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STORMWATER POLLUTION PREVENTION PLAN
for
248 Tioronda Ave

248 Tioronda Ave
City of Beacon
Dutchess County, New York

Issued: December 2019

Prepared for:

CHAI Builders
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Suffern, NY 10901

Prepared by:

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Chazen Project No. 81750.00

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PREPARER OF THE SWPPP

"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."

Name and Title[1]: Chris Lapine, P.E. - Director

Date: Issued: December 2019

[1] *This is a signature of a New York State licensed Professional Engineer employed by The Chazen Companies that is duly authorized to sign and seal Stormwater Pollution Prevention Plans (SWPPPs), NOIs, and NOTs prepared under their direct supervision. Refer to Appendix H for the Chazen Certifying Professionals Letter.*

TABLE OF CONTENTS

LIST OF TABLES

APPENDICES

1.0 EXECUTIVE SUMMARY

This Stormwater Pollution Prevention Plan (SWPPP) has been prepared for major activities associated with construction of 248 Tioronda Ave in the City of Beacon. This SWPPP includes the elements necessary to comply with the national baseline general permit for construction activities enacted by the U.S. Environmental Protection Agency (EPA) under the National Pollutant Discharge Elimination System (NPDES) program and all local governing agency requirements. This SWPPP must be implemented at the start of construction.

This SWPPP has been developed in accordance with the "New York State Department of Environmental Conservation (NYSDEC) State Pollution Discharge Elimination System (SPDES) General Permit for Stormwater Discharges from Construction Activity" General Permit Number GP-0-15-002, effective January 29, 2015 through January 28, 2020. The SWPPP and accompanying plans identify and detail stormwater management, pollution prevention, and erosion and sediment control measures necessary during and following completion of construction.

This SWPPP and the accompanying plans entitled "248 Tioronda Ave" have been submitted as a set. These engineering drawings are considered an integral part of this SWPPP. Therefore, this SWPPP is not considered complete without them. References made herein to "the plans" or to a specific "sheet" refer to these drawings.

This report considers the impacts associated with the intended development with the purpose of:

1. Maintaining existing drainage patterns as much as possible while continuing the conveyance of upland watershed runoff;
2. Controlling increases in the rate of stormwater runoff resulting from the proposed development so as not to adversely alter downstream conditions; and
3. Mitigating potential stormwater quality impacts and preventing soil erosion and sedimentation resulting from stormwater runoff generated both during and after construction.

The analysis and design completed and documented in this report is intended to be part of the application made for a mixed use multifamily and non-residential commercial development. Redevelopment project completed on behalf of the Owner/Operator.

1.1 Project Description

CHAI Builders is proposing a Redevelopment with increase in impervious surface. A location map of the site has been provided in Appendix G, as Figure 1.

This type of project is included in Table 2 of Appendix B of GP-0-15-002; and the project site is not located in one of the watersheds listed in Appendix C of GP-0-15-002. Therefore, this SWPPP includes post-construction stormwater management practices, as well as erosion and sediment controls.

This project is located within the City of Beacon regulated, traditional land use control Municipal Separate Stormwater Sewer System (MS4). Therefore, an MS4 SWPPP Acceptance Form is required to accompany NOIs submitted to the NYSDEC.

Runoff from the project site will discharge to the Fishkill Creek, which is not included in the list of Section 303(d) water bodies included in Appendix E of GP-0-15-002.

Project construction activities will consist primarily of site grading, paving, building construction, and the installation of storm drainage necessary to support the proposed Redevelopment. Construction phase pollutant sources anticipated at the site are disturbed (exposed) soil, vehicle fuels and lubricants, chemicals associated with building construction, and building materials. Without adequate control there is the potential for each type of pollutant to be transported by stormwater.

1.2 Stormwater Pollution Controls

The stormwater pollution controls outlined herein have been designed and evaluated in accordance with the following standards and guidelines:

- New York State Stormwater Management Design Manual, dated January 2015 (Design Manual).
- New York State Standards and Specifications for Erosion and Sediment Control, dated November 2016 (SSESC).

Stormwater quality will be enhanced through the implementation of temporary and permanent erosion and sediment control measures, the proposed stormwater management facilities, and other construction-phase pollution controls outlined herein.

The proposed stormwater collection system consisting of pipes, open drainage ways, and on-site stormwater management facilities will adequately collect, treat, and convey the stormwater runoff.

Bioretention ponds and a hydrodynamic separator will be used to manage and treat stormwater runoff generated by the proposed Redevelopment.

Pre- and post-development surface runoff rates have been evaluated for the 1-, 10-, and 100-year 24-hour storm events. Comparison of pre- and post-development watershed conditions demonstrates that the peak rate of runoff from the project site will not be increased.

The post-construction stormwater management practice(s) will be privately owned by the Applicant Deed restrictions will be in place, which require operation and maintenance of the practice(s) in accordance with the operation and maintenance plan.

1.3 Conclusion

This project is subject to the requirements of the City of Beacon regulated MS4, and this SWPPP has been prepared in conformance with the current Design Manual and SSESC. As such, GP-0-15-002 coverage will be effective five (5) business days from the date the NYSDEC receives the electronically submitted eNOI and signed “MS4 SWPPP Acceptance” form, or ten (10) business days from the date the NYSDEC receives the complete paper NOI and signed “MS4 SWPPP Acceptance” form.

2.0 SWPPP IMPLEMENTATION RESPONSIBILITIES

A summary of the responsibilities and obligations of all parties involved with compliance with the NYSDEC SPDES General Permit GP-0-15-002 conditions is outlined in the subsequent sections. For a complete listing of the definitions, responsibilities, and obligations, refer to the SPDES General Permit GP-0-15-002 presented in Appendix A.

2.1 Definitions

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

2. "Owner" or "Operator" means the person, persons, or legal entity which owns or leases the property on which the *construction activity* is occurring; and/or an entity that has operational control over the construction plans and specifications, including the ability to make modifications to the plans and specifications. There may be occasions during the course of a project in which there are multiple Owners/Operators, all of which will need to file and maintain the appropriate SWPPP documents and plans, including without limitation, the Notice of Intent (NOI) and Notice of Termination (NOT).

3. "Owner's/Operator's Engineer" means the person or entity retained by an Owner/Operator to design and oversee the implementation of the SWPPP.

4. "Contractor" means the person or entity identified as such in the construction contract with the Owner/Operator. The term "Contractor" shall also include the Contractor's authorized representative, as well as any and all subcontractors retained by the Contractor.

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

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

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

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

6. "Qualified Professional" means a person that is knowledgeable in the principles and practices of stormwater management and treatment, such as a licensed Professional Engineer, Registered Landscape Architect, or other Department endorsed individual(s). Individuals preparing SWPPPs

that require the post-construction stormwater management practice component must have an understanding of the principles of hydrology, water quality management practice design, water quantity control design, and, in many cases, the principles of hydraulics. All components of the SWPPP that involve the practice of engineering, as defined by the NYS Education Law (see Article 145), shall be prepared by, or under the direct supervision of, a professional engineer licensed to practice in the State of New York.

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

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

   The "Trained Contractor(s)" will be responsible for the day to day implementation of the SWPPP.

2.2 Owner's/Operator's Responsibilities

1. Ensure that control measures are selected, designed, installed, implemented and maintained to minimize the discharge of pollutants and prevent a violation of the water quality standards, meeting the non-numeric effluent limitations in Part I.B.1.(a)-(f) of the SPDES General Permit and in accordance with the New York State Standards and Specifications for Erosion and Sediment Control, dated November 2016.

2. Ensure that practices are selected, designed, installed, and maintained to meet the performance criteria in the Design Manual. Practices must be designed to meet the applicable sizing criteria in Part I.C.2.a., b., c. or d. of GP-0-15-002.

3. Retain the services of a "Qualified Inspector" or "Qualified Professional" as defined under Section 2.1, to provide the services outlined in Section 2.5 "Qualified Inspector's/Qualified Professional's Responsibilities."

4. Retain the services of a "Qualified Professional," as defined under Section 2.1, to provide the services outlined in Section 2.3 "Owner's/Operator's Engineers Responsibilities."

5. Have an authorized corporate officer sign the completed NOI. A copy of the completed NOI is included in Appendix B.

6. Submit the electronic version of the NOI (eNOI) along with the MS4 SWPPP acceptance form using the NYSDEC's website (http://www.dec.ny.gov/chemical/43133.html) or submit the signed NOI along with the MS4 SWPPP acceptance form to the following:

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

City of Beacon
1 Municipal Plaza
Beacon, NY 12508

7. Pay the required initial and annual fees upon receipt of invoices from NYSDEC. These invoices are generally issued in the fall of each year. The initial fee is calculated as $110.00 per acre disturbed plus $675.00 per acre of net increase in impervious cover, and the annual fee is $110.00.

8. Prior to the commencement of construction activity, identify the contractor(s) and subcontractor(s) that will be responsible for implementing the erosion and sediment control measures and stormwater management practices described in this SWPPP. Have each of these contractors and subcontractors identify at least one “Trained Contractor”, as defined under Section 2.1 that will be responsible for the implementation of the SWPPP. Ensure that the Contractor has at least one “Trained Contractor” on site on a daily basis when soil disturbance activities are being performed.

9. Schedule a pre-construction meeting which shall include the City of Beacon representative, Owner’s/Operator’s Engineer, Contractor, and their sub-contractors to discuss responsibilities as they relate to the implementation of this SWPPP.

10. Retain the services of an independent certified materials testing and inspection firm operating under the direction of a licensed Professional Engineer to perform regular tests, inspections, and certifications of the construction materials used in the construction of all post-construction stormwater management practices.

11. Retain the services of a NYS licensed land surveyor to perform an as-built topographic survey of the completed post-construction stormwater management facilities.

12. Require the Contractor to fully implement the SWPPP prepared for the site by the Owner/Operator’s Engineer to ensure that the provisions of the SWPPP are implemented from the commencement of construction activity until all areas of disturbance have achieved final stabilization and the Notice of Termination (NOT) has been submitted to the NYSDEC.

13. Forward a copy of the NOI Acknowledgement Letter received from the regulatory agency to the Owner’s/Operator’s Engineer for project records, and to the Contractor for display at the construction site.

14. Maintain a copy of the General Permit (GP-0-15-002), NOI, NOI Acknowledgement Letter, SWPPP, MS4 SWPPP Acceptance Form, inspection reports, Spill Prevention, Countermeasures, Cleanup (“SPCC”) Plan, and all documentation in accordance with Part I.F.8.a.-d of GP-0-15-002 necessary to demonstrate eligibility with the permit at the construction site, until all disturbed areas have achieved final stabilization and the NOT has been submitted to the NYSDEC. Place documents in a secure location that must be accessible during normal business hours to an individual performing a compliance inspection.

15. Prior to submitting a Notice of Termination, ensure for post-construction stormwater management practice(s) that are privately owned, the Owner/Operator has a deed restriction in place that requires operation and maintenance of the practice(s) in accordance with the operation and maintenance plan.

16. Submit a Notice of Termination (NOT) form (see Appendix B) within 48 hours of receipt of the Owner's/Operator's Engineer's certification of final site stabilization to the following:

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

    City of Beacon
    1 Municipal Plaza
    Beacon, NY 12508

17. Request and receive all SWPPP records from the Owner's/Operator's Engineer and archive those records for a minimum of five (5) years after the NOT is filed.

18. Implement the Post-Construction Inspections and Maintenance procedures outlined in Appendix F.

19. The NOI, SWPPP, and inspection reports required by GP-0-15-002 are public documents that the Owner/Operator must make available for review and copying by any person within five (5) business days of the Owner/Operator receiving a written request by any such person to review the NOI, SWPPP, or inspection reports. Copying of documents will be done at the requester's expense.

20. The Owner/Operator must keep the SWPPP current at all times. At a minimum, the Owner/Operator shall amend the SWPPP:

    a) Whenever the current provisions prove to be ineffective in minimizing pollutants in stormwater discharges from the project site;

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

    c) To address issues or deficiencies identified during an inspection by the "Qualified Inspector," the Department, or other Regulatory Authority.

2.3 Owner's/Operator's Engineer's Responsibilities

1. Prepare the SWPPP using good engineering practices, best management practices, and in compliance with all federal, state, and local regulatory requirements.

2. Prepare the Notice of Intent (NOI) form (see Appendix B), sign the "SWPPP Preparer Certification" section of the NOI, and forward to Owner/Operator for signature.

3. Provide copies of the SWPPP to the City of Beacon once all signatures and attachments are complete.

4. Enter Contractor's information in Section 2.5 "SWPPP Participants" once a Contractor is selected by the Owner/Operator.

5. Update the SWPPP each time there is a significant modification to the pollution prevention measures or a change of the principal Contractor working on the project who may disturb site soil.

2.4 Contractor's Responsibilities

1. Sign the SWPPP Contractor's Certification Form contained within Appendix C and forward to the Owner's/Operator's Engineer for inclusion in the Site Log Book.

2. Identify at least one Trained Contractor that will be responsible for implementation of this SWPPP. Ensure that at least one Trained Contractor is on site on a daily basis when soil disturbance activities are being performed. The Trained Contractor shall inspect the erosion and sediment control practices and pollution prevention measures being implemented within the active work area daily to ensure that they are being maintained in effective operating conditions at all times. If deficiencies are identified, the contractor shall begin implementing corrective actions within one business day and shall complete the corrective actions in a reasonable time frame.

3. Provide the names and addresses of all subcontractors working on the project site. Require all subcontractors who will be involved with construction activities that will result in soil disturbance to identify at least one Trained Contractor that will be on site on a daily basis when soil disturbance activities are being performed; and to sign a copy of the Subcontractor's Certification Form contained within Appendix C, then forward to the Owner's/Operator's Engineer for inclusion into the Site Log Book. This information must be retained as part of the Site Log Book.

4. Maintain a Spill Prevention and Response Plan in accordance with requirements outlined in Section 5.4 of this SWPPP. This plan shall be provided to the Owner's/Operator's Engineer for inclusion in the Site Log Book, prior to mobilization on-site.

5. Participate in a pre-construction meeting which shall include the City of Beacon representative, Owner/Operator, Owner's/Operator's Engineer, and all subcontractors to discuss responsibilities as they relate to the implementation of this SWPPP.

6. If Contractor plans on utilizing adjacent properties for material, waste, borrow, or equipment storage areas, or if Contractor plans to engage in industrial activity other than construction (such as operating asphalt and/or concrete plants) at the site, Contractor shall submit appropriate documentation to the Owner's/Operator's Engineer so that the SWPPP can be modified accordingly.

7. Implement site stabilization, erosion and sediment control measures, and other requirements of the SWPPP.

8. In accordance with the requirements in the most current version of the NYS Standards and Specifications for Erosion and Sediment Control, conduct inspections of erosion and sediment control measures installed at the site to ensure that they remain in effective operating condition at all times. Prepare and retain written documentation of inspections as well as of all repairs/maintenance activities performed. This information must be retained as part of the Site Log Book.

9. Begin implementing corrective actions within one (1) business day of receipt of notification by the Qualified Inspector/Qualified Professional that deficiencies exist with the erosion and sediment control measures employed at the site. Corrective actions shall be completed within a reasonable time frame.

10. Maintain a record of the date(s) and location(s) that soil restoration is performed in accordance with the accompanying plans and NYSDEC Division of Water's publication "Deep-Ripping and Decompaction," dated April 2008. A copy of this is publication is provided in Appendix E. The record that is to be maintained shall be a copy of the overall site grading plan delineating the area(s) and date(s) that the soil was restored.

11. Upon completion of all construction at the site, the contractor responsible for overall SWPPP Compliance shall sign the certification on their Contractor Certification Form indicating that: a.) all temporary erosion and sediment control measures have been removed from the site, b.) the on-site soils disturbed by construction activity have been restored in accordance with the SWPPP and the NYSDEC Division of Water's publication "Deep-Ripping and Decompaction," and c.) all permanent stormwater management practices required by the SWPPP have been installed in accordance with the contract documents.

2.5 Qualified Inspector's/Qualified Professional's Responsibilities

1. Participate in a pre-construction meeting with the City of Beacon representative, Owner/Operator, Contractor, and their subcontractors to discuss responsibilities as they relate to the implementation of this SWPPP.

2. Conduct an initial assessment of the site prior to the commencement of construction and certify in an inspection report that the appropriate erosion and sediment control measures described within this SWPPP have been adequately installed and implemented to ensure overall preparedness of the site.

3. Provide on-site inspections to determine compliance with the SWPPP. Site inspections shall occur at an interval of at least once every seven calendar days or, if at times, this project involves the disturbance of greater than five acres of soil at any one time, site inspections shall occur at an interval of at least twice every seven calendar days, with the inspections separated by a minimum of at least two full calendar days. A written inspection report shall be provided to the Owner/Operator and general contractor within one business day of the completion of the inspection, with any deficiencies identified. A sample inspection form is provided in Appendix D.

4. Prepare an inspection report subsequent to each and every inspection that shall include/address the items listed in Part IV.C.4.a-k of GP-0-15-002. Sign all inspection reports and maintain on site with the SWPPP.

5. Notify the owner/operator and appropriate contractor or subcontractor of any corrective actions that need to be taken.

6. Prepare a construction Site Log Book to be used as a record of all inspection reports generated throughout the duration of construction. Ensure that the construction Site Log Book is maintained and kept up-to-date throughout the duration of construction.

7. Review the Contractor's SWPPP records on a periodic basis to ensure compliance with the requirements for daily reports, soil restoration, inspections, and maintenance logs.

8. Based on the as-built survey and material testing certifications performed by others, perform evaluations of the completed stormwater management practices to determine whether they were constructed in accordance with this SWPPP.

9. Conduct a final site assessment and prepare a certification letter to the Owner/Operator indicating that, upon review of the material testing and inspection reports prepared by the firm retained by the Owner/Operator, review of the completed topographic survey, and evaluation of the completed stormwater management facilities, the stormwater management facilities have been constructed substantially in accordance with the contract documents and should function as designed.

10. Prepare the Notice of Termination (NOT). Sign the NOT Certifications VI (Final Stabilization) and VII (Post-construction Stormwater Management Practices), and forward the NOT to the Owner/Operator for signature on Certification VIII (Owner/Operator Certification).

11. Transfer the SWPPP documents, along with all NOI's, permit certificates, NOT's, construction Site Log Book, and written records required by the General Permit to the Owner/Operator for archiving.

2.6 SWPPP Participants

1. Owner's/Operator's Engineer: Chris Lapine, P.E. - Director
   The Chazen Companies
   21 Fox Street
   Poughkeepsie, NY 12601
   Phone: (845) 454-3980

2. Owner/Operator: CHAI Builderes
   120 Route 59, Suite 201
   Suffern, NY 10901
   Phone: 917-6964402

3. Contractor[2]:

Name and Title:	______________________________
Company Name:	______________________________
Mailing Address:	______________________________
	______________________________
Phone:	______________________________
Fax:	______________________________

[2] *Contractor's information to be entered once the Contractor has been selected.*

3.0 SITE CHARACTERISTICS

3.1 Land Use and Topography

The project parcel is in the Fishkill Creek Development (FCD) zone. It was previously the site of a Tuck Tape manufacturing facility. The facility was shuttered in the 1990's and has remained vacant since that time. In the late 2000's, the crumbling warehouse buildings were raized. There has also been an environmental cleanup at the site, which was monitored and approved by the NYSDEC.

Site elevations range from approximately 40 feet above mean sea level (MSL) to 120 feet MSL. The project site is quite narrow, approximately 1900 feet in length from north to south and 100-300 feet in width from west to east. The western portion of the site runs along an MTA railroad easement along Tioronda Avenue and is moderately sloped, with typical slopes of approximately 20-30%. The eastern portion of the site runs along the Fishkill Creek and is extremely sloped, with slopes in the range of 20-80%. The central portion of the site is relatively flat, with average slopes of 10-15%.

3.2 Soils and Groundwater

The United States Department of Agriculture (USDA) Soil Conservation Service (SCS) Soil Survey for Dutchess County was reviewed and provided surficial soil conditions for the study area.

The soils within the overall watershed are of the Udorthents classification. They fall into hydrologic soil groups A and D. According to the Soil Survey of Dutchess County, Udorthents typically range from being very deep to shallow, somewhat excessively drained to moderately well drained. They are found in disturbed areas and typically associated with areas that were subject to previous earthwork operations.

In an effort to ascertain a better understanding of the hydrologic nature of the on-site soils, Chazen observed deep tests at 11 locations at the site. We brought an excavator on site to investigate soil conditions and determine limiting factors such as groundwater, bedrock, and existing utilities. See Appendix K for the soil testing results. Our findings were consistent with the Soil Survey of Dutchess County. Layers consisted of fill material from the previous use on site, and a variety of clayey material.

Soil data as provided by the SCS is presented in Table 1.

Table 1: USDA Soil Data

Map Symbol & Description	Hydrologic Soil Group	Permeability (inches/hour)	Erosion Factor K	Depth to Water Table (feet)	Depth to Bedrock (inches)
Ud - Udorthents	A/D	0.06-20	0.37	>3.0	>60

Upon review of the soil data presented in Table 1, the project site does not contain soils with a soil slope phase of E or F.

The Soil Conservation Service defines the hydrologic soil groups as follows:

- Type A Soils: Soils having a high infiltration rate and low runoff potential when thoroughly wet. These soils consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a moderate rate of water transmission.

The soils map for the study area is presented in Appendix G, as Figure 2.

3.3 Watershed Designation

The project site is not located in a restricted watershed identified in Appendix C of GP-0-15-002.

3.4 Receiving Water Bodies

The nearest natural classified water body into which runoff from the project site will discharge is the Fishkill Creek.

The Fishkill Creek is classified by NYSDEC as a Class C water course, and is not included in the Section 303(d) list of impaired waters found in Appendix E of GP-0-15-002.

3.5 Aquifer Designation

The project site is not located over a US EPA designated Sole Source aquifer; nor is it located over a Primary or Principal aquifer listed in the NYSDEC Technical and Operational Guidance Series (TOGS) 2.1.3 (1980).

3.6 Wetlands

A search on the NYSDEC Environmental Resource Mapper on June 5, 2019, and a review of GIS data, determined that no regulated wetlands are located on or in the vicinity of the project site.

3.7 Flood Plains

According to the National Flood Insurance Program Flood Insurance Rate Map (FIRM), City of Beacon, New York, Community Panel Number 36027C0576E, the project site lies within Flood Zone X, areas determined to be outside 500-year floodplain.

3.8 Listed, Endangered, or Threatened Species

A search was performed on the NYSDEC Environmental Resource Mapper on June 5, 2019, and determined that the project site does contain threatened or endangered species, or critical habitat. An endangered, threatened, and rare species assessment, as prepared by Chazen, indicates that the hardwood/floodplain forest habitat on site could potentially support two threatened or endangered species, the Indiana Bat and the Bald Eagle. The proposed project will impact 0.6 acre of the upland hardwood forest habitat. The remaining 2.9 acres of upland riparian forest/floodplain wetlands on the site will be left undisturbed.

The NYSDEC New York Natural Heritage Program Letter dated July 24, 2013 indicated the presence of non-breeding bald eagle. By email dated August 8, 2013 from the NYSDEC, the Department indicated that the non-breeding occurrence is associated with wintering eagles and known roosting location, and that this roosting location is at the mouth of Fishkill Creek at the Hudson River at Denning's Point. This location is approximately 0.77 miles from the project site. According to the NYSDEC, there is no record of a breeding nest site within one mile of the project, but this should be reassessed annually until the project is constructed. The National Bald Eagle Management Guidelines would also recommend that the project minimize disruptive activities and development in the flight paths between nests, roost sites and important foraging areas; locate water dependent facilities away from foraging areas, avoid boating near foraging areas, and protect and preserve potential roost and nest sites by retaining, to the extent practicable, mature trees and old growth stands within 0.5 miles of the water. In this case, the project does not propose any marina or boating activities. The project will retain much of the wooded vegetation along Fishkill Creek. The activities proposed on the site are less disruptive than previous on-site activities associated with the Metro-North railroad. The project site will be reviewed annually for any nests until construction is completed. The US Fish and Wildlife Service did not have any concerns regarding possible use of the site by Bald Eagle. While the NYSDEC indicated that the closest occurrence of Indiana bat is more than 2.5 miles away, the USFWS requested that the project limit tree clearing to October 1 to March 31, minimize removal of large trees, use cut-off lighting, and not use pesticides or herbicides in any stormwater basins.

The stormwater discharges from the project site will not adversely impact listed, endangered or threatened species so long as the stormwater management practices have been constructed in accordance with this SWPPP.

An Environmental Resource Map has been provided in Appendix G, as Figure 4.

3.9 Historic Places

A search on the New York State Cultural Resource Information System (CRIS) database, performed on June 5, 2019, revealed that the property is not located within an archeologically sensitive area, and is not located on or immediately adjacent to a property listed or determined to be eligible for listing on the National or State Registers of Historic Places. Additionally, the construction activity does not include the construction of a new building within 50 feet 20-feet for 1-5 acres disturbance; 50-feet for 5-20 acres disturbance; 100-feet for 20+ acres of disturbance of any structure more than 50 years old. A printout of the historic places screening map is presented in Appendix G, as Figure 3.

3.10 Rainfall Data

Rainfall data utilized in the modeling and analysis was obtained from the Cornell University online Extreme Precipitation in New York & New England website (http://precip.eas.cornell.edu/). Rainfall data specific to the portion of Dutchess County under consideration, for various 24-hour storm events, is presented in the following Table:

Table 2: Rainfall Data

Storm Event Return Period	24-Hour Rainfall (inches)
1-year	2.80
10-year	5.20
100-year	7.81

These values were used to evaluate the pre- and post-development stormwater runoff characteristics.

4.0 CONSTRUCTION SEQUENCE

This project has not received written approval from City of Beacon allowing the disturbance of more than five acres of land at any one time. Therefore, if the Contractor's construction sequence requires the disturbance of more than five acres at any one time, written approval must be obtained from NYSDEC prior to disturbing more than five acres at once.

Should the waiver request be denied, the contractor shall limit the area of disturbance to less than five acres of disturbance at any given time. The Contractor shall prepare and submit to the Owner's/Operator's Engineer a sequencing plan that identifies the progression of construction through the site. This sequencing plan must be retained as part of the Site Log Book.

The "Erosion and Sediment Control Plan" and the "Erosion and Sediment Control Plan Prior to Construction" in the accompanying drawings and waiver request identifies the major construction activities that are the subject of this SWPPP. The order (or sequence) in which the major activities are expected to begin is presented on the accompanying drawings, though each activity will not necessarily be completed before the next begins. In addition, these activities could occur in a different order if necessary to maintain adequate erosion and sediment control. If this is the case, the contractor shall notify the Owner's/Operator's Engineer overseeing the implementation of the SWPPP.

The Contractor will be responsible for implementing the erosion and sediment control measures identified on the plans. The Contractor may designate these tasks to certain subcontractors as they see fit, but the ultimate responsibility for implementing these controls and ensuring their proper function remains with the Contractor.

Refer to the accompanying plans for details and specifications regarding the construction sequencing schedule.

5.0 CONSTRUCTION-PHASE POLLUTION CONTROL

The SWPPP and accompanying plans identify the temporary and permanent erosion and sediment control measures that have been incorporated into the design of this project. These measures will be implemented during construction, to minimize soil erosion and control sediment transport off-site, and after construction, to control the quality and quantity of stormwater runoff from the developed site.

Erosion control measures, designed to minimize soil loss, and sediment control measures, intended to retain eroded soil and prevent it from reaching water bodies or adjoining properties, have been developed in accordance with the following documents:

- NYSDEC SPDES General Permit for Stormwater Discharges From Construction Activity, Permit No. GP-0-15-002 (effective January 29, 2015 through January 28, 2020)
- New York State Standards and Specifications for Erosion and Sediment Control, NYSDEC (November 2016)

The SWPPP and accompanying plans outline the construction scheduling for implementing the erosion and sediment control measures. These documents include limitations on the duration of soil exposure, criteria and specifications for placement and installation of the erosion and sediment control measures, a maintenance schedule, and specifications for the implementation of erosion and sediment control practices and procedures.

Temporary and permanent erosion and sediment control measures that shall be applied during construction generally include:

1. Minimizing soil erosion and sedimentation by stabilization of disturbed areas and by removing sediment from construction site discharges.
2. Preservation of existing vegetation to the greatest extent practical. Following the completion of construction activities in any portion of the site, permanent vegetation shall be established on all exposed soils.
3. Site preparation activities to minimize the area and duration of soil disruption.
4. Establishment of permanent traffic corridors to ensure that “routes of convenience” are avoided.

5.1 Temporary Erosion and Sediment Control Measures

The temporary erosion and sediment control measures described in the following sections are included as part of the construction documents.

5.1.1 Stabilized Construction Access

Prior to construction, stabilized construction access(es) will be installed, per accompanying plans, to reduce the tracking of sediment onto public roadways.

Construction traffic must enter and exit the site at the stabilized construction access(es). The intent is to trap dust and mud that would otherwise be carried off-site by construction traffic.

The access(es) shall be maintained in a condition, which will control tracking of sediment onto public rights-of-way or streets. When necessary, additional aggregate will be placed atop the filter fabric to assure the minimum thickness is maintained. All sediment and/or soil spilled, dropped, or washed onto public rights-of-way must be removed immediately. Periodic inspection and needed maintenance shall be provided after each substantial rainfall event.

5.1.2 Dust Control

Water trucks shall be used as needed during construction to reduce dust generated on-site. Dust control must be provided by the Contractor(s) to a degree that is acceptable to the Owner, and in compliance with the applicable local and state dust control requirements.

5.1.3 Temporary Soil Stockpile

Materials, such as topsoil, will be temporarily stockpiled (if necessary) on the site during the construction process. Stockpiles shall be located in an area away from storm drainage, water bodies and/or courses, and will be properly protected from erosion by a surrounding silt fence barrier.

5.1.4 Silt Fencing

Prior to the initiation of and during construction activities, a geotextile filter fabric (or silt fence) will be established downgradient of all disturbed areas. These barriers may extend into non-impact areas to provide adequate protection of adjacent lands.

Clearing and grubbing will be performed only as necessary for the installation of the sediment control barrier. To facilitate effectiveness of the silt fencing, daily inspections and inspections immediately after significant storm events will be performed by the Contractor(s). Maintenance of the fence will be performed as needed.

5.1.5 Temporary Seeding

For areas undergoing clearing, grading, and disturbance as part of construction activities, where work has temporarily ceased, temporary soil stabilization measures must be initiated by the end of the next business day and completed within fourteen (14) days from the date the soil disturbance activity has temporarily ceased.

5.1.6 Stone and Block Drop Inlet Protection

Concrete blocks surrounded by wire mesh and crushed stone will be placed around both existing catch basins, and proposed catch basins once they have been installed, to prevent sediment from entering the catch basins and storm sewer system. During construction, crushed stone shall be replaced as necessary to ensure proper function.

5.1.7 Erosion Control Blanket

Erosion control blankets shall be installed in accordance with manufacturer’s requirements on all slopes exceeding 3:1. Erosion control blankets provide temporary erosion protection, rapid vegetative establishment, and long-term erosion resistance to shear stresses generated by high runoff flow velocities associated with steep slopes.

5.1.8 Stone Check Dams

Stone check dams will be installed within drainage ditches to reduce the velocity of stormwater runoff, promote settling of sediment, and reduce sediment transport off-site.

Sediment accumulated behind the stone check dam will be removed as needed to maintain flow through the stone check dam and prevent large flows from carrying sediment over or around the dam. Stones shall be replaced as needed to maintain the design cross section of the structures.

5.1.9 Temporary Diversion Swales

Temporary diversion swales shall be used to divert off-site runoff around the construction site and divert runoff from stabilized areas around disturbed areas.

5.1.10 Dewatering Operations

Dewatering will be used to intercept sediment-laden stormwater or pumped groundwater and allow it to settle out of the pumped discharge prior to being discharged from the site. Water from dewatering operations shall be treated to eliminate the discharge of sediment and other pollutants. Water resulting from dewatering operations shall be directed to temporary sediment traps or dewatering devices. Temporary sediment traps and dewatering bags will be provided, installed, and maintained at downgradient locations to control sediment deposits to downstream surfaces.

5.2 Permanent Erosion and Sediment Control Measures

The permanent erosion and sediment control measures described in the following sections are included as part of the construction documents.

5.2.1 Establishment of Permanent Vegetation

Disturbed areas that will be vegetated must be seeded in accordance with the contract documents. The type of seed, mulch, and maintenance measures as described in the contract documents shall also be followed.

Permanent soil stabilization measures must be initiated by the end of the next business day and completed within fourteen (14) days from the date the soil disturbance activity has permanently ceased.

Final site stabilization is achieved when all soil-disturbing activities at the site have been completed and a uniform, perennial vegetative cover with a density of 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.

5.2.2 Rock Outlet Protection

Rock outlet protection shall be installed at the locations as indicated and detailed on the accompanying plans. The installation of rock outlet protection will reduce the velocity and energy of water, such that the flow will not erode downstream surfaces.

5.2.3 Permanent Turf Reinforcement

Permanent turf reinforcement mats (TRMs) provide long-term erosion protection and vegetation establishment assistance while permanently reinforcing vegetation. TRMs shall be installed on slopes/channels where specified. TRM's provide two key advantages. First, their unique fiber shape and 3-D pattern create a thick matrix of voids that trap seed, soil, and water in place for quicker, thicker vegetation growth. Secondly, they provide additional reinforcement that doubles the vegetation's natural erosion protection abilities by remaining a permanent part of the application and anchoring mature plants to the soil for superior, long-term erosion resistance.

5.3 Other Pollutant Controls

Other necessary pollutant controls are listed below:

5.3.1 Solid and Liquid Waste Disposal

No solid or liquid waste materials, including building materials, shall be discharged from the site with stormwater. All solid waste, including disposable materials incidental to any construction activities, must be collected and placed in containers. The containers shall be emptied periodically by a licensed trash disposal service and hauled away from the site.

Substances that have the potential for polluting surface and/or groundwater must be controlled by whatever means necessary in order to ensure that they do not discharge from the site. As an example, special care must be exercised during equipment fueling and servicing operations. If a spill occurs, it must be contained and disposed of so that it will not flow from the site or enter groundwater, even if this requires removal, treatment, and disposal of soil. In this regard, potentially polluting substances should be handled in a manner consistent with the impact they represent.

5.3.2 Sanitary Facilities

Temporary sanitary facilities will be provided by the Contractor throughout the construction phase. They must be utilized by all construction personnel and will be serviced by a licensed commercial Contractor. These facilities must comply with state and local sanitary or septic system regulations.

5.3.3 Water Source

Non-stormwater components of site discharge must be clean water. Water used for construction, which discharges from the site, must originate from a public water supply or private well approved by the Health Department. Water used for construction that does not originate from an approved public supply must not discharge from the site; such water can be retained in temporary ponds/sediment traps until it infiltrates and/or evaporates.

5.4 Construction Housekeeping Practices

During the construction phase, the Contractor(s) will implement the following measures:

5.4.1 Material Stockpiles

Material resulting from clearing and grubbing operations that will be stockpiled on-site, must be adequately protected with downgradient erosion and sediment controls.

5.4.2 Equipment Cleaning and Maintenance

The Contractor(s) will designate areas for equipment cleaning, maintenance, and repair. The Contractor(s) and subcontractor(s) will utilize those areas. The areas will be protected by a temporary perimeter berm.

5.4.3 Detergents

The use of detergents for large-scale washing is prohibited (i.e., vehicles, buildings, pavement surfaces, etc.)

5.4.4 Spill Prevention and Response

A Spill Prevention and Response Plan shall be developed for the site by the Contractor(s). The plan shall detail the steps required in the event of an accidental spill and shall identify contact names and phone numbers of people and agencies that must be notified.

The plan shall include Safety Data Sheets (SDS) for all materials to be stored on-site. All workers on-site will be required to be trained on safe handling and spill prevention procedures for all materials used during construction. Regular tailgate safety meetings shall be held and all workers that are expected on the site during the week shall be required to attend.

5.4.5 Concrete Wash Areas

Concrete trucks will be allowed to wash out or discharge surplus concrete or drum wash water on the site, but only in specifically designated diked and impervious washout areas, which have been prepared to prevent contact between the concrete wash and stormwater. Waste generated from concrete wash water shall not be allowed to flow into drainage ways, inlets, receiving waters, or highway right of ways, or any location other than the designated concrete wash areas. Proper signage designating the "Concrete Wash Areas" shall be placed near the facility. Concrete wash areas shall be located at minimum 100 linear feet from drainage ways, inlets, and surface waters.

The hardened residue from the concrete wash areas will be disposed of in the same manner as other non-hazardous construction waste materials. Maintenance of the wash area is to include removal of hardened concrete. Facility shall have sufficient volume to contain all the concrete waste resulting from washout and a minimum freeboard of 12 inches. Facility shall not be filled beyond 95% capacity and shall be cleaned out once 75% full unless a new facility is constructed. The Contractor will be responsible for seeing that these procedures are followed.

Sawcut Portland Cement Concrete (PCC) slurry shall not be allowed to enter drainage ways, inlets, and/or surface waters. Sawcut residue should not be left on the surface of pavement or be allowed to flow over and off pavement.

The Project may require the use of multiple concrete wash areas. All concrete wash areas will be located in an area where the likelihood of the area contributing to stormwater discharges is negligible. If required, additional BMPs must be implemented to prevent concrete wastes from contributing to stormwater discharges.

5.4.6 Material Storage

Construction materials shall be stored in a dedicated staging area. The staging area shall be located in an area that prevents negative impacts of construction materials on stormwater quality.

Chemicals, paints, solvents, fertilizers, and other toxic material must be stored in waterproof containers. Except during application, the contents must be kept in trucks or within storage facilities. Runoff containing such material must be collected, removed from the site, treated, and disposed of at an approved solid waste or chemical disposal facility.

6.0 STORMWATER MANAGEMENT PLANNING

Chapter 3 of the Design Manual outlines a six-step planning process for site planning and selection of stormwater management practices that must be implemented for both new development and redevelopment projects. This process is intended to develop a design that maintains pre-construction hydrologic conditions through the application of environmentally sound development principles, as well as treatment and control of runoff discharges from the site. The following sections outline the step-by-step process and how it has been applied to this project.

The goals of this Stormwater Management Plan are to analyze the peak rate of runoff under pre- and post-development conditions, to maintain the pre-development rate of runoff in order to minimize impacts to adjacent or downstream properties, and to minimize the impact to the quality of runoff exiting the site.

The Design Manual provides both water quality and water quantity objectives to be met by projects requiring a "Full SWPPP". These objectives will be met by applying stormwater control practices to limit peak runoff rates and improve the quality of runoff leaving the developed site.

6.1 STEP 1 – Site Planning

During the Site Planning process, the project site is evaluated for implementation of the green infrastructure planning measures identified in Table 3.1 of the Design Manual, in order to preserve natural resources and reduce impervious cover. Table A of Appendix K provides a description of each green infrastructure planning measure, along with a project specific evaluation.

6.2 STEP 2 - Determine Water Quality Treatment Volume (WQv)

Stormwater runoff from impervious surfaces is recognized as a significant contributor of pollution that can adversely affect the quality of receiving water bodies. Therefore, treatment of stormwater runoff is important since most runoff related water quality contaminants are transported from land, particularly the impervious surfaces, during the initial stages of storm events.

6.2.1 NYSDEC Requirements for New Development

The Design Manual requires that water quality treatment be provided for the initial flush of runoff from every storm. The NYSDEC refers to the amount of runoff to be treated as the "Water Quality Volume" (WQv). Section 4.2 of the Design Manual defines the Water Quality Volume as follows:

$$WQv = \frac{[(P)(R_V)(A)]}{12}$$

Where:

	P	=	90% Rainfall Event Number
	R_v	=	0.05 + 0.009 (I), minimum R_v = 0.2
	I	=	Impervious Cover (Percent)
	A	=	Contributing Area in Acres

This definition ensures that, all other things being equal, the Water Quality Volume will increase along with the impervious cover percentage.

6.2.2 NYSDEC Requirements for Redevelopment Projects

Chapter 9 of the Design Manual outlines alternative WQv treatment objectives for redevelopment projects.

According to Section 9.2.1.B.II., redevelopment activities can achieve the water quality treatment objective if 25% of the water quality volume associated with the disturbed, impervious area is captured and treated by implementation of standard SMPs or reduced by application of RR techniques. In this case, 100% of any new impervious area must be treated. This project will implement bioretention ponds and hydrodynamic separators to meet the water quality objective.

The Water Quality Volume equation has been applied to the drainage area tributary to each of the stormwater quality practices proposed for this project. The practices have been sized to accommodate the Water Quality Volume, as per the performance criteria presented in Chapter 6 and/or Chapter 9 of the Design Manual. Water quality volume calculations for each of the proposed practices are presented in Table B of Appendix K.

6.3 STEP 3 – Apply Runoff Reduction Techniques and Standard SMPs with RRv Capacity to Reduce Total WQv

Land use change and development in the watershed increases the volume of runoff. As such, reductions in the amount of runoff from new development, accomplished through the implementation of a stormwater management plan for the site, will play an important role in the success or failure of the watershed-wide stormwater management plan. Runoff reduction techniques can be applied to manage, reduce, and treat stormwater, while maintaining and restoring natural hydrology through infiltration, evapo-transpiration, and the capture and reuse of stormwater. Volume reduction techniques by themselves typically are not sufficient to provide adequate attenuation of stormwater runoff, but they can decrease the size of the peak runoff rate reduction facilities.

6.3.1 NYSDEC Requirements for New Development

The Design Manual states that runoff reduction shall be achieved through infiltration, groundwater recharge, reuse, recycle, and/or evaporation/evapotranspiration of 100-percent of the post-development water quality volume to replicate pre-development hydrology. Runoff control techniques provide treatment in a distributed manner before runoff reaches the collection system, by maintaining pre-construction infiltration, peak runoff flow, discharge volume, as well as minimizing concentrated flow. This can be accomplished by applying a combination of Runoff Reduction Techniques, standard Stormwater Management Practices (SMPs) with RRv capacity, and good operation and maintenance.

6.3.2 NYSDEC Requirements for Redevelopment Projects

Section 3.2 of the Design Manual indicates, "Although encouraged, meeting the RRv criteria is not required for redevelopment activities that meet the criteria in Chapter 9 of this manual." This project involves the reconstruction of existing impervious area on a site that has adequate space for controlling stormwater runoff from the reconstructed area.

Although not required, bioretention ponds are proposed for this project and will provide both WQv and RRv at the site.

6.3.3 Methodology

In order to reduce the required WQv, a site-specific evaluation must be performed to determine the most practical means of reducing runoff volume. The Design Manual strongly encourages implementation of a combination of RR techniques and standard SMPs with RRv capacity. The following Table demonstrates a summary of the RRv practices being applied, and both the water quality and runoff reduction volumes they provide. The RR Technique(s) have been designed in accordance with Chapter 5 of the Design Manual. The standard SMP(s) with RRv capacity have been designed in accordance with Chapter 6 of the Design Manual. Refer to the contract drawings for practice dimensions, material specifications, and installation details. Practice specific calculations are presented in Table E of Appendix K.

Table 3: Summary of RR Techniques and Standard SMPs with RRv Capacity

RR Technique or Standard SMP with RRv Capacity	NYSDEC Design Variant	Pretreatment Volume Required (% of WQv)	Pretreatment Volume Provided (% of WQV)	WQv Required (CF)	WQv Provided (CF)	RRv Capacity	RRv Provided (CF)
Bioretention 1 & 2 (with underdrain) New Development	F-5	25	100	5,781	6,012	40%	2,405
						Total WQv Provided (CF)	**6,012**
						Total RRv Provided (CF)	**2,405**

6.3.4 Application of Standard Stormwater Management Practices (SMPs) with RRv Capacity

The standard SMPs with RRv capacity, described in the following section, have been incorporated into the stormwater management plan for this project. Design calculations for each measure have been included in Table E of Appendix K.

6.3.4.1 Bioretention (F-5)

Bioretention filters are shallow landscaped depressions commonly located in parking lot islands or within small pockets in residential areas that receive stormwater runoff. Stormwater flows into the bioretention area, ponds on the surface, and is gradually infiltrated into the soil bed. Pollutants are removed by a number of processes, such as adsorption, filtration, volatilization, ion exchange, and decomposition. Filtered runoff can either be allowed to infiltrate into the surrounding soil, functioning as an infiltration basin or rainwater garden or collected by an under drain system and discharged to the storm sewer system or directly to receiving waters, functioning like a surface sand filter. Runoff from larger storms is generally diverted past the bioretention area to the stormwater collection and conveyance system.

The Bioretention filters (F-5) were designed according to the criteria set forth in Section 6.4 “Stormwater Filtering Systems” of the Design Manual.

6.3.5 RRv Performance Summary

According to Section 3.6 of the Design Manual, "If the RRv calculated in this step is greater than or equal to the WQv calculated in Step 2, the designer has met the RRv requirement and may proceed to Step 6." A summary of the RRv provided is presented in the following table:

Table 4: Summary of RRv Provided

RRv Required = WQv Required (CF)	RRv Provided (CF)	% RRv Provided
13,859	2,405	16%

As indicated in the above table, the RRv provided is greater than the RRv required for the project site. As such, the design can proceed to Step 6.

6.4 STEP 4 – Determine the Minimum RRv Required

As previously discussed, meeting the RRv criteria is not required for redevelopment activities that meet the criteria in Chapter 9 of the Design Manual.

6.5 STEP 5 – Apply Standard Stormwater Management Practices to Address Remaining Water Quality Volume

If the entire Water Quality Volume is not reduced through implementation of RR techniques and standard SMPs with RRv capacity, then the design must achieve the remaining WQv through the standard SMPs listed in Table 3.3 of the Design Manual.

Table 5: Summary of WQv Provided

Step 2 WQv Required (CF)	Step 3 WQv Reduction by RR Techniques & Standard SMPs w/ RRv Capacity (CF)	Step 5 Reduced WQv to be Treated by Standard SMPs (CF)
13,859	6,012	7,487

Based upon the results listed in Tables 5, 100% of the required RRv and WQv have not been met through implementation of RR techniques and standard SMPs with RRv capacity. As such, the stormwater quality control systems (without RRv capacity) described in the following sections, have been incorporated into the stormwater management plan for this project, to meet the WQv objective.

6.5.1 Hydrodynamic Separators

Hydrodynamic separators accelerate the separation of floating and settling pollutants from stormwater through the use of a vortex. These pre-fabricated devices come in the form of an underground manhole or vault. The devices have no moving parts and are typically fabricated from concrete and marine grade aluminum.

During operation, stormwater runoff enters the unit tangentially to promote a gentle swirling motion in a treatment chamber. As stormwater circles within the chamber, settable solids fall into a sump and are retained. Buoyant debris, oil, and grease rise to the surface and are separated from the water as it flows under a baffle wall. Finally, treated water exits the treatment chamber through a flow control orifice located behind the baffle wall.

During low-flow conditions all runoff is diverted into the treatment chamber by a flow partition. At higher flow rates, a portion of the runoff spills over the flow partition and is diverted around the treatment chamber to prevent re-suspension and washout of previously trapped pollutants. Water that spills over the partition flows into a head equalization chamber above the treatment chamber outlet. As the head equalization chamber fills, the head differential driving flow through the treatment chamber collapses. The result is that flow rates in the treatment chamber remain relatively constant even as total flow rates increase substantially. This configuration further reduces the potential for re-suspension or washout.

According to Chapter 9 of the Design Manual, hydrodynamic separators of the type proposed for this project have been approved for use as a pretreatment system in new and redevelopment projects or as a primary treatment system on redevelopment projects.

STEP 6 - Table 6: Summary of WQ Practices

SWM Practice ID	NYSDEC Design Variant	Calculated WQv (CF)	Treatment Volume Required (% of WQv)	Treatment Volume Provided (CF)
Hydrodynamic Separator 2	HYDRO	3,494	75	3,494 (100%)
Hydrodynamic Separator 3	HYDRO	2,719	75	2,719 (100%)
Hydrodynamic Separator 5	HYDRO	3,159	75	3,159 (100%)
Total Treatment from Hydrodynamic Separators				**9,372**

6.6 Apply Volume and Peak Rate Control

This report presents the pre-development and post-development features and conditions associated with the rate of surface water runoff within the study area. For both cases, the drainage patterns, drainage structures, soil types, and ground cover types are considered in this study.

6.6.1 NYSDEC Requirements for New Development

Chapter 4 of the Design Manual requires that projects meet three separate stormwater quantity criteria:

1. The Channel Protection (CPv) requirement is designed to protect stream channels from erosion. This is accomplished by providing 24 hours of extended detention for the 1-year, 24-hour storm event. The Manual defines the CPv detention time as the center of mass detention time through each stormwater management practice.

2. The Overbank Flood Control (Qp) requirement is designed to prevent an increase in the frequency and magnitude of flow events that exceed the bank-full capacity of a channel, and therefore must spill over into the floodplain. This is accomplished by providing detention storage to ensure that, at each design point, the post-development 10-year 24-hour peak discharge rate does not exceed the corresponding pre-development rate.

3. The Extreme Flood Control (Qf) requirement is designed to prevent the increased risk of flood damage from large storm events, to maintain the boundaries of the pre-development 100-year floodplain, and to protect the physical integrity of stormwater management practices. This is accomplished by providing detention storage to ensure that, at each design point, the post-development 100-year 24-hour peak discharge rate does not exceed the corresponding pre-development rate.

Downstream analysis has been prepared for the project. Therefore, as described in Chapter 4 of the Design Manual, the stormwater quantity criteria described above do not apply to this project. However, a hydrologic and hydraulic analysis of the post-development project site has been performed in order to evaluate the performance of the proposed stormwater collection system.

6.6.2 Methodology

In order to demonstrate that the NYSDEC detention requirements are being met, the Design Manual requires that a hydrologic and hydraulic analysis of the pre- and post-development conditions be performed using the Natural Resources Conservation Service Technical Release 20 (TR-20) and Technical Release 55 (TR-55) methodologies. HydroCAD, developed by HydroCAD Software Solutions LLC of Tamworth, New Hampshire, is a Computer-Aided-Design (CAD) program for analyzing the hydrologic and hydraulic characteristics of a given watershed and associated stormwater management facilities. HydroCAD uses the TR-20 algorithms and TR-55 methods to create and route runoff hydrographs.

HydroCAD has the capability of computing hydrographs (which represent discharge rates characteristic of specified watershed conditions, precipitation, and geologic factors) combining hydrographs and routing flows though pipes, streams and ponds. HydroCAD can also calculate the center of mass detention time for various hydraulic features. Documentation for HydroCAD can be found on their website: http://www.hydrocad.net/.

For this analysis, the watershed and drainage system was broken down into a network consisting of two types of components as described below:

1. Subcatchment: A relatively homogeneous area of land, which produces a volume and rate of runoff unique to that area.
2. Pond: Natural or man-made impoundment, which temporarily stores stormwater runoff and empties in a manner determined by its geometry and the hydraulic structure located at its outlets.

Subcatchments and ponds are represented by hexagons and squares, respectively, on the watershed routing diagrams provided with the computations included in Appendix I and Appendix J.

The analysis of hydrologic and hydraulic conditions and proposed stormwater management facilities, servicing the study area, was performed by dividing the tributary watershed into relatively homogeneous subcatchments. The separation of the watershed into subcatchments was dictated by watershed conditions, methods of collection, conveyance, and points of discharge. Watershed characteristics for each subcatchment were then assessed from United States Geological Service (USGS) 7.5-minute topographic maps, aerial photographs, a topographical survey, soil surveys, site investigations, and land use maps.

Proposed stormwater management facilities were designed and evaluated in accordance with the Design Manual and local regulatory requirements. The hydrologic and hydraulic analysis considered the SCS, Type III 24-hour storm events identified in Table 8.

Table 7: Design Events

Facility	24-hour Storm Event
Storm Sewer	10-year
Detention Basin (pond)	1-year
	10-year
	100-year
Flood Conditions	100-year

6.6.3 Description of Design Points

The study area consists of an overall watershed that encompasses approximately 11.9 acres and contains the 5.93 acre project site. The overall watershed was broken down into smaller watersheds, or subcatchments, to allow for analysis of runoff conditions at several locations throughout the study area. Each of these locations was defined as a Design Point (DP) in order to compare the effects resulting from stormwater management facilities proposed as part of the project. Descriptions of each of the selected design points are provided below.

- Design Point 1: Off-site discharge to the Fishkill Creek downstream. Runoff enters the Fishkill Creek on the West side of the Creek and flows down to the Design Point.

6.6.4 Pre-development Watershed Conditions

The pre-development project site is covered predominantly by a combination of grass/woods and impervious surfaces. Analysis of pre-development conditions considered existing drainage patterns, soil types, ground cover, and topography. The Pre-Development Watershed Delineation Map has been provided in Appendix G, as Figure 4.

The results of the computer modeling used to analyze the overall watershed under pre-development conditions are presented in Appendix I. A summary of the pre-development watershed runoff rates at each design point is presented in Table 9.

6.6.5 Post-development Watershed Conditions

The post-development project site is covered predominantly by grass and impervious surfaces. The analysis of post-development conditions considered existing drainage patterns, soil types, ground cover to remain, planned site development, site grading and, stormwater management facilities proposed as part of site improvements. The Post-Development Watershed Delineation Map has been provided in Appendix G, as Figure 5.

The results of the computer modeling used to analyze the overall watershed under post-development conditions are presented in Appendix J. A summary of the post-development watershed runoff rates at each design point is presented in Table 9.

There are numerous locations and methods for providing controls of off-site discharge of stormwater from the project site. Each has been designed to provide the above quantity controls by attenuating stormwater runoff and releasing runoff to off-site locations at a rate equal to or less than that which existed prior to development of the site. Each device is detailed on the accompanying plans.

6.6.6 Performance Summary

A comparison of the pre- and post-development watershed conditions was performed for the design point and storm events evaluated herein. For the design point and design storms, this comparison demonstrates that the peak rate of runoff will not be increased. Therefore, the project will not have a significant adverse impact on the adjacent or downstream properties or receiving water courses.

The results of the computer modeling used to analyze the pre- and post-development watersheds are presented in Appendix I and Appendix J, respectively. The following Table summarizes the results of this analysis.

6.6.7 Downstream Analysis

The hydrologic evaluation and subsequent stormwater management design for this project evaluates the impact of site runoff on the peak flows of the Fishkill Creek. The design intent is to manage the peak rate of run-off during post-development conditions from the site in a manner that does not increase the peak flow rate or flood elevations of the Fishkill Creek. The point of interest for this project is where the Fishkill Creek crosses the eastern property line.

Information from the Flood Insurance Study (FIS) prepared for the Fishkill Creek was used to generate runoff hydrographs for the off-site, upstream watershed and the site watershed. The hydrographs were then reviewed to compare the timing of the off-site peak rate of runoff with the timing of the site watershed. A study location in the FIS was within or adjacent to the project site. Please see the FIS attached in Appendix L.

The FIS used various hydrologic analyses to establish the peak discharge frequency relationships for floods at locations along the creek. These methods included statistical analysis of stream gaging stations using several methods based on the available data, methods to regional frequency studies prepared by ACOE and methodologies developed by the Soil Conservation Service.

Subcatchment ES1 is made up of approximately 122,300-acres (+/-) of off-site and on-site drainage area, which encompasses the Fishkill Creek watershed northeast of the proposed site. This watershed drainage area generally consists of woods with light underbrush, meadows, residential, and impervious surfaces. Runoff from this subcatchment travels overland and is ultimately conveyed to the Fishkill Creek.

The computer model used to evaluate this project uses SCS methods TR-55 and TR-20 and generates hydrographs to compare the timing and flow rates from watersheds. Information from the FIS was incorporated into the model to provide a reasonable analysis of the site and upstream watershed runoff characteristics.

The results of the computer modeling used to analyze the pre- and post-development watersheds are presented in Appendix I and Appendix J, respectively. Table 5 summarizes the results of this analysis:

Table 8: Summary of Pre- and Post-Development Peak Discharge Rates

	Pre- vs. Post-Development Discharge Rate (cfs)					
Design Point (DP)	**1-year 24-hour storm event**		**10-year 24-hour storm event**		**100-year 24-hour storm event**	
	Pre	**Post**	**Pre**	**Post**	**Pre**	**Post**
1	1,349.72	1,349.72	6,047.51	6,047.51	12,834.86	12,834.86

As the table above shows, the proposed redevelopment project will not increase the post development peak discharge rates within the Fishkill Creek, during the 10-year or 100-year storm event by 5% or more. In fact, the table indicates that the proposed redevelopment project will not increase the post development peak discharge rates at all. This is most likely a result of the peak discharge from upstream areas being at a delay as compared to onsite conditions. Additionally, based on the hydrologic study, it is not anticipated that downstream structures will be adversely impacted by the redevelopment.

7.0 INSPECTIONS, MAINTENANCE, AND REPORTING

7.1 Inspection and Maintenance Requirements

7.1.1 Pre-Construction Inspection and Certification

Prior to the commencement of construction, the Qualified Inspector/Qualified Professional shall conduct an assessment of the site and certify that the appropriate erosion and sediment control measures have been adequately installed and implemented. The Contractor shall contact the Qualified Inspector/Qualified Professional once the erosion and sediment control measures have been installed.

7.1.2 Construction Phase Inspections and Maintenance

A Qualified Inspector/Qualified Professional, as defined in Appendix A of the General Permit GP-0-15-002, shall conduct regular site inspections between the time this SWPPP is implemented and final site stabilization. Site inspections shall occur at an interval of at least once every seven (7) calendar days.

The purpose of site inspections is to assess performance of pollutant controls. Based on these inspections, the Qualified Inspector/Qualified Professional will decide whether it is necessary to modify this SWPPP, add or relocate sediment barriers, or whatever else may be needed in order to prevent pollutants from leaving the site via stormwater runoff. The general contractor has the duty to cause pollutant control measures to be repaired, modified, maintained, supplemented, or whatever else is necessary in order to achieve effective pollutant control.

Examples of particular items to evaluate during site inspections are listed below. This list is not intended to be comprehensive. During each inspection the inspector must evaluate overall pollutant control system performance as well as particular details of individual system components. Additional factors should be considered as appropriate to the circumstances.

1. Locations where vehicles enter and exit the site must be inspected for evidence of off-site sediment tracking. A stabilized construction entrance will be constructed where vehicles enter and exit. This entrance will be maintained or supplemented as necessary to prevent sediment from leaving the site on vehicles.
2. Sediment barriers must be inspected and, if necessary, they must be enlarged or cleaned in order to provide additional capacity. All material from behind sediment barriers will be stockpiled on the up slope side. Additional sediment barriers must be constructed as needed.
3. Inspections will evaluate disturbed areas and areas used for storing materials that are exposed to rainfall for evidence of, or the potential for, pollutants entering the drainage system. If necessary, the materials must be covered or original covers must be repaired or supplemented. Also, protective berms must be constructed, if needed, in order to contain runoff from material storage areas.
4. Grassed areas will be inspected to confirm that a healthy stand of grass is maintained. The site has achieved final stabilization once all areas are covered with building foundation or pavement, or have a stand of grass with at least 80 percent density. The density of 80 percent or greater must be maintained to be considered as stabilized. Areas must be watered, fertilized, and reseeded as needed to achieve this goal.

5. All discharge points must be inspected to determine whether erosion control measures are effective in preventing significant impacts to receiving waters.

The inspection reports must be completed entirely and additional remarks should be included if needed to fully describe a situation. An important aspect of the inspection report is the description of additional measures that need to be taken to enhance plan effectiveness. The inspection report must identify whether the site was in compliance with the SWPPP at the time of inspection and specifically identify all incidents of non-compliance.

Within one (1) business day of the completion of an inspection, the *Qualified Inspector/Qualified Professional* shall notify the Owner/Operator and appropriate contractor or subcontractor of any corrective actions that need to be taken. The contractor or subcontractor shall begin implementing the corrective actions within one (1) business day of the notification and shall complete the corrective actions in a reasonable time frame.

In addition to the inspections performed by the *Qualified Inspector/Qualified Professional*, the Contractor shall perform routine inspections that include a visual check of all erosion and sediment control measures. All inspections and maintenance shall be performed in accordance with the inspection and maintenance schedule provided on the accompanying plans. Sediment removed from erosion and sediment control measures will be exported from the site, stockpiled for later use, or used immediately for general non-structural fill.

It is the responsibility of the general contractor to assure the adequacy of site pollutant discharge controls. Actual physical site conditions or contractor practices could make it necessary to install more structural controls than are shown on the accompanying plans. (For example, localized concentrations of runoff could make it necessary to install additional sediment barriers, sediment traps, etc.) Assessing the need for additional controls and implementing them or adjusting existing controls will be a continuing aspect of this SWPPP until the site achieves final stabilization.

7.1.3 Temporary Suspension of Construction Activities

For construction sites where soil disturbance activities have been temporarily suspended (e.g. Winter shutdown) and temporary stabilization measures have been applied to all disturbed areas, the frequency of Qualified Inspector/Qualified Professional inspections can be reduced to once every 30 calendar days. Prior to reducing the frequency of inspections, the Owner/Operator shall notify the NYSDEC Region 3 stormwater contact person and the City of Beacon in writing.

7.1.4 Partial Project Completion

For construction sites where soil disturbance activities have been shut down with partial project completion, all areas disturbed as of the project shutdown date have achieved final stabilization, and all post-construction stormwater management practices required for the completed portion of the project have been constructed in conformance with the SWPPP and are operational, the inspections by the Qualified Inspector/Qualified Professional can stop. Prior to the shutdown, the Owner/Operator shall notify the NYSDEC Region 3 stormwater contact person and the City of Beacon in writing.

If soil disturbance activities have not resumed within two years from the date of shutdown, a Notice of Termination (NOT) shall be properly completed and submitted to the NYSDEC.

7.1.5 Post-Construction Inspections and Maintenance

Inspections and maintenance of final stabilization measures and post-construction stormwater management practices shall be performed in accordance with Appendix F, once all disturbed areas are stabilized and all stormwater management systems are in place and operable.

7.2 Reporting Requirements

7.2.1 Inspection and Maintenance Reports

Inspection/maintenance reports shall be prepared prior to and during construction in accordance with the schedule outlined herein and in the SPDES General Permit GP-0-15-002 Part IV.C. The reports shall be prepared to identify and document the maintenance of the erosion and sediment control measures. A sample inspection form is provided in Appendix D.

Specifically, each inspection shall record the following information:

1. Date and time of inspection.
2. Name and title of person(s) performing inspection.
3. A description of the weather and soil conditions (e.g. dry, wet, saturated) at the time of the inspection.
4. A description of the condition of the runoff at all points of discharge from the construction site. This shall include identification of any discharges of sediment from the construction site. Include discharges from conveyance systems (i.e. pipes, culverts, ditches, etc.) and overland flow.
5. A description of the condition of all natural surface waterbodies located within, or immediately adjacent to, the property boundaries of the construction site which receive runoff from disturbed areas. This shall include identification of any discharges of sediment to the surface water body.
6. Identification of all erosion and sediment control practices and pollution prevention measures that need repair or maintenance.
7. Identification of all erosion and sediment control practices and pollution prevention measures that were not installed properly or are not functioning as designed and need to be reinstalled or replaced.
8. Description and sketch of areas with active soil disturbance activity, areas that have been disturbed but are inactive at the time of the inspection, and areas that have been stabilized (temporary and/or final) since the last inspection.
9. Indication of the current phase of construction of all post-construction stormwater management practices and identification of all construction that is not in conformance with the SWPPP and technical standards.

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

11. Identification and status of all corrective actions that were required by previous inspection.

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

All inspection reports shall be signed by the *Qualified Inspector*/*Qualified Professional*. Pursuant to Part II.C.2 of GP-0-15-002, the inspection reports shall be maintained on site with the SWPPP.

7.2.2 Site Log Book

The Owner/Operator shall retain a copy of the SWPPP required by GP-0-15-002 at the construction site from the date of initiation of construction activities to the date of final stabilization.

During construction, the Owner's/Operator's Engineer shall maintain a record of all SWPPP inspection reports at the site in the Site Log Book. The Site Log Book shall be maintained on-site and made available to the permitting authority, if necessary.

7.2.3 Post Construction Records and Archiving

Following construction, the Owner/Operator shall retain copies of the SWPPP, the complete construction Site Log Book, and records of all data used to complete the NOI to be covered by this permit, for a period of at least five years from the date that the site is finally stabilized. This period may be extended by the NYSDEC, at its sole discretion, at any time upon written notification.

Records shall be maintained of all post construction inspections and maintenance work performed in accordance with the requirements outlined in Appendix F.

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Appendix A:
NYSDEC SPDES General Permit GP-0-15-002

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

From

CONSTRUCTION ACTIVITY

Permit No. GP-0-15-002

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

Effective Date: January 29, 2015 Expiration Date: January 28, 2020

John J. Ferguson
Chief Permit Administrator

Authorized Signature 1 / 12 / 15
Date

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

PREFACE

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

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

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

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

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

Part I. PERMIT COVERAGE AND LIMITATIONS

A. Permit Application

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

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

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

3. *Construction activities* located in the watershed(s) identified in Appendix D that involve soil disturbances between five thousand (5,000) square feet and one (1) acre of land.

B. Effluent Limitations Applicable to Discharges from Construction Activities

*Discharge*s authorized by this permit must achieve, at a minimum, the effluent limitations in Part I.B.1. (a) – (f) of this permit. These limitations represent the degree of effluent reduction attainable by the application of best practicable technology currently available.

1. Erosion and Sediment Control Requirements - The *owner or operator* must select, design, install, implement and maintain control measures to *minimize* the *discharge* of *pollutants* and prevent a violation of the *water quality standards*. The selection, design, installation, implementation, and maintenance of these control measures must meet the non-numeric effluent limitations in Part I.B.1.(a) – (f) of this permit and be in accordance with the New York State Standards and Specifications for Erosion and Sediment Control, dated August 2005, using sound engineering judgment. Where control measures are not designed in conformance with the design criteria included in the technical standard, the *owner or operator* must include in the Stormwater Pollution Prevention Plan ("SWPPP") the reason(s) for the deviation or alternative design and provide information

which demonstrates that the deviation or alternative design is *equivalent* to the technical standard.

a. **Erosion and Sediment Controls.** Design, install and maintain effective erosion and sediment controls to *minimize* the *discharge* of *pollutants* and prevent a violation of the *water quality standards*. At a minimum, such controls must be designed, installed and maintained to:

(i) *Minimize* soil erosion through application of runoff control and soil stabilization control measure to *minimize pollutant discharge*s;

(ii) Control stormwater *discharge*s to *minimize* channel and streambank erosion and scour in the immediate vicinity of the *discharge* points;

(iii) *Minimize* the amount of soil exposed during *construction activity*;

(iv) *Minimize* the disturbance of *steep slopes*;

(v) *Minimize* sediment *discharge*s from the site;

(vi) Provide and maintain natural buffers around surface waters, direct stormwater to vegetated areas and maximize stormwater infiltration to reduce *pollutant discharge*s, unless *infeasible*;

(vii) *Minimize* soil compaction. Minimizing soil compaction is not required where the intended function of a specific area of the site dictates that it be compacted; and

(viii) Unless *infeasible*, preserve a sufficient amount of topsoil to complete soil restoration and establish a uniform, dense vegetative cover.

b. **Soil Stabilization**. In areas where soil disturbance activity has temporarily or permanently ceased, the application of soil stabilization measures must be initiated by the end of the next business day and completed within fourteen (14) days from the date the current soil disturbance activity ceased. For construction sites that *directly discharge* to one of the 303(d) segments listed in Appendix E or is located in one of the watersheds listed in Appendix C, the application of soil stabilization measures must be initiated by the end of the next business day and completed within seven (7) days from the date the current soil disturbance activity ceased. See Appendix A for definition of *Temporarily Ceased*.

c. **Dewatering**. *Discharge*s from dewatering activities, including *discharge*s from dewatering of trenches and excavations, must be managed by appropriate control measures.

d. **Pollution Prevention Measures**. Design, install, implement, and maintain effective pollution prevention measures to *minimize* the *discharge* of *pollutants* and prevent a violation of the *water quality standards*. At a minimum, such measures must be designed, installed, implemented and maintained to:

(i) *Minimize* the *discharge* of *pollutants* from equipment and vehicle washing, wheel wash water, and other wash waters. This applies to washing operations that use clean water only. Soaps, detergents and solvents cannot be used;

(ii) *Minimize* the exposure of building materials, building products, construction wastes, trash, landscape materials, fertilizers, pesticides, herbicides, detergents, sanitary waste and other materials present on the site to precipitation and to stormwater. Minimization of exposure is not required in cases where the exposure to precipitation and to stormwater will not result in a *discharge* of *pollutants*, or where exposure of a specific material or product poses little risk of stormwater contamination (such as final products and materials intended for outdoor use) ; and

(iii) Prevent the *discharge* of *pollutants* from spills and leaks and implement chemical spill and leak prevention and response procedures.

e. **Prohibited *Discharge*s.** The following *discharge*s are prohibited:

(i) Wastewater from washout of concrete;

(ii) Wastewater from washout and cleanout of stucco, paint, form release oils, curing compounds and other construction materials;

(iii) Fuels, oils, or other *pollutants* used in vehicle and equipment operation and maintenance;

(iv) Soaps or solvents used in vehicle and equipment washing; and

(v) Toxic or hazardous substances from a spill or other release.

f. Surface Outlets. When discharging from basins and impoundments, the outlets shall be designed, constructed and maintained in such a manner that sediment does not leave the basin or impoundment and that erosion

at or below the outlet does not occur.

C. Post-construction Stormwater Management Practice Requirements

1. The *owner or operator* of a *construction activity* that requires post-construction stormwater management practices pursuant to Part III.C. of this permit must select, design, install, and maintain the practices to meet the *performance criteria* in the New York State Stormwater Management Design Manual ("Design Manual"), dated January 2015, using sound engineering judgment. Where post-construction stormwater management practices ("SMPs") are not designed in conformance with the *performance criteria* in the Design Manual, the *owner or operator* must include in the SWPPP the reason(s) for the deviation or alternative design and provide information which demonstrates that the deviation or alternative design is *equivalent* to the technical standard.

2. The *owner or operator* of a *construction activity* that requires post-construction stormwater management practices pursuant to Part III.C. of this permit must design the practices to meet the applicable *sizing criteria* in Part I.C.2.a., b., c. or d. of this permit.

a. ***Sizing Criteria* for *New Development***

(i) Runoff Reduction Volume ("RRv"): Reduce the total Water Quality Volume ("WQv") by application of RR techniques and standard SMPs with RRv capacity. The total WQv shall be calculated in accordance with the criteria in Section 4.2 of the Design Manual.

(ii) Minimum RRv and Treatment of Remaining Total WQv: *Construction activities* that cannot meet the criteria in Part I.C.2.a.(i) of this permit due to *site limitations* shall direct runoff from all newly constructed *impervious areas* to a RR technique or standard SMP with RRv capacity unless *infeasible*. The specific *site limitations* that prevent the reduction of 100% of the WQv shall be documented in the SWPPP. For each *impervious area* that is not directed to a RR technique or standard SMP with RRv capacity, the SWPPP must include documentation which demonstrates that all options were considered and for each option explains why it is considered *infeasible.*

In no case shall the runoff reduction achieved from the newly constructed *impervious areas* be less than the Minimum RRv as calculated using the criteria in Section 4.3 of the Design Manual. The remaining portion of the total WQv that cannot be reduced shall be treated by application of standard SMPs.

(iii) Channel Protection Volume (“Cpv”): Provide 24 hour extended detention of the post-developed 1-year, 24-hour storm event; remaining after runoff reduction. The Cpv requirement does not apply when:
   (1) Reduction of the entire Cpv is achieved by application of runoff reduction techniques or infiltration systems, or

   (2) The site *discharge*s directly to tidal waters, or fifth order or larger streams.

(iv) Overbank Flood Control Criteria (“Qp”): Requires storage to attenuate the post-development 10-year, 24-hour peak *discharge* rate (Qp) to predevelopment rates. The Qp requirement does not apply when:
   (1) the site *discharge*s directly to tidal waters or fifth order or larger streams, or
   (2) A downstream analysis reveals that overbank control is not required.

(v) Extreme Flood Control Criteria (“Qf”): Requires storage to attenuate the post-development 100-year, 24-hour peak *discharge* rate (Qf) to predevelopment rates. The Qf requirement does not apply when:
   (1) the site *discharge*s directly to tidal waters or fifth order or larger streams, or
   (2) A downstream analysis reveals that overbank control is not required.

b. ***Sizing Criteria* for *New Development* in Enhanced Phosphorus Removal Watershed**

(i) Runoff Reduction Volume (RRv): Reduce the total Water Quality Volume (WQv) by application of RR techniques and standard SMPs with RRv capacity. The total WQv is the runoff volume from the 1-year, 24 hour design storm over the post-developed watershed and shall be calculated in accordance with the criteria in Section 10.3 of the Design Manual.

(ii) Minimum RRv and Treatment of Remaining Total WQv: *Construction activities* that cannot meet the criteria in Part I.C.2.b.(i) of this permit due to *site limitations* shall direct runoff from all newly constructed *impervious areas* to a RR technique or

standard SMP with RRv capacity unless *infeasible*. The specific *site limitations* that prevent the reduction of 100% of the WQv shall be documented in the SWPPP. For each *impervious area* that is not directed to a RR technique or standard SMP with RRv capacity, the SWPPP must include documentation which demonstrates that all options were considered and for each option explains why it is considered *infeasible.*

In no case shall the runoff reduction achieved from the newly constructed *impervious areas* be less than the Minimum RRv as calculated using the criteria in Section 10.3 of the Design Manual. The remaining portion of the total WQv that cannot be reduced shall be treated by application of standard SMPs.

(iii) Channel Protection Volume (Cpv): Provide 24 hour extended detention of the post-developed 1-year, 24-hour storm event; remaining after runoff reduction. The Cpv requirement does not apply when:
   (1) Reduction of the entire Cpv is achieved by application of runoff reduction techniques or infiltration systems, or

   (2) The site *discharge*s directly to tidal waters, or fifth order or larger streams.

(iv) Overbank Flood Control Criteria (Qp): Requires storage to attenuate the post-development 10-year, 24-hour peak *discharge* rate (Qp) to predevelopment rates. The Qp requirement does not apply when:
   (1) the site *discharge*s directly to tidal waters or fifth order or larger streams, or
   (2) A downstream analysis reveals that overbank control is not required.

(v) Extreme Flood Control Criteria (Qf): Requires storage to attenuate the post-development 100-year, 24-hour peak *discharge* rate (Qf) to predevelopment rates. The Qf requirement does not apply when:
   (1) the site *discharge*s directly to tidal waters or fifth order or larger streams, or
   (2) A downstream analysis reveals that overbank control is not required.

c. ***Sizing Criteria* for *Redevelopment Activity***

(i) Water Quality Volume (WQv): The WQv treatment objective for *redevelopment activity* shall be addressed by one of the following options. *Redevelopment activities* located in an Enhanced Phosphorus Removal Watershed (see Part III.B.3. and Appendix C of this permit) shall calculate the WQv in accordance with Section 10.3 of the Design Manual. All other *redevelopment activities* shall calculate the WQv in accordance with Section 4.2 of the Design Manual.

(1) Reduce the existing *impervious cover* by a minimum of 25% of the total disturbed, *impervious area*. The Soil Restoration criteria in Section 5.1.6 of the Design Manual must be applied to all newly created pervious areas, or
(2) Capture and treat a minimum of 25% of the WQv from the disturbed, *impervious area* by the application of standard SMPs; or reduce 25% of the WQv from the disturbed, *impervious area* by the application of RR techniques or standard SMPs with RRv capacity., or
(3) Capture and treat a minimum of 75% of the WQv from the disturbed, *impervious area* as well as any additional runoff from tributary areas by application of the alternative practices discussed in Sections 9.3 and 9.4 of the Design Manual., or
(4) Application of a combination of 1, 2 and 3 above that provide a weighted average of at least two of the above methods. Application of this method shall be in accordance with the criteria in Section 9.2.1(B) (IV) of the Design Manual.

If there is an existing post-construction stormwater management practice located on the site that captures and treats runoff from the *impervious area* that is being disturbed, the WQv treatment option selected must, at a minimum, provide treatment equal to the treatment that was being provided by the existing practice(s) if that treatment is greater than the treatment required by options 1 – 4 above.

(ii) Channel Protection Volume (Cpv): Not required if there are no changes to hydrology that increase the *discharge* rate from the project site.

(iii) Overbank Flood Control Criteria (Qp): Not required if there are no changes to hydrology that increase the *discharge* rate from the project site.

(iv) Extreme Flood Control Criteria (Qf): Not required if there are no changes to hydrology that increase the *discharge* rate from the project site.

d. ***Sizing Criteria* for Combination of *Redevelopment Activity* and *New Development***

Construction projects that include both *New Development* and *Redevelopment Activity* shall provide post-construction stormwater management controls that meet the *sizing criteria* calculated as an aggregate of the *Sizing Criteria* in Part I.C.2.a. or b. of this permit for the *New Development* portion of the project and Part I.C.2.c of this permit for *Redevelopment Activity* portion of the project.

D. Maintaining Water Quality

The Department expects that compliance with the conditions of this permit will control *discharge*s necessary to meet applicable *water quality standards*. It shall be a violation of the *ECL* for any discharge to either cause or contribute to a violation of *water quality standards* as contained in Parts 700 through 705 of Title 6 of the Official Compilation of Codes, Rules and Regulations of the State of New York, such as:

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

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

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

If there is evidence indicating that the stormwater *discharge*s authorized by this permit are causing, have the reasonable potential to cause, or are contributing to a violation of the *water quality standards*; the *owner or operator* must take appropriate corrective action in accordance with Part IV.C.5. of this general permit and document in accordance with Part IV.C.4. of this general permit. To address the *water quality standard* violation the *owner or operator* may need to provide additional information, include and implement appropriate controls in the SWPPP to correct the problem, or obtain an individual SPDES permit.

If there is evidence indicating that despite compliance with the terms and conditions of this general permit it is demonstrated that the stormwater *discharge*s authorized by this permit are causing or contributing to a violation of *water quality standards*, or if the Department determines that a modification of the permit is necessary to prevent a violation of *water quality standards*, the authorized *discharges* will no longer be eligible for coverage under this permit. The Department may require the *owner or operator* to obtain an individual SPDES permit to continue discharging.

E. Eligibility Under This General Permit

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

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

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

4. The *owner or operator* must maintain permit eligibility to *discharge* under this permit. Any *discharges* that are not compliant with the eligibility conditions of this permit are not authorized by the permit and the *owner or operator* must either apply for a separate permit to cover those ineligible *discharges* or take steps necessary to make the *discharge* eligible for coverage.

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

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

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

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

4. *Construction activities* or *discharges* from *construction activities* that may adversely affect an endangered or threatened species unless the *owner or operator* has obtained a permit issued pursuant to 6 NYCRR Part 182 for the project or the Department has issued a letter of non-jurisdiction for the project. All documentation necessary to demonstrate eligibility shall be maintained on site in accordance with Part II.C.2 of this permit.

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

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

   a. Where the *discharges* from the *construction activities* are tributary to waters of the state classified as AA or AA-s; and

   b. Which disturb one or more acres of land with no existing *impervious cover*; and

   c. Which are undertaken on land with a Soil Slope Phase that is identified as an E or F, or the map unit name is inclusive of 25% or greater slope, on the United States Department of Agriculture ("USDA") Soil Survey for the County where the disturbance will occur.

7. *Construction activities* for linear transportation projects and linear utility projects:

   a. Where the *discharges* from the *construction activities* are tributary to waters of the state classified as AA or AA-s; and

   b. Which disturb two or more acres of land with no existing *impervious cover*; and

   c. Which are undertaken on land with a Soil Slope Phase that is identified as an E or F, or the map unit name is inclusive of 25% or greater slope, on the USDA Soil Survey for the County where the disturbance will occur.

8. *Construction activities* that have the potential to affect an *historic property*, unless there is documentation that such impacts have been resolved. The following documentation necessary to demonstrate eligibility with this requirement shall be maintained on site in accordance with Part II.C.2 of this permit and made available to the Department in accordance with Part VII.F of this permit:

a. Documentation that the *construction activity* is not within an archeologically sensitive area indicated on the sensitivity map, and that the *construction activity* is not located on or immediately adjacent to a property listed or determined to be eligible for listing on the National or State Registers of Historic Places, and that there is no new permanent building on the construction site within the following distances from a building, structure, or object that is more than 50 years old, or if there is such a new permanent building on the construction site within those parameters that NYS Office of Parks, Recreation and Historic Preservation (OPRHP), a Historic Preservation Commission of a Certified Local Government, or a qualified preservation professional has determined that the building, structure, or object more than 50 years old is not historically/archeologically significant.

- 1-5 acres of disturbance - 20 feet
- 5-20 acres of disturbance - 50 feet
- 20+ acres of disturbance - 100 feet, or

b. DEC consultation form sent to OPRHP, and copied to the NYS DEC Agency Historic Preservation Officer (APO), and
(i) the State Environmental Quality Review (SEQR) Environmental Assessment Form (EAF) with a negative declaration or the Findings Statement, with documentation of OPRHP's agreement with the resolution; or
(ii) documentation from OPRHP that the *construction activity* will result in No Impact; or
(iii) documentation from OPRHP providing a determination of No Adverse Impact; or
(iv) a Letter of Resolution signed by the owner/operator, OPRHP and the DEC APO which allows for this *construction activity* to be eligible for coverage under the general permit in terms of the State Historic Preservation Act (SHPA); or

c. Documentation of satisfactory compliance with Section 106 of the National Historic Preservation Act for a coterminous project area:
(i) No Affect
(ii) No Adverse Affect

(iii) Executed Memorandum of Agreement, or

d. Documentation that:
(i) SHPA Section 14.09 has been completed by NYS DEC or another state agency.

9. *Discharges* from *construction activities* that are subject to an existing SPDES individual or general permit where a SPDES permit for *construction activity* has been terminated or denied; or where the *owner or operator* has failed to renew an expired individual permit.

Part II. OBTAINING PERMIT COVERAGE

A. Notice of Intent (NOI) Submittal

1. An *owner or operator* of a *construction activity* that is <u>not</u> subject to the requirements of a *regulated, traditional land use control MS4* must first prepare a SWPPP in accordance with all applicable requirements of this permit and then submit a completed NOI form to the Department in order to be authorized to *discharge* under this permit. An *owner or operator* shall use either the electronic (eNOI) or paper version of the NOI that the Department prepared. Both versions of the NOI are located on the Department's website (http://www.dec.ny.gov/). The paper version of the NOI shall be signed in accordance with Part VII.H. of this permit and submitted to the following address.

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

2. An *owner or operator* of a *construction activity* that is subject to the requirements of a *regulated, traditional land use control MS4* must first prepare a SWPPP in accordance with all applicable requirements of this permit and then have its SWPPP reviewed and accepted by the *regulated, traditional land use control MS4* prior to submitting the NOI to the Department. The *owner or operator* shall have the "MS4 SWPPP Acceptance" form signed in accordance with Part VII.H., and then submit that form along with a completed NOI to the Department. An *owner or operator* shall use either the electronic (eNOI) or paper version of the NOI.

The paper version of the NOI shall be signed in accordance with Part VII.H. of this permit and submitted to the address in Part II.A.1.

The requirement for an *owner or operator* to have its SWPPP reviewed and accepted by the *MS4* prior to submitting the NOI to the Department does not apply to an *owner or operator* that is obtaining permit coverage in accordance with the requirements in Part II.E. (Change of *Owner or Operator*) or where the *owner or operator* of the *construction activity* is the *regulated, traditional land use control MS4*.

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

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

B. Permit Authorization

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

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

   a. project review pursuant to the State Environmental Quality Review Act ("SEQRA") have been satisfied, when SEQRA is applicable. See the Department's website (http://www.dec.ny.gov/) for more information,

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

   c. the final SWPPP has been prepared, and

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

3. An *owner or operator* that has satisfied the requirements of Part II.B.2 above

will be authorized to *discharge* stormwater from their *construction activity* in accordance with the following schedule:

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

      (i) Five (5) business days from the date the Department receives a complete electronic version of the NOI (eNOI) for *construction activities* with a SWPPP that has been prepared in conformance with the design criteria in the technical standard referenced in Part III.B.1 and the *performance criteria* in the technical standard referenced in Parts III.B., 2 or 3, for *construction activities* that require post-construction stormwater management practices pursuant to Part III.C.; or

      (ii) Sixty (60) business days from the date the Department receives a complete NOI (electronic or paper version) for *construction activities* with a SWPPP that has <u>not</u> been prepared in conformance with the design criteria in technical standard referenced in Part III.B.1. or, for *construction activities* that require post-construction stormwater management practices pursuant to Part III.C., the *performance criteria* in the technical standard referenced in Parts III.B., 2 or 3, or;

      (iii) Ten (10) business days from the date the Department receives a complete paper version of the NOI for *construction activities* with a SWPPP that has been prepared in conformance with the design criteria in the technical standard referenced in Part III.B.1 and the *performance criteria* in the technical standard referenced in Parts III.B., 2 or 3, for *construction activities* that require post-construction stormwater management practices pursuant to Part III.C.

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

      (i) Five (5) business days from the date the Department receives both a complete electronic version of the NOI (eNOI) and signed "*MS4* SWPPP Acceptance" form, or

      (ii) Ten (10) business days from the date the Department receives both a complete paper version of the NOI and signed "MS4 SWPPP Acceptance" form.

4. The Department may suspend or deny an *owner's or operator's* coverage

under this permit if the Department determines that the SWPPP does not meet the permit requirements. In accordance with statute, regulation, and the terms and conditions of this permit, the Department may deny coverage under this permit and require submittal of an application for an individual SPDES permit based on a review of the NOI or other information pursuant to Part II.

5. Coverage under this permit authorizes stormwater *discharges* from only those areas of disturbance that are identified in the NOI. If an *owner or operator* wishes to have stormwater *discharges* from future or additional areas of disturbance authorized, they must submit a new NOI that addresses that phase of the development, unless otherwise notified by the Department. The *owner or operator* shall not *commence construction activity* on the future or additional areas until their authorization to *discharge* under this permit goes into effect in accordance with Part II.B. of this permit.

C. General Requirements For Owners or Operators With Permit Coverage

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

2. The *owner or operator* shall maintain a copy of the General Permit (GP-0-15-002), NOI, *NOI Acknowledgment Letter*, SWPPP, MS4 SWPPP Acceptance form, inspection reports, and all documentation necessary to demonstrate eligibility with this permit at the construction site until all disturbed areas have achieved *final stabilization* and the NOT has been submitted to the Department. The documents must be maintained in a secure location, such as a job trailer, on-site construction office, or mailbox with lock. The secure location must be accessible during normal business hours to an individual performing a compliance inspection.

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

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

   b. In areas where soil disturbance activity has temporarily or permanently ceased, the application of soil stabilization measures must be initiated by the end of the next business day and completed within seven (7) days from the date the current soil disturbance activity ceased. The soil stabilization measures selected shall be in conformance with the technical standard, New York State Standards and Specifications for Erosion and Sediment Control, dated August 2005.

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

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

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

4. In accordance with statute, regulations, and the terms and conditions of this permit, the Department may suspend or revoke an *owner's or operator's* coverage under this permit at any time if the Department determines that the SWPPP does not meet the permit requirements. Upon a finding of significant non-compliance with the practices described in the SWPPP or violation of this permit, the Department may order an immediate stop to all activity at the site until the non-compliance is remedied. The stop work order shall be in writing, describe the non-compliance in detail, and be sent to the *owner or operator*.

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

D. Permit Coverage for Discharges Authorized Under GP-0-10-001

1. Upon renewal of SPDES General Permit for Stormwater Discharges from *Construction Activity* (Permit No. GP-0-10-001), an *owner or operator* of *a construction activity* with coverage under GP-0-10-001, as of the effective date of GP-0-15-002, shall be authorized to *discharge* in accordance with GP-0-15-002, unless otherwise notified by the Department.

   An *owner or operator* may continue to implement the technical/design components of the post-construction stormwater management controls provided that such design was done in conformance with the technical standards in place at the time of initial project authorization. However, they must comply with the other, non-design provisions of GP-0-15-002.

E. Change of *Owner or Operator*

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

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

Part III. STORMWATER POLLUTION PREVENTION PLAN (SWPPP)

A. General SWPPP Requirements

1. A SWPPP shall be prepared and implemented by the *owner or operator* of each *construction activity* covered by this permit. The SWPPP must document the selection, design, installation, implementation and maintenance of the control measures and practices that will be used to meet the effluent limitations in Part I.B. of this permit and where applicable, the post-construction stormwater management practice requirements in Part I.C. of this permit. The SWPPP shall be prepared prior to the submittal of the NOI. The NOI shall be submitted to the Department prior to the *commencement of construction activity*. A copy of the completed, final NOI shall be included in the SWPPP.

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

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

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

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

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

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

5. The Department may notify the *owner or operator* at any time that the

SWPPP does not meet one or more of the minimum requirements of this permit. The notification shall be in writing and identify the provisions of the SWPPP that require modification. Within fourteen (14) calendar days of such notification, or as otherwise indicated by the Department, the *owner or operator* shall make the required changes to the SWPPP and submit written notification to the Department that the changes have been made. If the *owner or operator* does not respond to the Department's comments in the specified time frame, the Department may suspend the *owner's or operator's* coverage under this permit or require the *owner or operator* to obtain coverage under an individual SPDES permit in accordance with Part II.C.4. of this permit.

6. Prior to the *commencement of construction activity*, the *owner or operator* must identify the contractor(s) and subcontractor(s) that will be responsible for installing, constructing, repairing, replacing, inspecting and maintaining the erosion and sediment control practices included in the SWPPP; and the contractor(s) and subcontractor(s) that will be responsible for constructing the post-construction stormwater management practices included in the SWPPP. The *owner or operator* shall have each of the contractors and subcontractors identify at least one person from their company that will be responsible for implementation of the SWPPP. This person shall be known as the *trained contractor.* The *owner or operator* shall ensure that at least one *trained contractor* is on site on a daily basis when soil disturbance activities are being performed.

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

   > "I hereby certify under penalty of law that I understand and agree to comply with the terms and conditions of the SWPPP and agree to implement any corrective actions identified by the *qualified inspector* during a site inspection. I also understand that the *owner or operator* must comply with the terms and conditions of the most current version of the New York State Pollutant Discharge Elimination System ("SPDES") general permit for stormwater *discharge*s 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"

   In addition to providing the certification statement above, the certification page must also identify the specific elements of the SWPPP that each contractor and subcontractor will be responsible for and include the name and title of the person providing the signature; the name and title of the

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

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

B. Required SWPPP Contents

1. Erosion and sediment control component - All SWPPPs prepared pursuant to this permit shall include erosion and sediment control practices designed in conformance with the technical standard, New York State Standards and Specifications for Erosion and Sediment Control, dated August 2005. Where erosion and sediment control practices are not designed in conformance with the design criteria included in the technical standard, the *owner or operator* must demonstrate *equivalence* to the technical standard. At a minimum, the erosion and sediment control component of the SWPPP shall include the following:

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

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

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

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

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

f. A temporary and permanent soil stabilization plan that meets the requirements of this general permit and the technical standard, New York State Standards and Specifications for Erosion and Sediment Control, dated August 2005, for each stage of the project, including initial land clearing and grubbing to project completion and achievement of *final stabilization*;

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

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

i. A maintenance inspection schedule for the contractor(s) identified in Part III.A.6. of this permit, to ensure continuous and effective operation of the erosion and sediment control practices. The maintenance inspection schedule shall be in accordance with the requirements in the technical standard, New York State Standards and Specifications for Erosion and Sediment Control, dated August 2005;

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

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

l. Identification of any elements of the design that are not in conformance with the design criteria in the technical standard, New York State Standards and Specifications for Erosion and Sediment Control, dated August 2005. Include the reason for the deviation or alternative design

and provide information which demonstrates that the deviation or alternative design is *equivalent* to the technical standard.

2. Post-construction stormwater management practice component – The *owner or operator* of any construction project identified in Table 2 of Appendix B as needing post-construction stormwater management practices shall prepare a SWPPP that includes practices designed in conformance with the applicable *sizing criteria* in Part I.C.2.a., c. or d. of this permit and the *performance criteria* in the technical standard, New York State Stormwater Management Design Manual dated January 2015

Where post-construction stormwater management practices are not designed in conformance with the *performance criteria* in the technical standard, the *owner or operator* must include in the SWPPP the reason(s) for the deviation or alternative design and provide information which demonstrates that the deviation or alternative design is *equivalent* to the technical standard.

The post-construction stormwater management practice component of the SWPPP shall include the following:

a. Identification of all post-construction stormwater management practices to be constructed as part of the project. Include the dimensions, material specifications and installation details for each post-construction stormwater management practice;

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

c. A Stormwater Modeling and Analysis Report that includes:

(i) Map(s) showing pre-development conditions, including watershed/subcatchments boundaries, flow paths/routing, and design points;

(ii) Map(s) showing post-development conditions, including watershed/subcatchments boundaries, flow paths/routing, design points and post-construction stormwater management practices;

(iii) Results of stormwater modeling (i.e. hydrology and hydraulic analysis) for the required storm events. Include supporting calculations (model runs), methodology, and a summary table that compares pre and post-development runoff rates and volumes for the different storm events;

(iv) Summary table, with supporting calculations, which demonstrates that each post-construction stormwater management practice has been designed in conformance with the *sizing criteria* included in the Design Manual;

(v) Identification of any *sizing criteria* that is not required based on the requirements included in Part I.C. of this permit; and

(vi) Identification of any elements of the design that are not in conformance with the *performance criteria* in the Design Manual. Include the reason(s) for the deviation or alternative design and provide information which demonstrates that the deviation or alternative design is *equivalent* to the Design Manual;

d. Soil testing results and locations (test pits, borings);

e. Infiltration test results, when required; and

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

3. Enhanced Phosphorus Removal Standards - All construction projects identified in Table 2 of Appendix B that are located in the watersheds identified in Appendix C shall prepare a SWPPP that includes post-construction stormwater management practices designed in conformance with the applicable *sizing criteria* in Part I.C.2. b., c. or d. of this permit and the *performance criteria,* Enhanced Phosphorus Removal Standards included in the Design Manual. At a minimum, the post-construction stormwater management practice component of the SWPPP shall include items 2.a - 2.f. above.

C. Required SWPPP Components by Project Type

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

IV.

Part IV. INSPECTION AND MAINTENANCE REQUIREMENTS

A. General Construction Site Inspection and Maintenance Requirements

1. The *owner or operator* must ensure that all erosion and sediment control practices (including pollution prevention measures) and all post-construction stormwater management practices identified in the SWPPP are inspected and maintained in accordance with Part IV.B. and C. of this permit.

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

B. Contractor Maintenance Inspection Requirements

1. The *owner or operator* of each *construction activity* identified in Tables 1 and 2 of Appendix B shall have a *trained contractor* inspect the erosion and sediment control practices and pollution prevention measures being implemented within the active work area daily to ensure that they are being maintained in effective operating condition at all times. If deficiencies are identified, the contractor shall begin implementing corrective actions within one business day and shall complete the corrective actions in a reasonable time frame.

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

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

C. Qualified Inspector Inspection Requirements

The *owner or operator* shall have a *qualified inspector* conduct site inspections in conformance with the following requirements:

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

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

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

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

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

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

d. *construction activities* located in the watersheds identified in Appendix D that involve soil disturbances between five thousand (5,000) square feet and one (1) acre of land.

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

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

b. For construction sites where soil disturbance activities are on-going and

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

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

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

e. For construction sites that directly *discharge* to one of the 303(d) segments listed in Appendix E or is located in one of the watersheds listed in Appendix C, the *qualified inspector* shall conduct at least two (2) site inspections every seven (7) calendar days. The two (2) inspections shall be separated by a minimum of two (2) full calendar days.

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

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

a. Date and time of inspection;

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

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

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

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

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

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

h. Description and sketch of areas with active soil disturbance activity, areas that have been disturbed but are inactive at the time of the inspection, and areas that have been stabilized (temporary and/or final) since the last inspection;

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

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

k. Identification and status of all corrective actions that were required by previous inspection; and

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

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

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

V. **Part V. TERMINATION OF PERMIT COVERAGE**

A. Termination of Permit Coverage

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

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

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

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

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

   d. The *owner or operator* obtains coverage under an alternative SPDES general permit or an individual SPDES permit.

3. For *construction activities* meeting subdivision 2a. or 2b. of this Part, the *owner or operator* shall have the *qualified inspector* perform a final site inspection prior to submitting the NOT. The *qualified inspector* shall, by signing the "*Final Stabilization*" and "Post-Construction Stormwater Management Practice certification statements on the NOT, certify that all the requirements in Part V.A.2.a. or b. of this permit have been achieved.

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

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

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

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

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

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

Part VI. REPORTING AND RETENTION OF RECORDS

A. Record Retention

The *owner or operator* shall retain a copy of the NOI, NOI Acknowledgment Letter, SWPPP, MS4 SWPPP Acceptance form and any inspection reports that were prepared in conjunction with this permit for a period of at least five (5) years from the date that the Department receives a complete NOT submitted in accordance with Part V. of this general permit.

B. Addresses

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

Part VII. STANDARD PERMIT CONDITIONS

A. Duty to Comply

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

If any human remains or archaeological remains are encountered during excavation, the *owner or operator* must immediately cease, or cause to cease, all *construction activity* in the area of the remains and notify the appropriate Regional Water Engineer (RWE). *Construction activity* shall not resume until written permission to do so has been received from the RWE.

B. Continuation of the Expired General Permit

This permit expires five (5) years from the effective date. If a new general permit is not issued prior to the expiration of this general permit, an *owner or operator* with coverage under this permit may continue to operate and *discharge* in accordance with the terms and conditions of this general permit, if it is extended pursuant to the State Administrative Procedure Act and 6 NYCRR Part 621, until a new general permit is issued.

C. Enforcement

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

D. Need to Halt or Reduce Activity Not a Defense

It shall not be a defense for an *owner or operator* in an enforcement action that it would have been necessary to halt or reduce the *construction activity* in order to maintain compliance with the conditions of this permit.

E. Duty to Mitigate

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

F. Duty to Provide Information

The *owner or operator* shall furnish to the Department, within a reasonable specified time period of a written request, all documentation necessary to demonstrate eligibility and any information to determine compliance with this permit or to determine whether cause exists for modifying or revoking this permit, or suspending or denying coverage under this permit, in accordance with the terms and conditions of this permit. The NOI, SWPPP and inspection reports required by this permit are public documents that the *owner or operator* must make available for review and copying by any person within five (5) business days of the *owner or operator* receiving a written request by any such person to review these documents. Copying of documents will be done at the requester's expense.

G. Other Information

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

H. Signatory Requirements

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

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

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

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

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

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

(i) the chief executive officer of the agency, or

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

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

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

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

individual or any individual occupying a named position) and,

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

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

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

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

I. Property Rights

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

J. Severability

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

K. Requirement to Obtain Coverage Under an Alternative Permit

1. The Department may require any *owner or operator* authorized by this permit to apply for and/or obtain either an individual SPDES permit or another SPDES general permit. When the Department requires any *discharge*r authorized by a general permit to apply for an individual SPDES permit, it shall notify the *discharge*r in writing that a permit application is required. This notice shall include a brief statement of the reasons for this decision, an application form, a statement setting a time frame for the *owner or operator* to file the application for an individual SPDES permit, and a deadline, not sooner than 180 days from *owner or operator* receipt of the notification letter, whereby the authorization to

discharge under this general permit shall be terminated. Applications must be submitted to the appropriate Permit Administrator at the Regional Office. The Department may grant additional time upon demonstration, to the satisfaction of the Department, that additional time to apply for an alternative authorization is necessary or where the Department has not provided a permit determination in accordance with Part 621 of this Title.

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

L. Proper Operation and Maintenance

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

M. Inspection and Entry

The *owner or operator* shall allow an authorized representative of the Department, EPA, applicable county health department, or, in the case of a construction site which *discharges* through an *MS4*, an authorized representative of the *MS4* receiving the discharge, upon the presentation of credentials and other documents as may be required by law, to:

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

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

3. Inspect at reasonable times any facilities or equipment (including monitoring and control equipment), practices or operations regulated or required by this permit.

4. Sample or monitor at reasonable times, for purposes of assuring permit compliance or as otherwise authorized by the Act or ECL, any substances or parameters at any location.

N. Permit Actions

This permit may, at any time, be modified, suspended, revoked, or renewed by the Department in accordance with 6 NYCRR Part 621. The filing of a request by the *owner or operator* for a permit modification, revocation and reissuance, termination, a notification of planned changes or anticipated noncompliance does not limit, diminish and/or stay compliance with any terms of this permit.

O. Definitions

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

P. Re-Opener Clause

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

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

Q. Penalties for Falsification of Forms and Reports

In accordance with 6NYCRR Part 750-2.4 and 750-2.5, any person who knowingly makes any false material statement, representation, or certification in any application, record, report or other document filed or required to be maintained under this permit, including reports of compliance or noncompliance shall, upon conviction, be punished in accordance with ECL §71-1933 and or Articles 175 and 210 of the New York State Penal Law.

R. Other Permits

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

VIII. **APPENDIX A**

Definitions

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

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

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

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

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

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

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

Equivalent (Equivalence) – means that the practice or measure meets all the performance, longevity, maintenance, and safety objectives of the technical standard and will provide an equal or greater degree of water quality protection.

Final Stabilization - means that all soil disturbance activities have ceased and a uniform, perennial vegetative cover with a density of eighty (80) percent over the entire pervious surface has been established; or other equivalent stabilization measures, such as permanent landscape mulches, rock rip-rap or washed/crushed stone have been applied

on all disturbed areas that are not covered by permanent structures, concrete or pavement.

General SPDES permit - means a SPDES permit issued pursuant to 6 NYCRR Part 750-1.21 and Section 70-0117 of the ECL authorizing a category of discharges.

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

Historic Property – means any building, structure, site, object or district that is listed on the State or National Registers of Historic Places or is determined to be eligible for listing on the State
or National Registers of Historic Places.

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

Infeasible – means not technologically possible, or not economically practicable and achievable in light of best industry practices.

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

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

Minimize – means reduce and/or eliminate to the extent achievable using control measures (including best management practices) that are technologically available and economically practicable and achievable in light of best industry practices.

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

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

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

New Development – means any land disturbance that does meet the definition of Redevelopment Activity included in this appendix.

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

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

Performance Criteria – means the design criteria listed under the "Required Elements" sections in Chapters 5, 6 and 10 of the technical standard, New York State Stormwater Management Design Manual, dated January 2015. It does not include the Sizing Criteria (i.e. WQv, RRv, Cpv, Qp and Qf) in Part I.C.2. of the permit.

Pollutant - means dredged spoil, filter backwash, solid waste, incinerator residue, sewage, garbage, sewage sludge, munitions, chemical wastes, biological materials, radioactive materials, heat, wrecked or discarded equipment, rock, sand and industrial, municipal, agricultural waste and ballast discharged into water; which may cause or might reasonably be expected to cause pollution of the waters of the state in contravention of the standards or guidance values adopted as provided in 6 NYCRR Parts 700 et seq .

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

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

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

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

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

Redevelopment Activity(ies) – means the disturbance and reconstruction of existing impervious area, including impervious areas that were removed from a project site within five (5) years of preliminary project plan submission to the local government (i.e. site plan, subdivision, etc.).

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

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

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

Site limitations – means site conditions that prevent the use of an infiltration technique and or infiltration of the total WQv. Typical site limitations include: seasonal high groundwater, shallow depth to bedrock, and soils with an infiltration rate less than 0.5 inches/hour. The existence of site limitations shall be confirmed and documented using actual field testing (i.e. test pits, soil borings, and infiltration test) or using information from the most current United States Department of Agriculture (USDA) Soil Survey for the County where the project is located.

Sizing Criteria – means the criteria included in Part I.C.2 of the permit that are used to size post-construction stormwater management control practices. The criteria include; Water Quality Volume (WQv), Runoff Reduction Volume (RRv), Channel Protection Volume (Cpv), Overbank Flood (Qp), and Extreme Flood (Qf).

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

Steep Slope – means land area with a Soil Slope Phase that is identified as an E or F, or

the map unit name is inclusive of 25% or greater slope, on the United States Department of Agriculture ("USDA") Soil Survey for the County where the disturbance will occur.

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

Temporarily Ceased – means that an existing disturbed area will not be disturbed again within 14 calendar days of the previous soil disturbance.

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

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

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

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

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

Uniform Procedures Act (UPA) Permit - means a permit required under 6 NYCRR Part

621 of the Environmental Conservation Law (ECL), Article 70.

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

APPENDIX B

Required SWPPP Components by Project Type

Table 1
CONSTRUCTION ACTIVITIES THAT REQUIRE THE PREPARATION OF A SWPPP THAT ONLY INCLUDES EROSION AND SEDIMENT CONTROLS

The following construction activities that involve soil disturbances of one (1) or more acres of land, but less than five (5) acres:

- Single family home not located in one of the watersheds listed in Appendix C or not *directly discharging* to one of the 303(d) segments listed in Appendix E
- Single family residential subdivisions with 25% or less impervious cover at total site build-out and not located in one of the watersheds listed in Appendix C and not directly discharging to one of the 303(d) segments listed in Appendix E
- Construction of a barn or other agricultural building, silo, stock yard or pen.

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

- Installation of underground, linear utilities; such as gas lines, fiber-optic cable, cable TV, electric, telephone, sewer mains, and water mains
- Environmental enhancement projects, such as wetland mitigation projects, stormwater retrofits and stream restoration projects
- Bike paths and trails
- Sidewalk construction projects that are not part of a road/ highway construction or reconstruction project
- Slope stabilization projects
- Slope flattening that changes the grade of the site, but does not significantly change the runoff characteristics
- Spoil areas that will be covered with vegetation
- Land clearing and grading for the purposes of creating vegetated open space (i.e. recreational parks, lawns, meadows, fields), excluding projects that *alter hydrology from pre to post development* conditions
- Athletic fields (natural grass) that do not include the construction or reconstruction of *impervious area* and do not *alter hydrology from pre to post development* conditions
- Demolition project where vegetation will be established and no redevelopment is planned
- Overhead electric transmission line project that does not include the construction of permanent access roads or parking areas surfaced with *impervious cover*
- Structural practices as identified in Table II in the “Agricultural Management Practices Catalog for Nonpoint Source Pollution in New York State”, excluding projects that involve soil disturbances of less than five acres and construction activities that include the construction or reconstruction of impervious area

The following construction activities that involve soil disturbances between five thousand (5000) square feet and one (1) acre of land:

- All construction activities located in the watersheds identified in Appendix D that involve soil disturbances between five thousand (5,000) square feet and one (1) acre of land.

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

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

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

APPENDIX C

Watersheds Where Enhanced Phosphorus Removal Standards Are Required

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

- Entire New York City Watershed located east of the Hudson River - Figure 1
- Onondaga Lake Watershed - Figure 2
- Greenwood Lake Watershed -Figure 3
- Oscawana Lake Watershed – Figure 4
- Kinderhook Lake Watershed – Figure 5

Figure 1 - New York City Watershed East of the Hudson

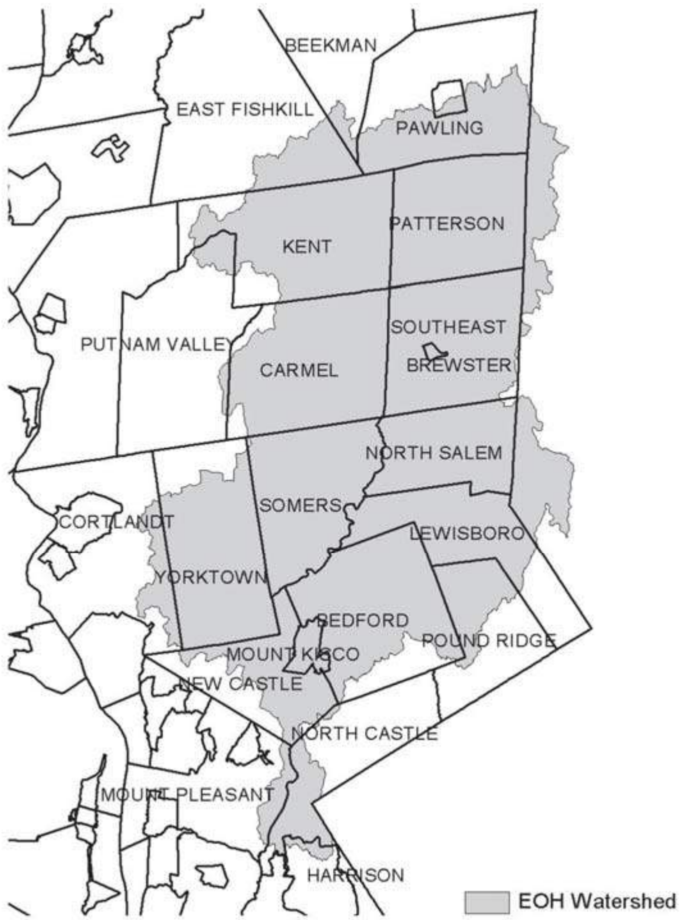


Figure 2 - Onondaga Lake Watershed

Figure 3 - Greenwood Lake Watershed

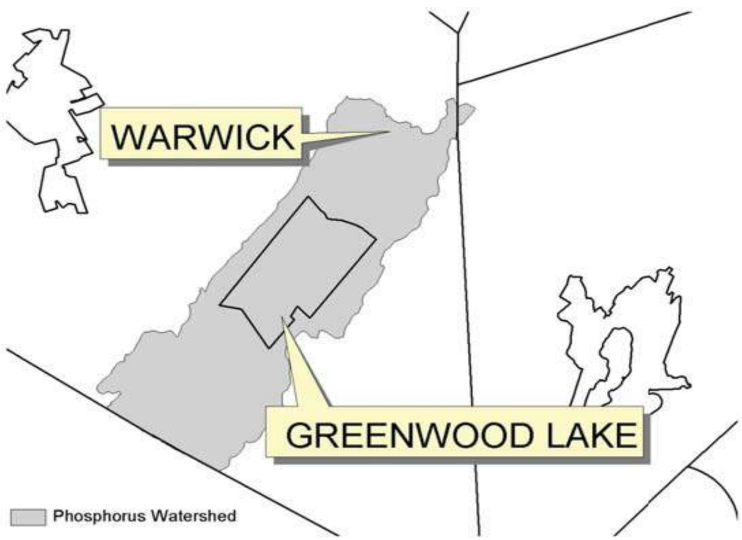


Figure 4 - Oscawana Lake Watershed

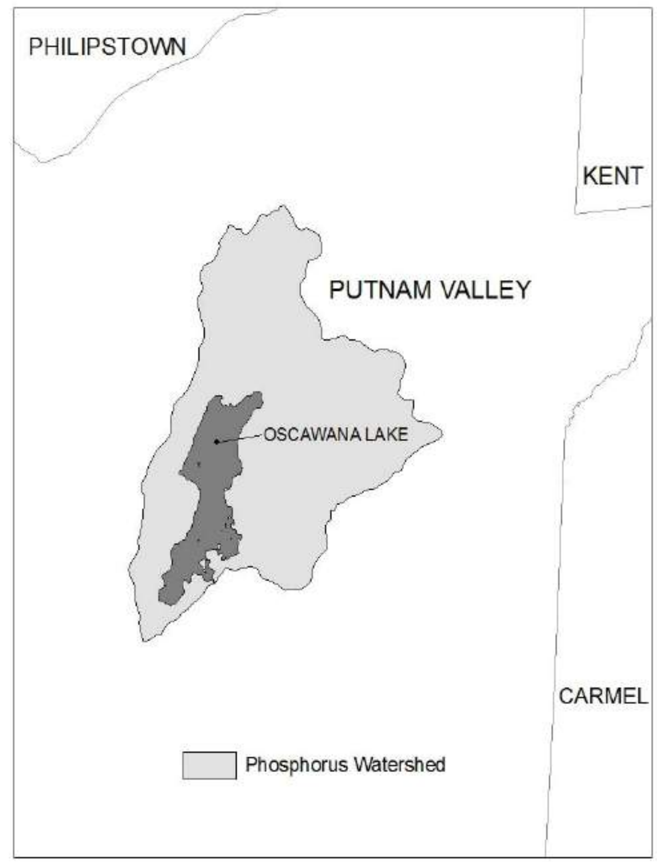
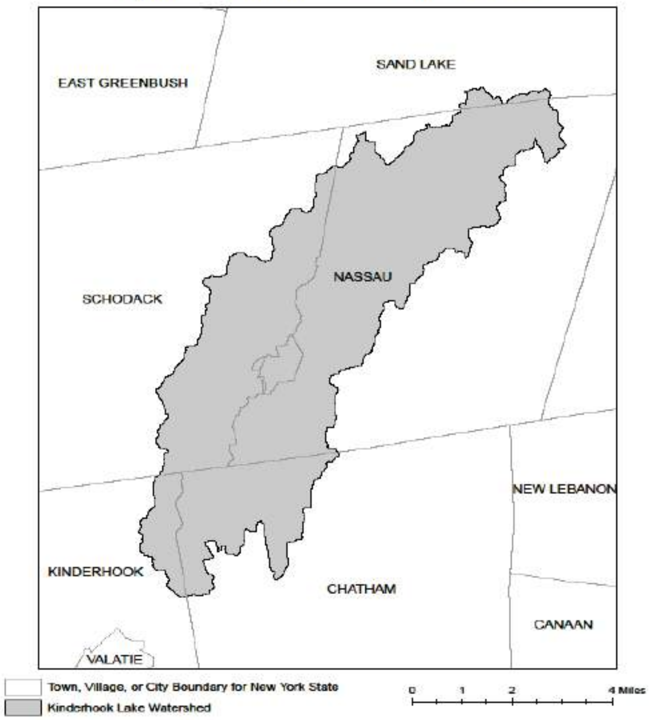


Figure 5: Kinderhook Lake Watershed



APPENDIX D

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

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

APPENDIX E

List of 303(d) segments impaired by pollutants related to *construction activity* (e.g. silt, sediment or nutrients). *Owners or operators* of single family home and single family residential subdivisions with 25% or less total impervious cover at total site build-out that involve soil disturbances of one or more acres of land, but less than 5 acres, and *directly discharge* to one of the listed segments below shall prepare a SWPPP that includes post-construction stormwater management practices designed in conformance with the New York State Stormwater Management Design Manual ("Design Manual"), dated January 2015.

COUNTY	WATERBODY
Albany	Ann Lee (Shakers) Pond, Stump Pond
Albany	Basic Creek Reservoir
Allegheny	Amity Lake, Saunders Pond
Bronx	Van Cortlandt Lake
Broome	Whitney Point Lake/Reservoir
Broome	Fly Pond, Deer Lake
Broome	Minor Tribs to Lower Susquehanna (north)
Cattaraugus	Allegheny River/Reservoir
Cattaraugus	Case Lake
Cattaraugus	Linlyco/Club Pond
Cayuga	Duck Lake
Chautauqua	Chautauqua Lake, North
Chautauqua	Chautauqua Lake, South
Chautauqua	Bear Lake
Chautauqua	Chadakoin River and tribs
Chautauqua	Lower Cassadaga Lake
Chautauqua	Middle Cassadaga Lake
Chautauqua	Findley Lake
Clinton	Great Chazy River, Lower, Main Stem
Columbia	Kinderhook Lake
Columbia	Robinson Pond
Dutchess	Hillside Lake
Dutchess	Wappinger Lakes
Dutchess	Fall Kill and tribs
Erie	Green Lake
Erie	Scajaquada Creek, Lower, and tribs
Erie	Scajaquada Creek, Middle, and tribs
Erie	Scajaquada Creek, Upper, and tribs
Erie	Rush Creek and tribs
Erie	Ellicott Creek, Lower, and tribs
Erie	Beeman Creek and tribs
Erie	Murder Creek, Lower, and tribs
Erie	South Branch Smoke Cr, Lower, and tribs
Erie	Little Sister Creek, Lower, and tribs
Essex	Lake George (primary county: Warren)
Genesee	Black Creek, Upper, and minor tribs
Genesee	Tonawanda Creek, Middle, Main Stem
Genesee	Oak Orchard Creek, Upper, and tribs
Genesee	Bowen Brook and tribs
Genesee	Bigelow Creek and tribs
Genesee	Black Creek, Middle, and minor tribs
Genesee	LeRoy Reservoir
Greene	Schoharie Reservoir

COUNTY	WATERBODY
Greene	Sleepy Hollow Lake
Herkimer	Steele Creek tribs
Kings	Hendrix Creek
Lewis	Mill Creek/South Branch and tribs
Livingston	Conesus Lake
Livingston	Jaycox Creek and tribs
Livingston	Mill Creek and minor tribs
Livingston	Bradner Creek and tribs
Livingston	Christie Creek and tribs
Monroe	Lake Ontario Shoreline, Western
Monroe	Mill Creek/Blue Pond Outlet and tribs
Monroe	Rochester Embayment - East
Monroe	Rochester Embayment - West
Monroe	Unnamed Trib to Honeoye Creek
Monroe	Genesee River, Lower, Main Stem
Monroe	Genesee River, Middle, Main Stem
Monroe	Black Creek, Lower, and minor tribs
Monroe	Buck Pond
Monroe	Long Pond
Monroe	Cranberry Pond
Monroe	Mill Creek and tribs
Monroe	Shipbuilders Creek and tribs
Monroe	Minor tribs to Irondequoit Bay
Monroe	Thomas Creek/White Brook and tribs
Nassau	Glen Cove Creek, Lower, and tribs
Nassau	LI Tribs (fresh) to East Bay
Nassau	East Meadow Brook, Upper, and tribs
Nassau	Hempstead Bay
Nassau	Hempstead Lake
Nassau	Grant Park Pond
Nassau	Beaver Lake
Nassau	Camaans Pond
Nassau	Halls Pond
Nassau	LI Tidal Tribs to Hempstead Bay
Nassau	Massapequa Creek and tribs
Nassau	Reynolds Channel, east
Nassau	Reynolds Channel, west
Nassau	Silver Lake, Lofts Pond
Nassau	Woodmere Channel
Niagara	Hyde Park Lake
Niagara	Lake Ontario Shoreline, Western
Niagara	Bergholtz Creek and tribs
Oneida	Ballou, Nail Creeks
Onondaga	Ley Creek and tribs
Onondaga	Onondaga Creek, Lower and tribs

APPENDIX E

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

COUNTY	WATERBODY
Onondaga	Onondaga Creek, Middle and tribs
Onondaga	Onondaga Creek, Upp, and minor tribs
Onondaga	Harbor Brook, Lower, and tribs
Onondaga	Ninemile Creek, Lower, and tribs
Onondaga	Minor tribs to Onondaga Lake
Onondaga	Onondaga Creek, Lower, and tribs
Ontario	Honeoye Lake
Ontario	Hemlock Lake Outlet and minor tribs
Ontario	Great Brook and minor tribs
Orange	Monhagen Brook and tribs
Orange	Orange Lake
Orleans	Lake Ontario Shoreline, Western
Oswego	Pleasant Lake
Oswego	Lake Neatahwanta
Putnam	Oscawana Lake
Putnam	Palmer Lake
Putnam	Lake Carmel
Queens	Jamaica Bay, Eastern, and tribs (Queens)
Queens	Bergen Basin
Queens	Shellbank Basin
Rensselaer	Nassau Lake
Rensselaer	Snyders Lake
Richmond	Grasmere, Arbutus and Wolfes Lakes
Rockland	Congers Lake, Swartout Lake
Rockland	Rockland Lake
Saratoga	Ballston Lake
Saratoga	Round Lake
Saratoga	Dwaas Kill and tribs
Saratoga	Tribs to Lake Lonely
Saratoga	Lake Lonely
Schenectady	Collins Lake
Schenectady	Duane Lake
Schenectady	Mariaville Lake
Schoharie	Engleville Pond
Schoharie	Summit Lake
Schuyler	Cayuta Lake
St. Lawrence	Fish Creek and minor tribs
St. Lawrence	Black Lake Outlet/Black Lake
Steuben	Lake Salubria
Steuben	Smith Pond
Suffolk	Millers Pond
Suffolk	Mattituck (Marratooka) Pond
Suffolk	Tidal tribs to West Moriches Bay
Suffolk	Canaan Lake
Suffolk	Lake Ronkonkoma
Suffolk	Beaverdam Creek and tribs
Suffolk	Big/Little Fresh Ponds
Suffolk	Fresh Pond
Suffolk	Great South Bay, East
Suffolk	Great South Bay, Middle

COUNTY	WATERBODY
Suffolk	Great South Bay, West
Suffolk	Mill and Seven Ponds
Suffolk	Moriches Bay, East
Suffolk	Moriches Bay, West
Suffolk	Quantuck Bay
Suffolk	Shinnecock Bay (and Inlet)
Sullivan	Bodine, Montgomery Lakes
Sullivan	Davies Lake
Sullivan	Pleasure Lake
Sullivan	Swan Lake
Tompkins	Cayuga Lake, Southern End
Tompkins	Owasco Inlet, Upper, and tribs
Ulster	Ashokan Reservoir
Ulster	Esopus Creek, Upper, and minor tribs
Ulster	Esopus Creek, Lower, Main Stem
Ulster	Esopus Creek, Middle, and minor tribs
Warren	Lake George
Warren	Tribs to L.George, Village of L George
Warren	Huddle/Finkle Brooks and tribs
Warren	Indian Brook and tribs
Warren	Hague Brook and tribs
Washington	Tribs to L.George, East Shr Lk George
Washington	Cossayuna Lake
Washington	Wood Cr/Champlain Canal, minor tribs
Wayne	Port Bay
Wayne	Marbletown Creek and tribs
Westchester	Lake Katonah
Westchester	Lake Mohegan
Westchester	Lake Shenorock
Westchester	Reservoir No.1 (Lake Isle)
Westchester	Saw Mill River, Middle, and tribs
Westchester	Silver Lake
Westchester	Teatown Lake
Westchester	Truesdale Lake
Westchester	Wallace Pond
Westchester	Peach Lake
Westchester	Mamaroneck River, Lower
Westchester	Mamaroneck River, Upp, and tribs
Westchester	Sheldrake River and tribs
Westchester	Blind Brook, Lower
Westchester	Blind Brook, Upper, and tribs
Westchester	Lake Lincolndale
Westchester	Lake Meahaugh
Wyoming	Java Lake
Wyoming	Silver Lake

Note: The list above identifies those waters from the final New York State "2014 Section 303(d) List of Impaired Waters Requiring a TMDL/Other Strategy", dated January 2015, that are impaired by silt, sediment or nutrients.

XIII. APPENDIX F

LIST OF NYS DEC REGIONAL OFFICES

Region	COVERING THE FOLLOWING COUNTIES:	DIVISION OF ENVIRONMENTAL PERMITS (DEP) PERMIT ADMINISTRATORS	DIVISION OF WATER (DOW) WATER (SPDES) PROGRAM
1	NASSAU AND SUFFOLK	50 CIRCLE ROAD STONY BROOK, NY 11790 TEL. (631) 444-0365	50 CIRCLE ROAD STONY BROOK, NY 11790-3409 TEL. (631) 444-0405
2	BRONX, KINGS, NEW YORK, QUEENS AND RICHMOND	1 HUNTERS POINT PLAZA, 47-40 21ST ST. LONG ISLAND CITY, NY 11101-5407 TEL. (718) 482-4997	1 HUNTERS POINT PLAZA, 47-40 21ST ST. LONG ISLAND CITY, NY 11101-5407 TEL. (718) 482-4933
3	DUTCHESS, ORANGE, PUTNAM, ROCKLAND, SULLIVAN, ULSTER AND WESTCHESTER	21 SOUTH PUTT CORNERS ROAD NEW PALTZ, NY 12561-1696 TEL. (845) 256-3059	100 HILLSIDE AVENUE, SUITE 1W WHITE PLAINS, NY 10603 TEL. (914) 428 - 2505
4	ALBANY, COLUMBIA, DELAWARE, GREENE, MONTGOMERY, OTSEGO, RENSSELAER, SCHENECTADY AND SCHOHARIE	1150 NORTH WESTCOTT ROAD SCHENECTADY, NY 12306-2014 TEL. (518) 357-2069	1130 NORTH WESTCOTT ROAD SCHENECTADY, NY 12306-2014 TEL. (518) 357-2045
5	CLINTON, ESSEX, FRANKLIN, FULTON, HAMILTON, SARATOGA, WARREN AND WASHINGTON	1115 STATE ROUTE 86, PO BOX 296 RAY BROOK, NY 12977-0296 TEL. (518) 897-1234	232 GOLF COURSE ROAD WARRENSBURG, NY 12885-1172 TEL. (518) 623-1200
6	HERKIMER, JEFFERSON, LEWIS, ONEIDA AND ST. LAWRENCE	STATE OFFICE BUILDING 317 WASHINGTON STREET WATERTOWN, NY 13601-3787 TEL. (315) 785-2245	STATE OFFICE BUILDING 207 GENESEE STREET UTICA, NY 13501-2885 TEL. (315) 793-2554
7	BROOME, CAYUGA, CHENANGO, CORTLAND, MADISON, ONONDAGA, OSWEGO, TIOGA AND TOMPKINS	615 ERIE BLVD. WEST SYRACUSE, NY 13204-2400 TEL. (315) 426-7438	615 ERIE BLVD. WEST SYRACUSE, NY 13204-2400 TEL. (315) 426-7500
8	CHEMUNG, GENESEE, LIVINGSTON, MONROE, ONTARIO, ORLEANS, SCHUYLER, SENECA, STEUBEN, WAYNE AND YATES	6274 EAST AVON-LIMA ROAD AVON, NY 14414-9519 TEL. (585) 226-2466	6274 EAST AVON-LIMA RD. AVON, NY 14414-9519 TEL. (585) 226-2466
9	ALLEGANY, CATTARAUGUS, CHAUTAUQUA, ERIE, NIAGARA AND WYOMING	270 MICHIGAN AVENUE BUFFALO, NY 14203-2999 TEL. (716) 851-7165	270 MICHIGAN AVE. BUFFALO, NY 14203-2999 TEL. (716) 851-7070

Appendix B:
NYSDEC Forms

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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)
CHAI Builders

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

Owner/Operator Contact Person First Name
Berry

Owner/Operator Mailing Address
120 Route 59, Suite 201

City
SUffern

State
NY

Zip
10901 - 4908

Phone (Owner/Operator)
917 - 696 - 4402

Fax (Owner/Operator)
- -

Email (Owner/Operator)
berry@chaibuilders.com

FED TAX ID
- (not required for individuals)

6401089828

Project Site Information

Project/Site Name
248 Tioronda Ave Apartments

Street Address (NOT P.O. BOX)
248 Tioronda Ave

Side of Street
○ North ○ South ● East ○ West

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

State	Zip	County	DEC Region
NY	12508 - 4022	Dutchess	3

Name of Nearest Cross Street
Knevels Ave

Distance to Nearest Cross Street (Feet)
100

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

Tax Map Numbers
Section-Block-Parcel

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)	Y Coordinates (Northing)
586100	4594101

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

Vacant Parcel

Post-Development Future Land Use

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

Mixed use

Number of Lots: [ ]

***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
9.2	5.0	2.5	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
100 %	0 %	0 %	0 %

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

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

Start Date __/__/____ - **End Date** __/__/____

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

Name

Fishkill Creek

9a. Type of waterbody identified in Question 9?

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

9b. How was the wetland identified?

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

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

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

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

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?

N/A

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
Christopher P. Lapine

Contact Name (Last, Space, First)
Lapine, Christopher

Mailing Address
21 Fox Street

City
Poughkeepsie

State NY Zip 12601-4724

Phone 845-454-3980 Fax - -

Email
clapine@chazencompanies.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 Christopher **MI** P

Last Name Lapine

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

Post-construction Stormwater Management Practice (SMP) Requirements

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

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

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

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

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

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

Total WQv Required

0.318 **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)

Practice	Total Contributing Area (acres)		Total Contributing Impervious Area (acres)
RR Techniques (Area Reduction)			
○ Conservation of Natural Areas (RR-1)	.	and/or	.
○ Sheetflow to Riparian Buffers/Filters Strips (RR-2)	.	and/or	.
○ Tree Planting/Tree Pit (RR-3)	.	and/or	.
○ Disconnection of Rooftop Runoff (RR-4)	.	and/or	.
RR Techniques (Volume Reduction)			
○ Vegetated Swale (RR-5)			.
○ Rain Garden (RR-6)			.
○ Stormwater Planter (RR-7)			.
○ Rain Barrel/Cistern (RR-8)			.
○ Porous Pavement (RR-9)			.
○ Green Roof (RR-10)			.
Standard SMPs with RRv Capacity			
○ Infiltration Trench (I-1)			.
○ Infiltration Basin (I-2)			.
○ Dry Well (I-3)			.
○ Underground Infiltration System (I-4)			.
● Bioretention (F-5)			1.144
○ Dry Swale (O-1)			.
Standard SMPs			
○ Micropool Extended Detention (P-1)			.
○ Wet Pond (P-2)			.
○ Wet Extended Detention (P-3)			.
○ Multiple Pond System (P-4)			.
○ Pocket Pond (P-5)			.
○ Surface Sand Filter (F-1)			.
○ Underground Sand Filter (F-2)			.
○ Perimeter Sand Filter (F-3)			.
○ Organic Filter (F-4)			.
○ Shallow Wetland (W-1)			.
○ Extended Detention Wetland (W-2)			.
○ Pond/Wetland System (W-3)			.
○ Pocket Wetland (W-4)			.
○ Wet Swale (O-2)			.

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

Alternative SMP	Total Contributing Impervious Area(acres)
● Hydrodynamic	1.88
○ 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

0.055 **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

0.052 **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

0.29 **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). 0.352

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	**CPv Provided**
0.0 **acre-feet**	0.0 **acre-feet**

DOWN STEAM ANALYSIS SHOWS NO FLOOD CONTROL DEVICES ARE NEEDED

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

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

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

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

Total Overbank Flood Control Criteria (Qp)

Pre-Development	**Post-development**
0. **CFS**	0. **CFS**

Total Extreme Flood Control Criteria (Qf)

Pre-Development	**Post-development**
0. **CFS**	0. **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

Berry Kahm

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

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

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

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

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

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

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

Owner/Operator Certification

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

Print First Name: Berry

MI:

Print Last Name: Kahn

Owner/Operator Signature:

Date: __ / __ / ____

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: Chai Builders
2. Contact Person: Berry Kahm
3. Street Address: 120 Route 59, Suite 201
4. City/State/Zip: Suffern, NY, 10901-4908
II. Project Site Information
5. Project/Site Name: Chai Builders
6. Street Address: 248 Tioronda Ave
7. City/State/Zip: Beacon, NY, 12508-4022
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:

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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)

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

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

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

I. Owner or Operator Information

1. Owner/Operator Name: Chai Builders

2. Street Address: 120 Route 59, Suite 201

3. City/State/Zip: Suffern, NY, 10901-4908

4. Contact Person: Berry Kohn | 4a.Telephone: 917-696-4402

4b. Contact Person E-Mail: berry@chaibuilders.com

II. Project Site Information

5. Project/Site Name: Chai Builders

6. Street Address: 248 Tioronda Ave

7. City/Zip: Beacon, 12508-4022

8. County: Dutchess

III. Reason for Termination

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

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

9c. □ Other (Explain on Page 2)

IV. Final Site Information:

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

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

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

____

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

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

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

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

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

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

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

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

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

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

V. Additional Information/Explanation:

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

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

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

Printed Name:

Title/Position:

Signature:	Date:

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

VII. Qualified Inspector Certification - Final Stabilization:	
I hereby certify that all disturbed areas have achieved final stabilization as defined in the current version of the general permit, and that all temporary, structural erosion and sediment control measures have been removed. Furthermore, I understand that certifying false, incorrect or inaccurate information is a violation of the referenced permit and the laws of the State of New York and could subject me to criminal, civil and/or administrative proceedings.	
Printed Name:	
Title/Position:	
Signature:	Date:
VIII. Qualified Inspector Certification - Post-construction Stormwater Management Practice(s):	
I hereby certify that all post-construction stormwater management practices have been constructed in conformance with the SWPPP. Furthermore, I understand that certifying false, incorrect or inaccurate information is a violation of the referenced permit and the laws of the State of New York and could subject me to criminal, civil and/or administrative proceedings.	
Printed Name:	
Title/Position:	
Signature:	Date:
IX. Owner or Operator Certification	
I hereby certify that this document was prepared by me or under my direction or supervision. My determination, based upon my inquiry of the person(s) who managed the construction activity, or those persons directly responsible for gathering the information, is that the information provided in this document is true, accurate and complete. Furthermore, I understand that certifying false, incorrect or inaccurate information is a violation of the referenced permit and the laws of the State of New York and could subject me to criminal, civil and/or administrative proceedings.	
Printed Name:	
Title/Position:	
Signature:	Date:

(NYS DEC Notice of Termination - January 2015)

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Appendix C:
Contractor's Certification Form
Subcontractor's Certification Form

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Stormwater Pollution Prevention Plan
Contractor Certification Statement
(Responsible for overall SWPPP Compliance)

248 Tioronda Ave.,
248 Tioronda Ave., City of Beacon, Dutchess County, New York

This is to certify that the following contracting firm will be responsible for installing, constructing, repairing, inspecting and/or maintaining the erosion and sediment control practices and post-construction stormwater management control practices required by the SWPPP.

Contracting Firm Information

Name: ______________________________

Address: ______________________________

Telephone & Fax: ______________________________

Trained Contractor(s) [1] **Responsible for SWPPP Implementation (**Provide name, title, and date of last training)

____

____

Prior to commencement of construction activity, the following certification shall be issued:

I hereby certify under penalty of law that I understand and agree to comply with the terms and conditions of the SWPPP and agree to implement any corrective actions identified by the *qualified inspector* during a site inspection. I also understand that the *owner or operator* must comply with the terms and conditions of the most current version of the New York State Pollutant Discharge Elimination System (“SPDES”) general permit for stormwater *discharges* from *construction activities* and that it is unlawful for any person to cause or contribute to a violation of *water quality standards*. Furthermore, I 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.

Printed Name: ______________________________

Title/Position: ______________________________

Signature: ______________________ Date: ______________________

Upon completion of construction activities, the following certification shall be issued, prior to issuance of the NOT:

I hereby certify that that all permanent stormwater management practices required by the SWPPP have been installed in accordance with the contract documents. I further certify that all temporary erosion and sediment control measures have been removed from the site, and that the on-site soils disturbed by construction activity have been restored in accordance with the SWPPP and the NYSDEC Division of Water’s publication “Deep-Ripping and Decompaction”.

Printed Name: ______________________________

Title/Position: ______________________________

Signature: ______________________ Date: ______________________

[1] “Trained Contractor” means an employee from a contracting (construction) company that has received four (4) hours of Department endorsed training in proper erosion and sediment control principles from a Soil and Water Conservation District, or other Department endorsed entity. After receiving the initial training, the “trained contractor” shall receive four (4) hours of training every three (3) years. It can also mean an employee from the contracting (construction) company that meets the “qualified inspector” qualifications (e.g. licensed Professional Engineer, Certified Professional in Erosion and Sediment Control (CPESC), Registered Landscape Architect, or someone working under the direct supervision of, and at the same company as, the licensed Professional Engineer or Registered Landscape Architect, provided they have received four (4) hours of Department endorsed training in proper erosion and sediment control principles from a Soil and Water Conservation District, or other Department endorsed entity). The “Trained Contractor” will be responsible for the day to day implementation of the SWPPP.

[2] Signatory Requirements:

a. For a corporation, this form shall be signed by (i) a president, secretary, treasurer, or vice-president of the corporation in charge of a principle business function, or any other person who performs similar policy or decision-making functions for the corporation; or (ii) the manager of one or more manufacturing, production or operating facilities, provided the manager is authorized to make management decisions which govern the operation of the regulated facility including having the explicit or implicit duty of making major capital investment recommendations, and initiating and directing other comprehensive measures to assure long term environmental compliance with environmental laws and regulations; the manager can ensure that the necessary systems are established or actions taken to gather complete and accurate information for permit application requirements; and where authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures.
b. For a partnership or sole proprietorship, this form shall be signed by a general partner or the proprietor, respectively.
c. For a municipality, State, Federal, or other public agency, this form shall be signed by either a principal executive officer or ranking elected official. For purposes of this section, a principal executive officer of a Federal agency includes (i) the chief executive officer of the agency, or (ii) a senior executive officer having responsibility for the overall operations of a principal geographic unit of the agency (e.g. Regional Administrators of EPA).

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Stormwater Pollution Prevention Plan
Subcontractor Certification Statement
(whose work involves soil disturbance)

248 Tioronda Ave.,

248 Tioronda Ave., City of Beacon, Dutchess County, New York

Each Subcontractor whose work will involve soil disturbance of any kind is required to complete and sign this Certification Statement before commencing any construction activity at the site. This completed Certification Statement(s) shall be maintained at the construction site in the Site Log Book.

Subcontracting Firm Information

Name: ____________________

Address: ____________________

____

Telephone & Fax: ____________________

Trained Contractor(s) [2] Responsible for SWPPP Implementation (Provide name, title, and date of last training)

____

____

Prior to commencement of construction activities, the following certification shall be issued:

I hereby certify under penalty of law that I understand and agree to comply with the terms and conditions of the SWPPP and agree to implement any corrective actions identified by the *qualified inspector* during a site inspection. I also understand that the *owner or operator* must comply with the terms and conditions of the most current version of the New York State Pollutant Discharge Elimination System ("SPDES") general permit for stormwater *discharges* from *construction activities* and that it is unlawful for any person to cause or contribute to a violation of *water quality standards*. Furthermore, I 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.

Printed Name: ____________________

Title/Position: ____________________

Signature: ____________________ Date: ____________________

[2] "Trained Contractor" means an employee from a contracting (construction) company that has received four (4) hours of Department endorsed training in proper erosion and sediment control principles from a Soil and Water Conservation District, or other Department endorsed entity. After receiving the initial training, the "trained contractor" shall receive four (4) hours of training every three (3) years. It can also mean an employee from the contracting (construction) company that meets the "qualified inspector" qualifications (e.g. licensed Professional Engineer, Certified Professional in Erosion and Sediment Control (CPESC), Registered Landscape Architect, or someone working under the direct supervision of, and at the same company as, the licensed Professional Engineer or Registered Landscape Architect, provided they have received four (4) hours of Department endorsed training in proper erosion and sediment control principles from a Soil and Water Conservation District, or other Department endorsed entity). The "Trained Contractor" will be responsible for the day to day implementation of the SWPPP.

[2] Signatory Requirements:

a. For a corporation, this form shall be signed by (i) a president, secretary, treasurer, or vice-president of the corporation in charge of a principle business function, or any other person who performs similar policy or decision-making functions for the corporation; or (ii) the manager of one or more manufacturing, production or operating facilities, provided the manager is authorized to make management decisions which govern the operation of the regulated facility including having the explicit or implicit duty of making major capital investment recommendations, and initiating and directing other comprehensive measures to assure long term environmental compliance with environmental laws and regulations; the manager can ensure that the necessary systems are established or actions taken to gather complete and accurate information for permit application requirements; and where authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures.
b. For a partnership or sole proprietorship, this form shall be signed by a general partner or the proprietor, respectively.
c. For a municipality, State, Federal, or other public agency, this form shall be signed by either a principal executive officer or ranking elected official. For purposes of this section, a principal executive officer of a Federal agency includes (i) the chief executive officer of the agency, or (ii) a senior executive officer having responsibility for the overall operations of a principal geographic unit of the agency (e.g. Regional Administrators of EPA).

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Appendix D:
SWPPP Inspection Report
(Sample Form)

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Stormwater Pollution Prevention Plan
Inspection Report

248 Tioronda Ave.

248 Tioronda Ave.

Beacon, Dutchess, NY

A Qualified Inspector[1] shall prepare an inspection report subsequent to each and every inspection, as required in Part IV.C of the SPDES General Permit GP-0-15-002. All sections of this report are to be completed.

1. Inspection Information

Inspection number: ______________________

Date and Time of Inspection: ______________________

Weather Conditions: Snowing

Soil Conditions (e.g. dry, wet, saturated): Snow Covered ______

2. Inspector Information

Qualified Inspector[1]

Printed Name:______________________ Date: ______________________

Signature:______________________

Qualified Professional[1]

Printed Name ______________________ Date: ______________________

Signature:______________________

3. On the included site plan, provide a sketch of areas that are disturbed at the time of the inspection and areas that have been stabilized (temporary and/or final) since the last inspection. Provide additional descriptions below if necessary.

[1] A Qualified Inspector means a person that is knowledgeable in the principles and practices of erosion and sediment control, such as licensed Professional Engineer, Certified Professional in Erosion and Sediment Control (CPESC), Registered Landscape Architect, or other Department endorsed individual(s). It can also mean someone working under the direct supervision of, and at the same company as, the licensed Professional Engineer or Registered Landscape Architect, provided that person has training in the principles and practices of erosion and sediment control. Training in the principles and practices of erosion and sediment control means that the individual working under the direct supervision of the licensed Professional Engineer or Registered Landscape Architect has received four (4) hours of Department endorsed training in proper erosion and sediment control principles from a Soil and Water Conservation District, or other Department endorsed entity. After receiving the initial training, the individual working under the direct supervision of the licensed Professional Engineer or Registered Landscape Architect shall receive four (4) hours of training every three (3) years. It can also mean a person that meets the Qualified Professional qualifications in addition to the Qualified Inspector qualifications. Note: Inspections of any post-construction stormwater management practices that include structural components, such as a dam for an impoundment, shall be performed by a licensed Professional Engineer.

4. **In the following table, provide a description of the condition of the runoff at all points of discharge from the construction site, including conveyance systems (pipes, culverts, ditches, etc.) and overland flow. Identify any discharges of sediment from the construction site. Use additional sheets if necessary.**

Description of Discharge Point	Condition of Runoff	Sediment Discharge Noted
		☐ yes / no ☐ Estimated Quantity:
		☐ yes / no ☐ Estimated Quantity:
		☐ yes / no ☐ Estimated Quantity:
		☐ yes / no ☐ Estimated Quantity:

5. **For all discharge points where sediment discharge has been noted in the above table, provide detailed corrective actions that are required. Use additional sheets if necessary.**

6. **In the following table, provide checkmarks in the appropriate columns to indicate the condition of all erosion and sediment control practices at the site.**

Erosion & Sediment Control Practice	Not Applicable	Functioning as Designed	Needs Repair or Maintenance	Not Installed Properly	Date Deficiency First Reported (If Applicable)	Deficiency Corrected? Y/N (If Applicable)
Stabilized construction entrance						
Temporary parking areas						
Construction vehicle wash areas						
Silt fence						
Temporary swales and berms						
Stone check dams						
Slope protection measures						
Dewatering operations						
Sediment traps						
Inlet protection measures						
Soil stockpiles						
Dust control measures						
Pavement sweeping						
Other:						
Other:						

7. **For all erosion and sediment control practices identified in the above table as “needs repair or maintenance” or “not installed properly”, provide detailed corrective actions that are required. Use additional sheets if necessary.**

8. **In the following table, indicate the current phase of construction of all post-construction stormwater management practices and identify all construction that is not in conformance with the SWPPP and technical standards.**

SWM Practice	Current Phase of Construction	Items not in conformance with the SWPPP

9. **For all post-construction stormwater management practices which are identified in the above table as including "items not in conformance with the SWPPP", provide detailed corrective action(s) that are required to correct the deficiencies. Use additional sheets if necessary.**

Photo Log

Date – Item in need of repair or maintenance:	*Date – Corrected Action:*
Date – Item in need of repair or maintenance:	*Date – Corrected Action:*

Photo Log

Date – Item in need of repair or maintenance:	*Date – Corrected Action:*
Date – Item in need of repair or maintenance:	*Date – Corrected Action:*

Appendix E:
NYSDEC “Deep-Ripping and Decompaction,” April 2008

New York State
DEPARTMENT OF ENVIRONMENTAL CONSERVATION

Division of Water

Deep-Ripping and Decompaction

April 2008

New York State
Department of Environmental Conservation

Document Prepared by:

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

Description

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

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

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

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

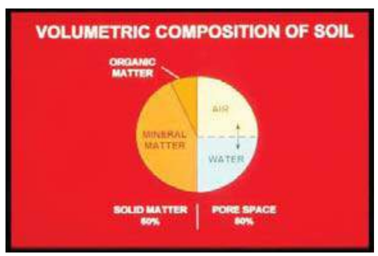

Fig. 2. About 50% of the volume of undisturbed loam surface soil is pore space, when soil is in good condition for plant growth. Brady, 2002.

Recommended Application of Practice

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

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

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

Benefits

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

- Increases the project (larger size) area's direct surface infiltration of rainfall by providing the open site's mitigated soil condition and lowers the demand on concentrated runoff control structures
- Enhances direct groundwater recharge through greater dispersion across and through a broader surface than afforded by some runoff-control structural measures
- Decreases runoff volume generated and provides hydrologic source control
- May be planned for application in feasible open locations either alone or in

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

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

Feasibility / Limitations

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

Soil

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

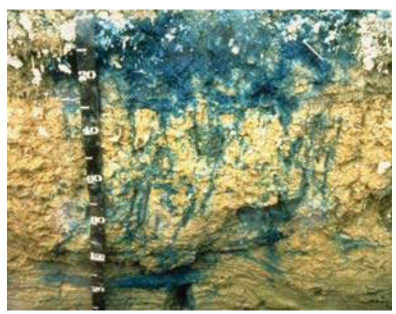

Fig. 4. Profile (in centimeters) displaying the infiltration test result of the natural undisturbed horizons of a soil in Hydrologic Soil Group C.

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

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

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

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

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

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

Slope

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

Local Weather/Timing/Soil Moisture

Effective fracturing of compressed subsoil material from the exposed work surface, laterally and vertically down through the affected zone is achieved only when the soil material is moderately dry to moderately moist. Neither one of the two-phases, deep ripping nor decompaction (deep subsoiling), can be effectively conducted when the soil material (subsoil or replaced topsoil) is in either a "plastic" or "liquid" state of soil consistency. Pulling the respective implements legs through the soil when it is overly moist only results in the "slicing and smearing" of the material or added "squeezing and compression" instead of the necessary fracturing. Ample drying time is needed for a "rippable" soil condition not merely in the material close to the surface, but throughout the material located down to the bottom of the physically compressed zone of the subsoil.

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

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

Design Guidance

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

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

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

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

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

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

Implements

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

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

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

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

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

Using the examples of a 3-shank and a 5-shank implement, the respective tractors should have 120 and 200 hp available for fracturing down to the final depth of 20-to-24 inches per phase. Final depth for the deep ripping in Phase 1 is achieved incrementally by a progressive series of passes (see Depth and Patterns of Movement, below); while for Phase 2, the full operating depth of the deep subsoiler is applied from the beginning.

The operating speed for pulling both types of implement should not exceed 2 to 3 mph. At this slow and managed rate of operating speed, maximum functional performance is sustained by the tractor and the implement performing the soil fracturing. Referring to Figure 8, the implement is the 6-leg version of the deep angled-leg subsoiler. Its two outside legs are "chained up" so that only four legs will be engaged (at the maximum depth), requiring no less than 160 hp, (rather than 240 hp) of pull. The 4-wheel drive, articulated-frame tractor in Figure 8 is 174 hp. It will be decompacting this unobstructed, former construction access area simultaneously through 11 inches of replaced topsoil and the upper 12 inches of the previously deep-ripped subsoil. In constricted areas of Phase 1) Deep Ripping, a medium-size tractor with adequate hp, such as the one in Figure 9 pulling a 3-shank deep ripper, may be more maneuverable.

Fig. 8. A deep, angled-leg subsoiler, ideal for Phase 2 decompaction of after the topsoil layer is graded on top of the ripped subsoil.

Some industrial-grade variations of ripping implements are attached to power graders and bulldozers. Although highly durable, they are generally not recommended. Typically, the shanks or "teeth" of these rippers are too short and stout; and they are mounted too far apart to achieve the well-distributed type of lateral and vertical fracturing of the soil materials necessary to restore soil permeability and infiltration. In addition, the power graders and bulldozers, as pullers, are far less maneuverable for turns and patterns than the tractor.

Fig. 9. This medium tractor is pulling a 3-shank deep ripper. The severely compacted construction access corridor is narrow, and the 120 hp tractor is more maneuverable for Phase 1 deep ripping (subsoil fracturing), here.

Depth and Patterns of Movement
As previously noted both Phase 1 Deep Ripping through significantly compressed, exposed subsoil and Phase 2 Decompaction (deep subsoiling) through the replaced topsoil and upper subsoil need to be performed at maximum capable depth of each implement. With an implement's guide wheels attached, some have a "normal" maximum operating depth of 18 inches, while others may go deeper. In many situations, however, the tractor/implement operator must first remove the guide wheels and other non essential elements from the implement. This adapts the ripper or the deep subsoiler for skillful pulling with its frame only a few inches above surface, while the shanks or legs, fracture the soil material 20-to-24 inches deep.

There may be construction sites where the depth of the exposed subsoil's compression is moderate, e.g.: 12 inches, rather than deep. This can be verified by using a ¾ inch cone penetrometer and a shovel to test the subsoil for its level of compaction, incrementally, every three inches of increasing depth. Once the full thickness of the subsoil's compacted zone is finally "pieced" and there is a significant drop in the psi measurements of the soil penetrometer, the depth/thickness of compaction is determined. This is repeated at several representative locations of the construction site. If the thickness of the site's subsoil compaction is verified as, for example, ten inches, then the Phase 1 Deep Ripping can be correspondingly reduced to the implement's minimum operable depth of 12 inches. However, the Phase 2 simultaneous Decompation (subsoiling) of an 11 inch thick layer of replaced topsoil and the upper subsoil should run at the subsoiling implements full operating depth.

Fig. 10. An early pass with a 3-shank deep ripper penetrating only 8 inches into this worksite's severely compressed subsoil.

Fig. 11. A repeat run of the 3-shank ripper along the same patterned pass area as Fig. 9; here, incrementally reaching 18 of the needed 22 inches of subsoil fracture.

Typically, three separate series (patterns) are used for both the Phase 1 Deep Ripping and the Phase 2 Decompaction on significantly compacted sites. For Phase 1, each series begins with a moderate depth of rip and, by repeat-pass, continues until full depth is reached. Phase 2 applies the full depth of Decompation (subsoiling), from the beginning.

Every separate series (pattern) consists of parallel, forward-and-return runs, with each progressive pass of the implement's legs or shanks evenly staggered between those from the previous pass. This compensates for the shank or leg-spacing on the implement, e.g., with 24-to-30 inches between each shank or leg. The staggered return pass ensures lateral and vertical fracturing actuated every 12 to 15 inches across the densely compressed soil mass.

Large, Unobstructed Areas
For larger easy areas, use the standard patterns of movement:

- The first series (pattern) of passes is applied lengthwise, parallel with the longest spread of the site; gradually progressing across the site's width, with each successive pass.

- The second series runs obliquely, crossing the first series at an angle of about 45 degrees.

- The third series runs at right angle (or 90 degrees), to the first series to complete the fracturing and shattering on severely compacted sites, and avoid leaving large unbroken blocks of compressed soil material. (In certain instances, the third series may be optional, depending on how thoroughly the first two series loosen the material and eliminate large chunks/blocks of material as verified by tests with a ¾-inch cone penetrometer.)

Fig. 12. Moderately dry topsoil is being replaced on the affected site now that Phase 1 deep ripping of the compressed subsoil is complete.


Fig. 13. The same deep, angled-leg subsoiler shown in Fig. 7 is engaged at maximum depth for Phase 2, decompaction (deep soiling), of the replaced topsoil and the upper subsoil materials.

Corridors
In long corridors of limited width and less maneuverability than larger sites, e.g.: along compacted areas used as temporary construction access, a modified series of pattern passes are used.

- First, apply the same initial lengthwise, parallel series of passes described above.

- A second series of passes makes a broad "S" shaped pattern of rips, continually and gradually alternating the "S" curves between opposite edges inside the compacted corridor.

- The third and final series again uses the broad, alternating S pattern, but it is "flip-flopped" to continually cross the previous S pattern along the corridor's centerline. This final series of the S pattern curves back along the edge areas skipped by the second series.

Maintenance and Cost

Once the two-phase practice of Deep Ripping and Decompation is completed, two items are essential for maintaining a site's soil porosity and permeability for infiltration. They are: planting and maintaining the appropriate ground cover with deep roots to maintain the soil structure (see Figure 15); and keeping the site free of traffic or other weight loads.

Note that site-specific choice of an appropriate vegetative ground-cover seed mix, including the proper seeding ratio of one or more perennial species with a deep taproot system and the proper amount of lime and soil nutrients (fertilizer mix) adapted to the soil-needs, are basic to the final practice of landscaping, i.e: surface tillage, seeding/planting/fertilizing and culti-packing or mulching is applied. The "maintenance" of an effectively deep-ripped and decompacted area is generally limited to the successful perennial (long-term) landscape ground cover; as long as no weight-bearing force of soil compaction is applied.


Fig. 14. The severely compacted soil of a temporary construction yard used daily by heavy equipment for four months; shown before deep ripping, topsoil replacement, and decompaction.


Fig. 15. The same site as Fig. 14 after deep ripping of the exposed subsoil, topsoil replacement, decompaction through the topsoil and upper subsoil and final surface tillage and revegetation to maintain soil permeability and infiltration.

The Deep Ripping and Decompaction practice is, by necessity, more extensive than periodic subsoiling of farmland.The cost of deep ripping and decompacting (deep subsoiling), will vary according to the depth and severity of soil-material compression and the relative amount of tractor and implement time that is required. In some instances, depending on open maneuverability, two-to-three acres of compacted project area may be deep-ripped in one day. In other situations of more severe compaction and - or less maneuverability, as little as one acre may be fully ripped in a day. Generally, if the Phase 1) Deep Ripping is fully effective, the Phase 2) Decompaction should be completed in 2/3 to 3/4 of the time required for Phase 1.

Using the example of two acres of Phase 1) Deep Ripping in one day, at $1800 per day, the net cost is $900 per acre. If the Phase 2) Decompacting or deep subsoiling takes 3/4 the time as Phase 1, it costs $675 per acre for a combined total of $1575 per acre to complete the practice (these figures do not include the cost of the separate practice of topsoil stripping and replacement). Due to the many variables, it must be recognized that cost will be determined by the specific conditions or constraints of the site and the availability of proper equipment.

Resources

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- Union Gas Limited, Ontario, Canada. 1984. *Rehabilitation of Agricultural Lands, Dawn-Kerwood Loop Pipeline; Technical Report*. Ecological Services for Planning, Ltd.; Robinson, Merritt & Devries, Ltd. and Smith, Hoffman Associates, Ltd.
- US Department of Agriculture in cooperation with Cornell University Agricultural Experiment Station. Various years. *Soil Survey of (various names) County, New York.* USDA.

Internet Access:

- Examples of implements:

V-Rippers. Access by internet search of *John Deere Ag -New Equipment for 915* (larger-frame model) *V-Rippe*; and, *for 913* (smaller-frame model) *V-Ripper*. Deep, angled-leg subsoiler. Access by internet search of: B*igham Brothers Shear Bolt Paratill-Subsoiler*. http://salesmanual.deere.com/sales/salesmanual/en_NA/primary_tillage/2008/feature/rippers/915v_pattern_frame.html?sbu=ag&link=prodcat Last visited March 08.

- Soils data of USDA Natural Resources Conservation Service. *NRCS Web Soil Survey.* http://websoilsurvey.nrcs.usda.gov/app/ and *USDA-NRCS Official Soil Series Descriptions; View by Name.* http://ortho.ftw.nrcs.usda.gov/cgi-bin/osd/osdname.cgi . *Last visited Jan. 08.*
- Soil penetrometer information. Access by internet searches of: *Diagnosing Soil Compaction using a Penetrometer (soil compaction tester), PSU Extension;* as well as *Dickey-john Soil Compaction Tester*. http://www.dickey-johnproducts.com/pdf/SoilCompactionTest.pdf and http://cropsoil.psu.edu/Extension/Facts/uc178pdf Last visited Sept. 07

Appendix F:
Post-Construction Inspections and Maintenance

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POST CONSTRUCTION INSPECTIONS AND MAINTENANCE

1. SITE COVER

a. Inspections

Site cover and associated structures and embankments should be inspected periodically for the first few months following construction and then on a biannual basis. Site inspections should also be performed following all major (i.e., intense storms, thunder storms, cloud burst, etc.) storm events. Items to check for include (but are not limited to):

i. Differential settlement of embankments, cracking or erosion.

ii. Lack of vigor and density of grass turf.

iii. Accumulation of sediments or litter on lawn areas, paved areas, or within catch basin sumps.

iv. Accumulation of pollutants, including oils or grease, in catch basin sumps.

v. Damage or fatigue of storm sewer structures or associated components.

b. Mowing and Sweeping

Vegetated areas and landscaping should be maintained to promote vigorous and dense growth. Lawn areas should be mowed at least three times a year (more frequent mowing may be desired for aesthetic reasons). Resultant yard waste shall be collected and disposed of off-site.

Paved areas should be swept at least twice a year. Additional sweeping may be appropriate in the early spring for removal of deicing materials

c. Debris and Litter Removal

Accumulation of litter and debris should be removed during each mowing or sweep operation.

d. Structural Repair or Replacement

Components of the system which require repair or replacement should be addressed immediately following identification.

e. Catch Basins

The frequency for cleanout of catch basin sumps will depend on the efficiency of mowing, sweeping, and debris and litter removal. Sumps should be cleaned when accumulation of sediments are within six inches of the catch basin outlet pipe.

Disposal of material from catch basins sumps, drainage manholes, and trench drains shall be in accordance with local, state, and federal guidelines.

f. Rip-rap Dissipation structures

Rip-rap used to dissipate energy from pipe outfalls shall be cleaned or replaced when it becomes overburdened with silt or sediment.

g. Winter Maintenance

To prevent impacts to storm water management facilities, the following winter maintenance limitations, restrictions, or requirements are recommended:

i. Remove snow and ice from inlet structures, basin inlet and outlet structures and away from culvert end sections.

ii. Snow removed from paved areas should not be piled at inlets/outlets of the storm water management basin.

iii. Use of deicing materials should be limited to sand and "environmentally friendly" chemical products. Use of salt mixtures should be kept to a minimum.

iv. Sand used for deicing should be clean, course material free of fines, silt, and clay.

v. Materials used for deicing should be removed during the early spring by sweeping and/ or vacuuming.

2. BIORETENTION FILTERS

a. Inspection Schedule

Bioretention filters should be inspected periodically for the first few months after construction and then on a monthly basis. Bioretention filters should be inspected after all major storm events.

b. Inspection of Uphill Drainage Area

Inspect areas that are uphill from the Bioretention filter.

i. Bare soil and/or erosion of the ground should be seeded and mulches to establish vegetation. Areas of erosion should be filled with soil, compacted, and seeded and strawed to establish vegetation.

ii. If a small channel(s) is forming, try to redirect water flowing to this area by creating a small berm or adding topsoil to areas that are heavily compacted.

iii. Piles of grass clippings, mulch, dirt, salt or other materials should be removed.

iv. Open containers of oil, grease, paint, or other substances should be covered and properly disposed of.

c. Inspection of Inlets

Stand in the Bioretention filter itself and inspect each location where water flows in.

i. Inlets should have a clear pathway for water to flow into the filter. Grit and debris or grass/weeds should be removed at curb inlets or openings.

ii. Clumps of growing grass or weeds and the associated soil or grit should be removed.

iii. Grass clippings, leaves, sticks, and other debris collecting at inlets should be removed.

iv. For pipes and ditches, sediment and debris partially blocking the pipe or ditch opening into the Bioretention filter should be removed.

v. All materials removed should be properly disposed in such a way that it may not re-enter the Bioretention filter.

vi. Small areas of erosion should be smoothed out and rock or stone applied to prevent further erosion. Reseeding and applying erosion-control matting can be used to prevent further erosion.

d. Inspection of Ponding Area

Examine the entire Bioretention surface and side slopes:

i. In areas where the mulch layer has decomposed or is less than 1-inch thick, new mulch should be added to a total depth of 2 to 3 inches. The mulch should be a shredded hardwood mulch that is less likely to float away during rainstorms. Avoid adding too much mulch so that inlets are obstructed, or certain areas become higher than the rest of the Bioretention surface.

ii. Excess sediment, grit, trash, or other debris that has accumulated on the bottom should be removed and disposed of in such a way that it cannot re-enter the Bioretention filter. If removing the material creates a hole or low area, fill in with a soil mix that matches the original mix and cover with mulch to create a flat surface.

iii. Eroded areas in the bottom or on the side slopes should be filled with clean topsoil or sand and covered with mulch. If the problem reoccurs, stone can be used to fill in the areas. If the erosion is on a side slope, fill in with clay that can be compacted and seed and mulch the area.

iv. The bottom of the Bioretention filter should be flat. The surface should be raked or mulch added to low spots to create a more level surface.

e. Inspection of Vegetation

Examine all Bioretention filter vegetation:

i. Weeds and dead and/or diseased plants should be removed and the mulch surrounding these replaced. Plants should be added to fill in areas that are not well vegetated.

ii. If bioretention filter utilized a vegetated seed mix, then grass areas shall be mowed to ensure that grass height does not exceed 6-inches.

iii. Undesirable trees and shrubs should be removed. Resultant yard wastes shall be collected and disposed of off-site

f. Inspection of Outlets

Examine the outlets that release water out of the Bioretention filter:

i. Stone should be added in areas of erosion at the outlet to reduce the impact from the water flowing out of the outlet pipe or weir during storms.

ii. Outlet obstructions should be removed and disposed of where it cannot re-enter the Bioretention filter.

g. Debris, Trash and Litter Control

Removal of debris and litter shall be accomplished during mowing operations. Inlet structures should be cleared of all debris and litter.

h. Structural Repairs and Replacement

Components of the bioretention filter, which require repair or replacement, should be addressed immediately following identification. This includes treating and or replacing diseased trees and shrub, fertilizing as necessary, replacing tree stakes and wires, replacing mulch where bare spots appear, replacing clogged underdrains, filter beds, and pea gravel diaphragm.

i. Erosion and Sediment Control

Sources of sedimentation, specifically eroded areas in upland drainage areas, should be stabilized immediately upon identification. Stabilization should be with vegetative practices or other erosion control practices when vegetative measures do not prove effective.

Soil slumpage, erosion of the embankments or around inlets/outlets, and cracking should be stabilized and repaired immediately upon identification.

j. Sediment Removal

Sediments that accumulate in the bioretention filter should be removed annually to prevent clogging of inlet or outlet structures. Disposal of material removed from bioretention filter shall be in accordance with local, state, and federal guidelines.

3. HYDRODYNAMIC DEVICE

The hydrodynamic device is a confined space environment and only properly trained personnel possessing the necessary safety equipment should enter the unit to perform maintenance or inspection.

a. Inspection Schedule

The hydrodynamic device shall be inspected every four months.

b. Inspection Items

The unit's internal components should be inspected for any signs of damage or any loosening of the bolts used to fasten the various components to the manhole structure and to each other.

Refer to attached Operations and Maintenance Guidelines, for the Hydrodynamic Device, for the manufacturer's detailed inspection and maintenance requirements.

c. Debris, Trash and Litter Control

The screen shall be power washed for the inspection. The floatables shall be removed and the sump cleaned when it has reached 50% capacity. The unit may require cleaning in the event of a spill of a toxic or foreign substance. At a minimum, the hydrodynamic device shall be pumped out at least once a year if the sump does not reach its 50% capacity.

d. Sediment removal

Disposal of material from the hydrodynamic device shall be in accordance with local, state, and federal guidelines.

CONTECH®
ENGINEERED SOLUTIONS

CDS Guide
Operation, Design, Performance and Maintenance

CDS®

Using patented continuous deflective separation technology, the CDS system screens, separates and traps debris, sediment, and oil and grease from stormwater runoff. The indirect screening capability of the system allows for 100% removal of floatables and neutrally buoyant material without blinding. Flow and screening controls physically separate captured solids, and minimize the re-suspension and release of previously trapped pollutants. Inline units can treat up to 6 cfs, and internally bypass flows in excess of 50 cfs (1416 L/s). Available precast or cast-in-place, offline units can treat flows from 1 to 300 cfs (28.3 to 8495 L/s). The pollutant removal capacity of the CDS system has been proven in lab and field testing.

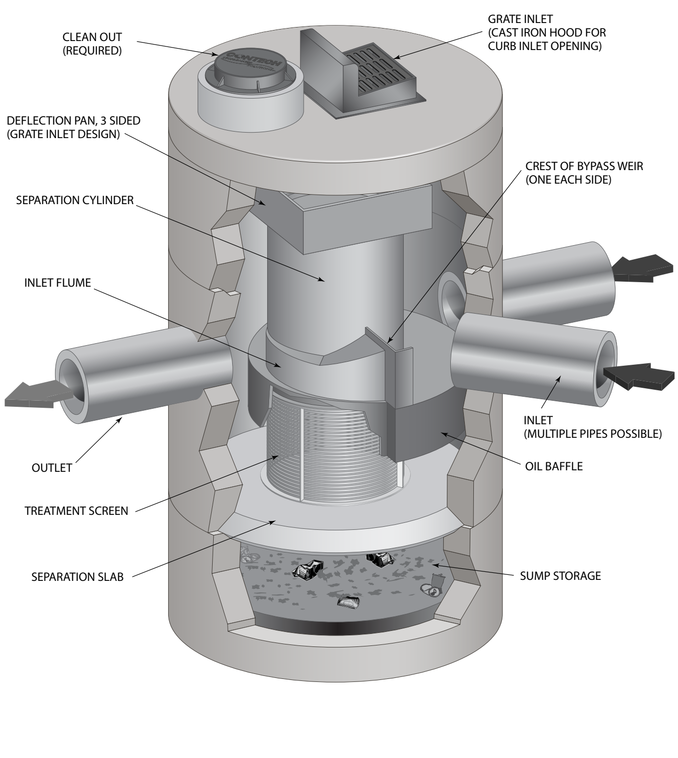
Operation Overview

Stormwater enters the diversion chamber where the diversion weir guides the flow into the unit's separation chamber and pollutants are removed from the flow. All flows up to the system's treatment design capacity enter the separation chamber and are treated.

Swirl concentration and screen deflection force floatables and solids to the center of the separation chamber where 100% of floatables and neutrally buoyant debris larger than the screen apertures are trapped.

Stormwater then moves through the separation screen, under the oil baffle and exits the system. The separation screen remains clog free due to continuous deflection.

During the flow events exceeding the treatment design capacity, the diversion weir bypasses excessive flows around the separation chamber, so captured pollutants are retained in the separation cylinder.



Design Basics

There are three primary methods of sizing a CDS system. The Water Quality Flow Rate Method determines which model size provides the desired removal efficiency at a given flow rate for a defined particle size. The Rational Rainfall Method™ or the and Probabilistic Method is used when a specific removal efficiency of the net annual sediment load is required.

Typically in the Unites States, CDS systems are designed to achieve an 80% annual solids load reduction based on lab generated performance curves for a gradation with an average particle size (d50) of 125 microns (μm). For some regulatory environments, CDS systems can also be designed to achieve an 80% annual solids load reduction based on an average particle size (d50) of 75 microns (μm) or 50 microns (μm).

Water Quality Flow Rate Method

In some cases, regulations require that a specific treatment rate, often referred to as the water quality design flow (WQQ), be treated. This WQQ represents the peak flow rate from either an event with a specific recurrence interval, e.g. the six-month storm, or a water quality depth, e.g. 1/2-inch (13 mm) of rainfall.

The CDS is designed to treat all flows up to the WQQ. At influent rates higher than the WQQ, the diversion weir will direct most flow exceeding the WQQ around the separation chamber. This allows removal efficiency to remain relatively constant in the separation chamber and eliminates the risk of washout during bypass flows regardless of influent flow rates.

Treatment flow rates are defined as the rate at which the CDS will remove a specific gradation of sediment at a specific removal efficiency. Therefore the treatment flow rate is variable, based on the gradation and removal efficiency specified by the design engineer.

Rational Rainfall Method™

Differences in local climate, topography and scale make every site hydraulically unique. It is important to take these factors into consideration when estimating the long-term performance of any stormwater treatment system. The Rational Rainfall Method combines site-specific information with laboratory generated performance data, and local historical precipitation records to estimate removal efficiencies as accurately as possible.

Short duration rain gauge records from across the United States and Canada were analyzed to determine the percent of the total annual rainfall that fell at a range of intensities. US stations' depths were totaled every 15 minutes, or hourly, and recorded in 0.01-inch increments. Depths were recorded hourly with 1-mm resolution at Canadian stations. One trend was consistent at all sites; the vast majority of precipitation fell at low intensities and high intensity storms contributed relatively little to the total annual depth.

These intensities, along with the total drainage area and runoff coefficient for each specific site, are translated into flow rates using the Rational Rainfall Method. Since most sites are relatively small and highly impervious, the Rational Rainfall Method is appropriate. Based on the runoff flow rates calculated for each intensity, operating rates within a proposed CDS system are determined. Performance efficiency curve determined from full scale laboratory tests on defined sediment PSDs is applied to calculate solids removal efficiency. The relative removal efficiency at each operating rate is added to produce a net annual pollutant removal efficiency estimate.

Probabilistic Rational Method

The Probabilistic Rational Method is a sizing program Contech developed to estimate a net annual sediment load reduction for a particular CDS model based on site size, site runoff coefficient, regional rainfall intensity distribution, and anticipated pollutant characteristics.

The Probabilistic Method is an extension of the Rational Method used to estimate peak discharge rates generated by storm events of varying statistical return frequencies (e.g. 2-year storm event). Under the Rational Method, an adjustment factor is used to adjust the runoff coefficient estimated for the 10-year event, correlating a known hydrologic parameter with the target storm event. The rainfall intensities vary depending on the return frequency of the storm event under consideration. In general, these two frequency dependent parameters (rainfall intensity and runoff coefficient) increase as the return frequency increases while the drainage area remains constant.

These intensities, along with the total drainage area and runoff coefficient for each specific site, are translated into flow rates using the Rational Method. Since most sites are relatively small and highly impervious, the Rational Method is appropriate. Based on the runoff flow rates calculated for each intensity, operating rates within a proposed CDS are determined. Performance efficiency curve on defined sediment PSDs is applied to calculate solids removal efficiency. The relative removal efficiency at each operating rate is added to produce a net annual pollutant removal efficiency estimate.

Treatment Flow Rate

The inlet throat area is sized to ensure that the WQQ passes through the separation chamber at a water surface elevation equal to the crest of the diversion weir. The diversion weir bypasses excessive flows around the separation chamber, thus preventing re-suspension or re-entrainment of previously captured particles.

Hydraulic Capacity

The hydraulic capacity of a CDS system is determined by the length and height of the diversion weir and by the maximum allowable head in the system. Typical configurations allow hydraulic capacities of up to ten times the treatment flow rate. The crest of the diversion weir may be lowered and the inlet throat may be widened to increase the capacity of the system at a given water surface elevation. The unit is designed to meet project specific hydraulic requirements.

Performance

Full-Scale Laboratory Test Results

A full-scale CDS system (Model CDS2020-5B) was tested at the facility of University of Florida, Gainesville, FL. This CDS unit was evaluated under controlled laboratory conditions of influent flow rate and addition of sediment.

Two different gradations of silica sand material (UF Sediment & OK-110) were used in the CDS performance evaluation. The particle size distributions (PSDs) of the test materials were analyzed using standard method "Gradation ASTM D-422 "Standard Test Method for Particle-Size Analysis of Soils" by a certified laboratory.

UF Sediment is a mixture of three different products produced by the U.S. Silica Company: "Sil-Co-Sil 106", "#1 DRY" and "20/40 Oil Frac". Particle size distribution analysis shows that the UF Sediment has a very fine gradation (d50 = 20 to 30 μm) covering a wide size range (Coefficient of Uniformity, C averaged at 10.6). In comparison with the hypothetical TSS gradation specified in the NJDEP (New Jersey Department of Environmental Protection) and NJCAT (New Jersey Corporation for Advanced Technology) protocol for lab testing, the UF Sediment covers a similar range of particle size but with a finer d50 (d50 for NJDEP is approximately 50 μm) (NJDEP, 2003).

The OK-110 silica sand is a commercial product of U.S. Silica Sand. The particle size distribution analysis of this material, also included in Figure 1, shows that 99.9% of the OK-110 sand is finer than 250 microns, with a mean particle size (d50) of 106 microns. The PSDs for the test material are shown in Figure 1.

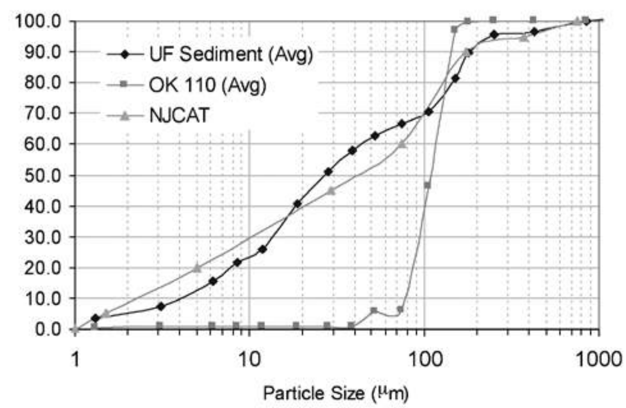


Figure 1. Particle size distributions

Tests were conducted to quantify the performance of a specific CDS unit (1.1 cfs (31.3-L/s) design capacity) at various flow rates, ranging from 1% up to 125% of the treatment design capacity of the unit, using the 2400 micron screen. All tests were conducted with controlled influent concentrations of approximately 200 mg/L. Effluent samples were taken at equal time intervals across the entire duration of each test run. These samples were then processed with a Dekaport Cone sample splitter to obtain representative sub-samples for Suspended Sediment Concentration (SSC) testing using ASTM D3977-97 "Standard Test Methods for Determining Sediment Concentration in Water Samples", and particle size distribution analysis.

Results and Modeling

Based on the data from the University of Florida, a performance model was developed for the CDS system. A regression analysis was used to develop a fitting curve representative of the scattered data points at various design flow rates. This model, which demonstrated good agreement with the laboratory data, can then be used to predict CDS system performance with respect to SSC removal for any particle size gradation, assuming the particles are inorganic sandy-silt. Figure 2 shows CDS predictive performance for two typical particle size gradations (NJCAT gradation and OK-110 sand) as a function of operating rate.

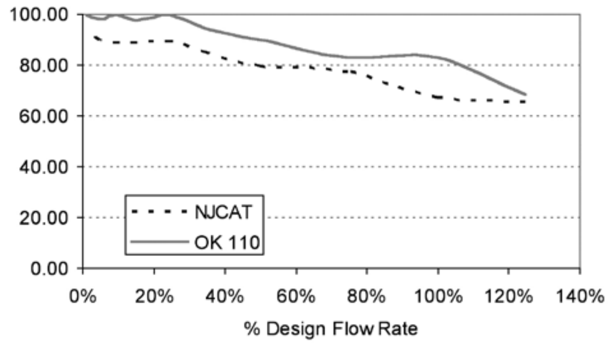


Figure 2. CDS stormwater treatment predictive performance for various particle gradations as a function of operating rate.

Many regulatory jurisdictions set a performance standard for hydrodynamic devices by stating that the devices shall be capable of achieving an 80% removal efficiency for particles having a mean particle size (d50) of 125 microns (e.g. Washington State Department of Ecology — WASDOE - 2008). The model can be used to calculate the expected performance of such a PSD (shown in Figure 3). The model indicates (Figure 4) that the CDS system with 2400 micron screen achieves approximately 80% removal at the design (100%) flow rate, for this particle size distribution (d50 = 125 μm).

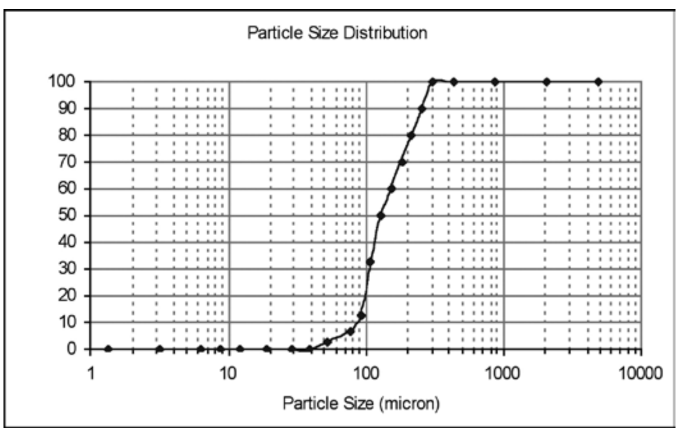


Figure 3. WASDOE PSD

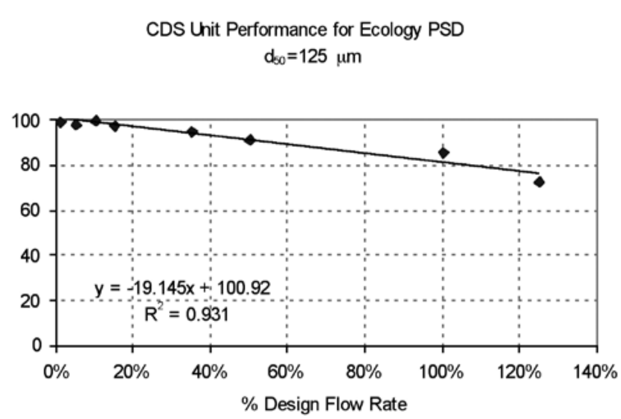


Figure 4. Modeled performance for WASDOE PSD.

Maintenance

The CDS system should be inspected at regular intervals and maintained when necessary to ensure optimum performance. The rate at which the system collects pollutants will depend more heavily on site activities than the size of the unit. For example, unstable soils or heavy winter sanding will cause the grit chamber to fill more quickly but regular sweeping of paved surfaces will slow accumulation.

Inspection

Inspection is the key to effective maintenance and is easily performed. Pollutant transport and deposition may vary from year to year and regular inspections will help ensure that the system is cleaned out at the appropriate time. At a minimum, inspections should be performed twice per year (e.g. spring and fall) however more frequent inspections may be necessary in climates where winter sanding operations may lead to rapid accumulations, or in equipment washdown areas. Installations should also be inspected more frequently where excessive amounts of trash are expected.

The visual inspection should ascertain that the system components are in working order and that there are no blockages or obstructions in the inlet and separation screen. The inspection should also quantify the accumulation of hydrocarbons, trash, and sediment in the system. Measuring pollutant accumulation can be done with a calibrated dipstick, tape measure or other measuring instrument. If absorbent material is used for enhanced removal of hydrocarbons, the level of discoloration of the sorbent material should also be identified

during inspection. It is useful and often required as part of an operating permit to keep a record of each inspection. A simple form for doing so is provided.

Access to the CDS unit is typically achieved through two manhole access covers. One opening allows for inspection and cleanout of the separation chamber (cylinder and screen) and isolated sump. The other allows for inspection and cleanout of sediment captured and retained outside the screen. For deep units, a single manhole access point would allows both sump cleanout and access outside the screen.

The CDS system should be cleaned when the level of sediment has reached 75% of capacity in the isolated sump or when an appreciable level of hydrocarbons and trash has accumulated. If absorbent material is used, it should be replaced when significant discoloration has occurred. Performance will not be impacted until 100% of the sump capacity is exceeded however it is recommended that the system be cleaned prior to that for easier removal of sediment. The level of sediment is easily determined by measuring from finished grade down to the top of the sediment pile. To avoid underestimating the level of sediment in the chamber, the measuring device must be lowered to the top of the sediment pile carefully. Particles at the top of the pile typically offer less resistance to the end of the rod than consolidated particles toward the bottom of the pile. Once this measurement is recorded, it should be compared to the as-built drawing for the unit to determine weather the height of the sediment pile off the bottom of the sump floor exceeds 75% of the total height of isolated sump.

Cleaning

Cleaning of a CDS systems should be done during dry weather conditions when no flow is entering the system. The use of a vacuum truck is generally the most effective and convenient method of removing pollutants from the system. Simply remove the manhole covers and insert the vacuum hose into the sump. The system should be completely drained down and the sump fully evacuated of sediment. The area outside the screen should also be cleaned out if pollutant build-up exists in this area.

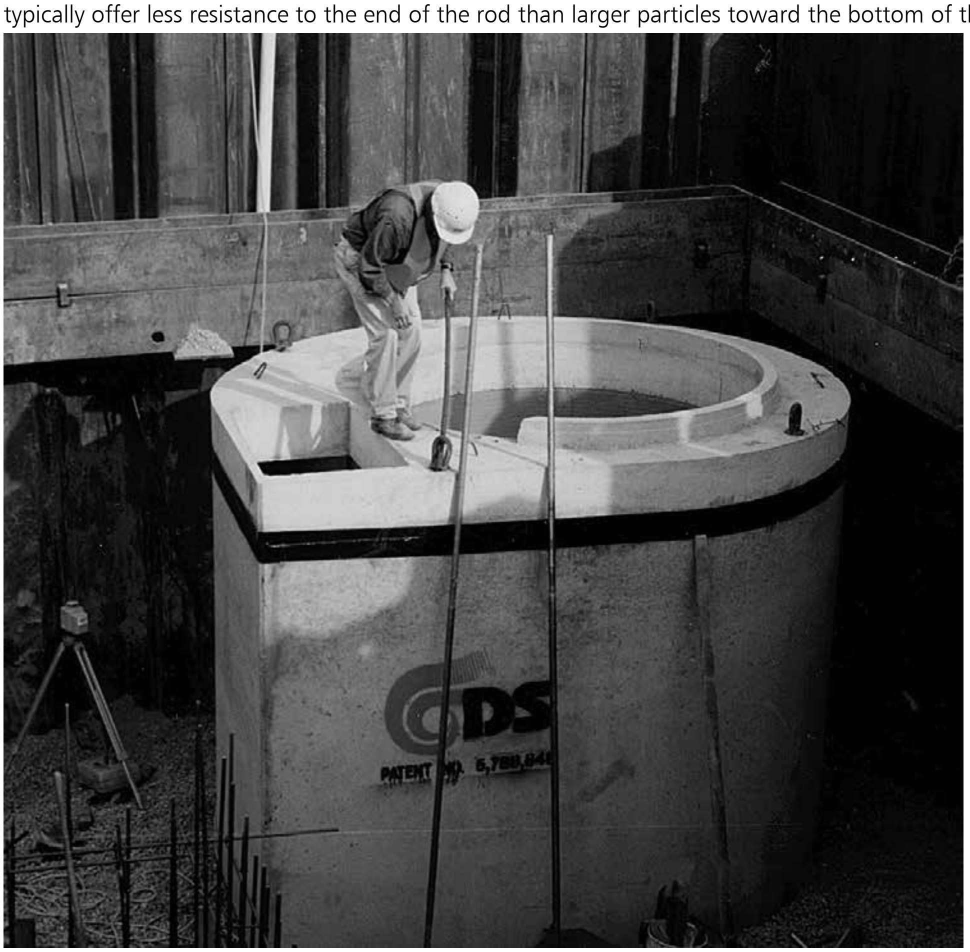
In installations where the risk of petroleum spills is small, liquid contaminants may not accumulate as quickly as sediment. However, the system should be cleaned out immediately in the event of an oil or gasoline spill. Motor oil and other hydrocarbons that accumulate on a more routine basis should be removed when an appreciable layer has been captured. To remove these pollutants, it may be preferable to use absorbent pads since they are usually less expensive to dispose than the oil/water emulsion that may be created by vacuuming the oily layer. Trash and debris can be netted out to separate it from the other pollutants. The screen should be cleaned to ensure it is free of trash and debris.

Manhole covers should be securely seated following cleaning activities to prevent leakage of runoff into the system from above and also to ensure that proper safety precautions have been followed. Confined space entry procedures need to be followed if physical access is required. Disposal of all material removed from the CDS system should be done in accordance with local regulations. In many jurisdictions, disposal of the sediments may be handled in the same manner as the disposal of sediments removed from catch basins or deep sump manholes. Check your local regulations for specific requirements on disposal.

CDS Model	Diameter		Distance from Water Surface to Top of Sediment Pile		Sediment Storage Capacity	
	ft	m	ft	m	y³	m³
CDS1515	3	0.9	3.0	0.9	0.5	0.4
CDS2015	4	1.2	3.0	0.9	0.9	0.7
CDS2015	5	1.5	3.0	0.9	1.3	1.0
CDS2020	5	1.5	3.5	1.1	1.3	1.0
CDS2025	5	1.5	4.0	1.2	1.3	1.0
CDS3020	6	1.8	4.0	1.2	2.1	1.6
CDS3025	6	1.8	4.0	1.2	2.1	1.6
CDS3030	6	1.8	4.6	1.4	2.1	1.6
CDS3035	6	1.8	5.0	1.5	2.1	1.6
CDS4030	8	2.4	4.6	1.4	5.6	4.3
CDS4040	8	2.4	5.7	1.7	5.6	4.3
CDS4045	8	2.4	6.2	1.9	5.6	4.3
CDS5640	10	3.0	6.3	1.9	8.7	6.7
CDS5653	10	3.0	7.7	2.3	8.7	6.7
CDS5668	10	3.0	9.3	2.8	8.7	6.7
CDS5678	10	3.0	10.3	3.1	8.7	6.7

Table 1: CDS Maintenance Indicators and Sediment Storage Capacities

Note: To avoid underestimating the volume of sediment in the chamber, carefully lower the measuring device to the top of the sediment pile. Finer silty particles at the top of the pile may be more difficult to feel with a measuring stick. These finer particles typically offer less resistance to the end of the rod than larger particles toward the bottom of the pile.



CDS Inspection & Maintenance Log

CDS Model: ____________________ Location: ____________________

Date	Water depth to sediment[1]	Floatable Layer Thickness[2]	Describe Maintenance Performed	Maintenance Personnel	Comments

1. The water depth to sediment is determined by taking two measurements with a stadia rod: one measurement from the manhole opening to the top of the sediment pile and the other from the manhole opening to the water surface. If the difference between these measurements is less than the values listed in table 1 the system should be cleaned out. **Note: to avoid underestimating the volume of sediment in the chamber, the measuring device must be carefully lowered to the top of the sediment pile**.

2. For optimum performance, the system should be cleaned out when the floating hydrocarbon layer accumulates to an appreciable thickness. In the event of an oil spill, the system should be cleaned immediately.

SUPPORT

- Drawings and specifications are available at www.ContechES.com.
- Site-specific design support is available from our engineers.

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The product(s) described may be protected by one or more of the following US patents: 5,322,629; 5,624,576; 5,707,527; 5,759,415; 5,788,848; 5,985,157; 6,027,639; 6,350,374; 6,406,218; 6,641,720; 6,511,595; 6,649,048; 6,991,114; 6,998,038; 7,186,058; 7,296,692; 7,297,266; related foreign patents or other patents pending.

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CDS® Models and Capacities

	CDS MODEL	Treatment Flow Rates[1]			Estimated Maximum Peak Conveyance Flow[3] (cfs)/(L/s)	Minimum Sump Storage Capacity[4] $(yd^3)/(m^3)$	Minimum Oil Storage Capacity[4] (gal)/(L)
		75 microns (cfs)/(L/s)	125 microns[2] (cfs)/(L/s)	Trash & Debris (cfs)/(L/s)			
PRECAST	CDS2015-4	0.5 (14.2)	0.7 (19.8)	1.0 (28.3)	10 (283)	0.9 (0.7)	61 (232)
PRECAST	CDS2015-5	0.5 (14.2)	0.7(19.8)	1.0 (28.3)	10 (283)	1.5 (1.1)	83 (313)
PRECAST	CDS2020-5	0.7 (19.8)	1.1 (31.2)	1.5 (42.5)	14 (396)	1.5 (1.1)	99 (376)
PRECAST	CDS2025-5	1.1 (31.2)	1.6 (45.3)	2.2 (62.3)	14 (396)	1.5 (1.1)	116 (439)
PRECAST	CDS3020-6	1.4 (39.6)	2.0 (56.6)	2.8 (79.3)	20 (566)	2.1 (1.6)	184 (696)
PRECAST	CDS3025-6	1.7 (48.1)	2.5 (70.8)	3.5 (99.2)	20 (566)	2.1 (1.6)	210 (795)
PRECAST	CDS3030-6	2.0 (56.6)	3.0 (85.0)	4.2 (118.9)	20 (566)	2.1 (1.6)	236 (895)
PRECAST	CDS3035-6	2.6 (73.6)	3.8 (106.2)	5.3 (150.0)	20 (566)	2.1 (1.6)	263 (994)
PRECAST	CDS4030-8	3.1 (87.7)	4.5 (127.4)	6.3 (178.3)	30 (850)	5.6 (4.3)	426 (1612)
PRECAST	CDS4040-8	4.1 (116.1)	6.0 (169.9)	8.4 (237.8)	30 (850)	5.6 (4.3)	520 (1970)
PRECAST	CDS4045-8	5.1 (144.4)	7.5 (212.4)	10.5 (297.2)	30 (850)	5.6 (4.3)	568 (2149)
PRECAST	CDS5640-10	6.1 (172.7)	9.0 (254.9)	12.6 (356.7)	50 (1416)	8.7 (6.7)	758 (2869)
PRECAST	CDS5653-10	9.5 (268.9)	14.0 (396.5)	19.6 (554.8)	50 (1416)	8.7 (6.7)	965 (3652)
PRECAST	CDS5668-10	12.9 (365.1)	19.0 (538.1)	26.6 (752.9)	50 (1416)	8.7 (6.7)	1172 (4435)
PRECAST	CDS5678-10	17.0 (481.2)	25.0 (708.0)	35.0 (990.7)	50 (1416)	8.7 (6.7)	1309 (4956)
PRECAST	CDS9280-12	27.2 (770.2)	40.0 (1132.7)	56.0 (1585.7)		16.8 (12.8)	
PRECAST	CDS9290-12	35.4 (1002.4)	52.0 (1472.5)	72 (2038.8)		16.8 (12.8)	
PRECAST	CDS92100-12	42.8 (1212.0)	63.0 (1783.9)	88 (2491.9)		16.8 (12.8)	
CAST-IN-PLACE	CDS150134-22	100.7 (2851.5)	148.0 (4190.9)	270 (7645.6)	Offline	56.3 (43.0)	N/A
CAST-IN-PLACE	CDS200164-26	183.6 (5199.0)	270.0 (7645.6)	378.0 (10703.8)		78.7 (60.2)	
CAST-IN-PLACE	CDS240160-32	204 (5776.6)	300.0 (8495.1)	420.0 (11893.0)		119.1 (91.1)	
CAST-IN-PLACE	Additional Cast-in-Place models available upon request.						

1. Alternative PSD/D_{50} sizing is available upon request.
2. 125 micron flows are based on the CDS Washington State Department of Ecology approval for 80% removal of a particle size distribution (PSD) having a mean particle size (D_{50}) of 125 microns.
3. Estimated maximum peak conveyance flow is calculated using conservative values and may be exceeded on sites with lower inflow velocities and sufficient head over the weir.
4. Sump and oil capacities can be customized to meet site needs.

Appendix G: Figures

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FIG 1

THE Chazen COMPANIES

ENGINEERS/SURVEYORS
PLANNERS
ENVIRONMENTAL SCIENTISTS
LANDSCAPE ARCHITECTS

Dutchess County Office:
21 Fox Street, Poughkeepsie, NY 12601
Phone: (845) 454-3980

Capital District Office:
547 River Street, Troy, NY 12180
Phone: (518) 273-0055

Glens Falls Office:
100 Glen Street, Glens Falls, NY 12801
Phone: (518) 812-0513

Beacon 248 Development LLC
Proposed Residential Development

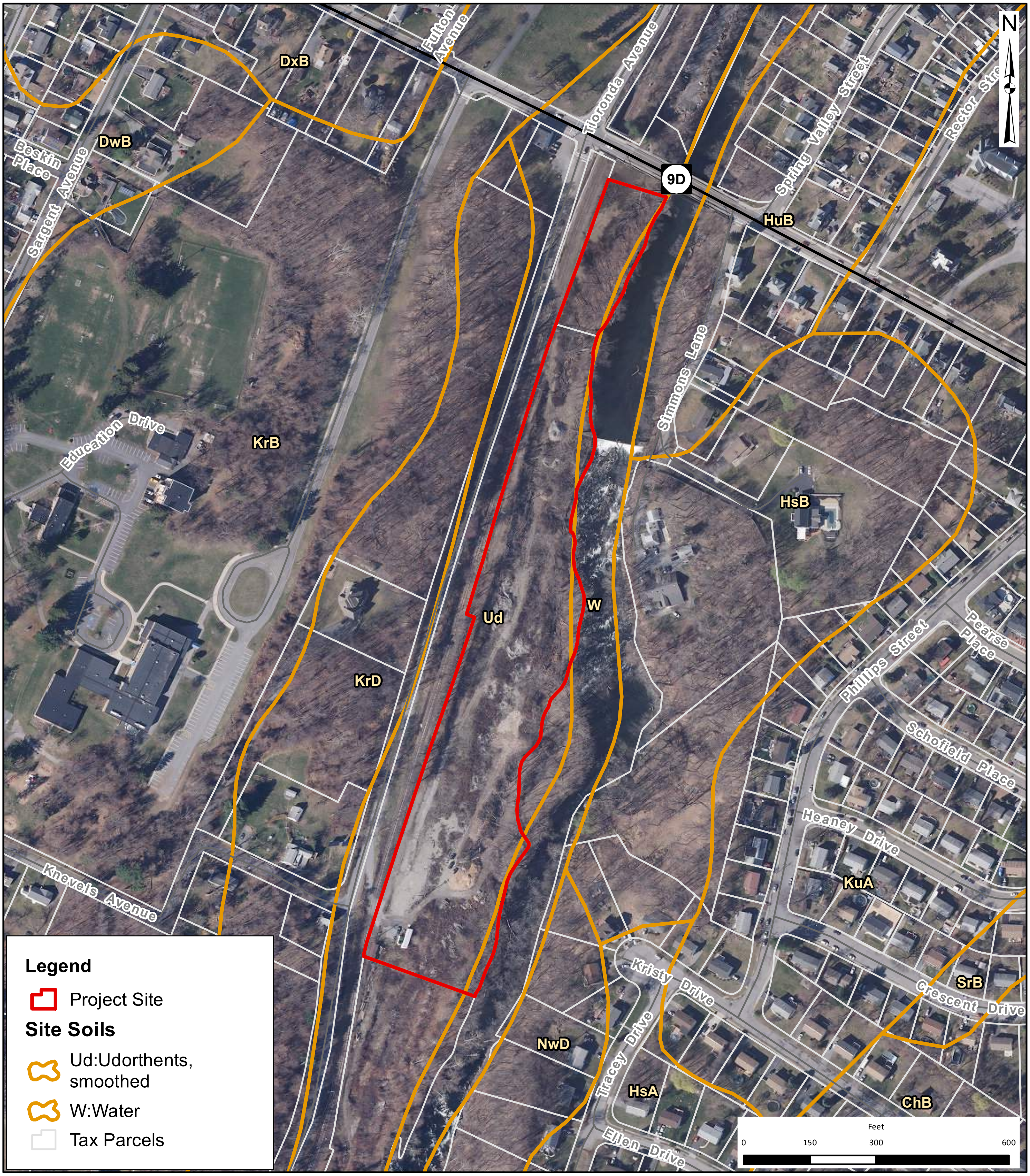
Orthophoto Map

104 Rochelle Avenue
City of Beacon
Dutchess County, New York

Drawn:	CLC
Date:	01/23/2011
Scale:	1:3,600
Project:	81056.00
Figure:	X

Map Document: (R:\8\81000-81999\81056_00_Beacon\GIS\maps\81056_00_Orthophoto_8x11.mxd)
1/23/2011 -- 1:07:07 PM

FIG 2



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PLANNERS
ENVIRONMENTAL & SAFETY PROFESSIONALS
LANDSCAPE ARCHITECTS

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Capital District Office:
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Phone: (518) 273-0055

North Country Office:
375 Bay Road, Queensbury, NY 12804
Phone: (518) 812-0513

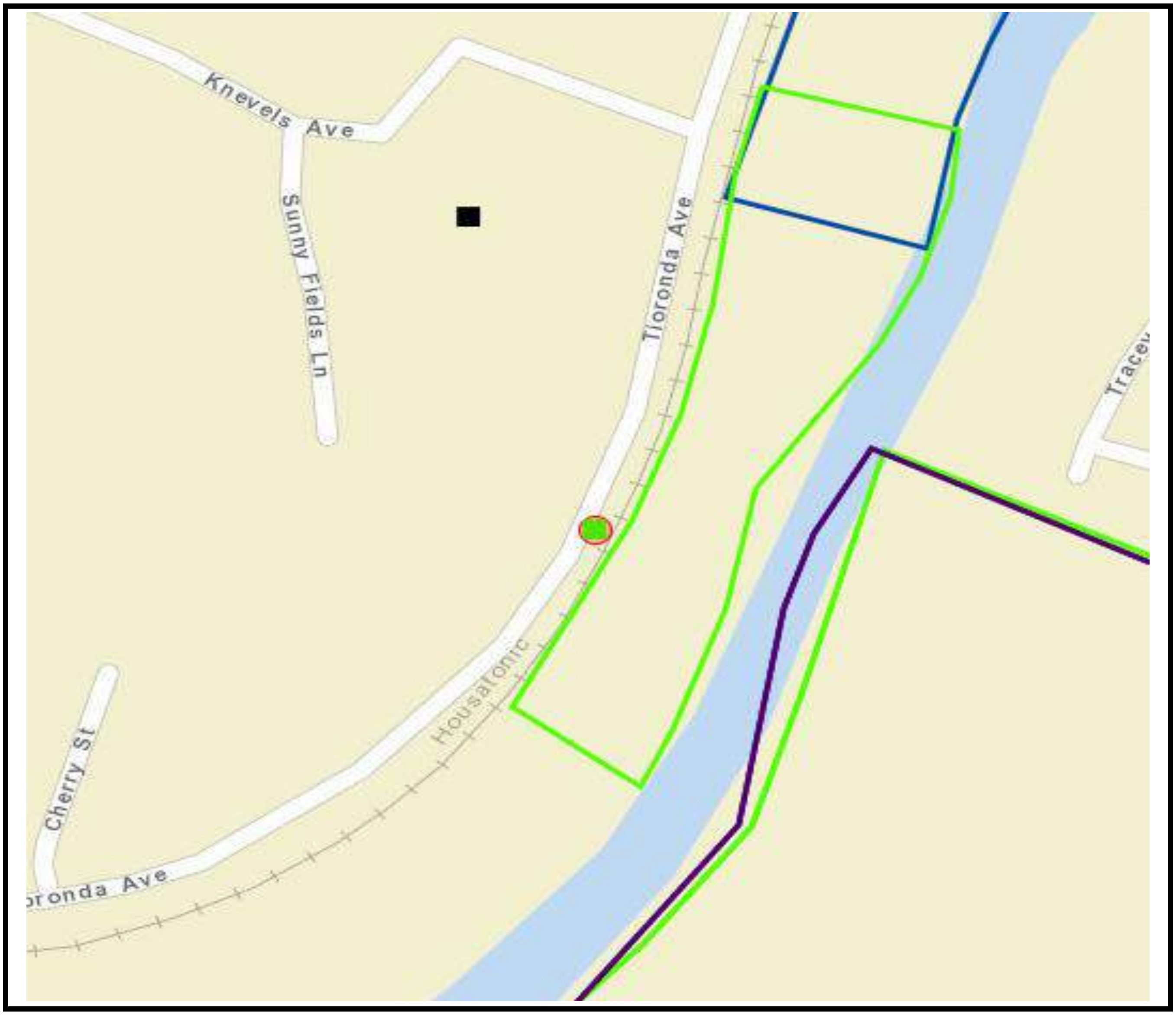
Proposed Fishkill Creek Development (FCD) Site Plan

Soils Map

Tioronda Avenue, City of Beacon - Dutchess County, NY

Drawn:	RLB
Date:	09/06/2018
Scale:	1 in = 300 feet
Project:	81750.00
Figure:	4

FIG 3



LEGEND

Consultation Projects (View)

Survey Archaeology Areas (View)

Survey Building Areas (View)

LPC Historic Districts

Archeologically Sensitive Areas

National Register Building Sites (View)

USN Building Districts (View)

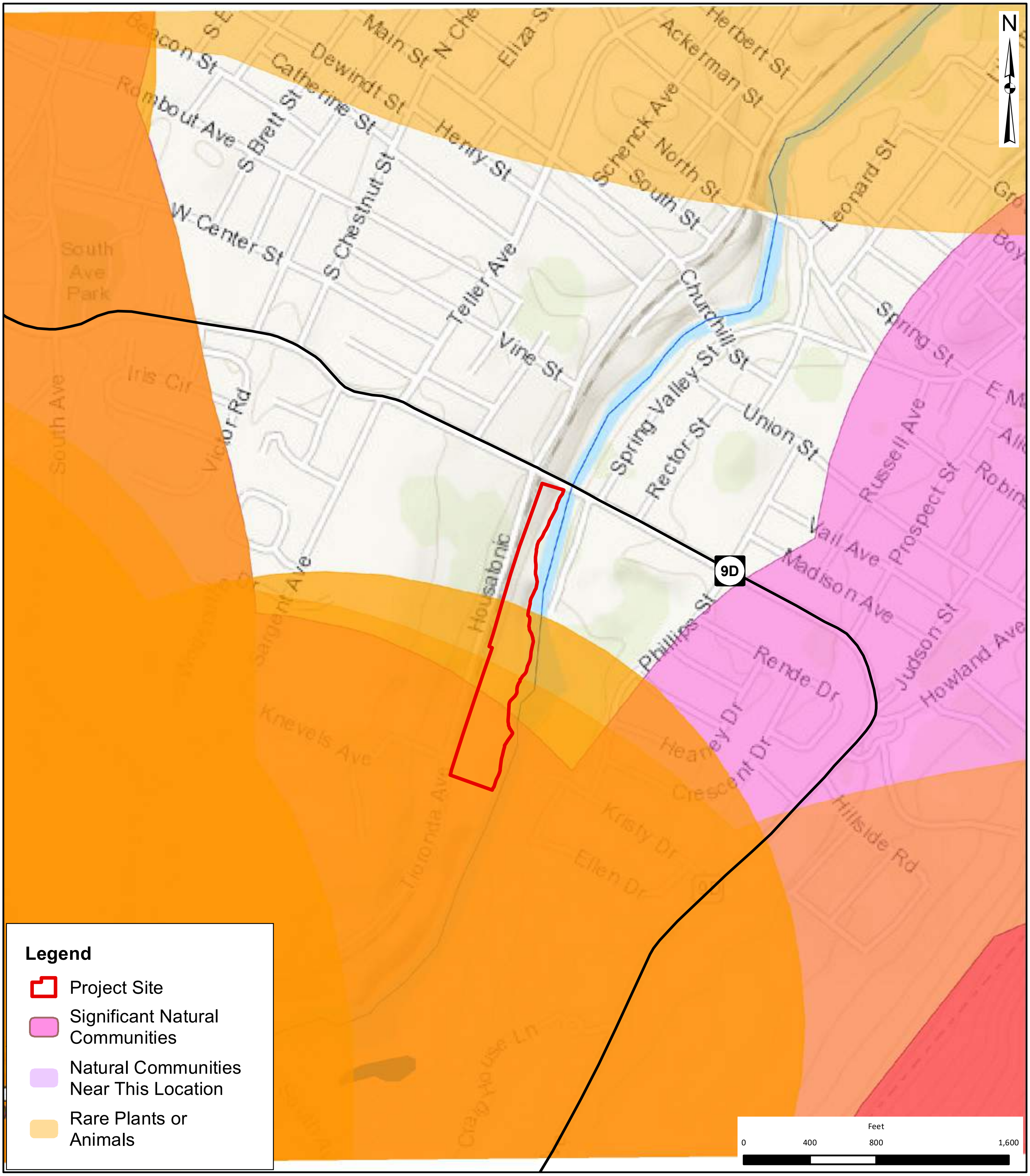
LPC Landmarks

USN Building Points (View)

- Eligible
- Listed
- Not Eligible
- Not Eligible - Demolished
- Undetermined

Cemeteries

FIG 4



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North Country Office:
375 Bay Road, Queensbury, NY 12804
Phone: (518) 812-0513

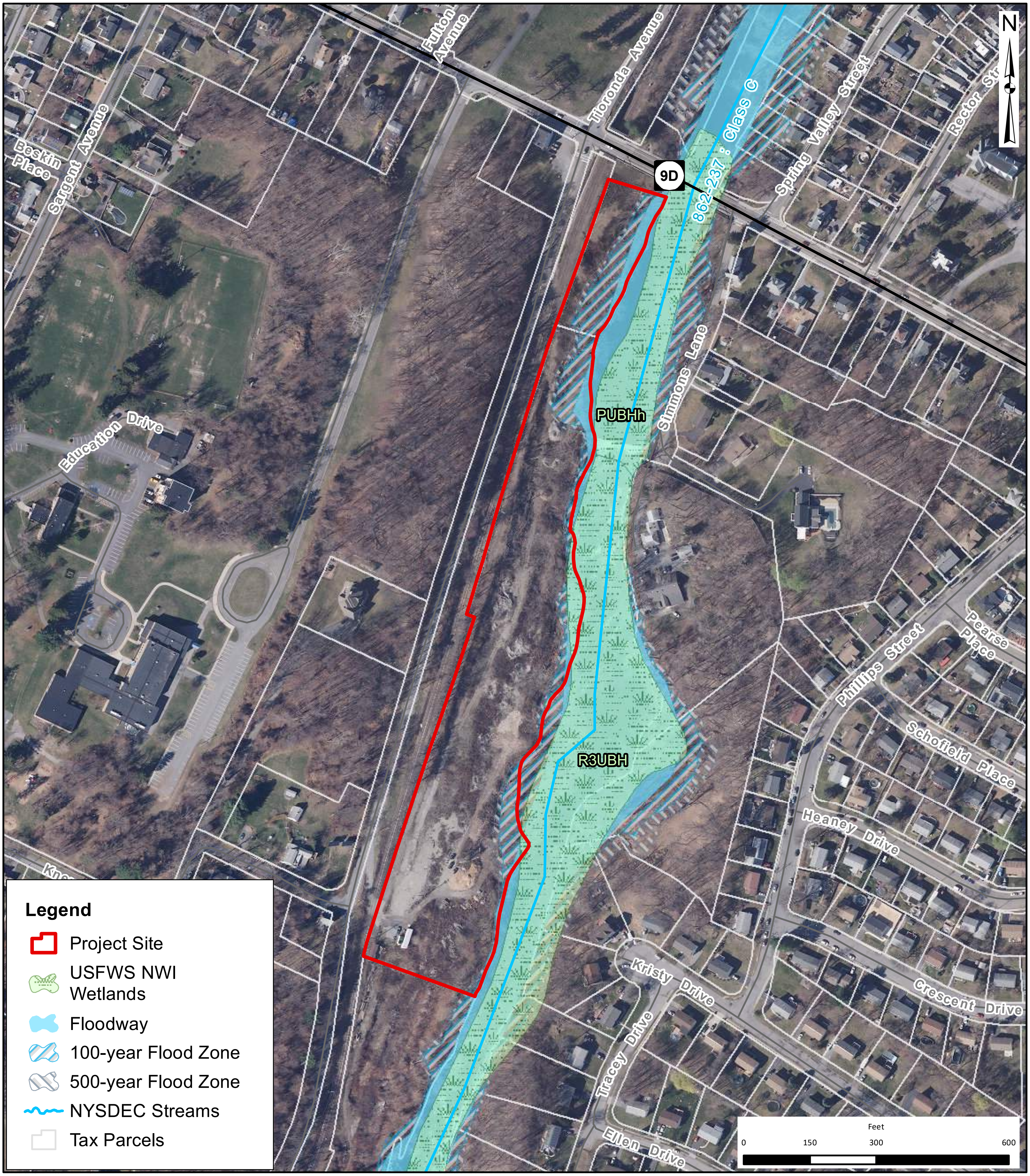
Proposed Fishkill Creek Development (FCD) Site Plan

NYSDEC Environmental Resource Map

Tioronda Avenue, City of Beacon - Dutchess County, NY

Drawn:	RLB
Date:	09/07/2018
Scale:	1 in = 800 feet
Project:	81750.00
Figure:	7

FIG 5



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Phone: (518) 812-0513

Proposed Fishkill Creek Development (FCD) Site Plan

Wetland, Streams and Floodplain Map

Tioronda Avenue, City of Beacon - Dutchess County, NY

Drawn:	RLB
Date:	09/06/2018
Scale:	1 in = 300 feet
Project:	81750.00
Figure:	6

TIME OF CONCENTRATION

SUB CATCHMENT ES1
Subcatchment ES1 encompasses 191.10 square miles upstream from Design Point 1. The time of concentration has been approximated from area and flow rate found in Federal Emergency Management Agency Flood Insurance Study Numbers 36027CV002A and 36027CV001A

SUB CATCHMENT ES2 - 10.18 ACRES			
TIME OF CONCENTRATION - 44.3 MINUTES			
NUMBER	LENGTH (FT)	TYPE OF FLOW	SLOPE (%)
1	100	SHEET	1
2	1045	SHALLOW CONCENTRATED	1
3	25	CHANNEL (PIPE)	5.6
4	56	SHALLOW CONCENTRATED	7.9
5	245	CHANNEL (GUTTER)	1
6	200	SHALLOW CONCENTRATED	9.4

STORM WATER LEGEND

- WATERSHED BOUNDARY
- TIME OF CONCENTRATION / FLOW PATH
- # – SUBCATCHMENT #

1 FIG 6 **PRE-DEVELOPMENT DRAINAGE MAP**
SCALE: 1"=60'

0 1 2 3
ORIGINAL SCALE IN INCHES

THE Chazen COMPANIES®
Engineers/Surveyors
Planners
Environmental Scientists
Landscape Architects

CHAZEN ENGINEERING, LAND SURVEYING & LANDSCAPE ARCHITECTURE CO., D.P.C.

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North Country Office:
375 Bay Road
Queensbury, New York 12804
Phone: (518) 812-0513

rev.	date	description
1	12/20/19	REVISED PER TOWN COMMENTS

TIORONDA AVENUE & 465 WOLCOTT AVENUE
CHAI BUILDERS

PRE-DEVELOPMENT DRAINAGE MAP

CITY OF BEACON, DUTCHESS COUNTY, NEW YORK

designed	checked
CJL	LAB
date 01/16/19	scale AS NOTED
project no. 81750.00	
sheet no. FIG 6	

Drawing Name: Z:\projects\81700-81799\81750.00 CHAI Builders B-248\DWG\11_STMF-FIG4-FIG5_81750_PRE-POST-WATERSHED-MAPS.dwg
Xref's Attached: XBASE-ENG_81750-00; XSTORM_81750-00; XTB_81750-00_24x36; XLAYOUT_81750-00; XGRADING_81750-00; XUTIL_81750-00
Date Printed: Dec 20, 2019, 7:28pm

STORM WATER LEGEND

- WATERSHED BOUNDARY
- TIME OF CONCENTRATION / FLOW PATH
- PROPOSED DIVIDE
- # – SUBCATCHMENT #

* SUBCATCHMENT ES1 ENCOMPASSES 191.08 SQUARE MILES UPSTREAM OF DESIGN POINT

1 / FIG 7 — POST-DEVELOPMENT DRAINAGE MAP
SCALE: 1"=60'

TIMES OF CONCENTRATION

SUB CATCHMENT PS4A			
NUMBER	LENGTH (FT)	TYPE OF FLOW	SLOPE (%)
1	100	SHEET	1
2	1045	SHALLOW CONCENTRATED	1

SUB CATCHMENT ES1

Subcatchment ES1 encompasses 191.10 square miles upstream from Design Point 1. The time of concentration has been approximated from area and flow rate found in Federal Emergency Management Agency Flood Insurance Study Numbers 36027CV002A and 36027CV001A

REMAINDER OF SUBCATCHMENTS HAVE BEEN ASSIGNED THE MINIMUM TR-55 VALUE OF 6 MINUTES DUE TO THEIR DRAINAGE AREA AND LAND COVER TYPE.

0 1 2 3
ORIGINAL SCALE IN INCHES

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Landscape Architects

CHAZEN ENGINEERING, LAND SURVEYING & LANDSCAPE ARCHITECTURE CO., D.P.C.

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North Country Office: 375 Bay Road, Queensbury, New York 12804, Phone: (518) 812-0513

rev.	date	description
1	12/20/19	REVISED PER TOWN COMMENTS

TIORONDA AVENUE & 465 WOLCOTT AVENUE
CHAI BUILDERS

POST-DEVELOPMENT DRAINAGE MAP

CITY OF BEACON, DUTCHESS COUNTY, NEW YORK

designed	checked
CJL	LAB
date	scale
01/16/19	AS NOTED
project no.	
81750.00	
sheet no.	
FIG 7	

Drawing Name: Z:\projects\81700-81799\81750.00 CHAI Builders B-248\DWG\11_STMF-FIG4-FIG5_81750_PRE-POST-WATERSHED-MAPS.dwg
Xref's Attached: XBASE-ENG_81750-00; XSTORM_81750-00; XTB_81750-00_24x36; XLAYOUT_81750-00; XGRADING_81750-00; XUTIL_81750-00
Date Printed: Dec 20, 2019, 7:28pm

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Appendix H:
Chazen Certifying Professionals Letter

THE Chazen COMPANIES®
Proud to be Employee Owned
Engineers
Land Surveyors
Planners
Environmental & Safety Professionals
Landscape Architects

Hudson Valley Office
21 Fox St., Poughkeepsie, NY 12601
P: (845) 454-3980 F: (845) 454-4026
www.chazencompanies.com

Capital District Office (518) 273-0055
North Country Office (518) 812-0513

April 7, 2016

To Whom it May Concern:

In accordance with the NYSDEC SPDES General Permit GP-0-15-002, part VII.H.2, the New York State licensed Professional Engineers employed by The Chazen Companies and listed on the attachment to this letter are duly authorized to sign and seal Stormwater Pollution Prevention Plans (SWPPPs), NOIs, and NOTs prepared under their direct supervision.

Sincerely,

Mark Kastner, P.E.
President

THE
Chazen
COMPANIES
Proud to be Employee Owned

Engineers
Land Surveyors
Planners
Environmental Professionals
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Hudson Valley Office
21 Fox Street, Poughkeepsie, NY 12601
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Capital District Office (518) 273-0055
North Country Office (518) 812-0513

Chazen Professional Engineers duly authorized to sign and seal SWPPPs, NOIs, and NOTs:

Name:	Position:	Signature:	Date:
Richard Chazen, P.E.	Senior Principal	[signature]	9/23/13
Daniel Stone, P.E.	Senior Principal	[signature]	9/25/13
Joseph Lanaro, P.E.	Vice President of Engineering	[signature]	9/18/13
James Connors, P.E.	Senior Director	[signature]	9/18/13
Chris Lapine, P.E.	Director	Christopher Lapine	9/23/13
Roger Keating, P.E.	Director	[signature]	9/18/13
Peter Romano, P.E.	Director	[signature]	9/18/13
Walter Kubow, P.E.	Senior Project Manager	Walter Kubow	9/18/13
Eric Johnson, P.E.	Director	Eric P. Johnson	9/18/13
George Cronk, P.E.	Project Manager	[signature]	9/23/13
Sean Doty, P.E.	Manager	[signature]	4/6/2016
Michael Flanagan, P.E.	Project Manager	Michael M. Flanagan	4/6/16

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Appendix I:
Pre-Development Stormwater Modeling

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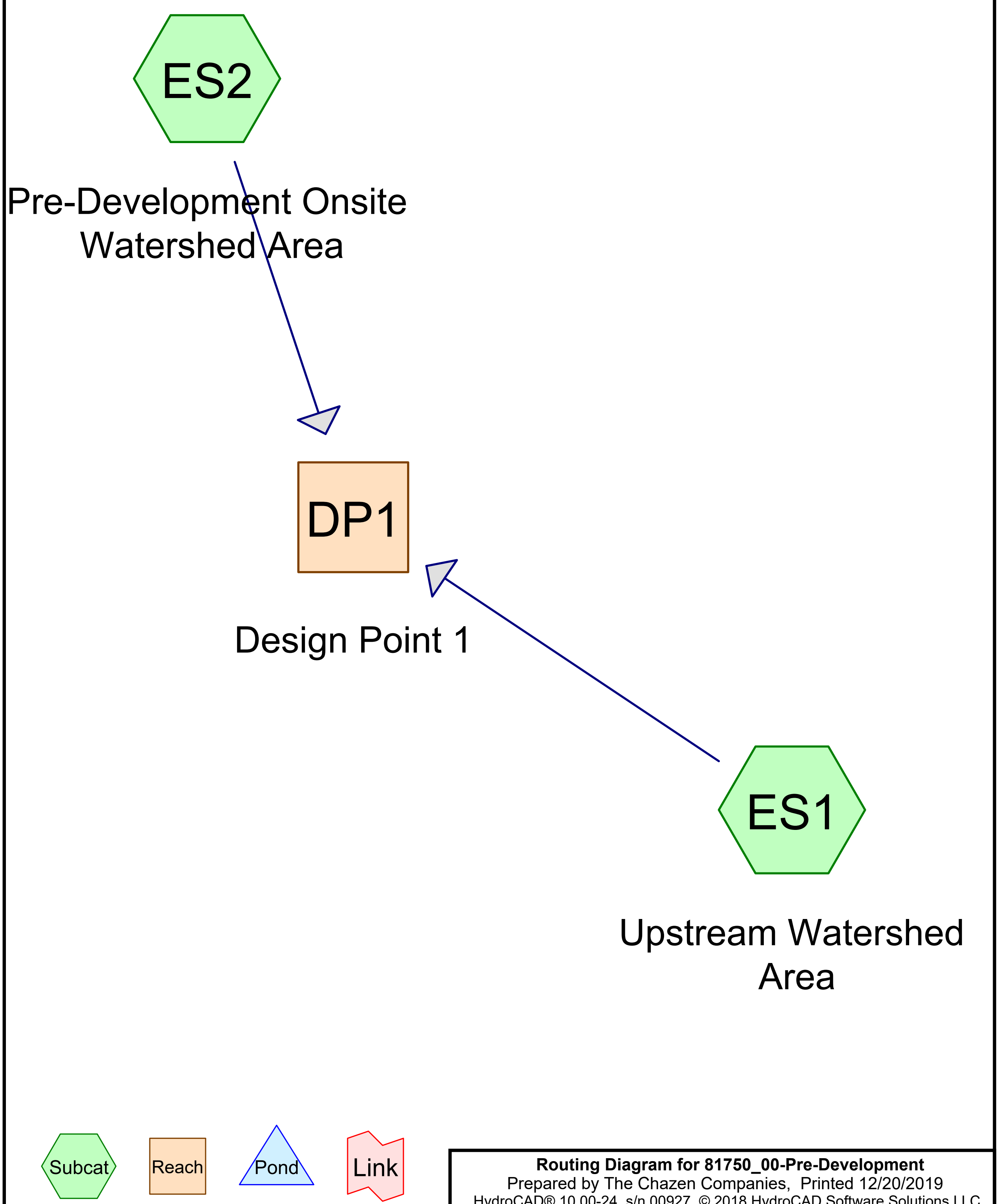

Routing Diagram for 81750_00-Pre-Development
Prepared by The Chazen Companies, Printed 12/20/2019
HydroCAD® 10.00-24 s/n 00927 © 2018 HydroCAD Software Solutions LLC

Summary for Subcatchment ES1: Upstream Watershed Area

Runoff = 1,349.72 cfs @ 43.44 hrs, Volume= 3,491.227 af, Depth> 0.34"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 1-Year Rainfall=2.80"

Area (ac)	CN	Description
*122,291.566	64	
122,291.566		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2,300.0					**Direct Entry, Time of Concentration**

Summary for Subcatchment ES2: Pre-Development Onsite Watershed Area

Runoff = 8.37 cfs @ 12.61 hrs, Volume= 1.276 af, Depth= 1.57"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 1-Year Rainfall=2.80"

Area (ac)	CN	Description
3.949	98	Unconnected pavement, HSG D
2.327	80	>75% Grass cover, Good, HSG D
3.500	79	Woods/grass comb., Good, HSG D
9.776	87	Weighted Average
5.827		59.61% Pervious Area
3.949		40.39% Impervious Area
3.949		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
18.0	100	0.0100	0.09		**Sheet Flow, 100' Sheet Grass @ .01** Grass: Dense n= 0.240 P2= 3.50"
24.9	1,045	0.0100	0.70		**Shallow Concentrated Flow, 1,045' Shallow Grass @ .01** Short Grass Pasture Kv= 7.0 fps
0.0	25	0.0560	10.73	8.43	**Pipe Channel, 25' 12" CIP @ .056** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Cast iron, coated
0.2	56	0.0790	5.71		**Shallow Concentrated Flow, 56' Shallow Paved @ .079** Paved Kv= 20.3 fps
0.5	245	0.0100	8.74	43.71	**Channel Flow, 245' Channel Gutter Flow @ .01** Area= 5.0 sf Perim= 5.0' r= 1.00' n= 0.017 Concrete, unfinished
0.5	200	0.0940	6.22		**Shallow Concentrated Flow, 200' Shallow Paved @ .094** Paved Kv= 20.3 fps
0.2	42	0.4380	3.31		**Shallow Concentrated Flow, 42' Shallow Woods @ .438** Woodland Kv= 5.0 fps
44.3	1,713	Total			

Summary for Reach DP1: Design Point 1

Inflow Area =122,301.342 ac, 0.00% Impervious, Inflow Depth > 0.34" for 1-Year event
Inflow = 1,349.72 cfs @ 43.44 hrs, Volume= 3,492.503 af
Outflow = 1,349.72 cfs @ 43.44 hrs, Volume= 3,492.503 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs

Summary for Subcatchment ES1: Upstream Watershed Area

Runoff = 6,047.51 cfs @ 43.44 hrs, Volume= 15,644.355 af, Depth> 1.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 10-Year Rainfall=5.20"

Area (ac)	CN	Description
*122,291.566	64	
122,291.566		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2,300.0					**Direct Entry, Time of Concentration**

Summary for Subcatchment ES2: Pre-Development Onsite Watershed Area

Runoff = 19.81 cfs @ 12.59 hrs, Volume= 3.060 af, Depth= 3.76"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 10-Year Rainfall=5.20"

Area (ac)	CN	Description
3.949	98	Unconnected pavement, HSG D
2.327	80	>75% Grass cover, Good, HSG D
3.500	79	Woods/grass comb., Good, HSG D
9.776	87	Weighted Average
5.827		59.61% Pervious Area
3.949		40.39% Impervious Area
3.949		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
18.0	100	0.0100	0.09		**Sheet Flow, 100' Sheet Grass @ .01** Grass: Dense n= 0.240 P2= 3.50"
24.9	1,045	0.0100	0.70		**Shallow Concentrated Flow, 1,045' Shallow Grass @ .01** Short Grass Pasture Kv= 7.0 fps
0.0	25	0.0560	10.73	8.43	**Pipe Channel, 25' 12" CIP @ .056** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Cast iron, coated
0.2	56	0.0790	5.71		**Shallow Concentrated Flow, 56' Shallow Paved @ .079** Paved Kv= 20.3 fps
0.5	245	0.0100	8.74	43.71	**Channel Flow, 245' Channel Gutter Flow @ .01** Area= 5.0 sf Perim= 5.0' r= 1.00' n= 0.017 Concrete, unfinished
0.5	200	0.0940	6.22		**Shallow Concentrated Flow, 200' Shallow Paved @ .094** Paved Kv= 20.3 fps
0.2	42	0.4380	3.31		**Shallow Concentrated Flow, 42' Shallow Woods @ .438** Woodland Kv= 5.0 fps
44.3	1,713	Total			

Summary for Reach DP1: Design Point 1

Inflow Area =122,301.342 ac, 0.00% Impervious, Inflow Depth > 1.54" for 10-Year event
Inflow = 6,047.51 cfs @ 43.44 hrs, Volume= 15,647.415 af
Outflow = 6,047.51 cfs @ 43.44 hrs, Volume= 15,647.415 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs

Summary for Subcatchment ES1: Upstream Watershed Area

Runoff = 12,834.86 cfs @ 43.44 hrs, Volume= 33,252.661 af, Depth> 3.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-Year Rainfall=7.81"

Area (ac)	CN	Description
*122,291.566	64	
122,291.566		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2,300.0					**Direct Entry, Time of Concentration**

Summary for Subcatchment ES2: Pre-Development Onsite Watershed Area

Runoff = 32.34 cfs @ 12.56 hrs, Volume= 5.104 af, Depth= 6.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-Year Rainfall=7.81"

Area (ac)	CN	Description
3.949	98	Unconnected pavement, HSG D
2.327	80	>75% Grass cover, Good, HSG D
3.500	79	Woods/grass comb., Good, HSG D
9.776	87	Weighted Average
5.827		59.61% Pervious Area
3.949		40.39% Impervious Area
3.949		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
18.0	100	0.0100	0.09		**Sheet Flow, 100' Sheet Grass @ .01** Grass: Dense n= 0.240 P2= 3.50"
24.9	1,045	0.0100	0.70		**Shallow Concentrated Flow, 1,045' Shallow Grass @ .01** Short Grass Pasture Kv= 7.0 fps
0.0	25	0.0560	10.73	8.43	**Pipe Channel, 25' 12" CIP @ .056** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Cast iron, coated
0.2	56	0.0790	5.71		**Shallow Concentrated Flow, 56' Shallow Paved @ .079** Paved Kv= 20.3 fps
0.5	245	0.0100	8.74	43.71	**Channel Flow, 245' Channel Gutter Flow @ .01** Area= 5.0 sf Perim= 5.0' r= 1.00' n= 0.017 Concrete, unfinished
0.5	200	0.0940	6.22		**Shallow Concentrated Flow, 200' Shallow Paved @ .094** Paved Kv= 20.3 fps
0.2	42	0.4380	3.31		**Shallow Concentrated Flow, 42' Shallow Woods @ .438** Woodland Kv= 5.0 fps
44.3	1,713	Total			

Summary for Reach DP1: Design Point 1

Inflow Area =122,301.342 ac, 0.00% Impervious, Inflow Depth > 3.26" for 100-Year event
Inflow = 12,834.86 cfs @ 43.44 hrs, Volume= 33,257.765 af
Outflow = 12,834.86 cfs @ 43.44 hrs, Volume= 33,257.765 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs

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Appendix J:
Post-Development Stormwater Modeling

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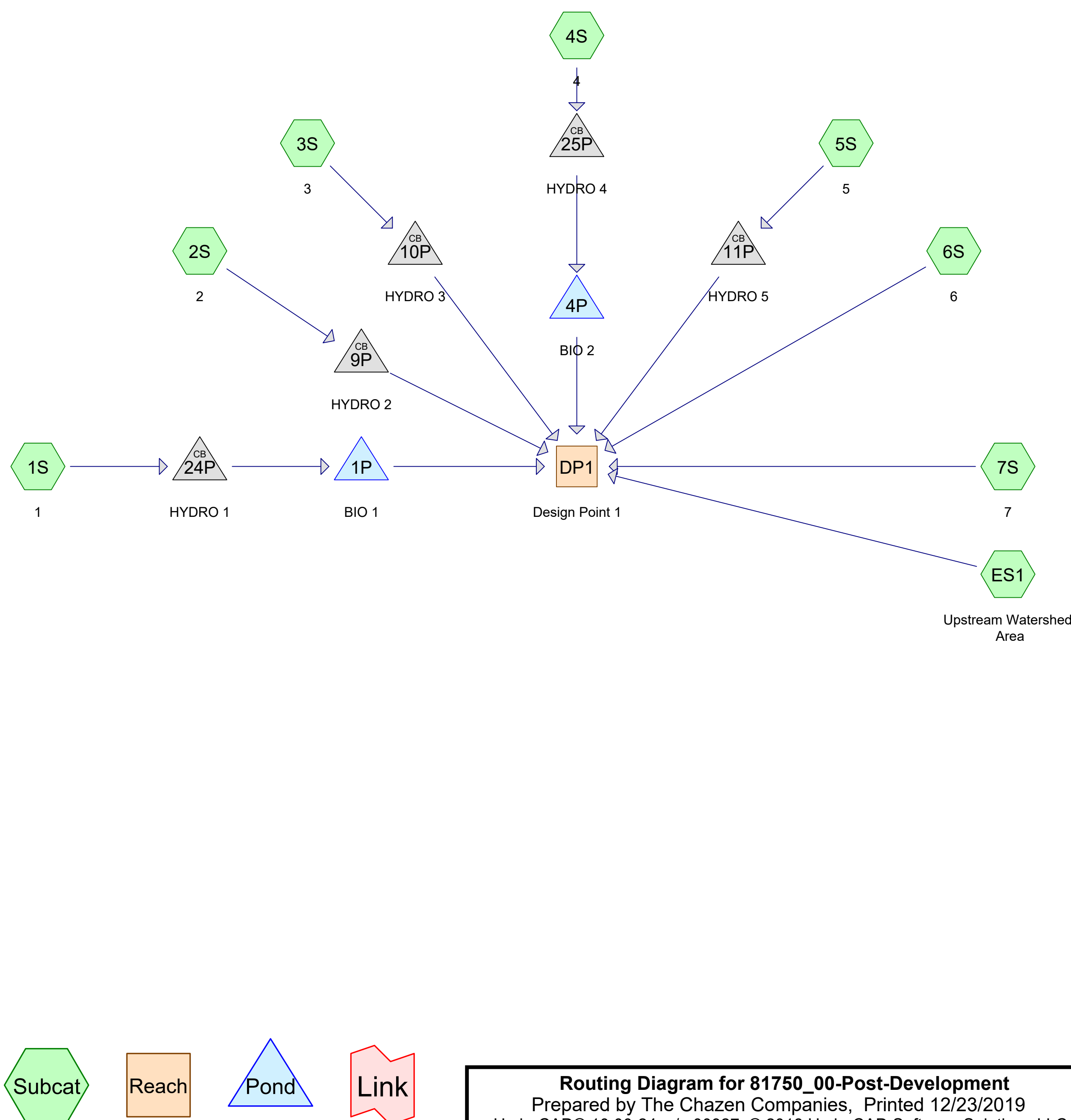

Routing Diagram for 81750_00-Post-Development
Prepared by The Chazen Companies, Printed 12/23/2019
HydroCAD® 10.00-24 s/n 00927 © 2018 HydroCAD Software Solutions LLC

Summary for Subcatchment 1S: 1

Runoff = 1.11 cfs @ 12.02 hrs, Volume= 0.067 af, Depth= 1.22"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 1-Year Rainfall=2.80"

Area (ac)	CN	Description
0.485	98	Paved parking, HSG A
0.175	39	>75% Grass cover, Good, HSG A
0.660	82	Weighted Average
0.175		26.52% Pervious Area
0.485		73.48% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.8	262	0.0734	5.50		**Shallow Concentrated Flow, 262 LF SCF @ 7.34% PAVED** Paved Kv= 20.3 fps
0.1	63	0.1500	17.57	13.80	**Pipe Channel, 63 LF @ 15%** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior
0.9	325	Total			

Summary for Subcatchment 2S: 2

Runoff = 0.68 cfs @ 12.17 hrs, Volume= 0.067 af, Depth= 0.61"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 1-Year Rainfall=2.80"

Area (ac)	CN	Description
0.640	39	>75% Grass cover, Good, HSG A
0.690	98	Paved parking, HSG A
1.330	70	Weighted Average
0.640		48.12% Pervious Area
0.690		51.88% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	100	0.0450	0.23		**Sheet Flow, 100 LF SF @ 4.5% GRASS** Grass: Short n= 0.150 P2= 3.19"
0.4	68	0.1500	2.71		**Shallow Concentrated Flow, 69 LF SCF @ 15% GRASS** Short Grass Pasture Kv= 7.0 fps
2.6	235	0.0100	1.50		**Shallow Concentrated Flow, 235 LF SCF @ 1%** Grassed Waterway Kv= 15.0 fps
0.1	68	0.0595	8.44	2.95	**Pipe Channel, 68 LF @ 6%** 8.0" Round Area= 0.3 sf Perim= 2.1' r= 0.17' n= 0.013 Corrugated PE, smooth interior
0.1	127	0.1250	16.04	12.60	**Pipe Channel, 127 LF @ 12.5%** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25'

n= 0.013 Corrugated PE, smooth interior

10.3 598 Total

Summary for Subcatchment 3S: 3

Runoff = 1.00 cfs @ 12.08 hrs, Volume= 0.074 af, Depth= 0.78"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 1-Year Rainfall=2.80"

Area (ac)	CN	Description
0.666	98	Paved parking, HSG A
0.461	39	>75% Grass cover, Good, HSG A
1.127	74	Weighted Average
0.461		40.91% Pervious Area
0.666		59.09% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.9	100	0.2050	0.43		**Sheet Flow, 100 LF SF @ 21% GRASS** Grass: Short n= 0.150 P2= 3.19"
0.1	27	0.0740	4.08		**Shallow Concentrated Flow, 27 LF SCF @ 7.4%** Grassed Waterway Kv= 15.0 fps
0.3	79	0.0412	4.12		**Shallow Concentrated Flow, 79 LF SF @ 4.12% PAVED** Paved Kv= 20.3 fps
0.3	283	0.0960	16.31	20.01	**Pipe Channel, 283 LF @ 9.6%** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
4.6	489	Total			

Summary for Subcatchment 4S: 4

Runoff = 0.54 cfs @ 12.08 hrs, Volume= 0.052 af, Depth= 0.42"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 1-Year Rainfall=2.80"

Area (ac)	CN	Description
0.659	98	Paved parking, HSG A
0.841	39	>75% Grass cover, Good, HSG A
1.500	65	Weighted Average
0.841		56.07% Pervious Area
0.659		43.93% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.1	55	0.2800	0.43		**Sheet Flow, 55 LF SF @ 28% GRASS** Grass: Short n= 0.150 P2= 3.19"
0.7	121	0.0190	2.80		**Shallow Concentrated Flow, 121 LF SCF @ 2% PAVED** Paved Kv= 20.3 fps
0.6	283	0.0270	7.45	5.85	**Pipe Channel, 283 LF @ 2.7%** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior
3.4	459	Total			

Summary for Subcatchment 5S: 5

Runoff = 1.08 cfs @ 12.31 hrs, Volume= 0.125 af, Depth= 2.16"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 1-Year Rainfall=2.80"

Area (ac)	CN	Description
0.652	98	Roofs, HSG A
0.045	39	>75% Grass cover, Good, HSG A
0.697	94	Weighted Average
0.045		6.46% Pervious Area
0.652		93.54% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
23.5	79	0.0100	0.06		**Sheet Flow, 79 LF SF @ 1%** Woods: Light underbrush n= 0.400 P2= 3.19"
0.1	63	0.2470	17.21	6.01	**Pipe Channel, 62.5 LF @ 25%** 8.0" Round Area= 0.3 sf Perim= 2.1' r= 0.17' n= 0.013 Corrugated PE, smooth interior
23.6	142	Total			

Summary for Subcatchment 6S: 6

Runoff = 0.05 cfs @ 12.73 hrs, Volume= 0.011 af, Depth= 0.32"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 1-Year Rainfall=2.80"

Area (ac)	CN	Description
0.243	39	>75% Grass cover, Good, HSG A
0.160	98	Paved parking, HSG A
0.403	62	Weighted Average
0.243		60.30% Pervious Area
0.160		39.70% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
37.4	100	0.0050	0.04		**Sheet Flow, 100 LF SF @ 0.5%** Woods: Light underbrush n= 0.400 P2= 3.19"
0.6	82	0.0221	2.23		**Shallow Concentrated Flow, 82 LF SCF @ 2.2% GRASS** Grassed Waterway Kv= 15.0 fps
0.1	107	0.0977	14.18	11.14	**Pipe Channel, 107 LF @ 9.8%** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior
38.1	289	Total			

Summary for Subcatchment 7S: 7

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

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 1-Year Rainfall=2.80"

Area (ac)	CN	Description
2.096	35	Brush, Fair, HSG A
0.375	98	Paved parking, HSG A
1.829	39	>75% Grass cover, Good, HSG A
4.300	42	Weighted Average
3.925		91.28% Pervious Area
0.375		8.72% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.4	100	0.0875	0.31		**Sheet Flow, 100 LF SF @ 8.75% GRASS** Grass: Short n= 0.150 P2= 3.19"
1.1	155	0.1032	2.25		**Shallow Concentrated Flow, 155 LF SCF @ 10% GRASS** Short Grass Pasture Kv= 7.0 fps
0.2	9	0.0278	0.97		**Sheet Flow, 9 LF SF @ 2.8% PAVEMENT** Smooth surfaces n= 0.011 P2= 3.19"
0.0	2	0.0278	1.17		**Shallow Concentrated Flow, 2 LF SCF @ 2.8% GRASS** Short Grass Pasture Kv= 7.0 fps
0.1	42	0.3869	9.33		**Shallow Concentrated Flow, 42 LF SCF @ 39% GRASS** Grassed Waterway Kv= 15.0 fps
6.8	308	Total			

Summary for Subcatchment ES1: Upstream Watershed Area

Runoff = 1,349.72 cfs @ 43.44 hrs, Volume= 3,491.227 af, Depth> 0.34"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 1-Year Rainfall=2.80"

Area (ac)	CN	Description
*122,291.566	64	
122,291.566		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2,300.0					**Direct Entry, Time of Concentration**

Summary for Reach DP1: Design Point 1

Inflow Area =122,301.583 ac, 0.00% Impervious, Inflow Depth > 0.34" for 1-Year event
Inflow = 1,349.72 cfs @ 43.44 hrs, Volume= 3,491.526 af
Outflow = 1,349.72 cfs @ 43.44 hrs, Volume= 3,491.526 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs

Summary for Pond 1P: BIO 1

Inflow Area = 0.660 ac, 73.48% Impervious, Inflow Depth = 1.22" for 1-Year event
Inflow = 1.11 cfs @ 12.02 hrs, Volume= 0.067 af
Outflow = 0.21 cfs @ 12.45 hrs, Volume= 0.067 af, Atten= 81%, Lag= 25.9 min
Discarded = 0.02 cfs @ 12.45 hrs, Volume= 0.046 af
Primary = 0.20 cfs @ 12.45 hrs, Volume= 0.022 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 60.52' @ 12.45 hrs Surf.Area= 2,623 sf Storage= 1,277 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 575.2 min (1,413.4 - 838.2)

Volume	Invert	Avail.Storage	Storage Description
#1	60.00'	4,172 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
60.00	2,250	0	0
61.00	2,962	2,606	2,606
61.50	3,300	1,566	4,172

Device	Routing	Invert	Outlet Devices
#1	Discarded	60.00'	**0.250 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 52.00'
#2	Primary	60.00'	**12.0" Round Culvert** L= 56.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 60.00' / 55.61' S= 0.0784 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#3	Device 2	60.50'	**24.0" x 24.0" Horiz. Orifice/Grate X 2.00** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.02 cfs @ 12.45 hrs HW=60.52' (Free Discharge)
↑—**1=Exfiltration** (Controls 0.02 cfs)

Primary OutFlow Max=0.19 cfs @ 12.45 hrs HW=60.52' TW=0.00' (Dynamic Tailwater)
↑—**2=Culvert** (Passes 0.19 cfs of 0.81 cfs potential flow)
  ↑—**3=Orifice/Grate** (Weir Controls 0.19 cfs @ 0.51 fps)

Summary for Pond 4P: BIO 2

Inflow Area = 1.500 ac, 43.93% Impervious, Inflow Depth = 0.42" for 1-Year event
Inflow = 0.54 cfs @ 12.08 hrs, Volume= 0.052 af
Outflow = 0.02 cfs @ 22.04 hrs, Volume= 0.052 af, Atten= 96%, Lag= 597.5 min
Discarded = 0.02 cfs @ 22.04 hrs, Volume= 0.052 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 76.47' @ 22.04 hrs Surf.Area= 3,141 sf Storage= 1,461 cf

Plug-Flow detention time= 815.2 min calculated for 0.052 af (100% of inflow)
Center-of-Mass det. time= 815.4 min (1,723.0 - 907.6)

Volume	Invert	Avail.Storage	Storage Description
#1	76.00'	3,144 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
76.00	3,100	0	0
77.00	3,187	3,144	3,144

Device	Routing	Invert	Outlet Devices
#1	Discarded	76.00'	**0.250 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 66.00'
#2	Primary	71.75'	**12.0" Round Culvert** L= 41.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 71.75' / 71.55' S= 0.0049 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#3	Device 2	76.50'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.02 cfs @ 22.04 hrs HW=76.47' (Free Discharge)
↑—**1=Exfiltration** (Controls 0.02 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=76.00' TW=0.00' (Dynamic Tailwater)
↑—**2=Culvert** (Passes 0.00 cfs of 5.78 cfs potential flow)
  ↑—**3=Orifice/Grate** (Controls 0.00 cfs)

Summary for Pond 9P: HYDRO 2

Inflow Area = 1.330 ac, 51.88% Impervious, Inflow Depth = 0.61" for 1-Year event
Inflow = 0.68 cfs @ 12.17 hrs, Volume= 0.067 af
Outflow = 0.68 cfs @ 12.17 hrs, Volume= 0.067 af, Atten= 0%, Lag= 0.0 min
Primary = 0.68 cfs @ 12.17 hrs, Volume= 0.067 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 66.42' @ 12.17 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	66.00'	**12.0" Round Culvert** L= 111.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 66.00' / 56.50' S= 0.0856 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf

Primary OutFlow Max=0.67 cfs @ 12.17 hrs HW=66.41' TW=0.00' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 0.67 cfs @ 2.19 fps)

Summary for Pond 10P: HYDRO 3

Inflow Area = 1.127 ac, 59.09% Impervious, Inflow Depth = 0.78" for 1-Year event
Inflow = 1.00 cfs @ 12.08 hrs, Volume= 0.074 af
Outflow = 1.00 cfs @ 12.08 hrs, Volume= 0.074 af, Atten= 0%, Lag= 0.0 min
Primary = 1.00 cfs @ 12.08 hrs, Volume= 0.074 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 66.97' @ 12.08 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	66.50'	**15.0" Round Culvert** L= 76.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 66.50' / 47.50' S= 0.2500 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf

Primary OutFlow Max=0.99 cfs @ 12.08 hrs HW=66.97' TW=0.00' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 0.99 cfs @ 2.34 fps)

Summary for Pond 11P: HYDRO 5

Inflow Area = 0.697 ac, 93.54% Impervious, Inflow Depth = 2.16" for 1-Year event
Inflow = 1.08 cfs @ 12.31 hrs, Volume= 0.125 af
Outflow = 1.08 cfs @ 12.31 hrs, Volume= 0.125 af, Atten= 0%, Lag= 0.0 min
Primary = 1.08 cfs @ 12.31 hrs, Volume= 0.125 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 67.21' @ 12.31 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	66.67'	**12.0" Round Culvert** L= 7.0' CPP, square edge headwall, Ke= 0.500

Inlet / Outlet Invert= 66.67' / 66.00' S= 0.0957 '/' Cc= 0.900
n= 0.013, Flow Area= 0.79 sf

Primary OutFlow Max=1.08 cfs @ 12.31 hrs HW=67.21' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 1.08 cfs @ 2.50 fps)

Summary for Pond 24P: HYDRO 1

Inflow Area = 0.660 ac, 73.48% Impervious, Inflow Depth = 1.22" for 1-Year event
Inflow = 1.11 cfs @ 12.02 hrs, Volume= 0.067 af
Outflow = 1.11 cfs @ 12.02 hrs, Volume= 0.067 af, Atten= 0%, Lag= 0.0 min
Primary = 1.11 cfs @ 12.02 hrs, Volume= 0.067 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 61.55' @ 12.02 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	61.00'	**12.0" Round Culvert** L= 18.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 61.00' / 60.50' S= 0.0278 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf

Primary OutFlow Max=1.11 cfs @ 12.02 hrs HW=61.55' TW=60.27' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 1.11 cfs @ 2.52 fps)

Summary for Pond 25P: HYDRO 4

Inflow Area = 1.500 ac, 43.93% Impervious, Inflow Depth = 0.42" for 1-Year event
Inflow = 0.54 cfs @ 12.08 hrs, Volume= 0.052 af
Outflow = 0.54 cfs @ 12.08 hrs, Volume= 0.052 af, Atten= 0%, Lag= 0.0 min
Primary = 0.54 cfs @ 12.08 hrs, Volume= 0.052 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 77.00' @ 12.08 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	76.59'	**15.0" Round Culvert** L= 18.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 76.59' / 76.50' S= 0.0050 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf

Primary OutFlow Max=0.54 cfs @ 12.08 hrs HW=77.00' TW=76.05' (Dynamic Tailwater)
└─**1=Culvert** (Barrel Controls 0.54 cfs @ 2.29 fps)

Summary for Subcatchment 1S: 1

Runoff = 2.97 cfs @ 12.02 hrs, Volume= 0.179 af, Depth= 3.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 10-Year Rainfall=5.20"

Area (ac)	CN	Description
0.485	98	Paved parking, HSG A
0.175	39	>75% Grass cover, Good, HSG A
0.660	82	Weighted Average
0.175		26.52% Pervious Area
0.485		73.48% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.8	262	0.0734	5.50		**Shallow Concentrated Flow, 262 LF SCF @ 7.34% PAVED** Paved Kv= 20.3 fps
0.1	63	0.1500	17.57	13.80	**Pipe Channel, 63 LF @ 15%** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior
0.9	325	Total			

Summary for Subcatchment 2S: 2

Runoff = 2.90 cfs @ 12.15 hrs, Volume= 0.242 af, Depth= 2.19"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 10-Year Rainfall=5.20"

Area (ac)	CN	Description
0.640	39	>75% Grass cover, Good, HSG A
0.690	98	Paved parking, HSG A
1.330	70	Weighted Average
0.640		48.12% Pervious Area
0.690		51.88% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	100	0.0450	0.23		**Sheet Flow, 100 LF SF @ 4.5% GRASS** Grass: Short n= 0.150 P2= 3.19"
0.4	68	0.1500	2.71		**Shallow Concentrated Flow, 69 LF SCF @ 15% GRASS** Short Grass Pasture Kv= 7.0 fps
2.6	235	0.0100	1.50		**Shallow Concentrated Flow, 235 LF SCF @ 1%** Grassed Waterway Kv= 15.0 fps
0.1	68	0.0595	8.44	2.95	**Pipe Channel, 68 LF @ 6%** 8.0" Round Area= 0.3 sf Perim= 2.1' r= 0.17' n= 0.013 Corrugated PE, smooth interior
0.1	127	0.1250	16.04	12.60	**Pipe Channel, 127 LF @ 12.5%** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25'

					n= 0.013 Corrugated PE, smooth interior
10.3	598	Total			

Summary for Subcatchment 3S: 3

Runoff = 3.49 cfs @ 12.07 hrs, Volume= 0.237 af, Depth= 2.52"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 10-Year Rainfall=5.20"

Area (ac)	CN	Description
0.666	98	Paved parking, HSG A
0.461	39	>75% Grass cover, Good, HSG A
1.127	74	Weighted Average
0.461		40.91% Pervious Area
0.666		59.09% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.9	100	0.2050	0.43		**Sheet Flow, 100 LF SF @ 21% GRASS** Grass: Short n= 0.150 P2= 3.19"
0.1	27	0.0740	4.08		**Shallow Concentrated Flow, 27 LF SCF @ 7.4%** Grassed Waterway Kv= 15.0 fps
0.3	79	0.0412	4.12		**Shallow Concentrated Flow, 79 LF SF @ 4.12% PAVED** Paved Kv= 20.3 fps
0.3	283	0.0960	16.31	20.01	**Pipe Channel, 283 LF @ 9.6%** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
4.6	489	Total			

Summary for Subcatchment 4S: 4

Runoff = 3.30 cfs @ 12.06 hrs, Volume= 0.224 af, Depth= 1.79"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 10-Year Rainfall=5.20"

Area (ac)	CN	Description
0.659	98	Paved parking, HSG A
0.841	39	>75% Grass cover, Good, HSG A
1.500	65	Weighted Average
0.841		56.07% Pervious Area
0.659		43.93% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.1	55	0.2800	0.43		**Sheet Flow, 55 LF SF @ 28% GRASS** Grass: Short n= 0.150 P2= 3.19"
0.7	121	0.0190	2.80		**Shallow Concentrated Flow, 121 LF SCF @ 2% PAVED** Paved Kv= 20.3 fps
0.6	283	0.0270	7.45	5.85	**Pipe Channel, 283 LF @ 2.7%** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior
3.4	459	Total			

Summary for Subcatchment 5S: 5

Runoff = 2.17 cfs @ 12.31 hrs, Volume= 0.262 af, Depth= 4.51"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 10-Year Rainfall=5.20"

Area (ac)	CN	Description
0.652	98	Roofs, HSG A
0.045	39	>75% Grass cover, Good, HSG A
0.697	94	Weighted Average
0.045		6.46% Pervious Area
0.652		93.54% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
23.5	79	0.0100	0.06		**Sheet Flow, 79 LF SF @ 1%** Woods: Light underbrush n= 0.400 P2= 3.19"
0.1	63	0.2470	17.21	6.01	**Pipe Channel, 62.5 LF @ 25%** 8.0" Round Area= 0.3 sf Perim= 2.1' r= 0.17' n= 0.013 Corrugated PE, smooth interior
23.6	142	Total			

Summary for Subcatchment 6S: 6

Runoff = 0.35 cfs @ 12.58 hrs, Volume= 0.053 af, Depth= 1.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 10-Year Rainfall=5.20"

Area (ac)	CN	Description
0.243	39	>75% Grass cover, Good, HSG A
0.160	98	Paved parking, HSG A
0.403	62	Weighted Average
0.243		60.30% Pervious Area
0.160		39.70% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
37.4	100	0.0050	0.04		**Sheet Flow, 100 LF SF @ 0.5%** Woods: Light underbrush n= 0.400 P2= 3.19"
0.6	82	0.0221	2.23		**Shallow Concentrated Flow, 82 LF SCF @ 2.2% GRASS** Grassed Waterway Kv= 15.0 fps
0.1	107	0.0977	14.18	11.14	**Pipe Channel, 107 LF @ 9.8%** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior
38.1	289	Total			

Summary for Subcatchment 7S: 7

Runoff = 0.60 cfs @ 12.37 hrs, Volume= 0.131 af, Depth= 0.37"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 10-Year Rainfall=5.20"

Area (ac)	CN	Description
2.096	35	Brush, Fair, HSG A
0.375	98	Paved parking, HSG A
1.829	39	>75% Grass cover, Good, HSG A
4.300	42	Weighted Average
3.925		91.28% Pervious Area
0.375		8.72% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.4	100	0.0875	0.31		**Sheet Flow, 100 LF SF @ 8.75% GRASS** Grass: Short n= 0.150 P2= 3.19"
1.1	155	0.1032	2.25		**Shallow Concentrated Flow, 155 LF SCF @ 10% GRASS** Short Grass Pasture Kv= 7.0 fps
0.2	9	0.0278	0.97		**Sheet Flow, 9 LF SF @ 2.8% PAVEMENT** Smooth surfaces n= 0.011 P2= 3.19"
0.0	2	0.0278	1.17		**Shallow Concentrated Flow, 2 LF SCF @ 2.8% GRASS** Short Grass Pasture Kv= 7.0 fps
0.1	42	0.3869	9.33		**Shallow Concentrated Flow, 42 LF SCF @ 39% GRASS** Grassed Waterway Kv= 15.0 fps
6.8	308	Total			

Summary for Subcatchment ES1: Upstream Watershed Area

Runoff = 6,047.51 cfs @ 43.44 hrs, Volume= 15,644.355 af, Depth> 1.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 10-Year Rainfall=5.20"

Area (ac)	CN	Description
*122,291.566	64	
122,291.566		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2,300.0					**Direct Entry, Time of Concentration**

Summary for Reach DP1: Design Point 1

Inflow Area =122,301.583 ac, 0.00% Impervious, Inflow Depth > 1.54" for 10-Year event
Inflow = 6,047.51 cfs @ 43.44 hrs, Volume= 15,645.575 af
Outflow = 6,047.51 cfs @ 43.44 hrs, Volume= 15,645.575 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs

Summary for Pond 1P: BIO 1

Inflow Area = 0.660 ac, 73.48% Impervious, Inflow Depth = 3.26" for 10-Year event
Inflow = 2.97 cfs @ 12.02 hrs, Volume= 0.179 af
Outflow = 1.61 cfs @ 12.10 hrs, Volume= 0.179 af, Atten= 46%, Lag= 4.9 min
Discarded = 0.02 cfs @ 12.10 hrs, Volume= 0.049 af
Primary = 1.60 cfs @ 12.10 hrs, Volume= 0.130 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 60.79' @ 12.10 hrs Surf.Area= 2,814 sf Storage= 2,006 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 231.8 min (1,041.8 - 809.9)

Volume	Invert	Avail.Storage	Storage Description
#1	60.00'	4,172 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
60.00	2,250	0	0
61.00	2,962	2,606	2,606
61.50	3,300	1,566	4,172

Device	Routing	Invert	Outlet Devices
#1	Discarded	60.00'	**0.250 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 52.00'
#2	Primary	60.00'	**12.0" Round Culvert** L= 56.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 60.00' / 55.61' S= 0.0784 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#3	Device 2	60.50'	**24.0" x 24.0" Horiz. Orifice/Grate X 2.00** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.02 cfs @ 12.10 hrs HW=60.79' (Free Discharge)
└─**1=Exfiltration** (Controls 0.02 cfs)

Primary OutFlow Max=1.60 cfs @ 12.10 hrs HW=60.79' TW=0.00' (Dynamic Tailwater)
└─**2=Culvert** (Inlet Controls 1.60 cfs @ 2.39 fps)
  └─**3=Orifice/Grate** (Passes 1.60 cfs of 8.26 cfs potential flow)

Summary for Pond 4P: BIO 2

Inflow Area = 1.500 ac, 43.93% Impervious, Inflow Depth = 1.79" for 10-Year event
Inflow = 3.30 cfs @ 12.06 hrs, Volume= 0.224 af
Outflow = 2.12 cfs @ 12.14 hrs, Volume= 0.224 af, Atten= 36%, Lag= 5.0 min
Discarded = 0.02 cfs @ 12.14 hrs, Volume= 0.058 af
Primary = 2.10 cfs @ 12.14 hrs, Volume= 0.166 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 76.69' @ 12.14 hrs Surf.Area= 3,160 sf Storage= 2,148 cf

Plug-Flow detention time= 238.7 min calculated for 0.223 af (100% of inflow)
Center-of-Mass det. time= 239.0 min (1,095.1 - 856.0)

Volume	Invert	Avail.Storage	Storage Description
#1	76.00'	3,144 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
76.00	3,100	0	0
77.00	3,187	3,144	3,144

Device	Routing	Invert	Outlet Devices
#1	Discarded	76.00'	**0.250 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 66.00'
#2	Primary	71.75'	**12.0" Round Culvert** L= 41.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 71.75' / 71.55' S= 0.0049 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#3	Device 2	76.50'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.02 cfs @ 12.14 hrs HW=76.69' (Free Discharge)
└─**1=Exfiltration** (Controls 0.02 cfs)

Primary OutFlow Max=2.10 cfs @ 12.14 hrs HW=76.69' TW=0.00' (Dynamic Tailwater)
└─**2=Culvert** (Passes 2.10 cfs of 6.29 cfs potential flow)
  └─**3=Orifice/Grate** (Weir Controls 2.10 cfs @ 1.41 fps)

Summary for Pond 9P: HYDRO 2

Inflow Area =	1.330 ac, 51.88% Impervious,	Inflow Depth = 2.19"	for 10-Year event
Inflow =	2.90 cfs @ 12.15 hrs,	Volume=	0.242 af
Outflow =	2.90 cfs @ 12.15 hrs,	Volume=	0.242 af, Atten= 0%, Lag= 0.0 min
Primary =	2.90 cfs @ 12.15 hrs,	Volume=	0.242 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 67.09' @ 12.15 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	66.00'	**12.0" Round Culvert** L= 111.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 66.00' / 56.50' S= 0.0856 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf

Primary OutFlow Max=2.88 cfs @ 12.15 hrs HW=67.08' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 2.88 cfs @ 3.67 fps)

Summary for Pond 10P: HYDRO 3

Inflow Area =	1.127 ac, 59.09% Impervious,	Inflow Depth = 2.52"	for 10-Year event
Inflow =	3.49 cfs @ 12.07 hrs,	Volume=	0.237 af
Outflow =	3.49 cfs @ 12.07 hrs,	Volume=	0.237 af, Atten= 0%, Lag= 0.0 min
Primary =	3.49 cfs @ 12.07 hrs,	Volume=	0.237 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 67.48' @ 12.07 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	66.50'	**15.0" Round Culvert** L= 76.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 66.50' / 47.50' S= 0.2500 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf

Primary OutFlow Max=3.46 cfs @ 12.07 hrs HW=67.48' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 3.46 cfs @ 3.36 fps)

Summary for Pond 11P: HYDRO 5

Inflow Area =	0.697 ac, 93.54% Impervious,	Inflow Depth = 4.51"	for 10-Year event
Inflow =	2.17 cfs @ 12.31 hrs,	Volume=	0.262 af
Outflow =	2.17 cfs @ 12.31 hrs,	Volume=	0.262 af, Atten= 0%, Lag= 0.0 min
Primary =	2.17 cfs @ 12.31 hrs,	Volume=	0.262 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 67.50' @ 12.31 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	66.67'	**12.0" Round Culvert** L= 7.0' CPP, square edge headwall, Ke= 0.500

Inlet / Outlet Invert= 66.67' / 66.00' S= 0.0957 '/' Cc= 0.900
n= 0.013, Flow Area= 0.79 sf

Primary OutFlow Max=2.17 cfs @ 12.31 hrs HW=67.50' TW=0.00' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 2.17 cfs @ 3.10 fps)

Summary for Pond 24P: HYDRO 1

Inflow Area =	0.660 ac, 73.48% Impervious, Inflow Depth = 3.26" for 10-Year event			
Inflow =	2.97 cfs @	12.02 hrs, Volume=	0.179 af	
Outflow =	2.97 cfs @	12.02 hrs, Volume=	0.179 af,	Atten= 0%, Lag= 0.0 min
Primary =	2.97 cfs @	12.02 hrs, Volume=	0.179 af	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 62.12' @ 12.02 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	61.00'	**12.0" Round Culvert** L= 18.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 61.00' / 60.50' S= 0.0278 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf

Primary OutFlow Max=2.95 cfs @ 12.02 hrs HW=62.11' TW=60.71' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 2.95 cfs @ 3.75 fps)

Summary for Pond 25P: HYDRO 4

Inflow Area =	1.500 ac, 43.93% Impervious, Inflow Depth = 1.79" for 10-Year event			
Inflow =	3.30 cfs @	12.06 hrs, Volume=	0.224 af	
Outflow =	3.30 cfs @	12.06 hrs, Volume=	0.224 af,	Atten= 0%, Lag= 0.0 min
Primary =	3.30 cfs @	12.06 hrs, Volume=	0.224 af	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 77.74' @ 12.06 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	76.59'	**15.0" Round Culvert** L= 18.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 76.59' / 76.50' S= 0.0050 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf

Primary OutFlow Max=3.29 cfs @ 12.06 hrs HW=77.74' TW=76.58' (Dynamic Tailwater)
↑—**1=Culvert** (Barrel Controls 3.29 cfs @ 3.64 fps)

Summary for Subcatchment 1S: 1

Runoff = 5.08 cfs @ 12.02 hrs, Volume= 0.312 af, Depth= 5.68"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-Year Rainfall=7.81"

Area (ac)	CN	Description
0.485	98	Paved parking, HSG A
0.175	39	>75% Grass cover, Good, HSG A
0.660	82	Weighted Average
0.175		26.52% Pervious Area
0.485		73.48% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.8	262	0.0734	5.50		**Shallow Concentrated Flow, 262 LF SCF @ 7.34% PAVED** Paved Kv= 20.3 fps
0.1	63	0.1500	17.57	13.80	**Pipe Channel, 63 LF @ 15%** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior
0.9	325	Total			

Summary for Subcatchment 2S: 2

Runoff = 5.80 cfs @ 12.14 hrs, Volume= 0.477 af, Depth= 4.30"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-Year Rainfall=7.81"

Area (ac)	CN	Description
0.640	39	>75% Grass cover, Good, HSG A
0.690	98	Paved parking, HSG A
1.330	70	Weighted Average
0.640		48.12% Pervious Area
0.690		51.88% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	100	0.0450	0.23		**Sheet Flow, 100 LF SF @ 4.5% GRASS** Grass: Short n= 0.150 P2= 3.19"
0.4	68	0.1500	2.71		**Shallow Concentrated Flow, 69 LF SCF @ 15% GRASS** Short Grass Pasture Kv= 7.0 fps
2.6	235	0.0100	1.50		**Shallow Concentrated Flow, 235 LF SCF @ 1%** Grassed Waterway Kv= 15.0 fps
0.1	68	0.0595	8.44	2.95	**Pipe Channel, 68 LF @ 6%** 8.0" Round Area= 0.3 sf Perim= 2.1' r= 0.17' n= 0.013 Corrugated PE, smooth interior
0.1	127	0.1250	16.04	12.60	**Pipe Channel, 127 LF @ 12.5%** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25'

n= 0.013 Corrugated PE, smooth interior

10.3	598	Total

Summary for Subcatchment 3S: 3

Runoff = 6.58 cfs @ 12.07 hrs, Volume= 0.447 af, Depth= 4.76"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-Year Rainfall=7.81"

Area (ac)	CN	Description
0.666	98	Paved parking, HSG A
0.461	39	>75% Grass cover, Good, HSG A
1.127	74	Weighted Average
0.461		40.91% Pervious Area
0.666		59.09% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.9	100	0.2050	0.43		**Sheet Flow, 100 LF SF @ 21% GRASS** Grass: Short n= 0.150 P2= 3.19"
0.1	27	0.0740	4.08		**Shallow Concentrated Flow, 27 LF SCF @ 7.4%** Grassed Waterway Kv= 15.0 fps
0.3	79	0.0412	4.12		**Shallow Concentrated Flow, 79 LF SF @ 4.12% PAVED** Paved Kv= 20.3 fps
0.3	283	0.0960	16.31	20.01	**Pipe Channel, 283 LF @ 9.6%** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
4.6	489	Total			

Summary for Subcatchment 4S: 4

Runoff = 7.17 cfs @ 12.05 hrs, Volume= 0.468 af, Depth= 3.74"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-Year Rainfall=7.81"

Area (ac)	CN	Description
0.659	98	Paved parking, HSG A
0.841	39	>75% Grass cover, Good, HSG A
1.500	65	Weighted Average
0.841		56.07% Pervious Area
0.659		43.93% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.1	55	0.2800	0.43		**Sheet Flow, 55 LF SF @ 28% GRASS** Grass: Short n= 0.150 P2= 3.19"
0.7	121	0.0190	2.80		**Shallow Concentrated Flow, 121 LF SCF @ 2% PAVED** Paved Kv= 20.3 fps
0.6	283	0.0270	7.45	5.85	**Pipe Channel, 283 LF @ 2.7%** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior
3.4	459	Total			

Summary for Subcatchment 5S: 5

Runoff = 3.34 cfs @ 12.31 hrs, Volume= 0.412 af, Depth= 7.09"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-Year Rainfall=7.81"

Area (ac)	CN	Description
0.652	98	Roofs, HSG A
0.045	39	>75% Grass cover, Good, HSG A
0.697	94	Weighted Average
0.045		6.46% Pervious Area
0.652		93.54% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
23.5	79	0.0100	0.06		**Sheet Flow, 79 LF SF @ 1%** Woods: Light underbrush n= 0.400 P2= 3.19"
0.1	63	0.2470	17.21	6.01	**Pipe Channel, 62.5 LF @ 25%** 8.0" Round Area= 0.3 sf Perim= 2.1' r= 0.17' n= 0.013 Corrugated PE, smooth interior
23.6	142	Total			

Summary for Subcatchment 6S: 6

Runoff = 0.80 cfs @ 12.55 hrs, Volume= 0.115 af, Depth= 3.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-Year Rainfall=7.81"

Area (ac)	CN	Description
0.243	39	>75% Grass cover, Good, HSG A
0.160	98	Paved parking, HSG A
0.403	62	Weighted Average
0.243		60.30% Pervious Area
0.160		39.70% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
37.4	100	0.0050	0.04		**Sheet Flow, 100 LF SF @ 0.5%** Woods: Light underbrush n= 0.400 P2= 3.19"
0.6	82	0.0221	2.23		**Shallow Concentrated Flow, 82 LF SCF @ 2.2% GRASS** Grassed Waterway Kv= 15.0 fps
0.1	107	0.0977	14.18	11.14	**Pipe Channel, 107 LF @ 9.8%** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior
38.1	289	Total			

Summary for Subcatchment 7S: 7

Runoff = 4.91 cfs @ 12.12 hrs, Volume= 0.484 af, Depth= 1.35"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-Year Rainfall=7.81"

Area (ac)	CN	Description
2.096	35	Brush, Fair, HSG A
0.375	98	Paved parking, HSG A
1.829	39	>75% Grass cover, Good, HSG A
4.300	42	Weighted Average
3.925		91.28% Pervious Area
0.375		8.72% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.4	100	0.0875	0.31		**Sheet Flow, 100 LF SF @ 8.75% GRASS** Grass: Short n= 0.150 P2= 3.19"
1.1	155	0.1032	2.25		**Shallow Concentrated Flow, 155 LF SCF @ 10% GRASS** Short Grass Pasture Kv= 7.0 fps
0.2	9	0.0278	0.97		**Sheet Flow, 9 LF SF @ 2.8% PAVEMENT** Smooth surfaces n= 0.011 P2= 3.19"
0.0	2	0.0278	1.17		**Shallow Concentrated Flow, 2 LF SCF @ 2.8% GRASS** Short Grass Pasture Kv= 7.0 fps
0.1	42	0.3869	9.33		**Shallow Concentrated Flow, 42 LF SCF @ 39% GRASS** Grassed Waterway Kv= 15.0 fps
6.8	308	Total			

Summary for Subcatchment ES1: Upstream Watershed Area

Runoff = 12,834.86 cfs @ 43.44 hrs, Volume= 33,252.661 af, Depth> 3.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-Year Rainfall=7.81"

Area (ac)	CN	Description
*122,291.566	64	
122,291.566		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2,300.0					**Direct Entry, Time of Concentration**

Summary for Reach DP1: Design Point 1

Inflow Area =122,301.583 ac, 0.00% Impervious, Inflow Depth > 3.26" for 100-Year event
Inflow = 12,834.86 cfs @ 43.44 hrs, Volume= 33,255.264 af
Outflow = 12,834.86 cfs @ 43.44 hrs, Volume= 33,255.264 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs

Summary for Pond 1P: BIO 1

Inflow Area = 0.660 ac, 73.48% Impervious, Inflow Depth = 5.68" for 100-Year event
Inflow = 5.08 cfs @ 12.02 hrs, Volume= 0.312 af
Outflow = 2.38 cfs @ 12.11 hrs, Volume= 0.312 af, Atten= 53%, Lag= 5.7 min
Discarded = 0.02 cfs @ 12.11 hrs, Volume= 0.052 af
Primary = 2.36 cfs @ 12.11 hrs, Volume= 0.261 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 61.13' @ 12.11 hrs Surf.Area= 3,047 sf Storage= 2,984 cf

Plug-Flow detention time= 143.4 min calculated for 0.312 af (100% of inflow)
Center-of-Mass det. time= 143.8 min (938.1 - 794.2)

Volume	Invert	Avail.Storage	Storage Description
#1	60.00'	4,172 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
60.00	2,250	0	0
61.00	2,962	2,606	2,606
61.50	3,300	1,566	4,172

Device	Routing	Invert	Outlet Devices
#1	Discarded	60.00'	**0.250 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 52.00'
#2	Primary	60.00'	**12.0" Round Culvert** L= 56.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 60.00' / 55.61' S= 0.0784 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#3	Device 2	60.50'	**24.0" x 24.0" Horiz. Orifice/Grate X 2.00** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.02 cfs @ 12.11 hrs HW=61.13' (Free Discharge)
└─**1=Exfiltration** (Controls 0.02 cfs)

Primary OutFlow Max=2.36 cfs @ 12.11 hrs HW=61.13' TW=0.00' (Dynamic Tailwater)
└─**2=Culvert** (Inlet Controls 2.36 cfs @ 3.01 fps)
  └─**3=Orifice/Grate** (Passes 2.36 cfs of 25.86 cfs potential flow)

Summary for Pond 4P: BIO 2

Inflow Area = 1.500 ac, 43.93% Impervious, Inflow Depth = 3.74" for 100-Year event
Inflow = 7.17 cfs @ 12.05 hrs, Volume= 0.468 af
Outflow = 6.47 cfs @ 12.09 hrs, Volume= 0.468 af, Atten= 10%, Lag= 2.0 min
Discarded = 0.02 cfs @ 12.09 hrs, Volume= 0.060 af
Primary = 6.45 cfs @ 12.09 hrs, Volume= 0.408 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 76.89' @ 12.09 hrs Surf.Area= 3,178 sf Storage= 2,804 cf

Plug-Flow detention time= 120.1 min calculated for 0.468 af (100% of inflow)
Center-of-Mass det. time= 120.5 min (954.6 - 834.1)

Volume	Invert	Avail.Storage	Storage Description
#1	76.00'	3,144 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
76.00	3,100	0	0
77.00	3,187	3,144	3,144

Device	Routing	Invert	Outlet Devices
#1	Discarded	76.00'	**0.250 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 66.00'
#2	Primary	71.75'	**12.0" Round Culvert** L= 41.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 71.75' / 71.55' S= 0.0049 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#3	Device 2	76.50'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.02 cfs @ 12.09 hrs HW=76.89' (Free Discharge)
└─**1=Exfiltration** (Controls 0.02 cfs)

Primary OutFlow Max=6.40 cfs @ 12.09 hrs HW=76.89' TW=0.00' (Dynamic Tailwater)
└─**2=Culvert** (Passes 6.40 cfs of 6.43 cfs potential flow)
  └─**3=Orifice/Grate** (Weir Controls 6.40 cfs @ 2.05 fps)

Summary for Pond 9P: HYDRO 2

Inflow Area = 1.330 ac, 51.88% Impervious, Inflow Depth = 4.30" for 100-Year event
Inflow = 5.80 cfs @ 12.14 hrs, Volume= 0.477 af
Outflow = 5.80 cfs @ 12.14 hrs, Volume= 0.477 af, Atten= 0%, Lag= 0.0 min
Primary = 5.80 cfs @ 12.14 hrs, Volume= 0.477 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 68.85' @ 12.14 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	66.00'	**12.0" Round Culvert** L= 111.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 66.00' / 56.50' S= 0.0856 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf

Primary OutFlow Max=5.78 cfs @ 12.14 hrs HW=68.84' TW=0.00' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 5.78 cfs @ 7.36 fps)

Summary for Pond 10P: HYDRO 3

Inflow Area = 1.127 ac, 59.09% Impervious, Inflow Depth = 4.76" for 100-Year event
Inflow = 6.58 cfs @ 12.07 hrs, Volume= 0.447 af
Outflow = 6.58 cfs @ 12.07 hrs, Volume= 0.447 af, Atten= 0%, Lag= 0.0 min
Primary = 6.58 cfs @ 12.07 hrs, Volume= 0.447 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 68.37' @ 12.07 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	66.50'	**15.0" Round Culvert** L= 76.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 66.50' / 47.50' S= 0.2500 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf

Primary OutFlow Max=6.52 cfs @ 12.07 hrs HW=68.34' TW=0.00' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 6.52 cfs @ 5.31 fps)

Summary for Pond 11P: HYDRO 5

Inflow Area = 0.697 ac, 93.54% Impervious, Inflow Depth = 7.09" for 100-Year event
Inflow = 3.34 cfs @ 12.31 hrs, Volume= 0.412 af
Outflow = 3.34 cfs @ 12.31 hrs, Volume= 0.412 af, Atten= 0%, Lag= 0.0 min
Primary = 3.34 cfs @ 12.31 hrs, Volume= 0.412 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 67.95' @ 12.31 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	66.67'	**12.0" Round Culvert** L= 7.0' CPP, square edge headwall, Ke= 0.500

Inlet / Outlet Invert= 66.67' / 66.00' S= 0.0957 '/' Cc= 0.900
n= 0.013, Flow Area= 0.79 sf

Primary OutFlow Max=3.33 cfs @ 12.31 hrs HW=67.95' TW=0.00' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 3.33 cfs @ 4.25 fps)

Summary for Pond 24P: HYDRO 1

Inflow Area =	0.660 ac, 73.48% Impervious, Inflow Depth = 5.68" for 100-Year event			
Inflow =	5.08 cfs @	12.02 hrs, Volume=	0.312 af	
Outflow =	5.08 cfs @	12.02 hrs, Volume=	0.312 af,	Atten= 0%, Lag= 0.0 min
Primary =	5.08 cfs @	12.02 hrs, Volume=	0.312 af	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 63.30' @ 12.02 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	61.00'	**12.0" Round Culvert** L= 18.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 61.00' / 60.50' S= 0.0278 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf

Primary OutFlow Max=5.02 cfs @ 12.02 hrs HW=63.26' TW=60.95' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 5.02 cfs @ 6.40 fps)

Summary for Pond 25P: HYDRO 4

Inflow Area =	1.500 ac, 43.93% Impervious, Inflow Depth = 3.74" for 100-Year event			
Inflow =	7.17 cfs @	12.05 hrs, Volume=	0.468 af	
Outflow =	7.17 cfs @	12.05 hrs, Volume=	0.468 af,	Atten= 0%, Lag= 0.0 min
Primary =	7.17 cfs @	12.05 hrs, Volume=	0.468 af	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 78.77' @ 12.05 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	76.59'	**15.0" Round Culvert** L= 18.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 76.59' / 76.50' S= 0.0050 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf

Primary OutFlow Max=7.12 cfs @ 12.05 hrs HW=78.75' TW=76.87' (Dynamic Tailwater)
↑—**1=Culvert** (Barrel Controls 7.12 cfs @ 5.80 fps)

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Appendix K:
Project Evaluation and Design Calculations

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Appendix K - Table A
Step 1 - Evaluation of Green Infrastructure Planning Measures

Group	Practice	Description	Applicable	Project Specific Evaluation
Preservation of Natural Resources	**Preservation of Undisturbed Areas**	Delineate and place into permanent conservation undisturbed forests, native vegetated areas, riparian corridors, wetlands, and natural terrain.	**No**	The proposed site layout has been designed to limit land disturbance to the greatest extent practical. Approximately 102 +/- acres of the 155.9 acre project site will remain undisturbed, in its natural state. The project does not propose permanent conservation of this area at this time.
	Preservation of Buffers	Define, delineate and preserve naturally vegetated buffers along perennial streams, rivers, shorelines and wetlands.	**N/A**	There are no perennial streams, rivers, shorelines, or wetlands on or adjacent to the project site. As such, this green planning measure does not apply.
	Reduction of Clearing and Grading	Limit clearing and grading to the minimum amount needed for roads, driveways, foundations, utilities and stormwater management facilities.	**Yes**	Clearing and grading will be limited to the area of disturbance and will be minimized to the greatest extent practical. As a Redevelopment Project, the majority of the land in question had been previously cleared or graded for construction of the existing buildings, roadways, etc. Site clearing and grading required for redevelopment will be minor in nature. Approximately 102 +/- acres of the 155.9 acre project site will remain undisturbed, in its natural state.
	Locating Development in Less Sensitive Areas	Avoid sensitive resource areas such as floodplains, steep slopes, erodible soils, wetlands, mature forests and critical habitats by locating development to fit the terrain in areas that will create the least impact.	**Yes**	The site layout has been designed to avoid sensitive resource areas to the greatest extent practical. Furthermore, there are no floodplains, highly erodible soils, wetlands, mature forests and critical habitats located on the project site.
	Open Space Design	Use clustering, conservation design or open space design to reduce impervious cover, preserve more open space and protect water resources.	**Yes**	The site layout has been designed to maximize open space. Impervious surfaces have been minimized to the greatest extent practical and approximately 65% of the project sitewill be maintained as vegetated open space.
	Soil Restoration	Restore the original properties and porosity of the soil by deep till and amendment with compost to reduce the generation of runoff and enhance the runoff reduction performance of practices such as downspout disconnections, grass channels, filter strips, and tree clusters.	**Yes**	Full soil restoration is proposed for all areas of disturbance that will not become hardscape. All areas will be stabilized with seed & mulch, and landscaped areas will be provided.
Reduction of Impervious Cover	**Roadway Reduction**	Minimize roadway widths and lengths to reduce site impervious area	**N/A**	No new roadways are proposed as part of this project.
	Sidewalk Reduction	Minimize sidewalk lengths and widths to reduce site impervious area	**Yes**	Sidewalk widths and lengths have been minimized to the greatest extent practical while alsoensuring comfortable and safe pedestrian access throughout the site.
	Driveway Reduction	Minimize driveway lengths and widths to reduce site impervious area	**Yes**	Driveway widths and lengths have been minimized to the greatest extent practical while maintaining access for emergency vehicles throughout the site.
	Cul-de-sac Reduction	Minimize the number of cul-de-sacs and incorporate landscaped areas to reduce their impervious cover.	**N/A**	No cul-de-sacs are proposed as part of this project.
	Building Footprint Reduction	Reduce the impervious footprint of residences and commercial buildings by using alternate or taller buildings while maintaining the same floor to area ratio.	**No**	All new building area has been allocated to efficiently implement the intended use, be architecturally appropriate for the surrounding neighborhood, and meet proposed zoning requirements consistent with other areas in the Town.
	Parking Reduction	Reduce imperviousness on parking lots by eliminating unneeded spaces, providing compact car spaces and efficient parking lanes, minimizing stall dimensions, using porous pavement surfaces in overflow parking areas, and using multi-storied parking decks where appropriate.	**Yes**	Porous pavement has been proposed at the project site.

Appendix K - Table B
Step 2 - Determine Water Quality Treatment Volume (WQv)

Determine Pre- and Post-Development Impervious Cover Areas				
Watershed Pre-Development Impervious Area:	172,762	sf =	3.97	ac
Watershed Post-Development Impervious Area:	209,853	sf =	4.82	ac
Total Area Within Work Limits:	258,379	sf =	5.93	ac
Existing Disturbed Impervious Area:	107,395	sf =	2.47	ac
New Development Impervious Area:	37,091	sf =	**0.85**	**ac**
Redevelopment Impervious % (based on proposed treatment practice)	75	%		
Redevelopment Impervious Area:	80,546	sf =	**1.85**	**ac**

Determine the Initial Water Quality Volume (WQv)				
WQv(acre-feet) = [(P)(Rv)(A)] /12				
Rv = 0.05+0.009(I)				
I = Impervious Cover (%)				
P=	1.40	*inch*		
I=	46%			
Rv=	0.460			
Initial WQv=	**13,859**	cf =	**0.318**	**ac-ft**

Determine Individual Practice Water Quality Volume (WQv)

Subcatchment Area	Development Type	Total Area *(Acres)*	Impervious Area* *(Acres)*	Percent Impervious *%*	Rv	WQv *(ft^3)*	Description
1	New Development	0.660	0.485	73%	0.71	2,386	Bioretention
2	Redevelopment	1.330	0.690	52%	0.52	3,494	Hydrodynamic Separator
3	Redevelopment	1.000	0.539	54%	0.54	2,719	Hydrodynamic Separator
4	New Development	1.500	0.659	44%	0.45	3,395	Bioretention
5	Redevelopment	0.698	0.652	93%	0.89	3,159	Hydrodynamic Separator
Total		9.88	3.58	36%	0.38	**15,154**	

** As per Section 9.3.2 of Chapter 9: Redevelopment of the NYSDEC Stormwater Design Manual, the plan proposes use of either standard practices to treat 25% or alternative practices to treat 75% of the WQv from existing disturbed, impervious area as well as any additional runoff from tributary areas that are not within the disturbed, impervious area.*

Appendix K - Table C
Step 3 - Determine Minimum Required Runoff Reduction Volume (RRv)

Section 4.3 of the NYSDEC Stormwater Management Design Manual describes the Runoff Reduction Volume equation as:

RRv = (P x Rv* x Ai) / 12

where: RRv = Runoff Reduction Volume (acre-feet)
P = 90% Rainfall Event Number (inches) (interpolated from Design Manual Fig 4.1)
Rv = 0.05 + 0.009 (I), where I is 100% impervious = 0.95 constant
Ai = (S x Aic) = Impervious cover targeted for runoff reduction
Aic = Total area of new impervious cover (acres)
S = Hydrologic Soil Group (HSG) Specific Reduction Factor
where:

HSG A=	0.55	HSG C=	0.30
HSG B=	0.40	HSG D=	0.20

The following table presents the RRv calculations for each of the proposed stormwater management practices (SMPs).

Enter the Soils Data for the site

Soil Group	Acres	S
A	5.93	0.55
B	0.00	0.40
C	0.00	0.30
D	0.00	0.20
Total Area	5.93	acres

Calculate the Minimum RRv

S =	**0.55**	
Impervious =	0.85	acre
Precipitation =	1.40	in
Rv	0.95	
Minimum RRv	**2,261**	**ft^3**
	0.052	ac-ft

Appendix K - Table D
Step 3 - Evaluation of Green Infrastructure Techniques

Design Variant	Practice	Description	Applicable	Project Specific Evaluation/Justification
RR-1	**Conservation of Natural Areas**	Retain the pre-development hydrologic and water quality characteristics of undisturbed natural areas, stream and wetland buffers by restoring and/or permanently conserving these areas on a site.	**No**	The project site does not contain any significant natural resources. The majority of the site has been previously disturbed. Approximately 102 +/- Acres will remain undisturbed, in its natural state. The project does not propose permanent conservation of these areas at this time.
RR-2	**Sheet flow to Riparian Buffers or Filter Strips**	Undisturbed natural areas such as forested conservation areas and stream buffers or vegetated filter strips and riparian buffers can be used to treat and control stormwater runoff from some areas of a development project.	**No**	No impervious areas flow to Design Point 1. Due to Design Point 2 being located within Raymond Avenue and an existing piped stormwater conyenace system, this technique is not feasible.
RR-3	**Tree Planting / Tree Box**	Plant or conserve trees to reduce stormwater runoff, increase nutrient uptake, and provide bank stabilization. Trees can be used for applications such as landscaping, stormwater management practice areas, and conservation areas.	**No**	The project proposes the preservation of existing mature trees, as well as the planting of numerous trees throughout the site, in order to reduce stormwater runoff, increase nutrient uptake, and provide bank stabilization. However, credit for these trees will not be taken toward an area reduction in the RRv calculations.
RR-4	**Disconnection of Rooftop Runoff**	Direct runoff from residential rooftop areas and upland overland runoff flow to designated pervious areas to reduce runoff volumes and rates.	**No**	Disconnected rooftop downspouts are proposed at a number of locations. However, no areas contain a long enough flow path before reconnecting with impervious areas to qualify for the rooftop disconnection credit.
RR-5	**Vegetated Swale**	The natural drainage paths, or properly designed vegetated channels, can be used instead of constructing underground storm sewers or concrete open channels to increase time of concentration, reduce the peak discharge, and provide infiltration.	**No**	The site has been designed to place greater emphasis on sheet flow instead of channeled flow. Stormwater practices have been designed to provide management and treatment at the source. A vegetated swale is proposed along the western edge of the project site to divert clean runoff from impervious area. However, credit for this practice will not be taken in the RRv calculations.
RR-6	**Rain Garden**	Manage and treat small volumes of stormwater runoff using a conditioned planting soil bed and planting materials to filter runoff stored within a shallow depression.	**No**	Due to the limited tributary area to rain gardens (less than or equal to 1,000SF), a rain garden is not practical at this site.
RR-7	**Stormwater Planter**	Small landscaped stormwater treatment devices that can be designed as infiltration or filtering practices. Stormwater planters use soil infiltration and biogeochemical processes to decrease stormwater quantity and improve water quality.	**No**	The stormwater management approach for this project is intended to provide a more natural aesthetic. Since stormwater planters have significant maintenance considerations and a more structured aesthetic, they have not been proposed for this project.
RR-8	**Rain Barrels/ Cisterns**	Capture and store stormwater runoff to be used for irrigation systems or filtered and reused for non-contact activities.	**No**	Rain Barrels/Cisterns are not proposed on-site due to the need for active management/maintenance and initial capital cost. In addition, the cold climate of the project area would require additional protection measures from freezing.
RR-9	**Porous Pavement**	Pervious types of pavements that provide an alternative to conventional paved surfaces, designed to infiltrate rainfall through the surface, thereby reducing stormwater runoff from a site and providing some pollutant uptake in the underlying soils.	**No**	Porous pavement is not proposed at this site.
RR-10	**Green Roof**	Capture runoff by a layer of vegetation and soil installed on top of a conventional flat or sloped roof. The rooftop vegetation allows evaporation and evapotranspiration processes to reduce volume and discharge rate of runoff entering conveyance system.	**No**	Green roofs are not proposed at this site.
	Stream Daylighting	Stream Daylight previously-culverted/piped streams to restore natural habitats, better attenuate runoff by increasing the storage size, promoting infiltration, and help reduce pollutant loads.	**No**	No stream daylighting opportunities are present on this site.

Appendix K - Table E

Summary Table: Runoff Reduction Volume and Treated volumes

	Runoff Reduction Techiques/Standard SMPs		Total Contributing Area	Total Contributing Impervious Area	WQv Reduced (RRv)	WQv Treated	
			(acres)	(acres)	cf	cf	
Area/Volume Reduction	Conservation of Natural Areas	RR-1	0.00	0.00			
	Sheetflow to Riparian Buffers/Filter Strips	RR-2	0.00	0.00			
	Tree Planting/Tree Pit	RR-3	0.00	0.00			
	Disconnection of Rooftop Runoff	RR-4		0.00			
	Vegetated Swale	RR-5	0.00	0.00	0		
	Rain Garden	RR-6	0.00	0.00	0		
	Stormwater Planter	RR-7	0.00	0.00	0		
	Rain Barrel/Cistern	RR-8	0.00	0.00	0		
	Porous Pavement	RR-9	0.00	0.00	0		
	Green Roof (Intensive & Extensive)	RR-10	0.00	0.00	0		
Standard SMPs w/RRv Capacity	Infiltration Trench	I-1	0.00	0.00	0	0	
	Infiltration Basin	I-2	0.00	0.00	0	0	
	Dry Well	I-3	0.00	0.00	0	0	
	Underground Infiltration System	I-4	0.00	0.00	0	0	
	Bioretention	F-5	2.16	1.14	2,405	3,607	
	Dry Swale	O-1			0	0	
Standard SMPs	Micropool Extended Detention (P-1)	P-1	0.00	0.00		0	
	Wet Pond (P-2)	P-2	0.00	0.00		0	
	Wet Extended Detention (P-3)	P-3	0.00	0.00		0	
	Multiple Pond System (P-4)	P-4	0.00	0.00		0	
	Pocket Pond (P-5)	P-5	0.00	0.00		0	
	Surface Sand Filter (F-1)	F-1	0.00	0.00		0	
	Underground Sand Filter (F-2)	F-2	0.00	0.00		0	
	Perimeter Sand Filter (F-3)	F-3	0.00	0.00		0	
	Organic Filter (F-4)	F-4	0.00	0.00		0	
	Shallow Wetland (W-1)	W-1	0.00	0.00		0	
	Extended Detention Wetland (W-2)	W-2	0.00	0.00		0	
	Pond/Wetland System (W-3)	W-3	0.00	0.00		0	
	Pocket Wetland (W-4)	W-4	0.00	0.00		0	
	Wet Swale (O-2)	O-2	0.00	0.00		0	
Alternative Practices	Hydrodynamic Separator		1.33	0.51		9,373	
	Filterra Bioretention System		0.00	0.00		0	
	Wet Vault		0.00	0.00		0	
	Media Filter		0.00	0.00		0	
	Underground Infiltration System		0.00	0.00		0	
	Totals by Area Reduction	→	1.33	0.51	0		
	Totals by Volume Reduction	→	0.00	0.00	0		
	Totals by Standard SMP w/RRV	→	2.16	1.14	2,405	3,607	
	Totals by Standard SMP	→	0.00	0.00		0	
	Totals by Alternative Practices	→	1.33	0.51		9,373	
	Totals (Area + Volume + all SMPs)	→	4.82	2.16	**2,405**	**12,979**	15,384

Appendix A - Table F
Practice Specific Sizing Calculation Worksheet

BIORETENTION NO. 1 (BIO-1)

Practice Proposed?	Yes

Enter Site Data For Drainage Area to be Treated by Practice

Catchment Number	Total Area *(Acres)*	Impervious Area *(Acres)*	Percent Impervious *%*	Rv	WQv *(ft^3)*	Precipitation *(in)*	Description
1	0.66	0.49	73%	0.71	2,386	1.40	Bioretention
Enter Impervious Area Reduced by Disconnection of Rooftops Within this Catchment:		0.00	73%	0.71	2,386	<<WQv after adjusting for Disconnected Rooftops	
Reduced by Tree Planting:	0.00	0.00	73%	0.71	2,386	<<WQv after adjusting for Tree Planting	
Enter the portion of the WQv that is not reduced for all practices routed to this practice:					0	ft^3	

Determine Required Water Quality Volume

WQv = (P/12) * Rv * A

where: WQv = Water Quality Volume (acre-feet)
P = 1-year 24-hour design storm (inches)
Rv = 0.05 + 0.009 (I); min Rv = 0.2
I = Impervious Cover (%) within the drainage area contributing to the SWM practice
A = Drainage area (square feet) contributing to the SWM practice

WQv =	2,386	CF

**Value taken from Appendix K - Table B*

Calculate Required Filter Bed Area

Af=(WQv)*(df)/[(k)*(hf+df)*(tf)]

where: Af = Surface area of filter bed (SF)
WQv = Required Water Quality Volume (CF)
df = Filter bed depth (ft)
k = Coefficient of permeability of filter media (ft/day)
hf = Average height of water above filter bed (ft)
tf = Design filter bed drain time (days)

SMP ID	WQv	df	k	hf	tf	Minimum Af	Provided Af
	(cubic feet)	(feet)	(ft/day)	(feet)	(days)	(sq-ft)	(sq-ft)
BIO-1	2,386	2.5	0.5	0.25	2.0	2,169	2,221

Calculate Provided Water Quality Volume

WQv Provided Within Practice = Total volumes of soil media, mulch, and ponding

WQv = $V_{SM} + V_M$ + Vpond

V_{SM} =	Af * df * P_{SM}	=	1,111 cf.
V_M =	Af * dm * P_M	=	222 cf.
V_{POND} =	(Af * hf * 2) + (2 * S * hf^2 * Pf)	=	1,201 cf.

where:

P_{SM} =	Porosity of soil media - 0.20	0.20
P_M =	Porosity of mulch - 0.40	0.40
S =	Bioretention Side Slopes	3.00 :1
Pf =	Bioretention Perimeter	241 LF

WQv =	2,533	CF

Calculate Provided Runoff Reduction Volume

Using Underdrains?	Yes	
RRv =	**1,013**	CF
RRv Applied =	**1,013**	**CF**

This is 40% of the storage provided or WQv, whichever is less.

Appendix A - Table F
Practice Specific Sizing Calculation Worksheet

BIORETENTION NO. 2 (BIO-2)

Practice Proposed?	Yes

Enter Site Data For Drainage Area to be Treated by Practice

Catchment Number	Total Area *(Acres)*	Impervious Area *(Acres)*	Percent Impervious *%*	Rv	WQv *(ft^3)*	Precipitation *(in)*	Description
4	1.50	0.66	44%	0.45	3,395	1.40	Bioretention
Enter Impervious Area Reduced by Disconnection of Rooftops Within this Catchment:		0.00	44%	0.45	3,395	<<WQv after adjusting for Disconnected Rooftops	
Reduced by Tree Planting:	0.00	0.00	44%	0.45	3,395	<<WQv after adjusting for Tree Planting	

Enter the portion of the WQv that is not reduced for all practices routed to this practic | 0 | ft^3

Determine Required Water Quality Volume

WQv = (P/12) * Rv * A

where: WQv = Water Quality Volume (acre-feet)
P = 1-year 24-hour design storm (inches)
Rv = 0.05 + 0.009 (I); min Rv = 0.2
I = Impervious Cover (%) within the drainage area contributing to the SWM practice
A = Drainage area (square feet) contributing to the SWM practice

WQv = 3,395 CF **Value taken from Appendix K - Table B*

Calculate Required Filter Bed Area

Af=(WQv)*(df)/[(k)*(hf+df)*(tf)]

where: Af = Surface area of filter bed (SF)
WQv = Required Water Quality Volume (CF)
df = Filter bed depth (ft)
k = Coefficient of permeability of filter media (ft/day)
hf = Average height of water above filter bed (ft)
tf = Design filter bed drain time (days)

SMP ID	WQv (cubic feet)	df (feet)	k (ft/day)	hf (feet)	tf (days)	Minimum Af (sq-ft)	Provided Af (sq-ft)
BIO-1	3,395	2.5	0.5	0.25	2.0	3,087	3,100

Calculate Provided Water Quality Volume

ded Within Practice = Total volumes of soil media, mulch, and ponding

WQv = $V_{SM} + V_M$ + Vpond

V_{SM} =	Af * df * P_{SM}	=	1,550	cf.
V_M =	Af * dm * P_M	=	310	cf.
V_{POND} =	(Af * hf * 2) + (2 * S * hf^2 * Pf)	=	1,618	cf.

where:

P_{SM} =	Porosity of soil media - 0.20	0.20	
P_M =	Porosity of mulch - 0.40	0.40	
S =	Bioretention Side Slopes	3.00	:1
Pf =	Bioretention Perimeter	181	LF

WQv = 3,478 CF

Calculate Provided Runoff Reduction Volume

Using Underdrains? Yes

RRv = **1,391** CF

RRv Applied = 1,391 CF *This is 40% of the storage provided or WQv, whichever is less.*

CONTECH ENGINEERED SOLUTIONS

TABLE G HYDRODYNAMIC SEPARATOR SIZING CALCULATIONS

Date: 12/19/2019
Project: City of Beacon Water Quality
Location: Beacon, NY
Prepared For: Chazen Companies

Purpose: To calculate the water quality flow rate (Qwq) over a given site area. In this situation the WQv to be analyzed is the runoff produced by the first 1.4 inch(es) of rainfall, per Fig 4.1 of the New York State Stormwater Management Design Manual

Reference: United States Department of Agriculture Natural Resources Conservation Service TR-55 Manual, New York State Stormwater Management Design Manual - 2015

Formulas:

$$WQv = \frac{(P)(R_v)(A)}{12}$$

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

$$CN = 1000/[10+5P+10Qa-10(Qa^2+1.25QaP)^{1/2}]$$

$$Qwq = (q_u)*(A)*(Qa)$$

Structure:	Unit 1		Structure:	Unit 2		Structure:	Unit 3	
P	1.40	in.	P	1.40	in.	P	1.40	in.
A	0.645	ac	A	1.236	ac	A	1.003	ac
I	71.63	%	I	38.51	%	I	66.40	%
t_c	6.0	min.	t_c	10.3	min.	t_c	6.0	min.
t_c	0.100	hr.	t_c	0.172	hr.	t_c	0.100	hr.
R_v	0.695		R_v	0.397		R_v	0.648	
90% WQv	0.052	ac-ft	90% WQv	0.057	ac-ft	90% WQv	0.076	ac-ft
90% WQv	2278.19	ft^3	90% WQv	2491.63	ft^3	90% WQv	3301.85	ft^3
Qa	0.973	in.	Qa	0.555	in.	Qa	0.907	in.
CN	95.67		CN	88.98		CN	94.82	
I_a	0.090		I_a	0.248		I_a	0.109	
I_a/P	0.064		I_a/P	0.177		I_a/P	0.078	
qu	650	(csm/in)	qu	560	(csm/in)	qu	650	(csm/in)
A	0.00101	$miles^2$	A	0.00193	$miles^2$	A	0.00157	$miles^2$
Qwq	0.64	cfs	Qwq	0.60	cfs	Qwq	0.92	cfs

Date: 12/19/2019
Project: City of Beacon Water Quality
Location: Beacon, NY
Prepared For: Chazen Companies

Purpose: To calculate the water quality flow rate (Qwq) over a given site area. In this situation the WQv to be analyzed is the runoff produced by the first 1.4 inch(es) of rainfall, per Fig 4.1 of the New York State Stormwater Management Design Manual

Reference: United States Department of Agriculture Natural Resources Conservation Service TR-55 Manual, New York State Stormwater Management Design Manual - 2015

Formulas:

$$WQv = \frac{(P)(R_v)(A)}{12}$$

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

$$CN = 1000/[10+5P+10Qa-10(Qa^2+1.25QaP)^{1/2}]$$

$$Qwq = (q_u)*(A)*(Qa)$$

Structure:	Unit 4		Structure:	Unit 5	
P	1.40	in.	P	1.40	in.
A	1.505	ac	A	0.698	ac
I	35.22	%	I	97.13	%
t_c	6.0	min.	t_c	23.6	min.
t_c	0.100	hr.	t_c	0.393	hr.
R_v	0.367		R_v	0.924	
90% WQv	0.064	ac-ft	90% WQv	0.075	ac-ft
90% WQv	2805.26	ft^3	90% WQv	3275.71	ft^3
Qa	0.513	in.	Qa	1.293	in.
CN	88.07		CN	99.07	
I_a	0.271		I_a	0.041	
I_a/P	0.194		I_a/P	0.029	
qu	625	(csm/in)	qu	450	(csm/in)
A	0.00235	$miles^2$	A	0.00109	$miles^2$
Qwq	0.75	cfs	Qwq	0.63	cfs

Appendix K:
Soil Testing Results

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1 / FIG 6 **SOIL TESTING RESULTS**
SCALE: 1"=60'

Deep Test Results 07/11/2013		
Test Number	Depth	Soil Type
DT-1	0-4.5'	Fill, Gravelly Loam w/ Brick, Concrete, Boulders
	4.5'-7'	Sandy Clay Loam
DT-2	0-2.5"	Fill: Gravelly Loam w/ Construction Debris
	2.5'	2" Metal Pipe Found, Ended DT
DT-3	0-1.5'	Gravelly Loam
	1.5-2.5'	Clay Fill w/ Construction Debris
	2.5-3'	Old Asphalt
	3-3.5'	Construction Debris
	3.5-7'	Clay
DT-4	0-1'	Gravelly Loam Fill
	1-7'	Sandy Loam, Water @ 7'
DT-5	0-5'	Gravelly Silty Loam Fill, Rock @ 5'
DT-6	0-5'-3"	Gravelly Loam Fill w/ Bricks & Construction Debris
	5'-3"	Rock
DT-7	0-5'	Gravely Loam Fill
	5-7'	Clay, Shale @ 7'
DT-8	0-3.5'	Intermittent Clay Loam and Gravelly Loam w/ Bricks & Construction Debris
	3.5-6.5'	Same w/o Bricks, No Rock, No Water
DT-9	0-4.5'	Gravelly Loam Fill - No Debris
	4.5-6.5'	Virgin Clay
	6.5'	Shale
DT-10	-	Search for forcemain, 2" fiberglass elbow found
	-	Remaining forcemain not found
DT-11	-	Search for water main
	-	4" DIP @ 3, no 8" DIP found

LEGEND:

DEEP TEST

0 1 2 3
ORIGINAL SCALE IN INCHES

THE Chazen COMPANIES®
Engineers/Surveyors
Planners
Environmental Scientists
Landscape Architects

CHAZEN ENGINEERING, LAND SURVEYING & LANDSCAPE ARCHITECTURE CO., D.P.C.

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Capital District Office:
547 River Street
Troy, New York 12180
Phone: (518) 273-0055

North Country Office:
375 Bay Road
Queensbury, New York 12804
Phone: (518) 812-0513

rev.	date	description

TIORONDA AVENUE & 465 WOLCOTT AVENUE
BEACON 248 DEVELOPMENT, LLC

SOIL TESTING RESULTS

CITY OF BEACON, DUTCHESS COUNTY, NEW YORK

designed	checked
date 8/21/13	scale AS NOTED
project no. 81056.00	
sheet no. FIG 6 1 OF 1	

Drawing Name: \\Acad100\x\8\81000-81099\81056 – Tioronda Ave – 100 Units\ENG\DWG\SOIL_TEST_RESULTS_81056.dwg
Xref's Attached: XBASE-ENG_81056-00; XTB_81056-00_24x36 – Soil
Date Printed: Aug 27, 2013, 11:26am

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Appendix L:
Flood Insurance Study, Volume 1 of 4

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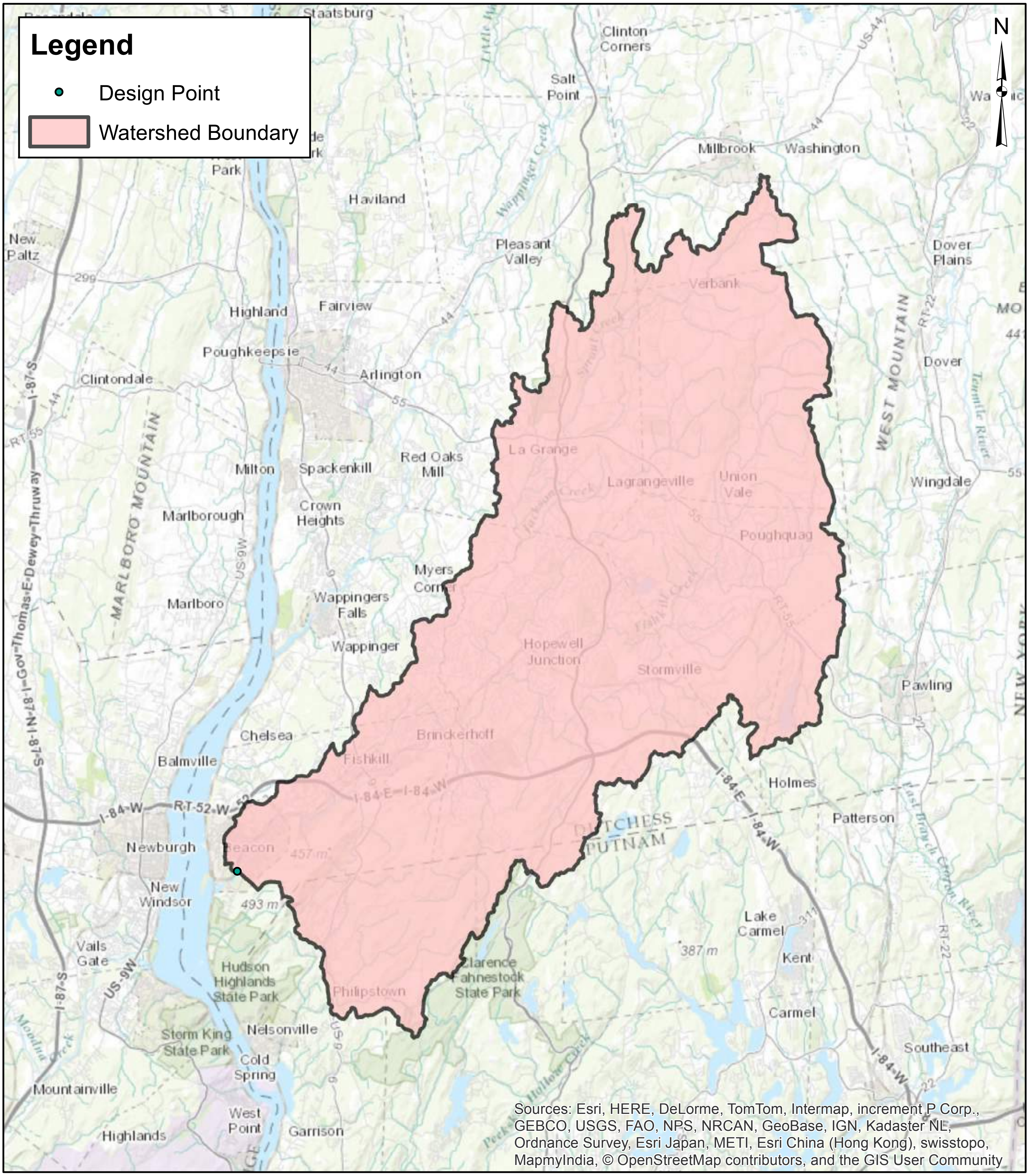

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375 Bay Road, Queensbury, NY 12804
Phone: (518) 812-0513

Beacon 248 Development

Fishkill Creek at Beacon 248 Development Watershed Map

City of Beacon, Dutchess County, New York

Drawn:	KGA
Date:	10/14/14
Scale:	1 " = 20,000 '
Project:	81056.00
Figure:	FIG 7

Map Document: (R:\0\standards\Gis\ChazenGIS\8X11P_MinimalChazenAddress.mxt)
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FLOOD INSURANCE STUDY

VOLUME 1 OF 4

DUTCHESS COUNTY, NEW YORK
(ALL JURISDICTIONS)

COMMUNITY NAME	COMMUNITY NUMBER	COMMUNITY NAME	COMMUNITY NUMBER
AMENIA, TOWN OF	361332	PAWLING, VILLAGE OF	361517
BEACON, CITY OF	360217	PINE PLAINS, TOWN OF	361141
BEEKMAN, TOWN OF	361333	PLEASANT VALLEY, TOWN OF	360221
CLINTON, TOWN OF	361334	POUGHKEEPSIE, CITY OF	360222
DOVER, TOWN OF	361335	POUGHKEEPSIE, TOWN OF	361142
EAST FISHKILL, TOWN OF	361336	RED HOOK, TOWN OF	361143
FISHKILL, TOWN OF	361337	RED HOOK, VILLAGE OF	361614
FISHKILL, VILLAGE OF	360218	RHINEBECK, TOWN OF	361144
HYDE PARK, TOWN OF	361338	RHINEBECK, VILLAGE OF	361999
LAGRANGE, TOWN OF	361011	STANFORD, TOWN OF	361145
MILAN, TOWN OF	361339	TIVOLI, VILLAGE OF	361507
MILLBROOK, VILLAGE OF	360219	UNION VALE, TOWN OF	361146
MILLERTON, VILLAGE OF	360220	WAPPINGER, TOWN OF	361387
NORTHEAST, TOWN OF	361340	WAPPINGERS FALLS, VILLAGE OF	360223
PAWLING, TOWN OF	361341	WASHINGTON, TOWN OF	361147

EFFECTIVE:
May 2, 2012

Federal Emergency Management Agency

FLOOD INSURANCE STUDY NUMBER
36027CV001A

NOTICE TO
FLOOD INSURANCE STUDY USERS

Communities participating in the National Flood Insurance Program have established repositories of flood hazard data for floodplain management and flood insurance purposes. This Flood Insurance Study (FIS) may not contain all data available within the repository. It is advisable to contact the community repository for any additional data.

Part or all of this FIS may be revised and republished at any time. In addition, part of this FIS may be revised by the Letter of Map Revision process, which does not involve republication or redistribution of the FIS. It is, therefore, the responsibility of the user to consult with community officials and to check the community repository to obtain the most current FIS components.

Selected Flood Insurance Rate Map panels for this community contain information that was previously shown separately on the corresponding Flood Boundary and Floodway Map panels (e.g., floodways and cross sections). In addition, former flood hazard zone designations have been changed as follows.

Old Zone(s)	New Zone
A1 through A30	AE
V1 through V30	VE
B	X
C	X

Initial Countywide FIS Effective Date: May 2, 2012

Revised Countywide FIS Date:

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TABLE OF CONTENTS – Volume 1 – May 2, 2012

TABLE OF CONTENTS – Volume 1 - continued

TABLE OF CONTENTS – Volume 2 – May 2, 2012

TABLE OF CONTENTS – Volume 3 – May 2, 2012

TABLE OF CONTENTS – Volume 4 – May 2, 2012

EXHIBITS

1.0 INTRODUCTION

1.1 Purpose of Study

This countywide Flood Insurance Study (FIS) investigates the existence and severity of flood hazards in, or revises and updates previous FISs/Flood Insurance Rate Maps (FIRMs) for the geographic area of Dutchess County, New York, including: the Cities of Beacon and Poughkeepsie; the Towns of Amenia, Beekman, Clinton, Dover, East Fishkill, Fishkill, Hyde Park, LaGrange, Milan, Northeast, Pawling, Pine Plains, Pleasant Valley, Poughkeepsie, Red Hook, Rhinebeck, Stanford, Union Vale, Wappinger, and Washington; and the Villages of Fishkill, Millbrook, Millerton, Pawling, Red Hook, Rhinebeck, Tivoli, and Wappingers Falls (hereinafter referred to collectively as Dutchess County).

This FIS aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. This FIS has developed flood risk data for various areas of the county that will be used to establish actuarial flood insurance rates. This information will also be used by Dutchess County to update existing floodplain regulations as part of the Regular Phase of the National Flood Insurance Program (NFIP), and will also be used by local and regional planners to further promote sound land use and floodplain development. Minimum floodplain management requirements for participation in the NFIP are set forth in the Code of Federal Regulations at 44 CFR§ 60.3.

In some States or communities, floodplain management criteria or regulations may exist that are more restrictive or comprehensive than the minimum Federal requirements. In such cases, the more restrictive criteria take precedence and the State (or other jurisdictional agency) will be able to explain them.

1.2 Authority and Acknowledgments

The sources of authority for this FIS are the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.

This FIS was prepared to include all jurisdictions within Dutchess County into a countywide format. Information on the authority and acknowledgments for each jurisdiction included in this countywide FIS, as compiled from their previously printed FIS reports, is shown below.

Amenia, Town of:	the hydrologic and hydraulic analyses from the FIS report dated November 15, 1989, were performed by Edwards and Kelcey Engineers, Inc., for the Federal Emergency Management Agency (FEMA), under Contract No. EMW-85-C-1887. That work was completed in November 1987.
Beacon, City of:	the hydrologic and hydraulic analyses from the FIS report dated September 1, 1983, were prepared by Kozma Associates for FEMA, under Contract No. EMW-C-0777. That work was completed in August 1982.
Beekman, Town of:	the hydrologic and hydraulic analyses from the FIS report dated March 5, 1984, were prepared by Kozma Associates for FEMA, under Contract No. EMW-C-0733. That work was completed in February 1983.
Clinton, Town of:	the hydrologic and hydraulic analyses from the FIS report dated January 5, 1984, were prepared by Kozma Associates for FEMA, under Contract No. EMW-C-0733. That work was completed in December 1982.
Dover, Town of:	the hydrologic and hydraulic analyses from the FIS report dated July 4, 1988, were prepared by Kozma Associates for FEMA, under Contract No. EMW-C-0733. That work was completed in December 1982.
East Fishkill, Town of:	the hydrologic and hydraulic analyses from the FIS report dated December 15, 1983, were prepared by Kozma Associates for FEMA, under Contract No. EMW-C-0733. That work was completed in December 1982.
Fishkill, Town of:	the hydrologic and hydraulic analyses from the FIS report dated December 1, 1983, were prepared by Kozma Associates for FEMA, under Contract No. EMW-C-0733. That work was completed in October 1982.
Fishkill, Village of:	the hydrologic and hydraulic analyses from the FIS report dated September 15, 1983, were prepared by Kozma Associates for FEMA, under Contract No. EMW-C-0733. That work was completed in October 1982.
Hyde Park, Town of:	the hydrologic and hydraulic analyses from the FIS report dated December 15, 1983, were prepared by Kozma Associates for FEMA, under

Contract No. EMW-C-0733. That work was completed in November 1982.

LaGrange, Town of: the hydrologic and hydraulic analyses for the original FIS, dated September 28, 1979, were performed by Harris-Toups Associates for the Federal Insurance Administration (FIA) under Contract No. H-3962. That work, which was completed in September 1977, covered all significant flooding sources in the Town of LaGrange. The hydrologic and hydraulic analyses for the November 5, 1986, FIS for Branch 3 Wappinger Creek were performed by Dewberry and Davis. The topographic data were obtained from Barger, Campbell, Gray and Rarling, Engineers and Surveyors.

For the FIS report dated September 8, 1999, updated hydrologic and hydraulic analyses for Wappinger Creek were prepared by Leonard Jackson Associates for FEMA, under Contract No. 93-C-4145. That work was completed in March 1997. Planimetric base map files for this revision were derived by digitizing U.S. Geological Survey 7.5-Minute Series Topographic Maps. These files were compiled at a scale of 1:24,000.

Millerton, Village of: the hydrologic and hydraulic analyses from the FIS report dated July 3, 1984, were prepared by Kozma Associates for FEMA, under Contract No. EMW-C-0733. That work was completed in February 1983.

Northeast, Town of: the hydrologic and hydraulic analyses from the FIS report dated March 5, 1984, were prepared by Kozma Associates for FEMA, under Contract No. EMW-C-0733. That work was completed in February 1983.

Pawling, Town of: the hydrologic and hydraulic analyses from the FIS report dated July 3, 1984, were prepared by Kozma Associates for FEMA, under Contract No. EMW-C-0733. That work was completed in March 1983.

Pawling, Village of: the hydrologic and hydraulic analyses from the FIS report dated February 1, 1984, were prepared

by Kozma Associates for FEMA, under Contract No. EMW-C-0733. That work was completed in March 1983.

Pleasant Valley, Town of: the hydrologic and hydraulic analyses from the FIS report dated July 1979 were performed by Harris-Toups Associates for the FIA under Contract No. H-3962. That work, which was completed in October 1977, covered all significant flooding sources in the Town of Pleasant Valley.

Poughkeepsie, City of: the hydrologic and hydraulic analyses from the FIS report dated July 5, 1983, were prepared by Kozma Associates for FEMA, under Contract No. EMW-C-0733. That work was completed in July 1982.

Poughkeepsie, Town of: the hydrologic and hydraulic analyses from the original FIS report dated May 1978 and FIRM dated November 15, 1978 (hereinafter referred to as the 1978 FIS) were prepared for the FIA by Harris-Toups Associates, under Contract No. H-3962. That work was completed in August 1977.

For the August 2, 1990, revision, the hydrologic and hydraulic analyses were prepared by Edwards and Kelcey Engineers, Inc., for FEMA, under Contract No. EMW-85-C-1887. That work was completed in January 1988.

For the FIS report dated September 8, 1999, revised hydrologic and hydraulic analyses were prepared by Leonard Jackson Associates for FEMA, under Contract No. 93-C-4145. That work was completed in March 1997.

Red Hook, Town of: the hydrologic and hydraulic analyses from the FIS report dated April 16, 1984, were prepared by Kozma Associates for FEMA, under Contract No. EMW-C-0733. That work was completed in March 1983.

Rhinebeck, Town of: the hydrologic and hydraulic analyses from the FIS report dated March 5, 1984, were prepared by Kozma Associates for FEMA, under Contract No. EMW-C-0733. That work was completed in December 1982.

Rhinebeck, Village of: the hydrologic and hydraulic analyses from the FIS report dated August 1, 1984, were prepared by Kozma Associates for FEMA, under Contract No. EMW-C-0733. That work was completed in December 1982.

Stanford, Town of: the hydrologic and hydraulic analyses from the FIS report dated December 17, 1991, were prepared by Kozma Associates Consulting Engineers, P.C. (the study contractor), for FEMA, under Contract No. EMW-86-C-2244. That work was completed in December 1989.

Tivoli, Village of: the hydrologic and hydraulic analyses from the FIS report dated February 1, 1984, were prepared by Kozma Associates for FEMA, under Contract No. EMW-C-0733. That work was completed in February 1983.

Union Vale, Town of: the hydrologic and hydraulic analyses from the FIS report dated September 2, 1988, were prepared by McCoy-Jackson Associates for FEMA, under Contract No. EMW-84-C-1603. That work was completed in February 1987.

Wappinger, Town of: the hydrologic and hydraulic analyses from the original FIS report dated December 1978 and FIRM dated June 15, 1979 (hereinafter referred to as the 1979 FIS), were performed by Harris-Toups Associates for the FIA, under Contract No. H-3962. That work was completed in July 1977.

The hydrologic and hydraulic analyses from the FIS report dated September 22, 1999, were prepared by Leonard Jackson Associates for FEMA, under Contract No. 93-C-4145. That work was completed in March 1997.

Wappingers Falls, Village of: the hydrologic and hydraulic analyses from the original FIS report dated March 1978 and FIRM dated September 1, 1978 (hereinafter referred to as the 1978 FIS), were performed by Harris-Toups Associates for the FIA, under Contract No. H-3962. That work was completed in June 1977.

Wappingers Falls, Vill. (cont.) The hydrologic and hydraulic analyses from the FIS report dated September 22, 1999, were prepared by Leonard Jackson Associates for FEMA, under Contract No. 93-C-4145. That work was completed in March 1997.

There are no previous FISs or FIRMs for the Village of Red Hook, and no previous FISs for the Towns of Milan, Pine Plains, and Washington, and for the Village of Millbrook; therefore, the previous authority and acknowledgment information for these communities is not included in this FIS.

For this countywide FIS, dated September 29, 2011 revised hydrologic and hydraulic analyses for Fishkill Creek, Maritje Kill and the Tenmile River were prepared by Dewberry for the New York State Department of Environmental Conservation (NYS DEC) under its Cooperating Technical Partner agreement with FEMA. This work was completed in June 2008. Additionally, floodplain boundaries for all unrevised flooding sources previously studied using detailed methodology were updated using topographic data provided to NYS DEC by Dutchess County. This work for also completed by Dewberry in June 2008. Flood hazard areas previously assessed using approximate methods were re-analyzed throughout the county and results were then mapped using the Dutchess County topographic data. This work was completed in May 2008.

Base map information for this FIRM was developed from digital orthoimagery provided by the New York State Office of Cyber Security & Critical infrastructure Coordination. This imagery was derived for 1- and 2- foot resolution natural color orthoimagery from photography dated April 2006.

The coordinate system used for the production of this FIRM is Universal Transverse Mercator (UTM), North American Datum of 1983 (NAD 83), GRS80 spheroid. Corner coordinates shown on the FIRM are in latitude and longitude referenced to the UTM projection, NAD 83. Differences in the datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent counties may result in slight positional differences in map features at the county boundaries. These differences do not affect the accuracy of information shown on the FIRM.

1.3 Coordination

Consultation Coordination Officer's (CCO) meetings may be held for each jurisdiction in this countywide FIS. An initial CCO meeting is held typically with representatives of FEMA, the community, and the study contractor to explain the nature and purpose of a FIS, and to identify the streams to be studied by detailed methods. A final CCO meeting is held typically with representatives of FEMA, the community, and the study contractor to review the results of the study.

The dates of the initial and final CCO meetings held for jurisdictions within Dutchess County are shown in Table 1, "Initial and Final CCO Meetings."

TABLE 1 – INITIAL AND FINAL CCO MEETINGS

Community	Initial CCO Date	Final CCO Date
Town of Amenia	September 18, 1984	October 20, 1988
City of Beacon	March 1978	April 4, 1983
Town of Beekman	March 1978	October 11, 1983
Town of Clinton	*	August 8, 1983
Town of Dover	March 1978	October 6, 1983
Town of East Fishkill	March 1978	August 11, 1983
Town of Fishkill	March 1978	June 6, 1983
Village of Fishkill	March 1978	May 9, 1983
Town of Hyde Park	March 1978	June 27, 1983
Town of Lagrange	November 1976	November 16, 1977
Town of Milan	*	*
Village of Millbrook	*	*
Village of Millerton	March 1978	October 12, 1983
Town of Northeast	March 1978	October 13, 1983
Town of Pawling	March 1978	November 16, 1983
Village of Pawling	March 1978	October 3, 1983
Town of Pine Plains	*	*
Town of Pleasant Valley	November 1976	December 8, 1977
City of Poughkeepsie	March 1978	January 20, 1983
Town of Poughkeepsie	September 19, 1984	March 1, 1989
Town of Red Hook	March 1978	December 13, 1983
Village of Red Hook	*	*
Town of Rhinebeck	March 1978	September 16, 1983
Village of Rhinebeck	March 1978	March 13, 1984
Town of Stanford	October 11, 1990	February 1, 1991
Village of Tivoli	March 1978	September 12, 1983
Town of Union Vale	March 1984	October 15, 1987
Town of Wappinger	October 1976	March 31, 1998[1]
Village of Wappingers Falls	October 1976	March 31, 1998[1]
Town of Washington	*	*

[1]Notified by letter
*Data not available

Three initial CCO meetings for this revision were held. The first was held for communities within the Fishkill Creek watershed in February 2002, which was attended by representatives of communities within the watershed as well as NYS DEC and FEMA staff. The second was held for communities within the Wappinger Creek watershed in March 2003, which was attended by representatives

of communities within the watershed as well as NYS DEC and FEMA staff. At the third meeting, in August 2006, the remaining communities in the county were invited to discuss flood hazards within their jurisdiction in the context of the planned flood map update. The final CCO meeting was held October 6 and 7, 2008.

2.0 AREA STUDIED

2.1 Scope of Study

This FIS covers the geographic area of Dutchess County, New York.

The areas studied by detailed methods were selected with priority given to all known flood hazard areas and areas of projected development and proposed construction. All or portions of the flooding sources listed in Table 2, "Flooding Sources Studied by Detailed Methods," were studied by detailed methods. Limits of detailed study are indicated on the Flood Profiles (Exhibit 1) and on the FIRM (Exhibit 2). The areas studied were selected with priority given to all known flood hazard areas and areas of projected development and proposed construction.

TABLE 2 - FLOODING SOURCES STUDIED BY DETAILED METHODS

Amenia Stream
Branch 1 Great Spring Creek
Branch 1 Sprout Creek #1
Branch 1 Wappinger Creek Reach 1
Branch 10 Wappinger Creek Reach 1
Branch 11 Wappinger Creek Reach 1
Branch 1A Hudson River
Branch 2 Sprout Creek #1
Branch 2 Wappinger Creek Reach 1
Branch 2A Wappinger Creek Reach 1
Branch 2B Wappinger Creek Reach 1
Branch 3 Wappinger Creek Reach 1
Branch 4 Wappinger Creek Reach 1
Branch 5 Wappinger Creek Reach 1
Branch 6 Wappinger Creek Reach 1
Branch 7 Wappinger Creek Reach 1
Branch 8 Wappinger Creek Reach 1
Branch 9 Wappinger Creek Reach 1
Casper Kill Creek
Clove Brook
Clove Creek
Clove Mountain Creek
Crum Elbow Creek
East Branch Croton River
East Branch Wappinger Creek Reach 1
Eighmy Ville Creek
Fall Kill
Fall Kill Creek
Fishkill Creek
Frog Hollow Brook
Great Spring Creek
Hudson River
Indian Lake
Jackson Creek Reach 1
Jackson Creek Reach 2
Kelsey Brook
Landsman Kill
Little Wappinger Creek Reach 1
Long Pond
Maritje Kill
Rhinebeck Kill
Saw Kill
Seeley Creek
Silver Lake
Sprout Creek #1
Sprout Creek #2
Stony Creek
Swamp River Reach 1
Swamp River Reach 2
Sweezy Creek
Sylvan Lake
Sylvan Lake Outlet
Tenmile River
Tributary 1 to Fishkill Creek
Tributary 2 to Fishkill Creek
Tributary to Amenia Stream
Tributary to East Branch Croton River
Walsh Creek

TABLE 2 - FLOODING SOURCES STUDIED BY DETAILED METHODS - continued

Wappinger Creek Reach 1	Webatuck Creek Reach 2	Whortlekill Creek Reach 1
Wappinger Creek Reach 2	Webatuck Creek Reach 3	Whortlekill Creek Reach 2
Wassaic Creek	Wells Brook	Willow Brook
Webatuck Creek Reach 1	Whaley Lake Stream	

Riverine flooding sources throughout the county have been studied by detailed methods at different times and prior to this countywide FIS, dated September 29, 2011 often on a community-by-community basis. Table 3, "Model Dates for Riverine Flooding Sources," below represents the hydraulic modeling dates for the detailed study flooding sources in the county.

TABLE 3 – MODEL DATES FOR RIVERINE FLOODING

STREAM NAME	COMMUNITY	MOST RECENT MODEL DATE
Amenia Stream	Town of Amenia	November 1987
Branch 1 Great Spring	Town of Pleasant Valley	October 1977
Branch 1 Sprout Creek #1	Town of LaGrange	September 1977
Branch 1 Wappinger Creek Reach 1	Town of Wappinger	March 1997
	Village of Wappingers Falls	March 1997
Branch 10 Wappinger Creek Reach 1	Town of Pleasant Valley	October 1977
Branch 11 Wappinger Creek Reach 1	Town of Pleasant Valley	October 1977
Branch 1A Hudson River	Town of Wappinger	July 1977
Branch 2 Sprout Creek #2	Town of LaGrange	September 1977
Branch 2 Wappinger Creek Reach 1	Town of Wappinger	July 1977
Branch 2A Wappinger Creek Reach 1	Town of Wappinger	July 1977
Branch 2B Wappinger Creek Reach 1	Town of Wappinger	July 1977
Branch 3 Wappinger Creek Reach 1	Town of Poughkeepsie	August 1977
Branch 4 Wappinger Creek Reach 1	Town of Poughkeepsie	January 1988
Branch 5 Wappinger Creek Reach 1	Town of LaGrange	September 1977
Branch 6 Wappinger Creek Reach 1	Town of Poughkeepsie	August 1977
Branch 7 Wappinger Creek Reach 1	Town of LaGrange	September 1977

TABLE 3 – MODEL DATES FOR RIVERINE FLOODING-continued

STREAM NAME	COMMUNITY	MOST RECENT MODEL DATE
Branch 8 Wappinger Creek Reach 1	Town of Poughkeepsie	August 1977
Branch 9 Wappinger Creek Reach 1	Town of Pleasant Valley	October 1977
Casper Kill Creek	Town of Poughkeepsie	January 1988
	City of Poughkeepsie	July 1982
Clove Creek	Town of Fishkill	October 1982
Clove Mountain Creek	Town of Union Vale	February 1987
Crum Elbow Creek	Town of Hyde Park	November 1982
	Town of Rhinebeck	December 1982
	Town of Clinton	December 1982
East Branch Croton River	Town of Pawling	March 1983
	Village of Pawling	March 1983
East Branch Wappinger Creek Reach 1	Town of Clinton	December 1982
	Town of Pleasant Valley	October 1977
Eighmy Ville Creek	Town of Rhinebeck	December 1982
Fall Kill	Town of Hyde Park	November 1982
Fall Kill Creek	Town of Poughkeepsie	January 1988
	City of Poughkeepsie	July 1982
Fishkill Creek	City of Beacon	July 2008
	Town of Beekman	July 2008
	Town of Fishkill	July 2008
	Village of Fishkill	July 2008
	Town of East Fishkill	July 2008
	Town of Union Vale	July 2008
Frog Hollow Creek	Town of Beekman	February 1983
Great Spring Creek	Town of Pleasant Valley	October 1977
Jackson Creek Reach 1	Town of LaGrange	September 1977
Jackson Creek Reach 2	Town of LaGrange	February 1987
Kelsey Brook	Village of Millerton	February 1983
	Town of Northeast	February 1983
Landsman Kill	Town of Rhinebeck	December 1982
	Village of Rhinebeck	December 1982
Little Wappinger Creek Reach 1	Town of Clinton	December 1982
	Town of Pleasant Valley	October 1977
Maritje Kill	Town of Hyde Park	July 2008
Rhinebeck Kill	Town of Red Hook	March 1983
	Town of Rhinebeck	December 1982
	Village of Rhinebeck	December 1982
Saw Kill	Town of Red Hook	March 1983
	Village of Red Hook	March 1983

TABLE 3 – MODEL DATES FOR RIVERINE FLOODING-continued

STREAM NAME	COMMUNITY	MOST RECENT MODEL DATE
Seeley Creek	Town of Union Vale	February 1987
Sprout Creek #1	Town of East Fishkill	December 1982
	Town of Fishkill	October 1982
	Town of LaGrange	September 1977
	Town of Wappinger	July 1977
Sprout Creek #2	Town of Union Vale	February 1987
	Town of Washington	February 1987
Stony Creek	Town of Red Hook	March 1983
	Village of Tivoli	February 1983
Swamp River Reach 1	Town of Dover	December 1982
Swamp River Reach 2	Town of Pawling	March 1983
	Village of Pawling	March 1983
Sweezy Creek	Town of Union Vale	February 1987
Sylvan Lake Outlet	Town of Beekman	February 1983
	Town of East Fishkill	December 1982
Tenmile River	Town of Amenia	July 2008
	Town of Beekman	July 2008
Tributary 1 to Fishkill Creek	Town of Fishkill	October 1982
	Village of Fishkill	October 1982
Tributary 2 to Fishkill Creek	Town of Beekman	February 1983
Tributary to Amenia Stream	Town of Amenia	November 1987
Tributary to East Branch Croton River	Town of Pawling	March 1983
Walsh Creek	Town of Union Vale	February 1983
Wappinger Creek Reach 1	Town of Clinton	December 1982
	Town of LaGrange	March 1997
	Town of Pleasant Valley	October 1997
	Town of Poughkeepsie	March 1997
	Town of Wappinger	March 1997
	Village of Wappinger Falls	March 1997
Wappinger Creek Reach 2	Town of Stanford	December 1989
	Town of Pine Plains	December 1989
Wassaic Creek	Town of Northeast	February 1983
Webatuck Creek Reach 1	Town of Amenia	November 1987
Webatuck Creek Reach 2	Town of Amenia	November 1987
	Village of Millerton	February 1983
	Town of Northeast	February 1983
Webatuck Creek Reach 2	Village of Millerton	February 1983
	Town of Northeast	February 1983
Wells Brook	Town of Dover	December 1982
Whortlekill Creek Reach 1	Town of East Fishkill	December 1982
Whortlekill Creek Reach 2	Town of LaGrange	September 1977
Willow Brook	Town of Stanford	December 1989

As part of the countywide FIS dated September 29, 2011, updated analysis were included for the flooding sources in Table 4, "Scope of Revision."

TABLE 4 - SCOPE OF REVISION

Stream	Limits of Revised or New Detailed Study
Fishkill Creek	From confluence with Hudson River to approximately 2,945 feet upstream of Clubhouse Lane
Maritje Kill	From confluence with Hudson River to approximately 4,255 feet upstream of Crum Elbow Road
Tenmile River	From county boundary to approximately 5,453 feet upstream of Mill Street

Table 5, "Stream Name Changes," lists streams that have names in this countywide FIS dated September 29, 2011 other than those used in previously printed FISs for the communities in which they are located.

TABLE 5 – STREAM NAME CHANGES

Community	Old Name	New Name
Town of Wappinger Village of Wappinger	Branch 1 Wappinger Creek	Branch 1 Wappinger Creek Reach 1
Town of Wappinger	Branch 2 Wappinger Creek	Branch 2 Wappinger Creek Reach 1
Town of Wappinger	Branch 2A Wappinger Creek	Branch 2A Wappinger Creek Reach 1
Town of Wappinger	Branch 2B Wappinger Creek	Branch 2B Wappinger Creek Reach 1
Town of LaGrange	Branch 3 Sprout Creek	Branch 1 Sprout Creek #1
Town of LaGrange	Branch 4 Sprout Creek	Branch 2 Sprout Creek #1
Town of Poughkeepsie	Branch 3 Wappinger Creek	Branch 3 Wappinger Creek Reach 1
Town of Poughkeepsie	Branch 4 Wappinger Creek	Branch 4 Wappinger Creek Reach 1
Town of LaGrange	Branch 3 Wappinger Creek	Branch 5 Wappinger Creek Reach 1

TABLE 5 – STREAM NAME CHANGES-continued

Community	Old Name	New Name
Town of LaGrange	Branch 3 Wappinger Creek	Branch 5 Wappinger Creek Reach 1
Town of Poughkeepsie	Branch 5 Wappinger Creek	Branch 6 Wappinger Creek Reach 1
Town of LaGrange	Branch 4 Wappinger Creek	Branch 7 Wappinger Creek Reach 1
Town of Poughkeepsie	Branch 6 Wappinger Creek	Branch 8 Wappinger Creek Reach 1
Town of Pleasant Valley	Branch 2 Wappinger Creek	Branch 9 Wappinger Creek Reach 1
Town of Pleasant Valley	Branch 3 Wappinger Creek	Branch 10 Wappinger Creek Reach 1
Town of Pleasant Valley	Branch 4 Wappinger Creek	Branch 11 Wappinger Creek Reach 1
Town of Clinton	East Branch Wappinger Creek	East Branch Wappinger Creek Reach 1
Town of LaGrange	Jackson Creek	Jackson Creek Reach 1
Town of Union Vale	Jackson Creek	Jackson Creek Reach 2
Town of Clinton Town of Pleasant Valley	Little Wappinger Creek	Little Wappinger Creek Reach 1
Town of East Fishkill Town of LaGrange	Sprout Creek	Sprout Creek #1
Town of Union Vale	Sprout Creek	Sprout Creek #2
Town of Dover	Swamp River	Swamp River Reach 1
Town of Dover Town of Pawling	Swamp River	Swamp River Reach 2
Town of Fishkill	Tributary to Fishkill Creek	Tributary 1 to Fishkill Creek
Town of Beekman	Tributary to Fishkill Creek	Tributary 2 to Fishkill Creek

TABLE 5 – STREAM NAME CHANGES-continued

Community	Old Name	New Name
Town of Clinton Town of LaGrange Town of Pleasant Valley Town of Poughkeepsie Town of Wappinger Village of Wappinger	Wappinger Creek	Wappinger Creek Reach 1
Town of Stanford	Wappinger Creek	Wappinger Creek Reach 2
Town of Amenia	Webatuck Creek	Webatuck Creek Reach 1
Town of Amenia Town of Northeast Village of Millerton	Webatuck Creek	Webatuck Creek Reach 2
Town of Northeast	Webatuck Creek	Webatuck Creek Reach 3
Town of East Fishkill	Whortle Kill Creek	Whortle Kill Creek Reach 1
Town of LaGrange	Whortle Kill Creek	Whortle Kill Creek Reach 2

All or portions of numerous flooding sources in the county were studied by approximate methods. Approximate analyses were used to study those areas having a low development potential or minimal flood hazards, or where resources were unavailable to conduct more refined and detailed analyses. For this revision, dated September 29, 2011 all areas of approximate flood hazard analyses were updated using the topography provided by Dutchess County and the flood frequency estimation techniques developed by the U.S. Geological Survey (USGS).

This FIS incorporates the determinations of the following LOMRs issued by FEMA. Case 03-02-029P on January 1, 2004, for Swamp River-River Valley Estates, and Case 07-02-0707P on October 15, 2007 for Furnia Site-NYS Route 22 both in the Town of Dover.

2.2 Community Description

Dutchess County is located in the southeastern portion of the State of New York. It is bordered on the north by Columbia County; on the east by Litchfield County, Connecticut; on the south by Putnam County; and to the west by Ulster and Orange Counties.

The climate of the area is characterized as humid continental. Summer and winter temperatures range from 74.7 degrees Fahrenheit (°F) to 26.2°F, respectively. The average annual precipitation is 38 inches, with a recorded annual snowfall of 42.2 inches. The precipitation is fairly evenly distributed throughout the year (U.S. Department of Commerce, 1972)

According to the 2000 U.S. Census Bureau, the population for Dutchess County was 280,150 and the land area was 801.6 square miles.

For ease of use, information on various flooding sources in Dutchess County was organized based on its 11-digit Hydrologic Unit Code (HUC). The USGS has developed the 8-digit HUC system as a hierarchial classification system of hydrologic drainage basins in the United States. NYS DEC, in conjunction with the USGS, and the Natural Resources Conservation Service (NRCS) of the United States Department of Agriculture, developed 11- digit HUCs for classification at the subwatershed level.

The HUC hierarchy corresponds to codes with 2, 4, 6, 8 and 11 digits. In decreasing area (increasing number of digits in the HUC) order each is made up by several of the contiguous watersheds of lower hierarchy. The first two digits of the HUC are the code for the Regional Boundary (e.g. 02, for the Mid-Atlantic Region). The next two digits of the HUC are the code for the Subregional boundary (e.g. 0202, Upper Hudson). The next two digits are the code for the Accounting Unit (e.g. 020200, the Upper Hudson basin). The next two digits of the HUC are the Cataloging Unit (e.g. 02020004, Mohawk). The last three digits of the HUC are the code for the NRCS Watershed Boundary (e.g. 02020004390, Stony Clove).

HUC 2020008060 Wappingers Creek to Castle Point is located in the center of Dutchess County. In the town of Clinton, Wappinger Creek meanders through a flat, wide floodplain for approximately 2 miles as it flows through the southeastern portion of the community. Wappinger Creek and its tributaries drain approximately one quarter of Dutchess County, forming the Wappinger Creek drainage basin with a watershed area of approximately 210 square miles.

East Branch Wappinger Creek enters Pleasant Valley from the Town of Washington, crossing the eastern town line north of the hamlet of Washington Hollow, flowing northward. East Branch Wappinger Creek then flows north through the Town of Clinton to its confluence with Wappinger Creek near Hibernia. The drainage area of East Branch Wappinger Creek is approximately 33 square miles, with a length of 11 miles and an average width of 3 miles. The floodplain of East Branch Wappinger Creek is undeveloped, but has encroaching residential developments.

Little Wappinger Creek originates in the Town of Milan. It flows south through Clinton and continues southeasterly into Pleasant Valley, crossing Salt Point Turnpike before joining the main channel of Wappinger Creek Reach 1. The creek has a drainage area of 32 square miles at its confluence with Wappinger Creek at

Salt Point. The stream has an average gradient of 16 feet per mile and meanders through relatively flat terrain with wide floodplains (Dutchess County Department of Planning, 1978; Hazen and Sawyer, 1980).

Great Spring Creek is a tributary to Wappinger Creek Reach 1 originating in Clinton and crossing into the Town of Pleasant Valley in the area northeast of Ward and Marshall Roads.

Branch 1 Great Spring Creek originates in the area west of Smith Road in Pleasant Valley and flows southward into a lake.

HUC 1100005480 Ten Mile River is situated in the western portion of Dutchess County. The Tenmile River flows through the Town of Dover and is a tributary of the Housatonic River in Connecticut. Its drainage basin ranges from 5 to 8 miles wide over a length of approximately 32 miles. It drains approximately 210 square miles, from Columbia County in the north to the Town of Pawling in the south.

Wells Brook originates in the southern portion of the Town of Washington and flows east to its confluence with the Tenmile River near Dover Plains. Wells Brook has a drainage area of approximately 6 square miles at its confluence.

In the Village of Millerton, Webatuck Creek, which is a tributary of the Tenmile River, flows south through the village. Its watershed drains approximately 81 square miles, with a length of 20 miles and an average width of 4 miles.

Kelsey Brook originates in Connecticut and flows west to its confluence with Webatuck Creek in Millerton. The watershed of Kelsey Brook is approximately 4 square miles at its confluence.

HUC 2020008070 Castle Point to Fishkill is located in the southwestern portion of the county. In the Town of East Fishkill, Fishkill Creek, a tributary of the Hudson River, flows southwest through the town. It has a drainage area of approximately 194 square miles and a total length of 28 miles.

Sprout Creek flows south to its confluence with Fishkill Creek near Lomala. It has a drainage area of 56 square miles at its confluence, with a length of 18 miles.

Whortlekill Creek also flows south to its confluence with Fishkill Creek. It has a drainage area of approximately 8 square miles.

In the Town of Union Vale, Clove Brook flows in a southern direction for a distance approximately 4.0 miles to its confluence with Pray Pond. Clove Brook has an average slope of 140 feet per mile and a drainage area of approximately 6.7 square miles.

Clove Mountain Creek flows in a western direction for a distance of approximately 1.8 miles to its confluence with Pray Pond. Clove Mountain Creek has an average slope of 190 feet per mile and a drainage area of approximately 2.1 square miles.

HUC 2030101080 Upper Croton River includes the East Branch Croton River, which flows south through the southern portion of the Town of Pawling. Its watershed drains approximately 1.5 square miles at the corporate limits with the Village of Pawling and increases to 16.5 square miles where it crosses the Dutchess Creek/Putnam County boundary. Tributary to East Branch Croton River originates in the Pawling Mountains in the western portion of the Town of Pawling. It flows southeast to its confluence in the Town of Patterson, Putnam County, NY. The watershed of the tributary drains approximately 35 squares miles at the Dutchess County/Putnam County boundary.

HUC 2020006200 Jansen Kill to Rhinecliff contains the Town of Red Hook, the Village of Red Hook, and the Village of Tivoli.

Landsman Kill flows southwest through the Town of Rhinebeck from its origin in the Town of Milan to its confluence with the Hudson River at Vanderburgh Cove. Its drainage area encompasses approximately 23 square miles with a length of 9 miles and average width of 2.5 miles.

Stony Creek, which flows south through the Village of Tivoli, and has a drainage area of approximately 22 square miles. The eastern half of Tivoli is in the Stony Creek drainage basin, while the western half drains directly into the Hudson River (Hazen and Sawyer, 1980).

HUC 2020008010 Rhinecliff to Wappingers Creek includes the Towns of Rhinebeck, Hyde Park and Poughkeepsie, the Village of Rhinebeck, and the City of Poughkeepsie.

In the Town of Hyde Park, Fall Kill is a tributary of the Hudson River which flows south through the town. Fall Kill has a drainage area of 13.2 square miles at Creek Street and a length of approximately 6.5 miles.

Rhinebeck Kill, a tributary of Landsman Kill, flows south from its origin in the Town of Red Hook to its confluence in the vicinity of Mill Road in the Town of Rhinebeck. Its watershed covers approximately 9 square miles, with a length of 6 miles and average width of 1.5 miles.

Crum Elbow Creek, which flows along the western border of the Town of Clinton, has a drainage area of approximately 19 square miles with a watershed which is approximately 1.5 miles wide and 12 miles long.

Maritje Kill is a tributary of the Hudson River which originates in central Hyde Park and flows southwest through the town to its confluence with the Hudson River.

2.3 Principal Flood Problems

In the Fishkill Creek basin, the flood of record occurred in April 2007. A storm that developed in Texas moved eastward, off the coast of Virginia, before turning northward. The storm reached the New York City area on April 15th and produced discharges on Fishkill Creek that surpassed the previous peak of October 2005. USGS New York estimated the peak discharge at gage 01372800, Fishkill Creek at Hopewell Junction, NY to be 3,910 cubic feet per second (cfs). The previous peak from the October 2005 event was 2,830 cfs. Other major events in the basin include September 1938, August 1955, and October 1955. In addition to coastal storms, rain events on melting snow, can also contribute to heavy runoff volumes.

In the Tenmile River basin, the three greatest floods occurred in September 1938, August 1955, and October 1955. The highest discharge recorded on the Tenmile River at USGS gage 01200000 (Gaylordsville, Connecticut) was 17,400 cfs. This peak discharge was a result of Hurricane Diane (FEMA, 1988). Other major floods include the ones that occurred in 1984 and April 2007, with discharges recorded at 10,400 cfs and 9,650 cfs, respectively.

In the City of Beacon, there have been a number of major storms resulting in high river stages along the Hudson River, including those of February 1875, October 1903, March 1913, November 1950, October 1955, and September 1960 (W. G. Hoyt, 1955; USACE, 1975).

In the Town of Beekman, seasonal residential homes have been subject to flooding from Sylvan Lake Outlet. The most highly flood-prone areas along Frog Hollow Brook extend from the Hamlet of Greenhaven to the confluence with Fishkill Creek. Along Whaley Lake Stream, the downstream areas between its confluence and the Hamlet of Poughquag are subject to inundation (Hazen and Sawyer, 1980).

In the Town of Clinton, the Wappinger Creek basin has been subject to significant flooding in the past. In much of New York State, major floods are usually caused by spring rain in combination with snowmelt. In Dutchess County, floods are usually the result of severe coastal storms and hurricanes. During the past 50 years, the three most severe floods occurred in September 1938, August 1955, and April 2007.

After a 3-day deluge which dropped nearly eight inches of rain in May 1984 Dutchess County was declared a disaster area by Governor Mario Cuomo (Poughkeepsie Journal, 1984). More recently, a Federal Disaster declaration was made in April 2007 after a severe flooding event.

In the Town of East Fishkill, areas adjacent to Sprout Creek, Whortlekill Creek, and Sylvan Lake Outlet are also subject to inundation. This includes residential areas near Sprout Creek in Lomala. Industrial and residential developments near the low-lying floodplain of Whortlekill Creek in the vicinity of Hopewell Junction can be inundated. Areas which are currently being developed along Sylvan Lake Outlet are also subject to flooding.

In the Village of Millerton, highly flood-prone areas exist along Webatuck Creek throughout its entire length. The steep overbanks of Webatuck Creek produce very rapid runoff and place a heavy burden on low-lying channel areas.

In the Town of Pawling, near the corporate limits with the Town of Dover, a number of industrial and commercial establishments have suffered flood damage from rising waters of the Swamp River.
In the Village of Pawling, both the East Branch Croton River and the Swamp River have wide and relatively poorly drained floodplains. These flat areas, which are subject to frequent inundation, contain primarily residential developments that have suffered flood damage in the past after heavy rainfalls.

In the Town of Pleasant Valley, peak flows have been recorded for Wappinger Creek since 1934, with the highest volume of flow occurring in August 1955. There have been complaints that local silt deposits in Wappinger Creek have created additional flooding hazards for adjoining properties. This condition is alleged to exist north of the U.S. Route 44 bridge crossing.

At Wappinger Creek, near Wappinger Falls gage (01372500), the record extends from 1929 to 2007. The 3 highest recorded flows at the gage were August 1955, September 1938 and April 2007. The 1955 flood had a return period of 80 years and a discharge of 18,600 cfs; the 1938 flood had a discharge of approximately 7,810 cfs; and the 2007 flood had a discharge of 7,640 cfs (U.S. Department of the Interior, 2008). These discharge-frequency estimates for Wappinger Creek and Little Wappinger Creek were based on records kept by the USGS at the gaging stations shown in Table 6, "Stream Gages."

TABLE 6 – STREAM GAGES

STREAM GAGE AND LOCATION	DRAINAGE AREA (sq. miles)	PERIOD OF RECORD
WAPPINGER CREEK		
Near Wappinger Falls, in Town of LaGrange, approximately 700 feet downstream of Red Oak Mill Dam and approximately 4.5 miles northeast of the Village of Wappingers Falls	181.0	1929-2008
Near Clinton Corners, in Town of Clinton, approximately 1,900 feet downstream of confluence of East Wappinger Creek and approximately 1 mile south of Clinton	92.4	1956-1990
LITTLE WAPPINGER CREEK		
In Town of Pleasant Valley, on the right bank at Salt Point, and approximately 0.6 mile upstream of confluence with Wappinger Creek	32.9	1956-1990

At the southeastern corner of the Town of Rhinebeck, Crum Elbow Creek flows through a low-lying area that has been flooded in the past. Residential development in this area along State Route 9G is most susceptible to flooding.

The principal flooding areas along Landsman Kill are located in low-lying areas adjacent to the Village of Rhinebeck. To the west of the village is a low swampy area that is frequently inundated and remains undeveloped. East of the village along State Route 308, development is subject to inundation from Landsman Kill.

Flooding from Rhinebeck Kill occurs along U.S. Route 9 in the northern portion of the Town of Rhinebeck near Weys Corners. Residential development along Old Post Road is also subject to inundation.

Stony Creek was identified by community representatives of the Village of Tivoli as having caused flood damage. Stony Creek creates a highly flood-prone area as it passes through the village.

Flooding can occur in the Town of Union Vale during all seasons, but generally the most notable floods have occurred between the months of February and April when snowmelt adds to heavy spring rains to produce increased runoff. Summer and fall floods also occur due to hurricane activity.

2.4 Flood Protection Measures

Sylvan Lake is located along the western corporate limits of the Town of Beekman. The dam at the lake does not afford any flood protection to the town.

In the Town of East Fishkill, Fishkill Creek, Sprout Creek, and Whortlekill Creek each have two dams located in East Fishkill.

There are two dams on Fishkill Creek within the Town of Fishkill and numerous dams located along the creek within the City of Beacon; however, these dams are not used as flood control structures.

Wappinger Creek is dammed at 3 locations between its confluence with the Hudson River and the upstream corporate limits of the Town of Poughkeepsie. Wappinger Falls Dam is the extreme downstream dam. Little Falls Dam is approximately 0.7 mile upstream of U.S. Route 9, and Red Oaks Mill Dam is just upstream of State Route 376.

The US Army Corps of Engineers, New York District, in 1961 and again in 1968 (USACE, 1961; USACE, 1968) studied the feasibility of constructing a large impounding structure across Wappinger Creek at a point north of the hamlet of Pleasant Valley which would have provided sufficient storage to achieve lower river stages in Wappinger Creek below the proposed dam site during times of severe floods. This scheme met with strong local opposition from officials and residents in Pleasant Valley since it would require inundation of a substantial part of Pleasant Valley. As a consequence, this proposal was shelved.

The Town of LaGrange, during this same 60s period,asked the USACE for local protection works along Wappinger Creek consisting of channel clearing, dredging, and straightening. Specifically, two local protection works within the town were considered by the USACE:

Overlook Road: The USACE considered that a local protection project consisting of levees would only substantially benefit the drive-in theatre at this location and felt that it would not be in the public interest to expend public funds for this purpose.
A protective dike in the general area was approved in 1974 by Dutchess County as a result of more frequently reported flooding at Milano Drive, allegedly caused by the building of the County bridge at DeGarmo Road.
Red Oaks Mill-Romca Road: The USACE considered a 1,500-foot wall and dike at this location but found that the costs of this project could not be justified by benefits accrued from the prevention of flood damages of a magnitude such as those that occurred in 1955.

In the Village of Wappingers Falls, the lake created by Wappinger Dam has no substantial impounding capacity, and is not effective in reducing large flood volume inflows. In 1976, the village passed a resolution which adopted the FIS requirements for floodplain management and designated as flood zones the special flood hazard areas delineated under the emergency program.

In the City of Poughkeepsie, the bank of the Hudson River has a non-continuous line of bulkheads that do not provide significant protection against flooding.

The Town of Wappinger initiated a drainage study designed to identify culvert locations which have inadequate drainage capacity. Streams included in this study include parts of Branches 1, 2, 2A, and 2B Wappinger Creek Reach 1. The report makes recommendations for either enlarging inadequate structures or alternately providing sufficient upstream detention pond storage to upgrade the conveyance capacity of the structure to the 4-percent annual chance (25-year) storm level (Rudolph Laper, 1975).

The National Oceanic and Atmospheric Administration (NOAA) maintains year-round surveillance of weather conditions at the Poughkeepsie Airport. Constant surveillance of stream flow gages at Red Oaks Mill and Clinton Corners has provided additional flood warning information. Flood warnings are transmitted by the National Warning System to civil defense facilities located in the sheriff's office and the emergency operating center. This information is then relayed from Civil Defense headquarters to responsible agencies as outlined in the County Natural Disaster Plan. Additional warning is provided by the Mid-Hudson Area Flood Group.

In the Town of Dover, along Tenmile River (right descending bank) there is a floodwall in the Powell Mobile Home Park area constructed by C.T. Male Associates that does not provide protection against flooding.

Non-structural measures of flood protection are being utilized to aid in the prevention of future flood damage. These measures are in the form of land-use regulations which control building within areas that have a high risk of flooding.

3.0 ENGINEERING METHODS

For the flooding sources studied in detail in the county, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this FIS. Flood events of a magnitude which are expected to be equaled or exceeded once on the average during any 10-, 50-, 100-, or 500-year period (recurrence interval) have been selected as having special significance for floodplain management and for flood insurance rates. These events, commonly termed the 10-, 50-, 100-, and 500-year floods, have a 10-, 2-, 1-, and 0.2-percent chance, respectively, of being equaled or exceeded during any year. Although the recurrence interval represents the long term average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than 1 year are considered. For example, the risk of having a flood which equals or exceeds the 100-year flood (1-percent chance of annual exceedence) in any 50-year period is approximately 40 percent (4 in 10), and, for any 90-year period, the risk increases to approximately 60 percent (6 in 10). The analyses reported herein reflect flooding potentials based on conditions existing in the county at the time of completion of this FIS. Maps and flood elevations will be amended periodically to reflect future changes.

3.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish peak discharge-frequency relationships for each riverine flooding source studied by detailed methods affecting the county.

For each community within Dutchess County that had a previously printed FIS report, the unrevised hydrologic analyses described in those reports have been compiled and are summarized below.

Precountywide Analyses

On ungaged streams having tributary drainage areas between 20 and 1,750 square miles, an analysis was made using the methodology outlined in "Regional Frequency Study, Upper Delaware and Hudson River Basins, New York District" published by the Hydrologic Engineering Center, USACE (USACE, 1974). Log-Pearson Type III frequency analyses were made on the basis of regional data developed for mean annual flows, standard deviations and skews, all of which have been mapped for the study region. According to FIA practice, adjustment for expected probability was not made.
The equations derived from this study are:

$$\log Q_m = C_m - 0.05 \log A$$

$$S = C_s - 0.05 \log A$$

$$\log [Q(p)] = \log Q_m + K(p,g)S$$

Where Q_m	=	geometric mean of annual flood peaks
C_m	=	a map coefficient for mean log of annual peaks
A	=	area in square miles
S	=	standard deviation of the logs of annual flood peaks
C_s	=	a map coefficient for standard deviation of logs of annual peaks (S)
$\log [Q(p)]$	=	log of the discharges for a given exceedence frequency (p)
K (p,g)	=	log of standard deviation for a given exceedence frequency (p) and skew coefficient (g)
g	=	skew coefficient for annual flood peaks

When the drainage area tributary to a point of interest is relatively small, between one and three square miles, a detailed investigation of stream flows from the drainage area was made according to the methodology given by SCS-TP-149, U.S. Soil Conservation Service (SCS) in their publication, "A Method for Estimation Volume and Rate Runoff in Small Watersheds" (Soil Conservation Service, 1973).

Input parameters included the following:

a. Soil type distribution within the drainage area obtained from county soil maps (Soil Conservation Service, 1955).

b. Existing land use patterns obtained from Dutchess County land use and generalized zoning maps.

c. County and local road and street maps.

d. Twenty-four hour rainfall obtained from U.S. Weather Bureau Technical Paper 40 (U.S. Weather Bureau, Rainfall Frequency Areas of the United States).

e. Average watershed land slope obtained from analysis of USGS topographic quadrangle sheets.

For ungaged streams with drainage areas falling in the range of 3 to 20 square miles, the flood discharges for varying return periods were obtained on a regional

basis for the drainage area covering Wappinger, Wappingers Falls, Poughkeepsie, LaGrange, and Pleasant Valley, New York. This became a regional analysis for the southwestern portion of Dutchess County. First, a regression analysis was made to determine the appropriate discharge-area relationship using input data from all small drainage areas studied within the five communities by the method outlined above. Next, the discharge-frequency relationships for large drainage areas (up to 1,000 square miles) were established on a regional basis by selecting a single representative value for the parameters of mean annual flow, standard deviation, and skew for Dutchess County. The values used were mean log coefficient, C_m = 1.45; standard deviation coefficient, C_s = 0.34; skew coefficient, g = 0.6. Finally, the interpolated discharge-frequency curves for the drainage areas between 3 and 20 square miles were smoothly fitted between the previously determined curves for large and small drainage areas.

Neither of these statistical computational methods are applicable to basins smaller than one square mile because of the lack of gage data available to incorporate into the regression analyses. The Rational Method of analysis was therefore used to compute peak discharges for upstream portions of streams with drainage basins smaller than one square mile.

HUC 2020006200 Jansen Kill to Rhinecliff

The calculated peak discharge as calculated by the regression equation for the USGS gaging station (No. 01372200) at Clinton Corners was used to adjust the peak discharge calculated by the regression equation at the ungaged site in accordance with the equation:

$$Qw = Qs[(Kg-1)(2As-Ag)/Ag + 1]$$

where Qw is the weighted discharge at the ungaged site, Qs is the discharge calculated by the regression equation for the ungaged site, As and Ag are the drainage areas at the site and the gage respectively, whereas Kg is the ratio of the weighted peak discharge to the peak discharge calculated by the regression equation at the gage.

For Stony Creek, the values of K were calculated to be 266, 458, 569, and 793, and the values of x were 0.61, 0.62, 0.63, and 0.69 for the 10-, 2-, 1-, and 0.2-percent annual chance flood discharges, respectively.

For Saw Kill, the values of K were determined to be 293, 464, 598, and 864, whereas values for x were found to be 0.58, 0.61, 0.61, and 0.66 for the 10-, 2-, 1-, and 0.2-percent annual chance flood discharges, respectively.

HUC 1100005480 TenMile River:
In the Town of Amenia, the hydrologic analyses for Wassaic Creek, Amenia Stream, and Tributary to Amenia Stream followed a procedure presented in Water Resources Investigations 79-93, Techniques for Estimating the Magnitude and Frequency of Floods on Rural Unregulated Streams in New York State Excluding

Long Island (U.S. Department of the Interior, 1979). This procedure relates drainage area and storage percent to a series of regression equations for the southeastern region. Discharges were computed for specific recurrence intervals by substituting the applicable values into the corresponding regression equations.

Discharges for Webatuck Creek Reach 1 were determined from the two separate log-Pearson Type III distributions for gaged streams published in the FISs for the Towns of Dover and Northeast (FEMA, August 1984; FEMA, September 1984). The discharges were transferred from the Amenia-Dover corporate limits to USGS stream gage No. 1199400, located on Webatuck Creek, applying the data from the Dover study to the transfer equation. Peak discharges at locations upstream of the gage were determined by using the transfer coefficients from the FIS for the Town of Northeast (FEMA, September 1984).

The above analyses conform with the techniques described in the USGS Bulletin 17B and Water Resources Investigations 79-83 (U.S. Department of the Interior, 1979; U.S. Department of the Interior, 1981).

The peak discharges were determined by the following transfer equation:

$$Q_2/Q_1 = (DA_2/DA_1)^x$$

where Q_1 is the peak discharge at a known location, DA_1 is the drainage area at a known location, Q_2 is the peak discharge at desired location, DA_2 is the drainage area at desired location, and x is the transfer coefficient.

The recurrence intervals and corresponding transfer coefficients used in the transfer equation are presented in the following tabulation:

Information Source	Recurrence Interval (years)	Transfer Coefficient
Flood Insurance Study for the Town of Dover	10	1.03
	50	1.25
	100	1.29
	500	1.48

Information Source	Recurrence Interval (years)	Transfer Coefficient
Flood Insurance Study for the Town of Northeast	10	0.67
	50	0.67
	100	0.67
	500	0.67

For Webatuck Creek Reach 2, the gage (No. 01199400, 14 years of record, at the time of the analysis) is located near South Amenia, New York, and has a drainage area of 81 square miles, and the transfer coefficient, "x" was calculated to be 0.67 for the 10-, 2-, 1-, and 0.2-percent annual chance floods.

HUC 2030101080 Upper Croton River:

For the East Branch Croton River, the values of K were determined to be 305, 534, 665, and 982, and the values for x were found to be 0.40, 0.39, 0.39, and 0.43 for the 10-, 2-, 1-, and 0.2-percent annual chance floods, respectively. For Tributary to East Branch Croton River, the values of K were determined to be 304, 529, 656, and 969, and the values of x were found to be 0.37, 0.35, 0.35, and 0.38. The values of K for the Swamp River were 290, 513, 624, and 911, and 0.41, 0.40, 0.41, and 0.44 for x. For Whaley Lake Stream, the values of K were 275, 462, 567, and 811, and the values of x were 0.44, 0.45, 0.46, and 0.50.

HUC 202000810 Rhinecliff to Wappingers Creek:

Discharges for Crum Elbow Creek were determined using a log-Pearson Type III analysis of data from a discontinued USGS gage (Water Resources Council, 1977). This gage (No. 01372040) is located at Hyde Park, New York. The transfer coefficients were determined to be 0.73, 0.74, 0.74, 0.77, and 0.76 for the 10-, 2-, 1-, and 0.2-percent annual chance recurrence interval floods.

Peak discharges at other locations were determined by the following transfer equation:

$$Q_2/Q_1 = (DA_2/DA_1)^x$$

where Q_1 and DA_1 are the discharge and drainage area at a gaged location; Q_2 and DA_2 are the discharge and drainage area at an ungaged location; and "x" is the transfer coefficient which was calculated to be 0.82, 0.89, 0.91, and 0.96 for the 10-, 2-, 1-, and 0.2-percent annual chance floods.

For Fall Kill, the values of K were determined to be 179, 283, 372, and 534, whereas for x they were found to be 0.060, 0.63, 0.61, and 0.65 for the 10-, 2-, 1-, and 0.2-percent annual chance flood discharges, respectively.

Casper Kill Creek, log-Pearson Type III analyses of two discontinued USGS gaging stations were used to determine peak discharges for the selected recurrence intervals. One of the USGS gages (No. 01372800) is located near Hopewell Junction, New York, and has a drainage area of 57.3 square miles; the other (No. 01373500) is located at Beacon, with a drainage area of 190 square miles.

For Landsman Kill, the values of K were determined to be 259, 415, 491, and 682, and the values for x were found to be 0.47, 0.49, 0.51, and 0.57 for the 10-, 2-, 1-, and 0.2-percent annual chance floods, respectively. For Rhinebeck Kill, the values of K were determined to be 319, 552, 687, and 1,013, and the values of x were found to be 0.36, 0.34, 0.35, and 0.37 for the 10-, 2-, 1-, and 0.2-percent annual chance floods, respectively.

HUC 2020008060 Wappingers Creek to Castle Point:

For the Town of LaGrange, on gaged streams that were studied for the 1979 FIS, the flood flow frequency at that particular gaging station was determined by a log-Pearson Type III analysis without correcting for expected probability. Adjustments for inadequate number of years of record, regional skew, historical records, high and low outliers, as applicable, were made according to procedures outlined in the Water Resources Council Bulletin No. 17 (Water Resources Council, 1976).

East Branch Wappinger Creek - data from a discontinued USGS gage (No. 01372100, drainage area 33.6 square miles) located at Clinton Corners, New York was used (Water Resources Council, 1977). For Little Wappinger Creek, information was used from discontinued USGS gage No. 01372300 located at Salt Point, New York. The transfer coefficient used for Little Wappinger Creek was 0.79 for floods of each of the recurrence intervals. For Wappinger Creek, data from USGS gage No. 01372200 at Clinton Corners, with a drainage area of 92.4 square miles was used. Peak discharges determined at this gaging station were used for the portion of Wappinger Creek within Clinton due to the close proximity of the gaging station. The values of K for Wells Brook were determined to be 294, 539, 650, and 935, and the values for x were found to be 0.40, 0.35, 0.37, and 0.41 for the 10-, 2-, 1-, and 0.2-percent annual chance floods, respectively. The values of K for Kelsey Brook were determined to be 317, 564, 692, and 1,009, and the values for x were found to be 0.31, 0.29, 0.29, and 0.32 for the 10-, 2-, 1-, and 0.2-percent annual chance floods, respectively. The analyses followed procedures outlined by the Water Resources Council and were published by the USGS (Water Resources Council, 1977; U.S. Department of the Interior, 1979).

Wappinger Creek Reach 1 – Discharge-frequency estimates developed for the Town of Pleasant Valley FIS were based on gage records recorded by the USGS at the following gaging stations:

Stream Gage	Location	Drainage Area (Square Miles)	Period of Record
Wappinger Creek Reach 1 near Wappingers Falls, NY	In Town of LaGrange, on left bank, 700 feet downstream of the Red Oak Mill dam and 4.5 miles northeast of The Village of Wappingers Falls, NY	181	1929-1979

Stream Gage	Location	Drainage Area (Square Miles)	Period of Record
Wappinger Creek Reach 1 near Clinton Corners, NY	In Town of Clinton, on left bank, 1,900 feet downstream of confluence of East Wappinger Creek and 1 mile south of Clinton, NY	92.4	1956-1979
Little Wappinger Creek Reach 1 at Salt Point, NY	In Town of Pleasant Valley on right bank at Salt Point, NY, and 0.6 mile from confluence with Wappinger Creek	32.9	1956-1979

While additional gage record is available at all these gages, the discharges compiled from the effective FIS and used for the hydraulic analyses reflect the period presented above.

Branch 1 Wappinger Creek Reach 1 - discharge-frequency estimates for this stream were made at its confluence with Wappinger Creek, based on the method developed for intermediate sized stream drainage areas in Dutchess County. Discharge-frequency estimates were also made at the confluence with a subbranch located adjacent to Old Hopewell Road according to the method described for small drainage areas.

Branch 2 Wappinger Creek Reach 1 - discharge-frequency estimates for were made at its confluence with Wappinger Creek and at a point upstream of the confluence of Branch 2B Wappinger Creek Reach 1 based on the method developed for intermediate sized stream drainage areas in Dutchess County. Discharge-frequency estimates were also made at a point upstream of the confluence of Branch 2A Wappinger Creek Reach 1 according to the method developed for small drainage areas.

Branch 2A Wappinger Creek Reach 1 - discharge-frequency estimates were made at its confluence with Branch 2 using the method developed for small drainage areas.

Branch 2B Wappinger Creek Reach 1 - discharge-frequency estimates for were made at its confluence with Branch 2 Wappinger Creek Reach 1 according to the analysis developed for intermediate-sized stream drainage areas in Dutchess County.

Branch 3 Wappinger Creek Reach 1 - flood frequency-discharge values were determined at its confluence with Wappinger Creek according to the method developed for small drainage areas.

Branch 4 Wappinger Creek Reach 1 - flood frequency-discharge values were determined for the August 2, 1990, FIS using a procedure developed by the Federal Highway Administration (U.S. Department of Transportation, 1977). This procedure relates basin characteristics such as drainage area, storage area, and precipitation to a series of regression equations for a given region. Discharges were computed for specific recurrence intervals by substituting the appropriate values into the corresponding regression equations.

Branch 5 Wappinger Creek Reach 1 – discharge-frequency estimates were made at the downstream limit of the detailed study adjacent to the CONRAIL tracks (drainage area = 1.62 sq. mi.) according to the method described for small drainage areas.

Branch 6 Wappinger Creek Reach 1 - flood frequency-discharge values for were made at its confluence with Wappinger Creek according to the method developed for small drainage areas.

Branch 7 Wappinger Creek Reach 1 – discharge-frequency estimates were made at the confluence with Wappinger Creek (drainage area = 3.20 sq. mi.) and also at the confluence with a subranch upstream of Overlook Road (drainage area = 2.08 sq. mi.). At the downstream location, the discharge-frequency estimate was made according to the method described above for intermediate-sized drainage areas. At the second location, the estimates were made according to the method described above for small drainage areas.

Branch 8 Reach 1 Wappinger Creek - flood frequency-discharge values for were determined at its confluence with Wappinger Creek according to the analysis developed for intermediate-sized drainage areas. Because of large swampy areas upstream of the study limit, the original discharge-frequency estimate used in the computer model was not consistent with data obtained from a flooding event that occurred in July 1975. The discharge-frequency estimates were revised by application of data from a regional publication which uses a surface storage index using lake and swamp areas as one of the parameters (U.S. Department of the Interior, 1974).

Branch 9 Wappinger Creek Reach 1 – the discharge-frequency estimates for this branch was made at the confluence with the main channel (Drainage Area = 11.1 sq. mi.) based on the regression analysis developed for intermediate sized ungaged drainage areas in Dutchess County.

Branch 10 Wappinger Creek Reach 1 – the discharge-frequency estimates for this branch were made at its confluence with the main channel (Drainage Area = 1.7 sq. mi.) according to the method described for small ungaged drainage areas.

Branch 11 Wappinger Creek Reach 1 – the discharge-frequency estimates for this branch were made at its confluence with the main channel (Drainage Area = 1.6 sq. mi.) according to the method described for small ungaged drainage areas.

Great Spring Creek – discharge-frequency estimates for this stream were made at the confluence with Wappinger Creek and at the mouth of Branch 1 Great Spring Creek. Great Spring had a USGS gage located on it from 1960 to 1965 at a point near its confluence with Wappinger Creek. The gage was discontinued in December 1965. The maximum discharge readings, however, were always affected by high water in Wappinger Creek and are not considered reliable. No statistical analysis of concurrent gage records between this gage and the nearby gage on Little Wappinger Creek at Salt Point is therefore possible. However, since the two basins are adjacent and have similar characteristics, a comparison was made with the Salt Point gaging station's frequency-discharge estimates using an area relationship to the 0.75 power. The discharge-frequency estimates for this creek were made on this basis for both locations. The maximum recorded discharge of 260 cfs in the 5-year gaging period would have a return period of less than 10 years according to the adopted discharge-frequency relationships.

Branch 1 Great Spring Creek – discharge-frequency estimates were made at the confluence of this stream with the main channel (Drainage Area = 1.8 sq. mi.) according to the method described for small ungaged drainage areas.

Wappinger Creek Reach 1 – the hydrologic analysis for Wappinger Creek Reach 1 was prepared using a drainage area transposition equation. This equation relates gaged site data and drainage areas to compute discharges at other locations.

Little Wappinger Creek Reach 1 – the discharge-frequency estimates were based on the gaging records for the creek at Salt Point (Drainage Area = 32.4 sq. mi.). A log-Pearson Type III analysis was performed using the regional skew obtained from the Regional Frequency Study, Upper Delaware and Hudson River Basins instead of the station skew in conformance with Bulletin No. 17. The flow at the gaging station was transferred to the confluence with Wappinger Creek using an area relationship to the 0.75 power.

East Branch Wappinger Creek Reach 1 – the discharge-frequency estimates were made at the town line with Clinton (Discharge Area = 34 sq. mi.) based on the "Regional Frequency Study" (USACE, 1974). A log-Pearson Type III analysis of the USGS gaging records could not be made due to the limited years of record. The USGS gage on this stream was in operation from 1956 to 1963. The maximum flood of record, 1,340 cfs recorded in 1961, would have a return period of somewhat less than 10 years according to the adopted discharge-frequency relationships.

Wappinger Creek Reach 2 - the peak discharge of the selected recurrence interval was determined using the procedures and regression equations outlined in USGS Water Resources Investigations 79-83 for ungaged sites on gaged streams (U.S. Department of the Interior, 1979; Water Resources Council, 1977). For the southern region of New York, the following equation was used:

$$Q = K(DA)^x(S)^y(P-20)^z$$

where Q is the stream discharge; DA is the drainage area; S is the main-channel slope; P is the mean annual precipitation; and K, x, y, and z are functions of the frequency. A value of 0.138 was used for K, 1.06 for x, 0.447 for y, and 1.57 for z, for the 1-percent annual chance discharge.

Sprout Creek No. 1 - discharge-frequency estimates for the ungaged Sprout Creek No. 1 were made at the downstream corporate limits and upstream of the confluence with Jackson Creek Reach 1 using the "Regional Frequency Study" (USACE, 1974). The following parameters were used: mean log coefficient, Cm equal to 1.35; a standard deviation coefficient, Cs equal to 0.33; and a skew coefficient, g equal to 0.65.

HUC 202000870 Castle Point to Fishkill:

The resulting values were connected by smooth curves, represented by the following equation:

$$Q = K(DA)^{x}$$

The values of K for Whortlekill Creek were determined to be 521, 734, 871, and 1,296, and the values of x were found to be 0.25, 0.27, 0.29, and 0.31 for the 10-, 2-, 1-, and 0.2-percent annual chance floods, respectively. For Sylvan Lake Outlet, the values of K were calculated to be 310, 540, 670, and 990, and the values of x were 0.36, 0.34, 0.34, and 0.36.

For Clove Brook, extrapolation resulted in the values of 132, 215, 246, and 359 for K and 0.84, 0.86, 0.87, and 0.88 for x.

For Tributary 1 to Fishkill Creek, the values of K were determined to be 309, 532, 668, and 974, and the values for x were found to be 0.36, 0.35, 0.35, and 0.38 for the 10-, 2-, 1-, and 0.2-percent annual chance floods, respectively.

Tributary 2 to Fishkill Creek, log-Pearson Type III analyses of two discontinued USGS gaging stations were used to determine peak discharges for the selected recurrence intervals. One of the USGS gages (No. 01372800) is located near Hopewell Junction, New York, and has a drainage area of 57.3 square miles; the other (No. 01373500) is located at Beacon, with a drainage area of 186 square miles.

For the Town of LaGrange, on gaged streams that were studied for the 1979 FIS, the flood flow frequency at that particular gaging station was determined by a log-Pearson Type III analysis without correcting for expected probability. Adjustments for inadequate number of years of record, regional skew, historical records, high and low outliers, as applicable, were made according to procedures outlined in the Water Resources Council Bulletin No. 17 (Water Resources Council, 1976). Sprout Creek # 1 – Discharge-frequency estimates for this ungaged stream were based on the "Regional Frequency Study" (USACE, 1974) for ungaged areas

described above. The following parameters were used: mean log coefficient, C_m = 1.35, a standard deviation coefficient, C_s = 0.33, and a skew coefficient, g = 0.65.

Jackson Creek Reach 1 – discharge-frequency estimates for this stream were determined according to the method described above for the intermediate-sized stream drainage areas.

Branch 1 Sprout Creek #1 – discharge-frequency estimates along this stream were made according to the methods described above for intermediate and small-sized drainage areas depending on the drainage area at the point in question.

Branch 2 Sprout Creek #1 – discharge-frequency estimates were made at the confluence with Sprout Creek (drainage area = 3.69 sq. mi.) according to the method described above for intermediate-sized drainage areas.

Whortle Kill Creek Reach 2 – discharge-frequency estimates for this creek were made at the town line with East Fishkill (drainage area = 2.38 sq. mi.) according to the method described above for small drainage areas.

Branch 1A Hudson River - discharge-frequency estimates were made at its confluence with the Hudson River according to the method described above for small drainage areas.

The streams within the Town of Union Vale are small, rural, ungaged basins: Clove Brook, Clove Mountain Creek, Fishkill Creek, Jackson Creek Reach 2, Selly Creek, Sprout Creek, Walsh Creek, and Willow Brook. For the streams studied by detailed methods, two regional analysis methods were used to compute peak discharges. a USGS analysis, Techniques for Estimating Magnitude and Frequency of Floods on Rural Unregulated Streams in New York State, utilized gage data throughout New York State to formulate regression equations for use on ungaged streams (U.S. Department of the Interior, 1979). A USACE analysis, Regional Frequency Study, Upper Delaware and Hudson River Basins, New York District, utilized gage data throughout the upper Delaware and Hudson River basins to formulate regression equations for use on ungaged streams (USACE, 1974). The two methods produced similar peak discharges, and the results were averaged together.

The Hudson River is tidal in nature in the study area; therefore, discharge-frequency relationships are not meaningful for determining flood stages. Instead, a stage-frequency relationship was established based on information available from the USACE (USACE, 1975). An analysis of stage-frequency relationships at Albany, Catskill, and Spuyten Duyvil indicated that the simplest method of straight-lining would not represent true conditions at intermediate locations. The rising and falling of mean tides have been found to correlate with the width of the river. Hence, the expectation of a similar effect on high river stages led to the establishment of maximum and minimum slopes of water-surface profiles between Spuyten Duyvil and Catskill (U.S. Department of Housing and Urban

Development, 1978). Stage-frequency relationships for the Hudson River at Beacon were then extracted from these water-surface profiles.

Countywide Analyses

Techniques provided in *Magnitude and Frequency of Floods in New York,* USGS SIR 2006-5112 (USGS 2006) formed the basis of the revised hydrologic analyses conducted for this countywide study. Details on techniques used for each of the 3 revised streams are presented below.

HUC 1100005480 Tenmile River:

The 10%, 2%, 1%, and 0.2% annual chance peak discharges were developed for the Tenmile River at twelve locations along the studied reach. Log-Pearson Type III statistical analysis was conducted for the lone gage location and the resulting discharges were weighted with the ones that were computed using New York State regression equations as presented in SIR 2006-5112 (USGS 2006).

At ungaged locations, discharges were computed based on the regression equations and if the gage had drainage area within the 50% to 150% of that of a gage, the regression discharges were weighted with log-Pearson Type III discharges. The log-Pearson Type III method consists of fitting the logarithms of annual peak flows to a log-Pearson Type III distribution. The equation provided below forms the basis for the log-Pearson Type III analysis.

Log Q = X + KS

Where, X is the mean of logarithms of annual peak flows, S is standard deviation of logarithms of annual peak flows and K is a factor that is a function of the skew coefficient.

Following are the equations used for computing the regression estimate:

$Q\ 10 = 3.4\ (A)^{0.810}\ (ST+0.5)^{-0.218}\ (RUNF)^{0.600}\ (EL12+1)^{0.133}\ (SR)^{0.268}$

$Q\ 50 = 39.0\ (A)^{0.819}\ (ST+0.5)^{-0.188}\ (RUNF)^{0.528}\ (EL12+1)^{0.157}\ (SR)^{0.305}$

$Q\ 100 = 46.0\ (A)^{0.823}\ (ST+0.5)^{-0.177}\ (RUNF)^{0.505}\ (EL12+1)^{0.166}\ (SR)^{0.318}$

$Q\ 500 = 62.7\ (A)^{0.834}\ (ST+0.5)^{-0.155}\ (RUNF)^{0.466}\ (EL12+1)^{0.183}\ (SR)^{0.345}$

Where,

A is drainage area, in square miles.

SR is slope ratio, which is defined as the ratio of main-channel slope to basin slope within the drainage basin.

EL12 is percentage of drainage basin at or greater than 1,200 feet above sea level.

ST is basin storage, which is the percentage of total drainage area shown as lakes, ponds, and swamps (wetlands).

RUNF is Mean annual runoff, in inches.

The equation used for computing the weighted-average discharges at the gage is:

$$Q_{T(w)} = \frac{Q_{T(g)}\,(N) + Q_{T(r)}\,(E)}{N+E}$$

Where,

QT(w) is weighted peak discharge at the gaged site, in cfs, for T-year recurrence interval

QT(g) is the peak discharge at the gage, in cfs, calculated by Log-Pearson Type III frequency analysis of the station's peak discharge record, for the T-year recurrence interval

N is the number of years of annual peak-discharge record used to calculate QT(g) at the gaging station

QT(r) is the regional regression estimate of the peak discharge at the gaged site, in cfs, for the T-year recurrence interval

E is the average equivalent years of record associated with the regression equation (Table 2 in SIR 2006-5112) that was used to calculate QT(r)

Following are the equations used for computing discharges at the locations influenced by the gage.

$$Q_{T(U)w} = \frac{2\Delta A}{A_g} Q_{T(U)r} + \left(1 - \frac{2\Delta A}{A_g}\right) Q_{T(U)g}$$

$$Q_{T(U)g} = \left(\frac{Au}{A_g}\right) b\, Q_{T(w)}$$

Where,

$Q_{T(U)w}$ is the weighted estimate of discharge QT for recurrence interval T at the ungaged site

ΔA is the absolute value of difference between the drainage areas of the streamflow-gaging station, (Ag) and the ungaged site, (Au)

$Q_{T(U)r}$ is the peak flow estimate for recurrence interval T at the ungaged site, derived from applicable regional equations

$Q_{T(U)g}$ is the peak flow estimate for recurrence interval T at the ungaged site, derived from the weighted estimate of peak discharge at the streamflow-gaging station QT(U)w

b is the exponent from the appropriate drainage area-only equation for Hydrologic Region, Region 2 in the case of Tenmile River.

HUC 2020008010 Maritje Kill:

The 10%, 2%, 1%, and 0.2% annual chance peak discharges were developed for the Maritje Kill River at 8 locations along the studied reach. Since there are no flows gages located on the stream, the discharges were computed based on flood frequency regression equations presented in SIR 2006-5112. The drainage-area only equations were used rather than the full parameter equation based on the observation that in this hydrologic region, for basins with smaller amounts of storage, the full parameter regression equations may underestimate discharges. The equations used for calculating the discharges follow:

$Q\ 10 = 197\ (A)^{0.695}$

$Q\ 50 = 378\ (A)^{0.666}$

$Q\ 100 = 480\ (A)^{0.656}$

$Q\ 500 = 782\ (A)^{0.638}$

Where,

A is drainage area, in square miles.

HUC 2020008070 Fishkill Creek:

The 10%, 2%, 1%, and 0.2% annual chance peak discharges were developed for Fishkill Creek at thirty locations along the studied reach. Log-Pearson Type III statistical analysis was conducted for the two gage locations and the resulting discharges were weighted with the ones that were computed using the regression equations. Before conducting the Log-Pearson Type III analysis, in order to optimize the available gage data and leverage the presence of 2 gages with substantial historical records, MOVE 2, a record extension technique was used to fill gaps in the historical gage data record.

At ungaged locations, discharges were computed based on the full parameter regression equations as presented in USGS SIR 2006-5112. For ungaged locations along Fishkill Creek where the drainage area is between 50% and 150% of the drainage area at the gaged location, the regression equation results were weighted with the Log-Pearson Type III calculated discharge transferred to the ungaged location.

The log-Pearson Type III method consists of fitting the logarithms of annual peak flows to a log-Pearson Type III distribution. The equation provided below forms the basis for the log-Pearson Type III analysis.

$\text{Log}\ Q = X + KS$

Where, X is the mean of logarithms of annual peak flows, S is standard deviation of logarithms of annual peak flows and K is a factor that is a function of the skew coefficient.

The full parameter equations used for computing the regression estimate (USGS 2006):

$Q\ 10 = 3.4\ (A)^{0.810}\ (ST+0.5)^{-0.218}\ (RUNF)^{0.600}\ (EL12+1)^{0.133}\ (SR)^{0.268}$

$Q\ 50 = 39.0\ (A)^{0.819}\ (ST+0.5)^{-0.188}\ (RUNF)^{0.528}\ (EL12+1)^{0.157}\ (SR)^{0.305}$

$Q\ 100 = 46.0\ (A)^{0.823}\ (ST+0.5)^{-0.177}\ (RUNF)^{0.505}\ (EL12+1)^{0.166}\ (SR)^{0.318}$

$Q\ 500 = 62.7\ (A)^{0.834}\ (ST+0.5)^{-0.155}\ (RUNF)^{0.466}\ (EL12+1)^{0.183}\ (SR)^{0.345}$

Where,

A is drainage area, in square miles.

SR is slope ratio, which is defined as the ratio of main-channel slope to basin slope within the drainage basin.

EL12 is percentage of drainage basin at or greater than 1,200 feet above sea level.

ST is basin storage, which is the percentage of total drainage area shown as lakes, ponds, and swamps (wetlands).

RUNF is Mean annual runoff, in inches.

The equation used for computing the weighted-average discharges at the gage is:

$$Q_{T(w)} = \frac{Q_{T(g)}\ (N) + Q_{T(r)}\ (E)}{N + E}$$

Where,

QT(w) is weighted peak discharge at the gaged site, in cfs, for T-year recurrence interval

QT(g) is the peak discharge at the gage, in cfs, calculated by Log-Pearson Type III frequency analysis of the station's peak discharge record, for the T-year recurrence interval

N is the number of years of annual peak-discharge record used to calculate QT(g) at the gaging station

QT(r) is the regional regression estimate of the peak discharge at the gaged site, in cfs, for the T-year recurrence interval

E is the average equivalent years of record associated with the regression equation (Table 2 in SIR 2006-5112) that was used to calculate QT(r)

Following are the equations used for computing discharges at the locations influenced by the gage.

$$Q_{T(U)w} = \frac{2\Delta A}{A_g} Q_{T(U)r} + (1 - \frac{2\Delta A}{A_g})Q_{T(U)g}$$

$$Q_{T(U)g} = \left(\frac{Au}{A_g}\right) bQ_{T(w)}$$

Where,

$Q_{T(U)w}$ is the weighted estimate of discharge QT for recurrence interval T at the ungaged site

ΔA is the absolute value of difference between the drainage areas of the streamflow-gaging station, (Ag) and the ungaged site, (Au)

$Q_{T(U)r}$ is the peak flow estimate for recurrence interval T at the ungaged site, derived from applicable regional equations

$Q_{T(U)g}$ is the peak flow estimate for recurrence interval T at the ungaged site, derived from the weighted estimate of peak discharge at the streamflow-gaging station QT(U)w

b is the exponent from the appropriate drainage area-only equation for Hydrologic Region.

A summary of the drainage area-peak discharge relationships for all the streams studied by detailed methods is shown in Table 7, "Summary of Discharges."

TABLE 7 – SUMMARY OF DISCHARGES

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs) 10-PERCENT	2-PERCENT	1-PERCENT	0.2-PERCENT
AMENIA STREAM					
Immediately upstream of confluence with Wassaic Creek	11.2	601	975	1,166	*
Immediately downstream of Lake Road	7.7	525	866	1,041	*
Immediately upstream of confluence of Tributary to Amenia Stream	3.3	206	333	396	*
BRANCH 1 GREAT SPRING CREEK					
Mouth of Great Spring Creek	1.8	360	520	660	960
BRANCH 1A HUDSON RIVER					
At confluence with Hudson River	1.7	393	565	700	975
BRANCH 1 SPROUT CREEK #1					
Mouth at Sprout Creek	4.07	650	940	1,180	1,800
BRANCH 2 SPROUT CREEK #1					
Mouth at Sprout Creek	3.69	610	900	1,120	1,720
BRANCH 1 WAPPINGER CREEK REACH 1					
At confluence with Wappinger Creek Reach 1	8.2	850	1,280	1,650	2,520
At Cross Section H	3.2	580	800	1,000	1,500
BRANCH 2 WAPPINGER CREEK REACH 1					
At confluence with Wappinger Creek Reach 1	11.8	990	1,520	1,930	3,000
At confluence of Branch 2B Wappinger Creek Reach 1	3.8	620	910	1,140	1,740
At confluence of Branch 2A Wappinger Creek Reach 1	1.5	440	610	780	1,200

*Data not available

TABLE 7 – SUMMARY OF DISCHARGES - continued

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs) 10-PERCENT	2-PERCENT	1-PERCENT	0.2-PERCENT
BRANCH 2A WAPPINGER CREEK REACH 1					
At confluence with Branch 2 Wappinger Creek Reach 1	1.1	300	420	550	900
BRANCH 2B WAPPINGER CREEK REACH 1					
At confluence with Branch 2 Wappinger Creek Reach 1	7.9	840	1,260	1,600	2,490
BRANCH 3 WAPPINGER CREEK REACH 1					
At confluence with Wappinger Creek Reach 1	1.23	600	800	900	1,350
BRANCH 4 WAPPINGER CREEK REACH 1					
At confluence with Wappinger Creek Reach 1	0.80	85	138	159	*
BRANCH 5 WAPPINGER CREEK REACH 1					
Cross section A	1.62	450	650	875	1,300
BRANCH 6 WAPPINGER CREEK REACH 1					
At confluence with Wappinger Creek Reach 1	0.83	460	600	710	970
BRANCH 7 WAPPINGER CREEK REACH 1					
Mouth at Wappinger Creek	3.20	580	840	1,060	1,600
Cross section L	2.08	510	800	1,000	1,550
BRANCH 8 WAPPINGER CREEK REACH 1					
At confluence with Wappinger Creek Reach 1	5.30	391	646	788	1,140

*Data not available

TABLE 7 – SUMMARY OF DISCHARGES - continued

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs) 10-PERCENT	2-PERCENT	1-PERCENT	0.2-PERCENT
BRANCH 9 WAPPINGER CREEK REACH 1					
Mouth of Wappinger Creek Reach 1	11.1	980	1,420	1,820	3,000
BRANCH 10 WAPPINGER CREEK REACH 1					
Mouth of Wappinger Creek Reach 1	1.7	300	430	545	810
BRANCH 11 WAPPINGER CREEK REACH 1					
Mouth of Wappinger Creek Reach 1	1.6	357	514	657	950
CASPER KILL CREEK					
At confluence with the Hudson River	12.22	1,000	1,530	1,950	3,070
Approximately 1,600 feet downstream of Hagen Drive	7.88	840	1,260	1,600	2,450
At downstream face of State Route 55	2.70	549	784	990	*
CLOVE BROOK					
At confluence with Pray Pond	6.7	430	800	1,010	1,690
Upstream of confluence of Sweezy Creek	4.9	340	630	790	1,320
Upstream of Tributary 1	3.8	280	530	660	1,110
Upstream of Tributary 2	3.2	240	450	570	960
CLOVE CREEK					
At its confluence with Fishkill Creek	20.0	1,630	2,830	3,330	5,010
At the upstream corporate limits	15.7	1,300	2,240	2,640	3,940
CLOVE MOUNTAIN CREEK					
At confluence with Jackson Creek Reach 2	2.1	240	340	430	690
Upstream of confluence of Walsh Creek	1.1	190	280	320	390

*Data not available

TABLE 7 – SUMMARY OF DISCHARGES - continued

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs) 10-PERCENT	2-PERCENT	1-PERCENT	0.2-PERCENT
CLOVE MOUNTAIN CREEK (continued)					
Approximately 100 feet downstream of lower West Clove Mountain Road culvert	0.98	180	260	300	390
Approximately 2,100 feet downstream of upper West Clove Mountain Road culvert	0.83	160	230	260	340
Upstream of confluence of Tributary	0.53	130	170	200	260
Approximately 1,000 feet upstream of upper West Clove Mountain Road culvert	0.40	110	140	160	210
Approximately 2,000 feet upstream of upper West Clove Mountain Road culvert	0.27	80	100	120	160
CRUM ELBOW CREEK					
At confluence with Hudson River	18.9	500	840	1,020	1,440
At South Cross Road	15.4	460	780	950	1,340
At Mills Cross Road	10.7	300	500	620	870
At Browns Pond Road	6.0	230	390	480	680
At Sipe Barracks Road	1.4	80	130	150	220
EAST BRANCH CROTON RIVER					
At the downstream Town of Pawling corporate limits	16.5	940	1,600	2,010	3,240
At the CONRAIL crossing	11.8	820	1,400	1,760	2,810
At the upstream corporate limits of Town of Pawling	1.5	350	620	770	1,150
At State Route 22	0.9	320	550	690	1,020

TABLE 7 – SUMMARY OF DISCHARGES - continued

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs) 10-PERCENT	2-PERCENT	1-PERCENT	0.2-PERCENT
EAST BRANCH WAPPINGER CREEK REACH 1					
Downstream Town of Pleasant Valley corporate limit	34	1,514	2,914	3,741	6,400
EIGHMY VILLE CREEK					
At White Schoolhouse Road	6.9	640	1,060	1,320	2,050
FALL KILL					
At Creek Road	13.2	790	1,330	1,660	2,660
Just upstream of Roosevelt Road	10.0	680	1,140	1,440	2,250
FALL KILL CREEK					
At downstream Town of Poughkeepsie corporate limits	17.40	1,150	1,820	2,300	*
FISHKILL CREEK					
Downstream of Pray Pond	6.9	544	937	1,140	1,730
Upstream of Tributary 1	7.0	548	943	1,150	1,740
Downstream of Tributary 1	8.6	709	1,210	1,480	2,230
Upstream of Tributary 3	11.1	740	1,260	1,540	2,310
At downstream corporate limits of Town of Union Vale	12.9	808	1,380	1,680	2,550
Downstream of Furnace Pond	12.9	818	1,400	1,710	2,590
Upstream of confluence of Whaley Lake Stream	17.8	1,190	2,030	2,460	3,710
Downstream of confluence of Whaley Lake Stream	35.6	1,976	3,375	4,109	6,218
Upstream of confluence of Frog Hollow Brook	38.5	2,013	3,430	4,172	6,291
Downstream of confluence of Frog Hollow Brook	43.4	2,181	3,713	4,520	6,805
At downstream corporate limits of Town of Beekman	47.9	2,212	3,768	4,586	6,905

*Data not available

TABLE 7 – SUMMARY OF DISCHARGES - continued

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs) 10-PERCENT	2-PERCENT	1-PERCENT	0.2-PERCENT
FISHKILL CREEK (continued)					
Upstream of confluence of Sylvan Lake Outlet	50.1	2,212	3,768	4,586	6,905
Downstream of confluence of Sylvan Lake Outlet	53.6	2,214	3,768	4,580	6,880
Downstream of Dam 1	55.2	2,223	3,786	4,601	6,912
USGS gage No. 01372800	57.2	2,258	3,849	4,679	7,029
Downstream of Fishkill CreekCreek_t12	74.4	2,812	4,708	5,698	8,509
Upstream of confluence of Whortle Kill Creek	75.4	2,812	4,708	5,698	8,509
Downstream of confluence of Whortle Kill Creek	81.9	3,098	5,140	6,213	9,245
Downstream of confluence of unnamed tributary	86.3	3,220	5,330	6,430	9,580
Downstream of confluence of Sprout Creek	144.4	5,109	8,645	10,493	15,880
At downstream corporate limits of Town of East Fishkill Creek	156.2	5,419	9,220	11,216	17,041
Downstream of confluence of Clove Creek	180.9	5,859	10,101	12,359	18,939
At a point approximately 1,090 feet upstream of unnamed tributary at Glenham	184.7	5,915	10,223	12,519	19,219
At upstream corporate limits of City of Beacon	187.1	5,956	10,310	12,633	19,416
USGS gage No. 01373500	188.2	5,976	10,353	12,688	19,512
At the confluence with Hudson River	192.8	6,116	10,545	12,907	19,786
LITTLE WAPPINGER CREEK REACH 1					
Mouth of Wappinger Creek	35	1,120	1,980	2,465	3,960
At corporate limits of Town of Pleasant Valley	32.3	1,510	1,860	2,320	3,720
At Hollow Road	27.4	910	1,620	2,020	3,230
At Nine Partners Road	22.6	840	1,490	1,860	2,980

TABLE 7 – SUMMARY OF DISCHARGES - continued

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs) 10-PERCENT	2-PERCENT	1-PERCENT	0.2-PERCENT
MARITJE KILL					
Upstream of Crum Elbow Drive	1.24	229	436	553	897
Upstream of Hidden Brook Drive	2.05	323	605	766	1,232
Downstream of State Route 9G (Violet Avenue)	2.17	336	628	796	1,278
Downstream of Unnamed Dam 1	2.52	282	371	421	860
Downstream of New Bold	2.86	316	431	497	978
Downstream of St. Andrews Road	3.40	369	523	612	1,157
Downstream of U. S. Route 9	3.78	403	583	687	1,273
Downstream of bridge at confluence with Hudson	4.08	431	631	748	1,367
SAW KILL					
At confluence with Hudson River	26.4	1,970	3,460	4,460	7,460
At Linden Avenue	21.1	1,730	3,020	3,890	6,440
At County Route 199	16.1	1,480	2,560	3,300	5,400
SEELEY CREEK					
At confluence with Clove Brook	0.69	210	280	330	420
SPROUT CREEK #1					
At its confluence with Fishkill Creek	55.3	1,550	2,790	3,480	5,720
At the upstream corporate limits	54.8	1,550	2,790	3,480	5,720
At the confluence of Jackson Creek Reach 1	35.8	1,070	1,980	2,500	4,200
Downstream Town of LaGrange corporate limits	35.56	1,072	1,982	2,498	4,198
Cross section J	28.72	912	1,698	2,148	3,639
At State Route 55	23.93	790	1,486	1,888	3,221

TABLE 7 – SUMMARY OF DISCHARGES - continued

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs) 10-PERCENT	2-PERCENT	1-PERCENT	0.2-PERCENT
SPROUT CREEK #2					
At downstream Town of Union Vale corporate limits	11.6	580	1,060	1,340	2,210
Upstream of confluence of Tributary 1	10.3	530	970	1,230	2,020
Upstream of confluence of Willow Brook	6.8	380	700	890	1,490
Upstream of confluence of Tributary 2	6.0	340	640	810	1,350
Downstream of Verbank Village Road culvert	5.6	330	600	770	1,290
STONY CREEK					
At the downstream Village of Tivoli corporate limits	22.0	1,750	3,060	3,970	6,580
At the upstream Village of Tivoli corporate limits	17.8	1,540	2,690	3,480	5,700
SWAMP RIVER REACH 1					
At a point approximately 0.2 mile upstream of its confluence with Tenmile River	48.0	*	*	5,077	*
SWAMP RIVER REACH 2					
At the downstream Town of Pawling corporate limits	13.5	850	1,440	1,810	2,870
At Swamp Road	7.5	670	1,140	1,420	2,220
At the upstream corporate limits of Town of Pawling	2.5	430	740	910	1,370
SYLVAN LAKE OUTLET					
At confluence with Fishkill Creek	3.4	480	820	1,020	1,540
At Sylvan Drive	1.0	310	540	670	990
SWEEZY CREEK					
At confluence with Clove Brook	1.1	250	340	390	500
Approximately 1,000 feet upstream of confluence with Clove Brook	0.91	220	300	340	440

*Data not available

TABLE 7 – SUMMARY OF DISCHARGES - continued

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs) 10-PERCENT	2-PERCENT	1-PERCENT	0.2-PERCENT
SWEEZY CREEK (continued)					
Approximately 100 feet downstream of County Route 9 culvert	0.73	180	250	290	370
TENMILE RIVER					
At the upstream Town of Dover corporate limit	133.25	4,532	7,038	8,328	11,978
Upstream of an Unknown Tributary	133.32	4,537	7,048	8,340	11,997
Upstream of an Unknown Tributary	143.02	4569	7106	8413	12109
Upstream from the confluence of Swamp River	143.49	4797	7503	8897	12835
Downstream from the confluence of Swamp River	190.01	6878	12443	15558	15040
At South Dover Bridge	194.82	6999	12652	15815	25443
Downstream of removed weir	195.43	7014	12679	15847	25493
At USGS Gage Number 1200000	203.62	7217	13030	16280	26170
At the county boundary	209.77	7368	13291	16601	26672
TRIBUTARY TO AMENIA STREAM					
Immediately upstream of confluence with Amenia Stream	2.5	179	292	349	*
TRIBUTARY TO EAST BRANCH CROTON RIVER					
At county boundary	3.5	480	820	1020	1550
At the conrail crossing	1.3	340	580	720	1070
TRIBUTARY 1 TO FISHKILL CREEK					
At confluence with Fishkill Creek	3.4	480	820	1020	1550
At a point approximately 2.75 miles upstream of confluence with Fishkill Creek	1.1	320	550	690	1010

*Data not available

TABLE 7 – SUMMARY OF DISCHARGES - continued

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs) 10-PERCENT	2-PERCENT	1-PERCENT	0.2-PERCENT
TRIBUTARY 2 TO FISHKILL CREEK					
At the Town of Beekman upstream corporate limits	15.9	750	1200	14400	2550
WAPPINGER CREEK REACH 1					
At confluence with the Hudson River	210	7,825	14,980	19,228	32,866
Approximately 1,600 feet downstream of U.S. Route 9	197	7,459	14,279	18,328	31,328
At USGS gaging station	181	7,000	13,400	17,200	29,400
Approximately 2,900 feet downstream of Titus Road	169	6,650	12,728	16,337	27,925
Downstream Town of Pleasant Valley corporate limit	167	6,770	13,450	17,530	31,100
At mouth of Branch 9 Wappinger Creek Reach 1	161	6,430	12,640	16,420	28,860
Mouth of Great Spring Creek	146	5,590	10,630	13,630	23,310
Hurley Road bridge	134	4,950	9,000	11,360	18,700
Mouth of Little Wappinger Creek	99	3,790	7,020	8,890	14,830
USGS gaging station near Clinton Corners, New York	92.4	3,970	7,100	8,790	13,400
WAPPINGER CREEK REACH 2					
At Salt Point Turnpike	50.2	*	*	3,490	*
Approximately 1,500 feet upstream from Salt Point Turnpike	40.3	*	*	2,780	*
Approximately 500 feet upstream from Depot Lane	35.1	*	*	2,220	*

*Data not available

TABLE 7 – SUMMARY OF DISCHARGES - continued

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs) 10-PERCENT	2-PERCENT	1-PERCENT	0.2-PERCENT
WALSH CREEK					
At confluence with Clove Mountain Creek	1.00	240	330	380	480
Approximately 2,280 feet upstream of confluence with Clove Mountain Creek	0.85	210	290	340	420
Approximately 1,700 feet downstream of Bloomer Road culvert	0.68	180	250	290	360
Upstream of confluence of Tributary	0.47	140	190	220	280
Approximately 400 feet upstream of Bloomer Road	0.42	130	170	200	260
WASSAIC CREEK					
At Wassaic State School boundary	37.3	2,018	3,340	4,040	*
WEBATUCK CREEK REACH 1					
At a point approximately 670 feet upstream of confluence with the Tenmile River	80.0	2,808	4,139	4,912	*
Immediately upstream of County Route 3	74.8	2,667	3,931	4,666	*
WEBATUCK CREEK REACH 2					
At a point approximately 2.0 miles downstream of County Route 2	57.6	2,238	3,298	3,915	*
WEBATUCK CREEK REACH 3					
At the downstream Town of Northeast corporate limits	31.9	1,460	2,340	2,840	4,050
At Indian Lake Road	25.0	1,240	1,990	2,410	3,440
Downstream of the confluence of Kelsey Brook	16.2	920	1,480	1,790	2,560
Upstream of the confluence of Kelsey Brook	12.4	770	1,240	1,500	2,140
At a point approximately 8 miles upstream of the downstream Town of Northeast corporate limits	8.1	580	930	1,120	1,610

*Data not available

TABLE 7 – SUMMARY OF DISCHARGES - continued

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs) 10-PERCENT	2-PERCENT	1-PERCENT	0.2-PERCENT
WELLS BROOK					
At confluence with the Tenmile River	6.1	610	1,010	1,270	1,960
At a point approximately 0.8 mile upstream of its confluence with the Tenmile River	2.6	430	750	930	1,380
WHALEY LAKE STREAM					
At confluence with Fishkill Creek	17.8	990	1,670	2,120	3,430
At the confluence of Gardner Hollow Stream at State Route 55	14.1	870	1,470	1,850	2,950
At State Route 55	8.1	680	1,140	1,420	2,210
At Whaley Lake	4.1	520	870	1,090	1,650
WHORTLEKILL CREEK REACH 1					
At confluence with Fishkill Creek	7.6	870	1,270	1,560	2,430
At Creamery Road	5.0	760	1,090	1,330	2,030
At Taconic State Parkway	2.4	650	930	1,120	1,700
WHORTLEKILL CREEK REACH 2					
Downstream Town of LaGrange corporate limits	2.38	298	420	471	583
Upstream of confluence with tributary	1.35	194	274	307	380
WILLOW BROOK					
At confluence with Sprout Creek	3.2	200	380	490	850
Approximately 500 feet downstream of Tompkins Road culvert	2.6	170	320	410	720
Upstream of confluence of Tributary	2.3	150	290	380	660
Approximately 1,200 feet downstream of Waterbury Hill Road	1.9	140	260	340	580
Upstream of Waterbury Hill Road	1.4	100	200	260	470

The stillwater elevations have been determined for the 10-, 2-, 1-, and 0.2-percent annual chance floods for the flooding sources studied by detailed methods and are summarized in Table 8, "Summary of Stillwater Elevations."

TABLE 8 - SUMMARY OF STILLWATER ELEVATIONS

FLOODING SOURCE AND LOCATION	ELEVATION (feet NAVD*) 10-PERCENT	2-PERCENT	1-PERCENT	0.2-PERCENT
HUDSON RIVER				
Entire shoreline within the Village of Tivoli	6.1	7.7	8.5	10.5
Entire shoreline affecting Rhinebeck	6.1	7.5	8.3	10.5
At Red Hook, New York	6.1	7.7	8.5	10.5
HUDSON RIVER (continued)				
Entire shoreline within City of Poughkeepsie	5.9	7.1	8.0	9.7
At Hyde Park, New York	5.8	7.2	7.9	9.7
At the Town of Wappinger	5.7	7.0	7.6	9.3
Entire shoreline within the City of Beacon	5.5	6.6	7.2	8.7
Entire shoreline affecting Town of Fishkill	5.5	6.6	7.2	8.7
INDIAN LAKE				
Entire shoreline affecting Northeast	628.3	628.3	628.3	628.37
LONG POND				
Entire shoreline within the county	344.5	344.7	344.8	345.17
SILVER LAKE				
Entire shoreline within the county	375.4	375.5	375.5	375.66
SYLVAN LAKE				
Entire shoreline within Beekman	323.8	324.2	324.4	324.8

*North American Vertical Datum of 1988

3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of flooding from the source studied were carried out to provide estimates of the elevations of floods of the selected recurrence intervals. Users should be aware that flood elevations shown on the FIRM represent rounded whole-foot elevations and may not exactly reflect the elevations shown on the Flood Profiles or in the Floodway Data tables in the FIS report. For construction and/or floodplain management purposes, users are encouraged to use the flood elevation data presented in this FIS in conjunction with the data shown on the FIRM.

Cross sections for the flooding sources studied by detailed methods were obtained from field surveys. All bridges, dams, and culverts were field surveyed to obtain elevation data and structural geometry.

Locations of selected cross sections used in the hydraulic analyses are shown on the Flood Profiles (Exhibit 1). For stream segments for which a floodway was computed (Section 4.2), selected cross section locations are also shown on the FIRM (Exhibit 2). Flood profiles were drawn showing computed water-surface elevations for floods of the selected recurrence intervals.

Each incorporated community within Dutchess County, has a previously printed FIS report. The hydraulic analyses described in those reports have been compiled and are summarized below.

Pre-Countywide Analyses

Cross sections for the backwater analyses of Amenia Stream, Tributary to Amenia Stream, Wassaic Creek, Webatuck Creek Reach 1 were obtained from aerial photographs at a scale of 1:7,200 (Quinn and Associates, Inc.).

Water-surface elevations of floods of the selected recurrence intervals for Amenia Stream, Branch 1 Great Spring Creek, Branch 1 Wappinger Creek Reach 1, Branch 3 Wappinger Creek Reach 1, Branch 4 Wappinger Creek Reach 1, Branch 5 Wappinger Creek Reach 1, Branch 6 Wappinger Creek Reach 1, Branch 7 Wappinger Creek Reach 1, Branch 8 Wappinger Creek Reach 1, Branch 9 Wappinger Creek Reach 1, Branch 10 Wappinger Creek Reach 1, Branch 11 Wappinger Creek Reach 1, Casper Kill Creek, Clove Brook, Clove Mountain Creek, Crum Elbow Creek, East Branch Croton River, East Branch Wappinger Creek Reach 1, Eighmy Ville Creek, Fall Kill Creek, Fall Kill, Frog Hollow Brook, Great Spring Creek, Jackson Creek Reach 1, Jackson Creek Reach 2, Kelsey Brook, Landsman Kill, Little Wappinger Creek Reach 1, Rhinebeck Kill, Seeley Creek, Sprout Creek No. 1, Sprout Creek No. 2, Stony Creek, Swamp River, Sweeney Creek, Sylvan Lake Outlet, Tributary 1 to Fishkill Creek, Tributary 2 to Fishkill Creek, Tributary to Amenia Stream, Tributary to East Branch Croton River, Walsh Creek, Wappinger Creek Reach 1, Wappinger Creek Reach 2, Wassaic Creek, Webatuck Creek Reach 1, Wells Brook, Whaley Lake Stream, Whortle Kill Creek Reach 1, and Willow Brook were computed using the USACE HEC-2 step-backwater computer program (USACE, 1984). Flood profiles were drawn showing computed water-surface elevations for floods of the selected recurrence intervals.

Starting water-surface elevations for Amenia Stream, Branch 1 Great Spring Creek, Branch 3 Wappinger Creek Reach 1, Branch 4 Wappinger Creek Reach 1, Branch 6 Wappinger Creek Reach 1, Branch 8 Wappinger Creek Reach 1, Branch 9 Wappinger Creek Reach 1, Branch 10 Wappinger Creek Reach 1, Branch 11 Wappinger Creek Reach 1, Casper Kill Creek, East Branch Croton River, East

Branch Wappinger Creek Reach 1, Fall Kill Creek, Fall Kill, Frog Hollow Brook, Great Spring Creek, Jackson Creek Reach 1, Kelsey Brook, Little Wappinger Creek Reach 1, Sprout Creek No. 1, Swamp River, Sylvan Lake Outlet, Tenmile River, Tributary to Amenia Stream, Wassaic Creek, Webatuck Creek Reach 1, Wells Brook, Whaley Lake Stream, and Whortle Kill Creek Reach 1 were calculated using the slope/area method.

Countywide Analyses

In Dutchess County, revised analyses were performed for the Tenmile River, Fishkill Creek and Maritje Kill.

For all revised detailed streams, field survey was obtained for both natural stream cross sections as well as hydraulic obstructions such as bridges, culverts, dams, and weirs. This information was combined with topographic data provided by Dutchess County in the form of bare earth mass points and break lines to create a bare earth surface for the stream corridor. This information was preprocessed using the HEC GeoRAS interface for ArcGIS 9.2. The interface prepared the geometry file for HEC-RAS and was eventually used to visualize results from the simulations.

Water-surface elevations of flood profiles of the selected recurrence intervals for all revised detailed streams were computed using the USACE HEC-RAS computer program, Version 3.1.3 (USACE, 2005).

Where data was available, for Fishkill Creek and the Tenmile River, flood stage for the April 2007 event was used to calibrate the revised hydraulic analyses. Flood profiles were drawn showing computed water-surface elevations for floods of the selected recurrence intervals.

Starting water-surface elevations for all 4 frequencies studied for Fishkill Creek and Maritje Kill were based on Mean Higher High Water (MHHW) elevation for the Hudson River. MHHW was determined from tidal gages on the Hudson River. For the Tenmile River, starting water-surface elevations were determined using slope-area method.

The hydraulic analyses for this FIS were based on unobstructed flow. The flood elevations shown on the profiles are thus considered valid only if channel conveyance areas and hydraulic structures remain unobstructed, operate properly, and do not fail.

Roughness factors (Manning's "n") used in the hydraulic computations were chosen by engineering judgment and were based on field observations of the streams and floodplain areas. Roughness factors for all streams studied by detailed methods are shown in Table 9, "Manning's "n" Values."

TABLE 9 - MANNING'S "n" VALUES

Stream	Channel "n"	Overbank "n"
Amenia Stream	0.029-0.050	0.030-0.100
Branch 1 Great Spring Creek	0.03-0.04	0.08-0.20
Branch 1 Sprout Creek #1	0.015-0.035	0.015-0.100
Branch 1 Wappinger Creek Reach 1	0.025-0.04	0.04-0.100
Branch 10 Wappinger Creek Reach 1	0.03-0.04	0.08-0.20
Branch 11 Wappinger Creek Reach 1	0.03-0.04	0.08-0.20
Branch 1A Hudson River	0.025-0.04	0.04-0.100
Branch 2 Sprout Creek #1	0.015-0.035	0.015-0.100
Branch 2 Wappinger Creek Reach 1	0.025-0.04	0.04-0.100
Branch 2A Wappinger Creek Reach 1	0.025-0.04	0.04-0.100
Branch 2B Wappinger Creek Reach 1	0.025-0.04	0.04-0.100
Branch 3 Wappinger Creek Reach 1	0.030-0.040	0.080-0.120
Branch 4 Wappinger Creek Reach 1	0.015-0.050	0.060-0.080
Branch 5 Wappinger Creek Reach 1	0.015-0.035	0.015-0.100
Branch 6 Wappinger Creek Reach 1	0.030-0.040	0.080-0.120
Branch 7 Wappinger Creek Reach 1	0.015-0.035	0.015-0.100
Branch 8 Wappinger Creek Reach 1	0.030-0.040	0.080-0.120
Branch 9 Wappinger Creek Reach 1	0.03-0.04	0.08-0.20
Casper Kill Creek	0.024-0.060	0.030-0.120
Clove Brook	0.025-0.050	0.070-0.500
Clove Creek	0.030-0.045	0.050-0.200
Clove Mountain Creek	0.015-0.040	0.060-0.120
Crum Elbow Creek	0.030-0.045	0.045-0.200
East Branch Croton River	0.025-0.030	0.030-0.060
East Branch Wappinger Creek Reach 1	0.03-0.04	0.055-0.20
Eighmy Ville Creek	0.035-0.040	0.055-0.075
Fall Kill	0.030-0.045	0.045-0.090
Fall Kill Creek	0.024-0.040	0.040-0.120
Fishkill Creek	0.025-0.12	0.035-0.12
Frog Hollow Brook	0.030-0.050	0.040-0.065
Great Spring Creek	0.03-0.04	0.08-0.20
Jackson Creek Reach 1	0.015-0.035	0.015-0.100
Jackson Creek Reach 2	0.020-0.045	0.050-0.500
Kelsey Brook	0.035-0.040	0.060-0.080
Landsman Kill	0.030-0.040	0.055-0.070
Little Wappinger Creek Reach 1	0.03-0.04	0.050-0.100
Maritje Kill	0.035-0.12	0.035-1.00
Rhinebeck Kill	0.030-0.045	0.055-0.080
Saw Kill	0.030-0.040	0.045-0.090

TABLE 9 - MANNING'S "n" VALUES - continued

Stream	Channel "n"	Overbank "n"
Seeley Creek	0.030-0.050	0.050-0.080
Sprout Creek #1	0.015-0.060	0.015-0.100
Sprout Creek #2	0.024-0.045	0.045-0.120
Stony Creek	0.030-0.040	0.055-0.090
Swamp River Reach 2	0.030-0.035	0.060-0.100
Sweezy Creek	0.025-0.050	0.060-0.120
Sylvan Lake Outlet	0.03	0.055-0.200
Tenmile River	0.03-0.11	0.02-0.2
Tributary 1 to Fishkill Creek	0.030-0.040	0.050-0.065
Tributary 2 to Fishkill Creek	0.030-0.035	0.050-0.065
Tributary to Amenia Stream	0.029-0.050	0.050-0.100
Tributary to East Branch Croton River	0.030-0.055	0.055-0.065
Walsh Creek	0.04	0.080-0.120
Wappinger Creek Reach 1	0.015-0.040	0.015-0.100
Wappinger Creek Reach 2	0.040-0.050	0.050-0.100
Wassaic Creek	0.04	0.060-0.090
Webatuck Creek Reach 1	0.015-0.060	0.015-0.090
Webatuck Creek Reach 2	0.015-0.060	0.015-0.090
Webatuck Creek Reach 3	0.030-0.040	0.050-0.200
Wells Brook	0.030-0.040	0.060-0.070
Whaley Lake Stream	0.030-0.040	0.050-0.100
Whortlekill Creek Reach 1	0.015-0.035	0.015-0.100
Whortlekill Creek Reach 2	0.030-0.040	0.050-0.200
Willow Brook	0.015-0.045	0.050-1.000

Qualifying bench marks within a given jurisdiction that are cataloged by the National Geodetic Survey (NGS) and entered into the National Spatial Reference System (NSRS) as First or Second Order Vertical and have a vertical stability classification of A, B, or C are shown and labeled on the FIRM with their 6-character NSRS Permanent Identifier.

Bench marks cataloged by the NGS and entered into the NSRS vary widely in vertical stability classification. NSRS vertical stability classifications are as follows:

- Stability A: Monuments of the most reliable nature, expected to hold position/elevation well (e.g., mounted in bedrock)
- Stability B: Monuments which generally hold their position/elevation well (e.g., concrete bridge abutment)

- Stability C: Monuments which may be affected by surface ground movements (e.g., concrete monument below frost line)

- Stability D: Mark of questionable or unknown vertical stability (e.g., concrete monument above frost line, or steel witness post)

In addition to NSRS bench marks, the FIRM may also show vertical control monuments established by a local jurisdiction; these monuments will be shown on the FIRM with the appropriate designations. Local monuments will only be placed on the FIRM if the community has requested that they be included, and if the monuments meet the aforementioned NSRS inclusion criteria.

To obtain current elevation, description, and/or location information for bench marks shown on the FIRM for this jurisdiction, please contact the Information Services Branch of the NGS at (301) 713-3242, or visit their Web site at www.ngs.noaa.gov.

It is important to note that temporary vertical monuments are often established during the preparation of a flood hazard analysis for the purpose of establishing local vertical control. Although these monuments are not shown on the FIRM, they may be found in the Technical Support Data Notebook associated with this FIS and FIRM. Interested individuals may contact FEMA to access this data.

3.3 Vertical Datum

All FISs and FIRMs are referenced to a specific vertical datum. The vertical datum provides a starting point against which flood, ground, and structure elevations can be referenced and compared. Until recently, the standard vertical datum in use for newly created or revised FISs and FIRMs was the National Geodetic Vertical Datum of 1929 (NGVD 29). With the finalization of the North American Vertical Datum of 1988 (NAVD 88), many FIS reports and FIRMs are being prepared using NAVD 88 as the referenced vertical datum.

All flood elevations shown in this FIS report and on the FIRM are referenced to NAVD 88. Structure and ground elevations in the community must, therefore, be referenced to NAVD 88. It is important to note that adjacent communities may be referenced to NGVD 29. This may result in differences in base flood elevations across the corporate limits between the communities.

Prior versions of the FIS report and FIRM were referenced to NGVD 29. When a datum conversion is effected for an FIS report and FIRM, the Flood Profiles, base flood elevations (BFEs) and ERMs reflect the new datum values. To compare structure and ground elevations to 1-percent annual chance flood elevations shown in the FIS and on the FIRM, the subject structure and ground elevations must be referenced to the new datum values.

As noted above, the elevations shown in the FIS report and on the FIRM for Dutchess County are referenced to NAVD 88. Ground, structure, and flood

elevations may be compared and/or referenced to NGVD 29 by applying a standard conversion factor. The conversion factor to NGVD 29 is +0.8. The conversion between the datums may be expressed as an equation:

NGVD 29 = NAVD 88 + 0.8 foot

The BFEs shown on the FIRM represent whole-foot rounded values. For example, a BFE of 102.4 will appear as 102 on the FIRM and 102.6 will appear as 103. Therefore, users that wish to convert the elevations in this FIS to NGVD 29 should apply the stated conversion factor(s) to elevations shown on the Flood Profiles and supporting data tables in the FIS report, which are shown at a minimum to the nearest 0.1 foot.

For more information on NAVD 88, see Converting the National Flood Insurance Program to the North American Vertical Datum of 1988, FEMA Publication FIA-20/June 1992, or contact the Spatial Reference System Division, National Geodetic Survey, NOAA, Silver Spring Metro Center, 1315 East-West Highway, Silver Spring, Maryland 20910 (Internet address http://www.ngs.noaa.gov).

4.0 FLOODPLAIN MANAGEMENT APPLICATIONS

The NFIP encourages State and local governments to adopt sound floodplain management programs. To assist in this endeavor, each FIS provides 1-percent annual chance floodplain data, which may include a combination of the following: 10-, 2-, 1-, and 0.2-percent annual chance flood elevations; delineations of the 1- and 0.2-percent annual chance floodplains; and 1-percent annual chance floodway. This information is presented on the FIRM and in many components of the FIS, including Flood Profiles, Floodway Data tables, and Summary of Stillwater Elevation tables. Users should reference the data presented in the FIS as well as additional information that may be available at the local community map repository before making flood elevation and/or floodplain boundary determinations.

4.1 Floodplain Boundaries

To provide a national standard without regional discrimination, the 1-percent annual chance flood has been adopted by FEMA as the base flood for floodplain management purposes. The 0.2-percent annual chance flood is employed to indicate additional areas of flood risk in the county. For the streams studied in detail, the 1- and 0.2-percent annual chance floodplain boundaries have been delineated using the flood elevations determined at each cross section. Between cross sections, the boundaries were interpolated using bare earth digital elevation data provided by Dutchess County. The topographic data was composed of bare earth mass points and 3-D breaklines. The point elevation data is comprised mostly of LiDAR with some spot heights generated from aerial photography flown within the same year in support of digital orthophotography acquisition. The 3-D breaklines were produced from 1"=1000' high precision color aerial photography collected in 2001 using photogrammetric methods. Water surface elevation triangular irregular networks (TINs) were created from the model cross sections and intersected with the bare earth ground TIN to produce the floodplain corridor. The resulting floodplains were smoothed and incorporated in the DFIRM.

Similarly, using datum-converted effective flood profiles for non-revised, detailed streams, all flood boundaries were made current with the topography supplied by the county to FEMA.

The 1- and 0.2-percent annual chance floodplain boundaries are shown on the FIRM (Exhibit 2). On this map, the 1-percent annual chance floodplain boundary corresponds to the boundary of the areas of special flood hazards (Zones A and AE and AO), and the 0.2-percent annual chance floodplain boundary corresponds to the boundary of areas of moderate flood hazards. In cases where the 1- and 0.2-percent annual chance floodplain boundaries are close together, only the 1-percent annual chance floodplain boundary has been shown. Small areas within the floodplain boundaries may lie above the flood elevations but cannot be shown due to limitations of the map scale and/or lack of detailed topographic data.

For the streams studied by approximate methods, only the 1-percent annual chance floodplain boundary is shown on the FIRM (Exhibit 2). These boundaries were also delineated using the topographic data provided by Dutchess County.

4.2 Floodways

Encroachment on floodplains, such as structures and fill, reduces flood-carrying capacity, increases flood heights and velocities, and increases flood hazards in areas beyond the encroachment itself. One aspect of floodplain management involves balancing the economic gain from floodplain development against the resulting increase in flood hazard. For purposes of the NFIP, a floodway is used as a tool to assist local communities in this aspect of floodplain management. Under this concept, the area of the 1-percent annual chance floodplain is divided into a floodway and a floodway fringe. The floodway is the channel of a stream, plus any adjacent floodplain areas, that must be kept free of encroachment so that the 1-percent annual chance flood can be carried without substantial increases in flood heights. Minimum federal standards limit such increases to 1.0 foot, provided that hazardous velocities are not produced. The floodways in this FIS are presented to local agencies as minimum standards that can be adopted directly or that can be used as a basis for additional floodway studies.

The floodways presented in this FIS were computed for certain stream segments on the basis of equal conveyance reduction from each side of the floodplain. Floodway widths were computed at cross sections. Between cross sections, the floodway boundaries were interpolated. The results of the floodway computations are tabulated for selected cross sections (Table 10). The computed floodways are shown on the FIRM (Exhibit 2). In cases where the floodway and 1-percent annual chance floodplain boundaries are either close together or collinear, only the floodway boundary is shown.

There is no floodway data table information available for Eighmy Ville Creek and the Hudson River.

Encroachment into areas subject to inundation by floodwaters having hazardous velocities aggravates the risk of flood damage, and heightens potential flood hazards by further increasing velocities. A listing of stream velocities at selected cross sections is provided in Table 10, "Floodway Data." In order to reduce the risk of property damage in areas where the stream velocities are high, the community may wish to restrict development in areas outside the floodway.

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Amenia Stream								
A	792[1]	100	384	3.0	455.5	455.5	456.1	0.6
B	11,121[1]	214	643	1.8	472.3	472.3	472.8	0.5
C	16,351[1]	180	455	2.6	494.8	494.8	495.0	0.2
D	23,430[1]	100	429	2.4	541.3	541.3	541.6	0.3
E	28,682[1]	630	815	0.5	548.4	548.4	548.7	0.3
Branch 1 Great Spring Creek								
A	600[2]	64	241	2.7	212.8	211.1[3]	212.0	0.9
B	1,050[2]	176	632	1.0	212.8	211.8[3]	212.8	1.0
C	1,142[2]	77	314	2.1	212.8	212.6[3]	213.4	0.8
D	2,020[2]	207	571	1.2	213.2	213.2	214.1	0.9
E	2,081[2]	531	2,830	0.2	217.2	217.2	218.0	0.8
F	2,960[2]	137	484	1.4	217.3	217.3	218.1	0.8
G	4,070[2]	29	96	6.9	230.0	230.0	230.5	0.5
H	4,207[2]	84	551	1.2	235.8	235.8	236.7	0.9
I	4,615[2]	257	1,066	0.6	236.0	236.0	236.9	0.9
J	4,765[2]	110	481	1.4	238.5	238.5	239.3	0.8
K	5,300[2]	88	177	3.7	249.3	249.3	249.3	0.0
L	5,875[2]	217	254	2.6	279.0	279.0	279.0	0.0

[1]Feet above confluence with Wassaic Creek
[2]Feet above Great Spring Creek
[3]Elevation computed without consideration of backwater effects from Great Spring Creek

FEDERAL EMERGENCY MANAGEMENT AGENCY

DUTCHESS COUNTY, NY (ALL JURISDICTIONS)

FLOODWAY DATA

AMENIA STREAM – BRANCH 1 GREAT SPRING CREEK

TABLE 10

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Branch 1 Sprout Creek #1								
A	100[1]	110	369	3.2	303.0	301.6[2]	302.5	0.9
B	2,140[1]	155	534	2.2	305.1	305.1	305.8	0.7
C	4,700[1]	203	995	1.2	308.8	308.8	309.7	0.9
D	6,200[1]	520	2,527	0.5	309.2	309.2	310.1	0.9
E	7,080[1]	362	1,552	0.8	309.3	309.3	310.2	0.9
F	7,218[1]	262	1,343	0.9	314.3	314.3	315.2	0.9
G	7,368[1]	158	1,035	1.1	314.4	314.4	315.3	0.9
H	7,420[1]	158	2,378	0.5	314.4	314.4	315.3	0.9

[1]Feet above confluence with Sprout Creek #1
[2]Elevation computed without consideration of backwater effects from Sprout Creek #1

FEDERAL EMERGENCY MANAGEMENT AGENCY

DUTCHESS COUNTY, NY (ALL JURISDICTIONS)

FLOODWAY DATA

BRANCH 1 SPROUT CREEK #1

TABLE 10

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Branch 1 Wappinger Creek Reach 1								
A	126	30	208	7.8	8.1	5.7[2]	6.3	0.6
B	500	42	220	7.4	8.1	7.2[2]	7.5	0.3
C	1,800	48	203	8.0	60.5	60.5	60.9	0.4
D	3,645	40	147	11.0	111.5	111.5	111.5	0.0
E	3,878	21	119	13.6	121.3	121.3	121.6	0.3
F	4,067	267	1,535	1.1	125.7	125.7	126.6	0.9
G	5,300	70	580	2.8	125.9	125.9	126.7	0.8
H	6,453	92	433	2.3	126.3	126.3	127.1	0.8
I	9,000	149	405	2.5	133.7	133.7	134.7	1.0
J	9,710	310	722	1.4	136.3	136.3	137.1	0.8
K	9,895	510	2,155	0.5	136.4	136.4	137.3	0.9
L	10,215	66	205	4.9	140.9	140.9	140.9	0.0
M	10,709	35	240	4.2	145.3	145.3	145.5	0.2
N	11,015	103	355	2.8	148.7	148.7	148.9	0.2
O	11,198	269	1,314	0.8	149.1	149.1	149.4	0.3
P	11,445	627	2,564	0.4	149.3	149.3	149.6	0.3
Q	11,920	554	2,603	0.4	149.3	149.3	149.6	0.3

[1]Feet above confluence with Wappinger Creek Reach 1
[2]Elevation computed without consideration of backwater effects from Wappinger Creek Reach 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

DUTCHESS COUNTY, NY (ALL JURISDICTIONS)

FLOODWAY DATA

BRANCH 1 WAPPINGER CREEK REACH 1

TABLE 10

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Branch 10 Wappinger Creek Reach 1								
A	50	19	67	8.1	214.0	203.4[2]	203.9	0.5
B	1,160	31	75	7.3	218.0	218.0	218.0	0.0
C	1,323	47	89	6.1	221.5	221.5	221.5	0.0
D	1,925	25	97	5.6	227.3	227.3	227.4	0.1
E	2,112	27	312	1.7	235.3	235.3	236.3	1.0
F	2,535	364	3,013	0.2	235.4	235.4	236.4	1.0
G	2,716	343	2,919	0.2	235.4	235.4	236.4	1.0
Branch 11 Wappinger Creek Reach 1								
A	187	100	799	0.8	238.1	238.1	239.1	1.0
B	640	88	192	3.4	238.5	238.5	239.0	0.5
C	875	19	63	10.4	239.4	239.4	239.4	0.0
D	1,430	26	102	6.5	241.6	241.6	242.3	0.7
E	1,650	21	73	9.0	243.0	243.0	243.0	0.0
F	2,525	19	75	8.8	248.6	248.6	249.2	0.6
G	2,700	27	128	5.1	249.6	249.6	250.1	0.5
H	3,280	23	87	7.5	253.4	253.4	253.9	0.5

[1]Feet above confluence with Wappinger Creek Reach 1
[2]Elevation computed without consideration of backwater effects from Wappinger Creek Reach 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

DUTCHESS COUNTY, NY (ALL JURISDICTIONS)

FLOODWAY DATA

BRANCH 10 WAPPINGER CREEK REACH 1 - BRANCH 11 WAPPINGER CREEK REACH 1

TABLE 10

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Branch 1A Hudson River								
A	125[1]	75	283	2.5	11.6	11.6	11.6	0.0
B	451[1]	106	312	2.2	11.6	11.6	11.8	0.2
C	612[1]	50	206	3.4	17.2	17.2	17.9	0.7
D	865[1]	70	130	5.4	20.2	20.2	21.0	0.8
E	2,010[1]	65	224	3.1	35.8	35.8	36.7	0.9
F	2,600[1]	74	154	4.5	41.5	41.5	41.5	0.0
G	3,677[1]	225	414	1.7	45.1	45.1	47.7	0.6
Branch 2 Sprout Creek #1								
A	200[2]	170	340	3.3	325.0	325.0	325.0	0.0
B	555[2]	127	634	1.8	327.8	327.8	328.8	1.0
C	690[2]	249	471	2.4	328.3	328.3	329.1	0.8
D	2,230[2]	36	165	6.8	337.5	337.5	337.5	0.0
E	3,168[2]	43	270	4.2	348.2	348.2	348.2	0.0
F	3,950[2]	153	292	3.8	353.7	353.7	353.7	0.0
G	4,600[2]	23	102	11.0	361.9	361.9	362.0	0.1
H	6,125[2]	126	364	3.1	369.2	369.2	369.8	0.6
I	6,302[2]	435	2,171	0.5	378.0	378.0	378.0	0.0
J	7,150[2]	253	947	1.2	378.1	378.1	378.0	0.0
K	7,400[2]	544	440	2.5	379.0	379.0	379.0	0.0
L	7,670[2]	321	404	2.8	383.8	383.8	383.8	0.0

[1]Feet above confluence with Hudson River
[2]Feet above Sprout Creek #1

FEDERAL EMERGENCY MANAGEMENT AGENCY

DUTCHESS COUNTY, NY (ALL JURISDICTIONS)

TABLE 10

FLOODWAY DATA

BRANCH 1A HUDSON RIVER – BRANCH 2 SPROUT CREEK #1

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Branch 2 Wappinger Creek Reach 1								
A	236	35	269	7.2	107.9	104.3[2]	104.5	0.2
B	1,800	84	335	5.8	111.7	108.2[2]	109.1	0.9
C	2,136	67	516	3.7	112.8	112.8	112.8	0.0
D	2,300	76	394	4.9	112.8	112.8	112.8	0.0
E	2,526	477	5,004	0.2	129.5	129.5	129.5	0.0
F	2,840	37	273	4.2	129.5	129.5	129.5	0.0
G	4,100	31	107	10.7	146.6	146.6	146.8	0.2
H	6,058	300	1,113	1.0	149.5	149.5	150.5	1.0
I	6,845	109	435	2.6	150.1	150.1	150.8	0.7
J	8,000	145	609	1.9	152.6	152.6	153.3	0.7
K	9,500	357	1,299	0.9	153.1	153.1	154.0	0.9
L	11,500	70	285	4.0	155.0	155.0	155.0	0.0
M	13,000	78	329	3.5	156.7	156.7	157.7	1.0
N	13,610	201	304	2.6	159.3	159.3	159.5	0.2
O	14,048	203	613	1.3	160.3	160.3	160.7	0.4
P	15,250	22	74	10.5	171.7	171.7	172.0	0.3
Q	15,635	150	1,053	0.7	181.0	181.0	181.2	0.2
R	15,787	120	952	0.8	183.1	183.1	183.1	0.0
S	16,942	20	72	10.8	192.8	192.8	193.1	0.3
T	17,875	43	141	5.5	212.1	212.1	212.1	0.0
U	18,880	19	71	11.0	218.1	218.1	218.2	0.1
V	19,090	245	301	2.6	223.6	223.6	223.6	0.0
W	19,470	340	1,262	0.6	224.2	224.2	224.2	0.0

[1]Feet above confluence with Wappinger Creek Reach 1
[2]Elevation computed without consideration of backwater effects from Wappinger Creek Reach 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

DUTCHESS COUNTY, NY (ALL JURISDICTIONS)

TABLE 10

FLOODWAY DATA

BRANCH 2 WAPPINGER CREEK REACH 1

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Branch 2A Wappinger Creek Reach 1								
A	583	75	188	2.9	161.3	161.3	161.9	0.6
B	1,520	64	127	4.3	164.5	164.5	164.5	0.0
C	1,675	211	295	1.9	165.2	165.2	165.2	0.0
D	2,030	55	155	3.5	165.8	165.8	165.8	0.0
E	2,341	107	521	1.1	170.2	170.2	170.5	0.3
F	3,340	65	128	4.3	176.5	176.5	176.5	0.0
Branch 2B Wappinger Creek Reach 1								
A	175	100	521	3.1	130.6	130.6	131.4	0.8
B	775	74	304	5.3	131.5	131.5	132.5	1.0
C	1,090	139	703	2.3	132.8	132.8	133.8	1.0
D	2,600	147	517	3.1	135.4	135.4	135.8	0.4
E	3,129	75	361	4.4	137.6	137.6	138.0	0.4
F	4,190	41	147	10.9	142.0	142.0	142.0	0.0
G	5,046	37	167	9.6	164.9	164.9	165.2	0.3
H	5,250	75	653	2.5	169.5	169.5	169.6	0.1
I	5,418	70	555	2.9	176.2	176.2	176.3	0.1
J	6,600	68	230	7.0	179.2	179.2	179.2	0.0
K	7,998	96	513	3.1	183.9	183.9	184.3	0.4

[1]Feet above confluence with Branch 2 Wappinger Creek

FEDERAL EMERGENCY MANAGEMENT AGENCY

DUTCHESS COUNTY, NY (ALL JURISDICTIONS)

FLOODWAY DATA

BRANCH 2A WAPPINGER CREEK REACH 1 - BRANCH 2B WAPPINGER CREEK

TABLE 10

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Branch 3 Wappinger Creek Reach 1								
A	300	18	76	11.8	123.0	123.0	123.4	0.4
B	597	67	293	3.1	142.6	142.6	143.4	0.8
C	1,499	100	228	3.9	157.0	157.0	157.0	0.0
D	1,501	208	409	2.2	158.0	158.0	158.1	0.1
E	1,730	75	252	3.6	159.2	159.2	159.5	0.3
F	2,030	157	593	1.5	161.8	161.8	162.5	0.7
G	3,700	78	247	3.6	165.7	165.7	166.7	1.0
Branch 4 Wappinger Creek Reach 1								
A	930	43	112	1.4	122.5	122.5	122.5	0.0
B	3,846	30	147	1.1	158.3	158.3	159.0	0.7
Branch 5 Wappinger Creek Reach 1								
A	10,708	40	116	7.5	215.2	215.2	215.6	0.4
B	11,097	45	166	5.6	218.8	218.8	219.3	0.5
C	11,667	31	91	9.6	224.2	224.2	224.3	0.1
D	12,375	93	183	4.8	240.7	240.7	241.3	0.6
E	12,736	26	178	4.9	264.3	264.3	264.3	0.0
F	13,300	41	109	8.0	290.0	290.0	290.0	0.0
G	13,900	109	183	4.8	301.8	301.8	301.8	0.0
H	14,610	70	256	3.4	304.8	304.8	304.9	0.1
I	15,220	40	115	7.6	318.6	318.6	318.9	0.3
J	15,400	236	6,381	0.1	327.3	327.3	327.8	0.5
K	16,560	69	159	5.5	332.0	332.0	332.2	0.2
L	17,490	24	83	10.5	343.9	343.9	344.7u	0.0

[1]Feet above confluence with Wappinger Creek Reach 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

DUTCHESS COUNTY, NY (ALL JURISDICTIONS)

FLOODWAY DATA

BRANCH 3 WAPPINGER CREEK REACH 1 – BRANCH 4 WAPPINGER CREEK REACH 1 – BRANCH 5 WAPPINGER CREEK REACH 1

TABLE 10

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Branch 6 Wappinger Creek Reach 1								
A	300	120	300	2.4	166.7	160.1[2]	160.7	0.6
B	905	120	293	2.4	166.9	161.2[2]	161.4	0.2
C	1,036	84	330	2.2	167.0	162.2[2]	162.4	0.2
D	1,450	180	220	3.2	167.0	163.8[2]	163.8	0.0
E	3,400	89	360	2.0	167.0	167.0	167.7	0.7
Branch 7 Wappinger Creek Reach 1								
A	100	94	198	5.3	168.0	164.7[2]	164.8	0.1
B	950	141	238	4.5	174.4	174.4	174.4	0.0
C	2,000	45	147	7.2	186.2	186.2	186.6	0.4
D	2,300	64	240	4.4	189.1	189.1	190.0	0.9
E	2,700	120	338	3.1	194.9	194.9	195.0	0.1
F	3,220	34	109	9.8	204.2	204.2	204.2	0.0
G	4,475	37	130	8.2	245.5	245.5	245.5	0.0
H	4,655	135	1,301	0.8	257.4	257.4	258.4	1.0
I	4,900	79	350	3.0	257.4	257.4	258.4	1.0
J	5,800	21	90	11.8	284.2	284.2	284.2	0.0
K	6,730	56	138	7.7	314.9	314.9	314.9	0.0
L	7,020	150	984	1.1	325.5	325.5	326.5	1.0
M	7,890	85	165	6.1	349.8	349.8	349.8	0.0
N	8,090	168	1,221	0.8	360.9	360.9	360.9	0.0
O	8,395	100	667	1.5	361.0	361.0	361.0	0.0

[1]Feet above confluence with Wappinger Creek Reach 1
[2]Elevation computed without consideration of backwater effects from Wappinger Creek Reach 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

DUTCHESS COUNTY, NY (ALL JURISDICTIONS)

FLOODWAY DATA

BRANCH 6 WAPPINGER CREEK REACH 1 - BRANCH 7 WAPPINGER CREEK REACH 1

TABLE 10

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Branch 8 Wappinger Creek Reach 1								
A	192	28	175	4.5	190.1	190.1	191.1	1.0
B	705	62	332	2.4	192.0	192.0	192.8	0.8
C	1,273	99	442	18.0	196.7	196.7	192.7	1.0
D	1,400	410	4,821	0.2	196.9	196.9	197.9	1.0
E	1,700	610	7,704	0.1	196.9	196.9	197.9	1.0
F	1,815	556	4,450	0.2	196.9	196.9	197.9	1.0
Branch 9 Wappinger Creek Reach 1								
A	100	37	222	8.2	207.2	199.4[2]	200.0	0.6
B	370	32	176	10.3	207.2	202.8[2]	203.1	0.3
C	1,240	37	209	8.7	207.2	206.3[2]	206.9	0.6
D	1,365	126	1,137	1.6	223.0	223.0	224.0	1.0
E	1,940	84	823	2.2	223.1	223.1	224.1	1.0
F	2,378	50	330	5.5	223.3	223.3	224.2	0.9
G	2,850	33	237	7.7	229.3	229.3	230.3	1.0
H	2,985	130	1,346	1.4	245.9	245.9	246.8	0.9
I	3,510	135	1,155	1.6	245.9	245.9	246.8	0.9
J	4,096	40	1,001	1.8	246.1	246.1	246.9	0.8
K	4,695	122	978	1.9	252.1	252.1	253.1	1.0

[1]Feet above confluence with Wappinger Creek Reach 1
[2]Elevation computed without consideration of backwater effects from Wappinger Creek Reach 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

DUTCHESS COUNTY, NY (ALL JURISDICTIONS)

FLOODWAY DATA

BRANCH 8 WAPPINGER CREEK REACH 1 - BRANCH 9 WAPPINGER CREEK REACH 1

TABLE 10

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Casper Kill Creek								
A	184	44	349	5.6	7.9	7.1[2]	8.0	0.9
B	655	38	167	11.7	11.6	11.6	11.8	0.2
C	748	130	1,185	1.6	19.2	19.2	19.4	0.2
D	970	21	168	11.6	20.0	20.0	20.6	0.6
E	1,416	43	390	5.0	21.1	21.1	22.0	0.9
F	1,800	26	228	8.5	22.3	22.3	23.1	0.8
G	2,780	909	22,931	0.1	36.2	36.2	37.1	0.9
H	4,350	1,070	25,184	0.1	36.2	36.2	37.1	0.9
I	5,280	138	1,441	1.4	36.2	36.2	37.1	0.9
J	6,120	411	4,740	0.4	36.4	36.4	37.3	0.9
K	6,250	911	9,300	0.2	36.4	36.4	37.3	0.9
L	7,900	344	2,438	0.8	36.5	36.5	37.4	0.9
M	9,230	37	185	10.5	37.7	37.7	38.3	0.6
N	10,354	329	1,749	1.1	41.4	41.4	41.4	0.0
O	11,960	112	773	2.5	54.1	54.1	54.9	0.8
P	13,520	45	173	11.3	70.9	70.9	70.9	0.0
Q	13,990	297	1,578	1.2	83.3	83.3	83.5	0.2
R	14,925	159	1,150	1.7	88.4	88.4	89.3	0.8
S	17,620	223	1,486	1.3	89.2	89.2	90.0	0.8
T	18,668	84	605	3.2	89.6	89.6	90.3	0.7
U	19,660	40	294	6.6	90.3	90.3	91.2	0.9
V	20,370	102	806	2.4	93.3	93.3	94.0	0.7
W	21,425	60	355	4.5	93.8	93.8	94.4	0.6
X	22,420	252	600	2.7	96.9	96.9	97.3	0.4
Y	23,171	172	851	1.9	101.4	101.4	101.6	0.2
Z	24,654	481	3,107	0.5	105.5	105.5	106.1	0.6

[1]Feet above confluence with the Hudson River
[2]Elevation computed without consideration of backwater effects from the Hudson River

TABLE 10

FEDERAL EMERGENCY MANAGEMENT AGENCY

DUTCHESS COUNTY, NY
(ALL JURISDICTIONS)

FLOODWAY DATA

CASPER KILL CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Casper Kill Creek (continued)								
AA	25,900	376	1,891	0.8	105.8	105.8	106.4	0.6
AB	26,450	81	239	6.7	106.2	106.2	106.7	0.5
AC	28,375	308	1,080	1.5	111.7	111.7	111.8	0.1
AD	30,000	101	375	4.3	112.9	112.9	113.5	0.6
AE	32,390	230	1,794	0.9	115.0	115.0	115.7	0.7
AF	33,044	445	3,735	0.4	121.9	121.9	121.9	0.0
AG	34,100	358	1,950	0.8	122.0	122.0	122.0	0.0
AH	35,850	231	924	1.7	122.5	122.5	122.6	0.1
AI	37,580	41	167	9.6	125.3	125.3	125.4	0.1
AJ	39,200	39	270	5.9	129.3	129.3	129.6	0.3
AK	39,550	184	960	1.2	130.7	130.7	131.2	0.5
AL	39,870	47	267	4.3	130.8	130.8	131.3	0.5
AM	40,320	23	156	7.4	133.1	133.1	133.6	0.5
AN	40,870	43	329	3.5	134.4	134.4	134.9	0.5
AO	41,830	62	327	3.5	135.1	135.1	135.6	0.5
AP	42,250	128	802	1.4	136.8	136.8	136.8	0.0
AQ	43,360	29	105	11.0	137.7	137.7	137.7	0.0
AR	45,780	520	2,681	0.4	152.2	152.2	153.0	0.8
AS	47,450	280	2,679	0.4	156.3	156.3	156.5	0.2

[1]Feet above confluence with the Hudson River

TABLE 10

FEDERAL EMERGENCY MANAGEMENT AGENCY

DUTCHESS COUNTY, NY
(ALL JURISDICTIONS)

FLOODWAY DATA

CASPER KILL CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Clove Brook								
A	500[1]	459	779	1.3	496.5	496.5	497.2	0.7
B	1,148[1]	300	761	1.3	498.1	498.1	498.9	0.8
C	2,600[1]	385	388	2.6	499.8	499.8	500.6	0.8
D	3,500[1]	152	370	2.1	504.6	504.6	505.3	0.7
E	4,400[1]	180	467	1.7	507.5	507.5	508.4	0.9
F	5,400[1]	226	381	2.1	511.0	511.0	511.8	0.8
G	6,400[1]	186	517	1.5	514.9	514.9	515.8	0.9
H	7,600[1]	129	312	2.1	520.2	520.2	521.2	1.0
I	8,800[1]	180	237	2.8	525.7	525.7	526.5	0.8
J	9,600[1]	160	208	2.7	532.4	532.4	533.4	1.0
K	10,300[1]	106	198	2.9	538.7	538.7	539.7	1.0
Clove Creek								
A	1,700[2]	90	520	5.8	211.2	208.7[3]	209.7	1.0
B	3,140[2]	90	743	4.0	214.5	214.5	215.2	0.7
C	5,730[2]	90	709	4.2	217.3	217.3	218.2	0.9
D	8,440[2]	90	617	4.8	225.1	225.1	225.9	0.8
E	11,700[2]	75	378	7.9	232.6	232.6	233.2	0.6
F	13,490[2]	100	699	4.3	238.1	238.1	238.9	0.8
G	15,240[2]	75	527	5.7	244.9	244.9	245.3	0.4
H	17,180[2]	325	1,197	2.5	247.5	247.5	248.1	0.6

[1]Feet above confluence with Pray Pond
[2]Feet above confluence with Fishkill Creek
[3]Elevation computed without consideration of backwater effects from Fishkill Creek

TABLE 10

FEDERAL EMERGENCY MANAGEMENT AGENCY

DUTCHESS COUNTY, NY (ALL JURISDICTIONS)

FLOODWAY DATA

CLOVE BROOK – CLOVE CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Clove Mountain Creek								
A	170[1]	23	59	7.3	502.2	502.2	502.2	0.0
B	1,230[1]	19	62	5.2	519.2	519.2	519.9	0.7
C	2,250[1]	13	37	8.1	554.7	554.7	554.7	0.0
D	5,400[1]	46	205	1.3	665.1	665.1	665.7	0.6
E	6,015[1]	52	157	1.3	667.8	667.8	668.6	0.8
F	7,000[1]	31	67	2.4	678.2	678.2	679.2	1.0
G	7,900[1]	21	46	3.5	689.6	689.6	690.5	0.9
H	8,800[1]	11	24	5.0	702.9	702.9	703.6	0.7
Crum Elbow Creek								
A	800[2]	35	104	9.8	10.4	10.4	10.4	0.0
B	3,235[2]	55	370	2.8	108.7	108.7	108.7	0.0
C	3,745[2]	115	770	1.3	112.6	112.6	112.6	0.0
D	5,310[2]	195	324	3.1	133.1	133.1	133.1	0.0
E	7,380[2]	45	115	8.9	154.3	154.3	154.3	0.0
F	9,140[2]	50	167	6.1	177.0	177.0	177.0	0.0
G	11,430[2]	44	177	5.8	201.9	201.9	202.4	0.5
H	12,650[2]	60	246	4.1	213.8	213.8	213.9	0.1
I	15,150[2]	131	231	4.4	221.5	221.5	221.8	0.3
J	17,890[2]	264	755	1.3	230.7	230.7	230.7	0.0
K	21,180[2]	55	288	3.5	235.1	235.1	235.1	0.0
L	24,420[2]	40	286	3.6	238.0	238.0	238.2	0.2
M	25,850[2]	55	336	3.0	238.3	238.3	238.9	0.6
N	27,790[2]	70	350	2.9	239.8	239.8	240.4	0.6

[1]Feet above confluence with Jackson Creek Reach 2
[2]Feet above confluence with Hudson River

TABLE 10

FEDERAL EMERGENCY MANAGEMENT AGENCY

DUTCHESS COUNTY, NY (ALL JURISDICTIONS)

FLOODWAY DATA

CLOVE MOUNTAIN CREEK – CRUM ELBOW CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Crum Elbow Creek (continued)								
O	30,780	50	146	7.0	244.4	244.4	244.6	0.2
P	31,650	57	349	2.9	246.3	246.3	247.0	0.7
Q	33,730	70	215	4.0	248.8	248.8	249.3	0.5
R	37,330	90	376	2.3	253.7	253.7	254.6	0.9
S	39,720	100	449	1.9	256.2	256.2	256.9	0.7
T	41,990	100	399	2.1	258.1	258.1	259.1	1.0
U	45,640	80	250	3.4	268.3	268.3	268.4	0.1
V	47,170	40	225	2.8	272.6	272.6	273.0	0.4
W	49,450	30	137	4.5	275.0	275.0	275.6	0.6
X	51,470	40	179	3.5	278.6	278.6	279.1	0.5
Y	53,720	40	153	4.1	280.2	280.2	280.8	0.6
Z	54,560	35	150	4.1	281.8	281.8	282.5	0.7
AA	56,510	45	180	3.5	288.4	288.4	288.7	0.3
AB	58,220	97	286	2.2	289.7	289.7	290.5	0.8
AC	60,080	64	195	3.2	292.3	292.3	293.0	0.7
AD	63,040	27	110	2.9	297.8	297.8	298.5	0.7
AE	64,960	40	137	2.3	300.1	300.1	300.8	0.7
AF	67,060	20	71	4.5	312.0	312.0	312.7	0.7
AG	69,840	19	42	7.7	321.7	321.7	322.5	0.8
AH	71,550	17	48	6.7	344.7	344.7	345.3	0.6
AI	73,740	21	57	5.6	386.5	386.5	387.1	0.6
AJ	75,640	25	50	6.4	411.5	411.5	411.6	0.1

[1]Feet above confluence with Hudson River

FEDERAL EMERGENCY MANAGEMENT AGENCY

DUTCHESS COUNTY, NY (ALL JURISDICTIONS)

FLOODWAY DATA

CRUM ELBOW CREEK

TABLE 10

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
East Branch Croton River								
A	400[1]	318	1,369	1.4	433.7	433.7	434.7	1.0
B	1,420[1]	255	1,278	1.5	434.9	434.9	435.4	0.5
C	3,730[1]	225	1,003	1.1	436.5	436.5	436.7	0.2
D	6,250[1]	230	1,156	1.0	436.7	436.7	437.0	0.3
E	9,220[1]	210	804	1.1	437.1	437.1	437.6	0.5
F	12,000[1]	120	550	1.7	440.4	440.4	440.6	0.2
G	13,640[1]	150	796	0.9	442.7	442.7	442.9	0.2
H	15,040[1]	160	813	0.9	442.8	442.8	443.0	0.2
I	17,060[1]	90	253	2.9	449.0	449.0	449.1	0.1
East Branch Wappinger Creek Reach 1								
A	310[2]	75	612	6.1	252.8	251.1[3]	252.1	1.0
B	620[2]	55	295	12.7	253.4	253.4	254.2	0.8
C	1,600[2]	70	900	4.2	262.7	262.7	263.7	1.0
D	3,390[2]	358	2,727	1.4	263.4	263.4	264.4	1.0
E	4,400[2]	186	1,075	3.5	263.7	263.7	264.7	1.0
F	5,994[2]	156	1,228	3.0	266.2	266.2	267.0	0.8
G	6,220[2]	76	739	5.1	282.0	282.0	283.0	1.0
H	7,300[2]	167	1,064	3.5	283.1	283.1	284.0	0.9

[1]Feet above limit of detailed study (limit of detailed study is approximately 580 feet downstream of railroad)
[2]Feet above confluence with Wappinger Creek Reach 1
[3]Elevation computed without consideration of backwater effects from Wappinger Creek Reach 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

DUTCHESS COUNTY, NY (ALL JURISDICTIONS)

FLOODWAY DATA

EAST BRANCH CROTON RIVER - EAST BRANCH WAPPINGER CREEK REACH 1

TABLE 10

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Fall Kill								
A	5,770[1]	80	361	4.6	216.9	216.9	217.1	0.2
B	8,830[1]	180	876	1.9	220.2	220.2	220.4	0.2
C	11,860[1]	120	702	2.4	222.9	222.9	223.4	0.5
D	13,970[1]	100	660	2.5	223.8	223.8	224.5	0.7
E	15,670[1]	140	1,020	1.6	224.6	224.6	225.4	0.8
F	19,570[1]	100	653	2.2	227.5	227.5	227.8	0.3
G	21,110[1]	130	598	2.4	228.3	228.3	228.8	0.5
H	23,350[1]	120	319	4.5	232.2	232.2	232.5	0.3
Fall Kill Creek								
A	14,250[2]	90	1,012	2.3	181.2	181.2	182.2	1.0
B	14,945[2]	237	2,346	1.0	181.4	181.4	182.4	1.0
C	16,200[2]	613	6,205	0.4	181.5	181.5	182.5	1.0
D	16,974[2]	390	3,712	0.6	181.7	181.7	182.6	0.9
E	17,800[2]	138	1,466	1.6	182.7	182.7	183.4	0.7
F	19,230[2]	116	1,024	2.2	182.8	182.8	183.6	0.8

[1]Feet above limit of detailed study (Limit of Detailed Study is approximately 4,477 feet downstream of East Dorsey Lane)
[2]Feet above confluence with Hudson River

TABLE 10

FEDERAL EMERGENCY MANAGEMENT AGENCY

DUTCHESS COUNTY, NY (ALL JURISDICTIONS)

FLOODWAY DATA

FALL KILL – FALL KILL CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Fishkill Creek								
A	90	308	5,004	6.7	7.2	4.1[2]	4.1	0.0
B	1,991	137	809	14.5	7.2	5.4[2]	5.4	0.0
C	2,239	118	1,431	9.0	8.3	8.3	8.6	0.3
D	2,693	141	1,902	6.8	16.5	16.5	16.5	0.0
E	3,330	194	2,319	5.6	34.3	34.3	34.3	0.0
F	4,967	117	1,017	12.7	41.5	41.5	41.9	0.4
G	5,298	97	1,177	11.0	50.6	50.6	50.9	0.3
H	6,286	150	1,029	12.6	54.3	54.3	54.3	0.0
I	6,745	177	2,153	6.0	85.0	85.0	85.7	0.7
J	7,897	111	1,422	9.1	86.4	86.4	87.1	0.7
K	9,011	150	2,114	6.1	95.1	95.1	95.1	0.0
L	11,741	135	1,397	9.2	129.0	129.0	129.2	0.2
M	12,272	92	829	15.6	132.2	132.2	132.4	0.2
N	12,895	87	954	13.5	137.1	137.1	137.6	0.5
O	13,641	185	2,616	4.9	143.2	143.2	143.6	0.4
P	15,345	178	1,896	6.7	146.1	146.1	146.1	0.0
Q	16,827	91	2,509	5.1	180.6	180.6	181.3	0.7
R	18,193	117	1,753	7.2	182.7	182.7	183.3	0.6
S	19,548	325	2,549	5.0	203.9	203.9	203.9	0.0
T	20,366	185	2,108	6.0	205.6	205.6	205.6	0.0
U	21,438	155	1,800	7.0	206.9	206.9	207.2	0.3
V	24,410	1,089	11,553	1.1	209.4	209.4	209.9	0.5
W	31,280	327	3,568	3.5	210.2	210.2	210.7	0.5
X	34,591	994	9,500	1.3	211.0	211.0	211.7	0.7
Y	37,852	363	3,269	3.8	214.5	214.5	214.6	0.1
Z	40,867	570	4,396	2.8	216.3	216.3	216.5	0.2
AA	44,562	354	3,260	3.4	218.9	218.9	219.4	0.5
AB	46,887	266	2,319	4.8	220.1	220.1	221.1	1.0

[1]Feet above confluence with Hudson River
[2]Elevation computed without consideration of backwater effects from Hudson River

TABLE 10

FEDERAL EMERGENCY MANAGEMENT AGENCY

DUTCHESS COUNTY, NY (ALL JURISDICTIONS)

FLOODWAY DATA

FISHKILL CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Fishkill Creek (continued)								
AC	48,578	329	3,598	3.1	222.1	222.1	222.9	0.8
AD	52,858	1,047	10,449	1.1	223.6	223.6	224.4	0.8
AE	60,038	1,800	12,464	0.5	224.0	224.0	225.0	1.0
AF	61,914	758	4,401	1.5	225.0	225.0	225.6	0.6
AG	65,432	1,108	6,948	0.9	225.5	225.5	226.2	0.7
AH	71,375	1,314	4,856	1.3	229.5	229.5	230.1	0.6
AI	73,334	397	2,735	2.4	233.7	233.7	233.7	0.0
AJ	78,830	129	866	6.6	236.3	236.3	236.5	0.2
AK	79,650	169	1,170	4.0	239.1	239.1	239.8	0.7
AL	81,649	460	2,602	1.8	242.2	242.2	242.5	0.3
AM	83,196	401	2,347	2.0	244.0	244.0	244.1	0.1
AN	85,284	187	1,145	4.1	247.2	247.2	247.5	0.3
AO	88,987	380	2,169	2.2	251.4	251.4	251.9	0.5
AP	90,818	282	1,631	2.9	253.5	253.5	253.9	0.4
AQ	91,906	138	1,067	4.4	254.9	254.9	255.2	0.3
AR	94,711	347	2,453	1.9	258.4	258.4	258.5	0.1
AS	96,194	59	341	13.5	269.4	269.4	269.4	0.0
AT	96,386	158	1,068	4.3	285.8	285.8	285.9	0.1
AU	99,404	810	3,996	1.2	287.2	287.2	287.5	0.3
AV	102,199	369	2,116	2.2	292.4	292.4	292.4	0.0
AW	103,380	619	2,507	1.8	292.9	292.9	293.2	0.4
AX	107,496	614	2,816	1.6	298.3	298.3	298.4	0.1
AY	110,224	385	1,815	2.5	302.4	302.4	302.4	0.0
AZ	113,199	358	2,131	2.2	306.0	306.0	306.3	0.3
BA	113,853	282	1,800	2.6	307.4	307.4	308.2	0.8
BB	116,445	776	5,495	0.8	309.6	309.6	310.1	0.5
BC	118,977	336	735	6.2	311.1	311.1	311.2	0.1
BD	119,792	558	3,118	1.5	313.7	313.7	314.5	0.8

[1]Feet above confluence with Hudson River

FEDERAL EMERGENCY MANAGEMENT AGENCY

DUTCHESS COUNTY, NY (ALL JURISDICTIONS)

FLOODWAY DATA

FISHKILL CREEK

TABLE 10

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Fishkill Creek (continued)								
BE	123,962	1,481	5,824	1.2	316.4	316.4	317.2	0.8
BF	125,972	1,342	26,059	3.5	320.9	320.9	320.9	0.0
BG	127,552	1,608	21,670	3.2	325.8	325.8	325.8	0.0
BH	129,346	178	794	5.3	331.5	331.5	331.5	0.0
BI	131,227	230	1,154	3.6	336.3	336.3	337.1	0.8
BJ	134,564	400	1,827	2.3	347.5	347.5	347.8	0.3
BK	136,939	346	1,211	2.0	351.9	351.9	352.0	0.1
BL	140,196	417	848	3.8	361.3	361.3	361.3	0.0
BM	141,008	225	866	2.8	364.8	364.8	364.9	0.1
BN	144,168	301	1,104	2.2	374.8	374.8	374.8	0.0
BO	144,945	321	718	3.4	377.3	377.3	377.4	0.1
BP	146,099	457	919	2.1	380.9	380.9	380.9	0.0
BQ	147,377	180	586	3.3	386.4	386.4	386.5	0.1
BR	148,895	42	251	7.8	395.7	395.7	395.7	0.0
BS	149,724	90	392	4.4	404.5	404.5	404.7	0.2
BT	149,876	106	1,501	1.1	424.7	424.7	424.7	0.0
BU	152,670	61	175	9.6	445.7	445.7	445.7	0.0
BV	153,301	124	460	3.7	450.0	450.0	450.2	0.2
BW	153,925	198	763	2.2	454.0	454.0	454.0	0.0
BX	154,598	80	250	6.7	455.6	455.6	455.7	0.1
BY	155,352	203	1,274	1.3	467.0	467.0	467.0	0.0
BZ	160,302	542	1,751	0.8	468.2	468.2	468.4	0.2
CA	163,849	548	1,291	1.2	471.5	471.5	471.9	0.4
CB	165,540	335	871	1.8	472.9	472.9	473.6	0.7
CC	167,435	304	857	1.8	476.1	476.1	476.6	0.5
CD	168,614	266	950	1.6	478.4	478.4	478.5	0.1
CE	171,843	131	539	2.9	485.6	485.6	485.7	0.1
CF	173,181	345	1,255	1.2	487.3	487.3	487.6	0.3

[1]Feet above confluence with Hudson River

FEDERAL EMERGENCY MANAGEMENT AGENCY

DUTCHESS COUNTY, NY (ALL JURISDICTIONS)

FLOODWAY DATA

FISHKILL CREEK

TABLE 10

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Fishkill Creek (continued)								
CG	175,637[1]	289	894	1.3	491.3	491.3	491.8	0.5
CH	177,389[1]	384	971	1.2	496.1	496.1	496.2	0.1
Frog Hollow Brook								
A	830[2]	35	138	7.0	314.3	314.3	315.3	1.0
B	2,250[2]	35	145	6.6	321.3	321.3	321.8	0.5
C	6,310[2]	28	101	9.5	370.7	370.7	371.3	0.6
D	7,960[2]	42	121	7.9	394.9	394.9	395.8	0.9
E	12,070[2]	55	188	5.1	428.2	428.2	429.2	1.0

[1]Feet above confluence with Hudson River
[2]Feet above confluence with Fishkill Creek

FEDERAL EMERGENCY MANAGEMENT AGENCY

DUTCHESS COUNTY, NY (ALL JURISDICTIONS)

FLOODWAY DATA

FISHKILL CREEK - FROG HOLLOW BROOK

TABLE 10

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Great Spring Creek								
A	500	74	212	6.6	210.8	202.4[2]	202.5	0.1
B	650	292	2,134	0.7	210.8	209.1[2]	209.2	0.1
C	2,058	48	204	6.9	210.8	209.2[2]	209.2	0.0
D	2,650	154	714	2.0	211.7	211.7	212.0	0.3
E	3,240	217	1,168	1.2	212.0	212.0	212.5	0.5
F	4,285	68	406	3.5	212.3	212.3	212.8	0.5
G	4,360	183	865	1.6	212.5	212.5	213.1	0.6
H	4,740	299	1,354	1.0	212.7	212.7	213.4	0.7
I	5,480	431	1,843	0.5	212.8	212.8	213.6	0.8
J	6,740	44	129	7.1	214.0	214.0	214.5	0.5
K	7,350	87	480	1.9	217.4	217.4	218.2	0.8
L	7,454	108	569	1.6	217.5	217.5	218.3	0.8
M	7,790	419	1,898	0.5	217.8	217.8	218.6	0.8
N	7,895	325	1,509	0.6	217.8	217.8	218.6	0.8
O	8,800	76	237	3.9	219.7	219.7	219.7	0.0
P	11,095	120	210	4.4	230.8	230.8	231.1	0.3
Q	11,265	50	242	3.8	231.8	231.8	232.4	0.6
R	13,040	200	1,468	0.6	244.3	244.3	244.8	0.5
S	13,160	103	609	1.5	244.3	244.3	244.8	0.5

[1]Feet above confluence with Wappinger Creek Reach 1
[2]Elevation computed without consideration of backwater effects from Wappinger Creek

FEDERAL EMERGENCY MANAGEMENT AGENCY

DUTCHESS COUNTY, NY (ALL JURISDICTIONS)

FLOODWAY DATA

GREAT SPRING CREEK

TABLE 10

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Jackson Creek Reach 1								
A	4,530	420	1,126	1.7	295.3	295.3	296.2	0.9
B	6,470	396	1,473	1.3	298.2	298.2	298.2	0.0
C	8,875	269	794	2.5	306.1	306.1	307.1	1.0
D	9,867	301	1,874	1.0	314.0	314.0	315.0	1.0
E	11,155	241	1,135	1.7	314.8	314.8	315.7	0.9
F	11,920	179	713	2.8	318.3	318.3	318.5	0.2
G	12,780	280	1,053	1.9	320.5	320.5	320.7	0.2
H	13,720	340	676	2.9	324.5	324.5	324.5	0.0
I	15,670	575	1,424	1.4	331.2	331.2	331.2	0.0
J	19,060	514	3,221	0.6	344.2	344.2	344.3	0.1
K	21,300	128	458	3.8	355.3	355.3	356.0	0.7
L	22,370	66	298	5.8	364.0	364.0	364.9	0.9
M	24,090	36	187	9.0	380.8	380.8	381.3	0.5
N	25,475	262	514	3.3	405.6	405.6	405.8	0.2
O	25,785	36	193	8.7	413.4	413.4	413.5	0.1
P	26,360	63	447	3.8	429.9	429.9	430.8	0.9

[1]Feet above mouth

FEDERAL EMERGENCY MANAGEMENT AGENCY

DUTCHESS COUNTY, NY (ALL JURISDICTIONS)

TABLE 10

FLOODWAY DATA

JACKSON CREEK REACH 1

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Jackson Creek Reach 2								
A	200	24	92	9.9	423.1	423.1	423.6	0.5
B	1,250	70	196	4.6	435.7	435.7	436.1	0.4
C	2,230	40	159	5.7	443.7	443.7	444.1	0.4
D	3,180	140	350	2.6	455.2	455.2	456.2	1.0
E	3,900	245	329	2.8	461.0	461.0	461.8	0.8
F	4,600	90	255	3.3	466.4	466.4	467.3	0.9
G	5,350	37	142	5.4	471.9	471.9	472.4	0.5
H	6,400	31	96	8.0	481.0	481.0	481.0	0.0
I	7,600	36	83	9.2	496.1	496.1	496.1	0.0
J	8,824	135	131	3.4	510.3	510.3	510.5	0.2
K	9,800	25	63	7.0	522.1	522.1	522.9	0.8
L	11,100	64	87	5.1	538.2	538.2	539.2	1.0
M	11,900	24	75	5.9	546.5	546.5	546.5	0.0
N	12,950	37	92	4.0	558.2	558.2	559.2	1.0
O	14,200	21	52	7.2	573.2	573.2	573.6	0.4
P	15,150	19	41	7.5	588.2	588.2	588.5	0.3
Q	16,075	28	45	6.9	604.0	604.0	604.0	0.0
R	16,950	29	39	6.6	617.6	617.6	617.7	0.1
S	17,530	23	43	6.0	632.8	632.8	632.8	0.0
T	17,740	17	36	7.3	637.1	637.1	637.3	0.2

[1]Feet above Limit of Detailed Study (Limit of Detailed Study is approximately 3,264 feet downstream of State Route 55)

FEDERAL EMERGENCY MANAGEMENT AGENCY

DUTCHESS COUNTY, NY (ALL JURISDICTIONS)

TABLE 10

FLOODWAY DATA

JACKSON CREEK REACH 2

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Kelsey Brook								
A	150[1]	140	731	1.3	681.5	681.5	682.3	0.8
B	900[1]	34	177	5.4	695.0	695.0	695.6	0.6
C	1,220[1]	80	350	2.7	704.7	704.7	704.7	0.0
D	1,990[1]	96	345	2.8	705.7	705.7	706.0	0.3
E	2,780[1]	84	379	2.5	706.9	706.9	707.8	0.9
F	5,420[1]	18	129	7.4	724.3	724.3	725.2	0.9
Landsman Kill								
A	1,910[2]	160	686	2.2	127.1	127.1	128.1	1.0
B	2,890[2]	110	598	2.6	129.0	129.0	129.4	0.4
C	3,900[2]	90	268	5.7	131.2	131.2	131.5	0.3
D	4,290[2]	20	115	13.3	141.1	141.1	141.7	0.6
E	5,040[2]	25	125	12.2	165.1	165.1	165.4	0.3
F	6,050[2]	100	643	2.4	184.3	184.3	184.3	0.0
G	8,960[2]	70	279	5.5	189.4	189.4	189.6	0.2
H	10,660[2]	130	578	2.6	193.0	193.0	193.4	0.4
I	11,840[2]	120	656	2.3	198.8	198.8	198.8	0.0
J	14,040[2]	50	285	5.4	202.4	202.4	203.2	0.8
K	15,890[2]	26	130	11.8	218.6	218.6	219.6	1.0
L	17,060[2]	50	233	6.6	238.8	238.8	239.8	1.0
M	19,530[2]	50	349	4.4	256.9	256.9	256.9	0.0
N	22,330[2]	100	250	6.1	292.4	292.4	292.5	0.1
O	24,550[2]	100	657	2.3	301.0	301.0	301.4	0.4
P	26,170[2]	70	351	4.4	303.3	303.3	303.6	0.3

[1]Feet above confluence with Webatuck Creek Reach 3
[2]Feet above confluence of Rhinebeck Kill

FEDERAL EMERGENCY MANAGEMENT AGENCY

DUTCHESS COUNTY, NY (ALL JURISDICTIONS)

TABLE 10

FLOODWAY DATA

KELSEY BROOK – LANDSMAN KILL

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Little Wappinger Creek Reach 1								
A	175	101	800	3.1	230.5	230.5	230.8	0.3
B	1,680	93	434	5.7	231.3	231.3	231.8	0.5
C	2,690	87	418	5.9	233.8	233.8	234.0	0.2
D	4,040	73	260	9.5	238.1	238.1	238.1	0.0
E	4,335	65	1,519	1.6	242.9	242.9	243.0	0.1
F	5,200	126	861	2.9	250.7	250.7	250.8	0.1
G	6,600	133	820	3.0	251.2	251.2	251.4	0.2
H	7,830	74	348	6.7	251.6	251.6	252.0	0.4
I	9,910	145	861	2.7	256.3	256.3	257.0	0.7
J	12,670	70	515	4.5	260.0	260.0	260.5	0.5
K	15,850	110	528	4.9	265.1	265.1	265.9	0.8
L	18,670	100	514	4.5	273.6	273.6	274.2	0.6
M	19,790	90	454	5.1	276.9	276.9	277.7	0.8
N	23,910	90	279	6.1	289.7	289.7	290.2	0.5
O	26,450	120	510	4.0	304.0	304.0	304.0	0.0
P	28,360	90	409	4.9	308.2	308.2	308.3	0.1
Q	32,210	90	476	4.2	320.7	320.7	321.1	0.4
R	35,130	100	458	4.4	327.8	327.8	328.1	0.3
S	37,390	100	615	3.3	330.7	330.7	331.4	0.7
T	39,850	130	373	5.4	336.7	336.7	336.7	0.0

[1]Feet above confluence with Wappinger Creek Reach 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

DUTCHESS COUNTY, NY (ALL JURISDICTIONS)

TABLE 10

FLOODWAY DATA

LITTLE WAPPINGER CREEK REACH 1

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Maritje Kill								
A	670	78	798	0.9	10.0	10.0	10.0	0.0
B	1,582	47	121	6.2	53.7	53.7	53.7	0.0
C	2,273	32	144	4.8	72.4	72.4	72.4	0.0
D	3,156	110	219	3.1	93.0	93.0	93.1	0.1
E	4,344	36	110	6.2	112.9	112.9	113.2	0.3
F	5,649	45	139	4.4	150.5	150.5	150.5	0.0
G	6,433	63	104	6.0	177.0	177.0	177.0	0.0
H	6,872	61	228	2.7	187.9	187.9	188.0	0.1
I	7,705	37	157	3.9	189.7	189.7	189.8	0.1
J	9,309	107	442	1.1	193.3	193.3	193.7	0.4
K	10,952	53	161	3.1	199.2	199.2	199.4	0.2
L	12,865	155	596	0.7	220.5	220.5	220.5	0.0
M	14,951	157	184	2.3	221.2	221.2	221.2	0.0
N	16,450	205	1,539	0.5	231.4	231.4	231.4	0.0
O	16,876	144	1,324	0.6	231.4	231.4	231.4	0.0
P	19,906	296	2,524	0.3	231.4	231.4	231.5	0.1
Q	21,812	64	103	5.4	236.2	236.2	236.4	0.2
R	23,613	80	304	1.8	250.0	250.0	250.7	0.7

[1]Feet above confluence with Hudson River

FEDERAL EMERGENCY MANAGEMENT AGENCY

DUTCHESS COUNTY, NY (ALL JURISDICTIONS)

FLOODWAY DATA

MARITJE KILL

TABLE 10

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Rhinebeck Kill								
A	1,430	163	1,095	1.3	126.1	126.1	127.1	1.0
B	2,500	191	637	2.2	126.7	126.7	127.5	0.8
C	4,510	76	365	3.9	128.5	128.5	129.2	0.7
D	7,570	94	818	1.7	136.6	136.6	137.0	0.4
E	10,320	117	929	1.5	139.0	139.0	139.1	0.1
F	11,330	88	515	2.8	139.3	139.3	139.5	0.2
G	12,880	111	694	2.0	140.3	140.3	140.8	0.5
H	13,615	30	199	7.1	140.6	140.6	141.0	0.4
I	14,900	106	886	1.3	145.0	145.0	145.1	0.1
J	17,060	98	723	1.6	145.6	145.6	145.9	0.3
K	18,850	85	559	2.1	146.3	146.3	146.6	0.3
L	21,010	53	336	3.5	147.9	147.9	148.3	0.4
M	22,830	28	176	6.6	149.2	149.2	149.7	0.5
N	25,180	120	731	1.1	156.1	156.1	156.1	0.0
O	26,340	65	349	2.4	156.4	156.4	156.4	0.0
P	28,480	50	151	5.6	159.8	159.8	160.6	0.8
Q	29,250	40	178	4.7	163.9	163.9	164.5	0.6

[1]Feet above confluence with Landsman Kill

FEDERAL EMERGENCY MANAGEMENT AGENCY

DUTCHESS COUNTY, NY (ALL JURISDICTIONS)

FLOODWAY DATA

RHINEBECK KILL

TABLE 10

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Saw Kill								
A	130[1]	55	366	11.4	9.1	9.1	10.1	1.0
B	3,240[1]	50	319	13.1	113.6	113.6	114.6	1.0
C	4,230[1]	45	354	11.8	145.7	145.7	146.7	1.0
D	9,670[1]	90	612	6.8	167.0	167.0	168.0	1.0
E	12,940[1]	85	765	5.5	171.6	171.6	172.0	0.4
F	14,670[1]	350	2,803	1.5	173.0	173.0	173.6	0.6
G	19,150[1]	180	979	4.3	177.0	177.0	177.7	0.7
H	21,540[1]	410	3,607	1.0	182.8	182.8	183.1	0.3
I	24,050[1]	85	569	6.3	183.6	183.6	184.1	0.5
J	26,630[1]	155	1,161	3.1	202.9	202.9	202.9	0.0
K	28,820[1]	90	562	6.4	205.1	205.1	205.2	0.1
L	31,800[1]	100	809	4.5	213.0	213.0	213.5	0.5
M	33,360[1]	110	829	4.3	214.5	214.5	215.2	0.7
N	37,160[1]	140	754	4.8	220.3	220.3	220.9	0.6
O	38,140[1]	240	1,520	2.4	221.3	221.3	222.1	0.8
Seeley Creek								
A	250[2]	17	42	7.8	548.6	548.6	548.9	0.3
B	750[2]	17	41	8.0	562.8	562.8	562.8	0.0
C	1,360[2]	14	37	9.0	584.4	584.4	584.4	0.0

[1]Feet above confluence with Hudson River
[2]Feet above confluence with Clove Brook

FEDERAL EMERGENCY MANAGEMENT AGENCY

DUTCHESS COUNTY, NY (ALL JURISDICTIONS)

TABLE 10

FLOODWAY DATA

SAW KILL – SEELEY CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Sprout Creek #1								
A	1,230	175	1,240	2.8	224.3	223.7[2]	224.5	0.9
B	2,530	350	2,076	1.7	225.4	225.4	226.4	1.0
C	4,100	386	2,044	1.7	226.6	226.6	227.4	0.8
D	6,100	758	3,599	1.0	227.4	227.4	228.3	0.9
E	10,050	590	2,269	1.5	232.1	232.1	233.1	1.0
F	12,330	295	1,743	2.0	234.6	234.6	235.2	0.6
G	14,940	335	1,538	2.3	236.1	236.1	236.7	0.6
H	16,600	360	1,591	2.2	239.1	239.1	239.6	0.5
I	18,840	220	965	3.6	242.0	242.0	242.5	0.5
J	19,640	250	1,240	2.8	243.2	243.2	244.1	0.9
K	22,750	220	1,178	3.0	247.2	247.2	248.0	0.8
L	24,000	200	763	4.6	249.8	249.8	250.5	0.7
M	25,400	77	662	5.3	253.1	253.1	253.3	0.2
N	27,460	100	789	4.4	255.6	255.6	256.3	0.7
O	28,400	474	3,421	1.0	257.9	257.9	258.8	0.9
P	29,780	685	2,589	1.3	258.3	258.3	259.1	0.8
Q	31,830	546	1,129	3.1	262.8	262.8	262.8	0.0
R	33,077	96	611	5.7	265.7	265.7	266.3	0.6
S	34,480	102	841	4.1	267.2	267.2	268.0	0.8
T	34,565	300	1,526	2.3	267.5	267.5	269.2	0.9
U	36,000	720	4,191	0.8	268.2	268.2	269.2	1.0
V	37,080	182	672	5.2	270.6	270.6	270.6	0.0
W	38,390	370	1,645	2.1	272.1	272.1	272.8	0.7
X	39,000	292	1,079	3.2	273.1	273.1	273.9	0.8
Y	40,020	540	2,277	1.5	276.7	276.7	276.7	0.0
Z	41,384	168	803	4.3	278.3	278.3	278.3	0.0
AA	42,500	162	588	5.9	279.6	279.6	279.8	0.2
AB	43,900	317	1,579	2.2	282.4	282.4	282.7	0.3

[1]Feet above confluence with Fishkill Creek
[2]Elevation computed without consideration of backwater effects from Fishkill Creek

FEDERAL EMERGENCY MANAGEMENT AGENCY

DUTCHESS COUNTY, NY (ALL JURISDICTIONS)

TABLE 10

FLOODWAY DATA

SPROUT CREEK #1

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Sprout Creek #1 (continued)								
AC	45,000	552	2,470	1.4	283.3	283.3	284.1	0.8
AD	46,270	530	2,480	1.4	285.6	285.6	286.3	0.7
AE	47,400	428	1,688	2.1	286.1	286.1	286.7	0.6
AF	48,400	263	1,070	2.3	287.3	287.3	288.1	0.8
AG	49,660	287	1,420	1.8	288.8	288.8	289.7	0.9
AH	50,042	583	2,675	1.0	289.0	289.0	290.0	1.0
AI	51,200	232	1,059	2.4	289.9	289.9	290.6	0.7
AJ	51,710	414	2,135	1.2	290.6	290.6	291.6	1.0
AK	52,330	662	2,853	0.9	290.9	290.9	291.9	1.0
AL	53,100	165	474	5.3	292.0	292.0	292.0	0.0
AM	56,210	531	2,184	1.1	296.8	296.8	297.3	0.5
AN	56,341	61	369	6.8	296.9	296.9	297.3	0.4
AO	56,790	105	1,432	1.7	298.1	298.1	298.6	0.5
AP	59,030	345	3,577	0.7	299.7	299.7	300.6	0.9
AQ	63,280	180	1,722	1.5	304.2	304.2	305.0	0.8
AR	64,100	28	944	2.6	305.9	305.9	306.7	0.8
AS	65,140	220	1,887	1.1	309.6	309.6	310.3	0.7
AT	65,266	124	713	3.0	312.2	312.2	313.0	0.8
AU	68,165	251	702	3.1	315.9	315.9	316.6	0.7
AV	68,527	58	373	5.8	318.1	318.1	318.1	0.0
AW	71,000	244	1,591	1.4	322.1	322.1	322.9	0.8
AX	71,890	87	278	7.7	324.0	324.0	324.0	0.0
AY	72,030	334	1,587	1.2	327.2	327.2	327.2	0.0
AX	73,780	436	1,405	1.3	327.5	327.5	327.9	0.4
BA	73,889	731	3,527	0.5	329.0	329.0	330.0	1.0
BB	74,020	471	2,079	0.9	329.1	329.1	330.1	1.0
BC	74,970	200	692	2.7	329.7	329.7	330.6	0.9
BD	78,390	387	1,393	1.4	336.0	336.0	336.6	0.6

[1]Feet above confluence with Fishkill Creek

TABLE 10

FEDERAL EMERGENCY MANAGEMENT AGENCY

DUTCHESS COUNTY, NY
(ALL JURISDICTIONS)

FLOODWAY DATA

SPROUT CREEK #1

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Sprout Creek #2								
A	250[1]	*	142	9.4	433.3	433.3	433.6	0.3
B	1,250[1]	*	106	11.6	461.0	461.0	461.0	0.0
C	2,200[1]	46	286	4.3	508.6	508.6	509.4	0.8
D	2,800[1]	87	403	3.1	509.8	509.8	510.8	1.0
E	3,700[1]	28	150	8.2	515.6	515.6	516.3	0.7
F	4,800[1]	28	155	8.0	530.5	530.5	530.9	0.4
G	5,685[1]	125	305	4.0	541.0	541.0	541.7	0.7
H	6,750[1]	56	160	5.6	546.4	546.4	547.4	1.0
I	7,750[1]	85	321	2.8	552.2	552.2	553.2	1.0
J	8,750[1]	71	235	3.4	557.4	557.4	558.3	0.9
K	9,617[1]	150	256	3.2	563.4	563.4	564.3	0.9
L	9,800[1]	89	193	4.0	564.7	564.7	565.7	1.0
Stony Creek								
A	1,580[2]	110	642	5.8	83.8	83.8	84.7	0.9
B	3,200[2]	40	262	14.2	101.9	101.9	102.5	0.6
C	4,270[2]	65	356	10.5	112.4	112.4	112.5	0.1
D	6,180[2]	60	660	5.7	131.3	131.3	131.3	0.0

[1]Feet above Limit of Detailed Study (Limit of Detailed Study is approximately 1,820 feet downstream of Verbank Village Road)
[2]Feet above Limit of Detailed Study (Limit of Detailed Study is approximately 3,108 feet downstream of Mill Street)
*Floodway coincident with channel banks

TABLE 10

FEDERAL EMERGENCY MANAGEMENT AGENCY

DUTCHESS COUNTY, NY
(ALL JURISDICTIONS)

FLOODWAY DATA

SPROUT CREEK #2 – STONY CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Swamp River Reach 1								
A	979[1]	250	2,350	3.1	366.8	366.8	367.6	0.8
B	3,445[1]	254	1,380	8.0	367.7	367.7	368.7	1.0
C	4,325[1]	275	1,267	9.1	369.5	369.5	370.5	1.0
D	5,603[1]	244	1,262	5.9	372.4	372.4	372.9	0.5
Swamp River Reach 2								
A	1,860[2]	167	1,188	1.5	423.9	423.9	424.4	0.5
B	3,630[2]	298	2,153	0.8	424.1	424.1	424.6	0.5
C	5,400[2]	178	1,282	1.3	424.5	424.5	425.1	0.6
D	7,200[2]	250	1,802	1.0	425.1	425.1	425.8	0.7
E	9,120[2]	257	1,777	1.0	425.5	425.5	426.2	0.7
F	11,120[2]	212	1,194	1.4	425.9	425.9	426.6	0.7
G	13,030[2]	202	950	1.5	426.7	426.7	427.5	0.8
H	15,870[2]	176	921	1.6	427.9	427.9	428.7	0.8
I	17,690[2]	177	967	1.1	429.9	429.9	430.1	0.2
J	19,330[2]	216	956	1.1	430.3	430.3	430.6	0.3
K	21,030[2]	64	331	3.3	431.6	431.6	432.4	0.8
L	22,090[2]	140	733	1.5	434.4	434.4	434.7	0.3
M	24,280[2]	158	1,065	1.0	436.8	436.8	437.3	0.5
N	26,150[2]	139	576	1.9	437.9	437.9	438.7	0.8
O	29,780[2]	70	300	3.6	453.3	453.3	454.2	0.9

[1]Feet above confluence with Tenmile River
[2]Feet above Limit of Detailed Dtudy (Limit of Detailed Study is approximately 910 feet downstream of Kitchen Road)

TABLE 10

FEDERAL EMERGENCY MANAGEMENT AGENCY

DUTCHESS COUNTY, NY (ALL JURISDICTIONS)

FLOODWAY DATA

SWAMP RIVER REACH 1 – SWAMP RIVER REACH 2

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Sweezy Creek								
A	230[1]	78	195	2.0	499.4	499.4	500.2	0.8
B	930[1]	58	94	3.6	507.8	507.7	508.4	0.7
C	1,680[1]	56	76	4.5	520.5	520.5	521.0	0.5
D	2,430[1]	36	60	5.6	536.3	536.3	537.1	0.8
E	3,030[1]	13	37	7.9	556.5	556.5	557.2	0.7
F	3,330[1]	15	36	8.1	572.0	572.0	572.0	0.0
G	3,630[1]	14	36	8.1	582.6	582.6	582.6	0.0
Sylvan Lake Outlet								
A	730[2]	54	168	5.1	292.8	290.9[3]	291.8	0.9
B	2,260[2]	100	273	3.1	295.5	295.5	296.0	0.5
C	3,890[2]	100	230	3.7	302.9	302.9	303.3	0.4
D	6,130[2]	40	145	5.9	309.2	309.2	310.0	0.8
E	7,580[2]	129	355	2.4	313.1	313.1	313.6	0.5
F	9,126[2]	76	322	2.6	319.8	319.8	320.7	0.9
G	10,546[2]	78	285	3.0	321.5	321.5	322.0	0.5
H	11,366[2]	20	84	10.1	323.8	323.8	324.6	0.8

[1]Feet above confluence with Clove Brook
[2]Feet above confluence with Fishkill Creek
[3]Elevation computed without consideration of backwater effects from Fish Kill Creek

TABLE 10

FEDERAL EMERGENCY MANAGEMENT AGENCY

DUTCHESS COUNTY, NY (ALL JURISDICTIONS)

FLOODWAY DATA

SWEEZY CREEK – SYLVAN LAKE OUTLET

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
TenMile River								
A	847	132	1,044	15.8	292.6	292.6	292.6	0.0
B	2,622	187	1,615	10.3	305.3	305.3	305.3	0.0
C	4,810	224	2,074	7.9	310.8	310.8	310.9	0.1
D	6,750	264	2,341	7.0	317.8	317.8	317.8	0.0
E	8,807	275	2,475	6.4	321.1	321.1	321.6	0.5
F	10,984	128	1,796	8.8	328.8	328.8	328.9	0.1
G	12,607	126	1,696	9.3	330.4	330.4	330.8	0.4
H	14,497	306	2,482	6.4	333.3	333.3	334.0	0.7
I	16,388	205	1,965	8.1	336.5	336.5	336.8	0.3
J	17,562	211	2,113	7.5	338.1	338.1	338.8	0.7
K	18,938	112	1,759	9.0	342.9	342.9	342.9	0.0
L	21,865	259	2,213	7.1	345.4	345.4	346.3	0.9
M	24,776	432	5,735	2.7	350.6	350.6	351.5	0.9
N	26,980	520	5,410	2.9	351.2	351.2	352.1	0.9
O	29,085	541	3,501	4.4	351.9	351.9	352.9	1.0
P	31,727	508	3,801	4.1	353.4	353.4	354.3	0.9
Q	34,396	1,023	8,613	1.8	355.6	355.6	356.6	1.0
R	37,350	988	8,416	1.8	356.8	356.8	357.8	1.0
S	39,308	818	4,599	3.4	357.7	357.7	358.6	0.9
T	40,983	216	1,710	9.1	358.9	358.9	359.9	1.0
U	42,913	610	4,251	2.1	364.3	364.3	364.9	0.6
V	46,173	481	2,492	3.4	366.1	366.1	366.9	0.8
W	48,129	370	2,489	3.4	368.5	368.5	369.2	0.7
X	50,248	358	1,833	4.5	371.9	371.9	372.6	0.7
Y	54,121	171	1,121	7.4	277.0	277.0	277.1	0.1
Z	55,285	214	970	8.6	378.9	378.9	378.9	0.0
AA	57,259	310	1,742	4.8	385.3	385.3	385.3	0.0
AB	59,603	239	1,327	6.3	387.2	387.2	388.1	0.9

[1]Feet above county boundary

FEDERAL EMERGENCY MANAGEMENT AGENCY

DUTCHESS COUNTY, NY (ALL JURISDICTIONS)

FLOODWAY DATA

TENMILE RIVER

TABLE 10

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Tributary to Amenia Stream								
A	1,836[1]	286	186	1.9	548.8	548.8	549.1	0.3
Tributary 1 to Fishkill Creek								
A	1,470[2]	16	93	9.2	209.8	205.6[4]	206.4	0.8
B	3,820[2]	85	551	1.6	213.9	213.9	213.9	0.0
C	7,180[2]	60	302	2.8	217.2	217.2	217.4	0.2
D	10,560[2]	80	690	1.2	223.5	223.5	223.6	0.1
E	14,460[2]	60	384	2.2	224.1	224.1	224.4	0.3
Tributary 2 to Fishkill Creek								
A	1,170[2]	200	297	5.1	388.4	388.4	388.4	0.0
B	3,990[2]	85	237	6.4	433.6	433.6	433.6	0.0
Tributary to East Branch Croton River								
A	395[3]	35	132	6.6	615.3	615.3	615.8	0.5
B	1,765[3]	55	134	6.5	655.2	655.2	655.6	0.4
C	3,825[3]	45	112	7.7	687.7	687.7	688.6	0.9
D	5,175[3]	35	200	4.3	703.3	703.3	704.3	1.0
E	7,725[3]	85	406	2.1	717.8	717.8	718.0	0.2

[1]Feet above confluence with Amenia Stream
[2]Feet above confluence with Fishkill Creek
[3]Feet above county boundary
[4]Elevation computed without consideration of backwater effects from Fishkill Creek

FEDERAL EMERGENCY MANAGEMENT AGENCY

DUTCHESS COUNTY, NY (ALL JURISDICTIONS)

FLOODWAY DATA

TRIBUTARY TO AMENIA STREAM – TRIBUTARY 1 TO FISHKILL CREEK - TRIBUTARY 2 TO FISHKILL CREEK – TRIBUTARY TO EAST BRANCH CROTON RIVER

TABLE 10

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Walsh Creek								
A	300[1]	20	35	10.7	523.7	523.7	523.7	0.0
B	1,200[1]	62	98	3.9	541.7	541.7	542.7	1.0
C	2,292[1]	30	136	2.5	568.5	568.5	569.4	0.9
D	2,700[1]	18	37	9.1	576.6	576.6	576.8	0.2
E	3,200[1]	12	39	8.7	591.5	591.5	592.1	0.6
F	4,100[1]	12	40	8.5	615.2	615.2	615.6	0.4
G	5,100[1]	12	27	10.7	639.1	639.1	639.4	0.3
H	6,000[1]	12	29	7.5	664.9	664.9	664.9	0.0
I	6,540[1]	12	24	8.4	684.1	684.1	684.4	0.3
Wappinger Creek Reach 1								
A	61[2]	250	1,293	14.9	7.9	0.2[3]	0.2	0.0
B	2,591[2]	402	4,633	4.2	7.9	6.3[3]	6.3	0.0
C	5,256[2]	587	7,294	2.6	7.9	7.3[3]	7.7	0.4
D	7,061[2]	350	4,092	4.7	8.1	8.1	8.4	0.3
E	8,941[2]	204	2,365	8.1	9.1	9.1	9.3	0.2
F	9,561[2]	236	1,631	7.7	9.4	9.4	9.6	0.2
G	11,442[2]	94	1,167	16.5	70.6	70.6	70.9	0.3
H	13,602[2]	634	7,094	2.6	90.1	90.1	90.9	0.8
I	14,902[2]	1,090	10,419	1.8	90.3	90.3	91.0	0.7
J	16,991[2]	369	2,641	6.9	90.4	90.4	91.1	0.7
K	20,208[2]	607	5,506	3.3	103.1	103.1	103.6	0.5
L	21,328[2]	688	6,524	2.8	104.4	104.4	105.1	0.7
M	22,968[2]	641	7,061	2.6	107.6	107.6	107.8	0.2

[1]Feet above confluence with Clove Mountain Creek
[2]Feet above confluence with the Hudson River

FEDERAL EMERGENCY MANAGEMENT AGENCY

DUTCHESS COUNTY, NY (ALL JURISDICTIONS)

FLOODWAY DATA

WALSH CREEK – WAPPINGER CREEK REACH 1

TABLE 10

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Wappinger Creek Reach 1 (continued)								
N	25,068	489	3,364	5.4	108.8	108.8	109.7	0.9
O	27,098	197	2,180	8.4	111.6	111.6	112.4	0.8
P	28,474	388	4,049	4.5	117.4	117.4	117.8	0.4
Q	30,474	575	7,818	2.3	118.9	118.9	119.5	0.6
R	32,774	390	6,740	2.7	119.4	119.4	120.0	0.6
S	35,037	146	2,354	7.8	120.5	120.5	121.4	0.9
T	36,632	135	1,801	9.5	121.8	121.8	122.7	0.9
U	38,912	186	2,567	6.7	128.7	128.7	129.0	0.3
V	40,618	172	2,539	6.8	139.2	139.2	139.2	0.0
W	42,358	705	9,819	1.8	143.7	143.7	143.7	0.0
X	44,848	526	6,184	2.8	144.5	144.5	144.5	0.0
Y	47,488	304	2,861	6.0	145.7	145.7	146.3	0.6
Z	49,768	311	3,957	4.3	147.2	147.2	148.0	0.8
AA	51,548	204	2,478	6.9	147.7	147.7	148.5	0.8
AB	54,008	327	3,277	5.2	149.2	149.2	149.9	0.7
AC	56,028	111	1,000	17.2	152.1	152.1	152.1	0.0
AD	58,439	560	7,267	2.4	161.2	161.2	161.4	0.2
AE	60,569	700	7,501	2.3	162.0	162.0	162.1	0.1
AF	63,149	614	3,475	4.9	165.4	165.4	165.9	0.5
AG	65,161	712	4,891	3.5	167.0	167.0	167.7	0.7
AH	66,901	685	3,849	4.5	168.6	168.6	169.5	0.9
AI	69,681	392	3,439	5.0	172.3	172.3	173.0	0.7
AJ	72,501	122	1,537	11.2	175.2	175.2	175.8	0.6
AK	74,391	191	1,371	12.5	183.2	183.2	183.3	0.1
AL	76,181	193	3,535	4.6	190.5	190.5	190.9	0.4

[1]Feet above confluence with Hudson River

FEDERAL EMERGENCY MANAGEMENT AGENCY

DUTCHESS COUNTY, NY (ALL JURISDICTIONS)

FLOODWAY DATA

WAPPINGER CREEK REACH 1

TABLE 10

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Wappinger Creek Reach 1 (continued)								
AM	78,892	355	5,697	3.1	195.0	195.0	195.3	0.3
AN	80,846	144	2,213	7.9	195.3	195.3	195.6	0.3
AO	82,641	152	2,488	7.0	197.0	197.0	197.8	0.8
AP	84,647	552	8,281	2.1	198.9	198.9	199.8	0.9
AQ	85,492	940	13,400	1.3	199.1	199.1	200.0	0.9
AR	86,442	249	3,051	5.7	200.0	200.0	200.7	0.7
AS	88,132	135	1,803	9.7	201.7	201.7	202.1	0.4
AT	88,554	150	2,085	8.4	204.5	204.5	204.6	0.1
AU	89,610	104	1,385	12.7	205.9	205.9	205.9	0.0
AV	91,775	440	5,289	3.1	209.8	209.8	210.5	0.7
AW	94,574	180	2,013	6.8	211.3	211.3	212.1	0.8
AX	96,210	279	3,948	3.5	213.2	213.2	214.1	0.9
AY	97,425	792	9,015	1.5	213.7	213.7	214.6	0.9
AZ	99,959	338	3,023	4.5	213.7	213.7	215.4	0.9
BA	101,332	264	2,567	5.3	214.5	214.5	217.2	0.9
BB	103,444	303	3,370	4.0	219.0	219.0	219.8	0.8
BC	105,345	485	5,847	2.3	221.2	221.2	222.1	0.9
BD	106,454	500	10,939	1.2	221.5	221.5	222.4	0.9
BE	109,094	184	2,145	6.4	224.6	224.6	224.6	0.0
BF	111,417	675	5,319	2.1	228.8	228.8	228.9	0.1
BG	113,265	978	8,348	1.4	230.4	230.4	230.7	0.3
BH	113,740	203	1,713	5.2	231.2	231.2	232.1	0.9

[1]Feet above confluence with Hudson River

FEDERAL EMERGENCY MANAGEMENT AGENCY

DUTCHESS COUNTY, NY (ALL JURISDICTIONS)

TABLE 10

FLOODWAY DATA

WAPPINGER CREEK REACH 1

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Wappinger Creek Reach 1 (continued)								
BI	115,377[1]	120	1,290	6.9	232.8	232.8	233.5	0.7
BJ	117,330[1]	165	1,081	8.2	235.1	235.1	235.7	0.6
BK	118,967[1]	216	1,472	6.0	239.4	239.4	239.6	0.2
BL	120,921[1]	381	2,645	3.4	242.0	242.0	242.4	0.4
BM	121,322[1]	400	2,885	3.0	242.4	242.4	242.8	0.4
BN	122,032[1]	450	2,612	3.4	243.0	243.0	243.4	0.4
BO	123,982[1]	220	1,270	6.9	245.1	245.1	245.6	0.5
BP	125,082[1]	250	2,074	4.2	248.2	248.2	248.9	0.7
BQ	126,082[1]	190	1,838	4.8	250.4	250.4	251.0	0.6
BR	127,732[1]	240	2,405	3.7	252.8	252.8	253.4	0.6
Wappinger Creek Reach 2								
A	0[2]	380	2,418	1.4	282.4	282.4	283.4	1.0
B	1,150[2]	190	1,060	3.3	283.9	283.9	284.8	0.9
C	3,150[2]	124	471	5.9	288.3	288.3	289.2	0.9
D	4,830[2]	69	368	7.6	294.1	294.1	294.7	0.6
E	6,980[2]	83	326	8.5	312.0	312.0	312.6	0.6
F	8,160[2]	50	352	7.9	321.9	321.9	322.5	0.6
G	10,310[2]	81	479	4.6	331.5	331.5	332.3	0.8

[1]Feet above confluence with Hudson River
[2]Feet above County Route 17 (Salt Point Turnpike)

FEDERAL EMERGENCY MANAGEMENT AGENCY

DUTCHESS COUNTY, NY (ALL JURISDICTIONS)

TABLE 10

FLOODWAY DATA

WAPPINGER CREEK REACH 1 – WAPPINGER CREEK REACH 2

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Wassaic Creek								
A	3,590	617	2,131	1.9	420.6	420.6	421.5	0.9
B	7,990	97	643	6.3	432.4	432.4	433.1	0.7
Webatuck Creek Reach 1								
A	2,432	211	1,638	3.0	423.9	423.9	424.6	0.7
B	5,708	729	4,797	1.0	425.5	425.5	426.3	0.8
C	8,675	360	2,199	2.2	431.9	431.9	432.0	0.1
D	12,380	460	3,583	1.4	439.5	439.5	439.9	0.4
E	19,180	148	1,230	3.8	442.0	442.0	442.2	0.2
F	25,850	778	3,872	1.2	443.6	443.6	444.2	0.6
G	32,257	233	1,019	4.6	446.4	446.4	446.9	0.5
Webatuck Creek Reach 2								
A	45,035	64	518	7.6	460.7	460.7	461.7	1.0
B	48,749	170	965	4.1	469.2	469.2	469.6	0.4
C	53,768	340	1,278	3.1	480.5	480.5	481.3	0.8

[1]Feet above confluence with Tenmile River

FEDERAL EMERGENCY MANAGEMENT AGENCY

DUTCHESS COUNTY, NY (ALL JURISDICTIONS)

FLOODWAY DATA

WASSAIC CREEK – WEBATUCK CREEK REACH 1 – WEBATUCK CREEK REACH 2

TABLE 10

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Webatuck Creek Reach 3								
A	950	75	450	5.9	548.4	548.4	549.4	1.0
B	3,230	50	379	6.9	558.7	558.7	559.5	0.8
C	5,510	70	474	5.5	563.9	563.9	564.7	0.8
D	7,720	120	790	3.3	567.8	567.8	568.5	0.7
E	9,830	130	667	3.9	570.1	570.1	570.7	0.6
F	11,140	130	526	5.0	572.8	572.8	573.3	0.5
G	12,380	130	507	4.1	574.8	574.8	575.4	0.6
H	14,020	240	863	2.4	578.7	578.7	579.4	0.7
I	17,030	220	874	2.4	583.1	583.1	583.4	0.3
J	19,760	140	716	2.9	589.6	589.6	589.9	0.3
K	22,620	65	287	7.3	601.6	601.6	602.2	0.6
L	25,530	30	179	11.7	632.8	632.8	633.1	0.3
M	27,740	18	148	14.2	665.0	665.0	665.0	0.0
N	28,355	150	1,014	2.1	670.4	670.4	671.3	0.9
O	28,695	90	444	4.7	670.6	670.6	671.5	0.9
P	29,595	130	491	4.3	676.1	676.1	676.1	0.0
Q	30,975	50	156	8.4	683.7	683.7	683.7	0.0
R	33,395	110	425	3.1	699.8	699.8	699.8	0.0
S	35,110	265	1,942	0.7	710.9	710.9	710.9	0.0
T	36,250	60	198	6.6	711.4	711.4	711.8	0.4
U	38,340	21	107	12.3	725.2	725.2	725.7	0.5
V	41,020	65	251	5.2	743.8	743.8	744.4	0.6
W	42,500	50	358	3.7	754.0	754.0	754.9	0.9

[1]Feet above Limit of Detailed Study (Limit of Detailed Study is approximately 6,720 feet downstream of Reagen Road)

FEDERAL EMERGENCY MANAGEMENT AGENCY

DUTCHESS COUNTY, NY (ALL JURISDICTIONS)

FLOODWAY DATA

WEBATUCK CREEK REACH 3

TABLE 10

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Wells Brook								
A	725[1]	115	270	4.1	373.4	373.4	374.3	0.9
B	1,980[1]	28	168	6.6	379.4	379.4	379.6	0.2
C	4,280[1]	69	270	4.1	390.5	390.5	390.6	0.1
Whaley Lake Stream								
A	920[2]	35	169	11.7	352.6	352.6	352.8	0.2
B	1,685[2]	41	266	7.5	356.3	356.3	357.2	0.9
C	3,730[2]	100	282	7.1	375.4	375.4	375.4	0.0
D	5,160[2]	80	426	4.7	381.2	381.2	381.6	0.4
E	9,000[2]	80	363	5.5	404.8	404.8	405.8	1.0
F	12,480[2]	58	212	9.4	433.2	433.2	433.2	0.0
G	14,700[2]	50	209	9.5	448.1	448.1	448.4	0.3
H	17,120[2]	50	193	8.5	491.5	491.5	492.0	0.5
I	18,990[2]	31	176	7.2	517.1	517.1	518.0	0.9
J	22,500[2]	115	174	7.2	600.6	600.6	600.6	0.0
K	24,820[2]	75	186	6.8	676.7	676.7	676.7	0.0
L	27,620[2]	140	704	1.8	691.4	691.4	691.4	0.0
M	29,530[2]	70	420	3.0	692.4	692.4	693.2	0.8
N	31,220[2]	24	141	9.0	696.0	696.0	696.6	0.6

[1]Feet above confluence with Tenmile River
[2]Feet above confluence with Fishkill Creek

FEDERAL EMERGENCY MANAGEMENT AGENCY

DUTCHESS COUNTY, NY (ALL JURISDICTIONS)

TABLE 10

FLOODWAY DATA

WELLS BROOK-WHALEY LAKE STREAM

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Whortlekill Creek Reach 1								
A	1,070[1]	86	440	3.3	232.6	231.6[3]	232.5	0.9
B	2,480[1]	270	2,120	0.7	238.1	238.1	238.1	0.0
C	4,790[1]	108	685	2.1	241.3	241.3	241.4	0.1
D	5,760[1]	126	414	3.5	242.4	242.4	243.0	0.6
E	8,060[1]	139	1,367	1.1	253.7	253.7	253.7	0.0
F	9,870[1]	144	1,273	1.1	253.8	253.8	253.8	0.0
G	12,580[1]	132	613	2.4	254.1	254.1	254.4	0.3
H	14,270[1]	183	955	1.5	259.3	259.3	259.4	0.1
I	15,570[1]	55	181	8.0	264.8	264.8	265.2	0.4
J	17,390[1]	89	333	3.7	279.5	279.5	279.6	0.1
K	19,280[1]	108	511	2.4	285.7	285.7	286.6	0.9
L	21,180[1]	103	574	2.1	291.3	291.3	292.2	0.9
M	24,320[1]	76	200	6.2	298.1	298.1	298.7	0.6
N	26,820[1]	58	203	6.1	312.7	312.7	313.5	0.8
O	28,260[1]	83	250	4.9	323.6	323.6	324.0	0.4
Whortlekill Creek Reach 2								
A	0[2]	30	141	3.3	334.9	334.9	335.9	1.0
B	500[2]	31	72	4.2	338.6	338.6	338.9	0.3
C	1,000[2]	40	86	3.6	344.2	344.2	344.9	0.7
D	1,500[2]	31	77	4.0	350.1	350.1	350.4	0.3
E	2,050[2]	20	38	8.0	359.5	359.5	359.5	0.0
F	2,600[2]	20	38	8.0	368.1	368.1	368.2	0.1
G	3,000[2]	20	38	8.0	377.6	377.6	377.6	0.0
H	3,850[2]	46	93	3.3	395.3	395.3	396.3	1.0
I	4,290[2]	17	37	8.4	409.9	409.9	410.0	0.1

[1]Feet above confluence with Fishkill Creek
[2]Feet above limit of detailed study (limit of detailed study is approximately 328 feet downstream of Arthursburg Road)
[3]Elevatiuon computed without consideration of backwater effects from Fishkill Creek

FEDERAL EMERGENCY MANAGEMENT AGENCY

DUTCHESS COUNTY, NY (ALL JURISDICTIONS)

TABLE 10

FLOODWAY DATA

WHORTLEKILL CREEK REACH 1 - WHORTLEKILL CREEK REACH 2

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Willow Brook								
A	500	39	149	3.3	545.6	545.6	546.5	0.9
B	1,500	22	87	5.7	552.1	552.1	552.9	0.8
C	2,470	19	76	6.5	560.9	560.9	561.7	0.8
D	3,480	50	168	2.4	572.8	572.8	573.4	0.6
E	3,937	120	251	1.6	579.1	579.1	579.8	0.7
F	4,800	52	112	3.4	586.4	586.4	587.4	1.0
G	5,750	43	96	4.0	599.6	599.6	600.5	0.9
H	6,360	114	873	0.4	610.9	610.9	611.8	0.9
I	6,730	20	73	5.2	612.8	612.8	612.8	0.0
J	7,077	110	151	2.2	618.3	618.3	619.2	0.9
K	7,390	31	55	6.2	622.4	622.4	622.5	0.1
L	7,990	39	71	4.8	632.0	632.0	632.5	0.5
M	8,740	11	43	6.0	645.1	645.1	646.0	0.9
N	9,590	19	51	5.1	660.7	660.7	661.5	0.8
O	9,820	12	38	6.8	668.9	668.9	669.5	0.6
P	10,185	150	993	0.3	681.6	681.6	681.7	0.1
Q	10,540	23	39	6.7	684.2	684.2	684.2	0.0
R	10,890	33	177	1.1	689.0	689.0	689.8	0.8

[1]Feet above confluence with Sprout Creek #2

FEDERAL EMERGENCY MANAGEMENT AGENCY

DUTCHESS COUNTY, NY
(ALL JURISDICTIONS)

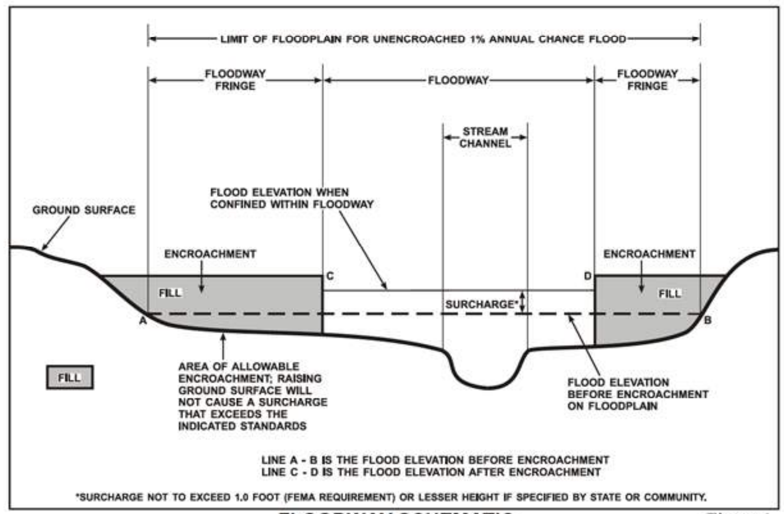
FLOODWAY DATA

WILLOW BROOK

TABLE 10

Near the mouths of streams studied in detail, floodway computations are made without regard to flood elevations on the receiving water body. Therefore, "Without Floodway" elevations presented in Table 10 for certain downstream cross sections of Branch 1 Great Spring Creek, Branch 1 Sprout Creek # 1, Branch 1 Wappinger Creek Reach 1, Branch 2 Wappinger Creek Reach 1, Branch 6 Wappinger Creek Reach 1, Branch 7 Wappinger Creek Reach 1, Branch 9 Wappinger Creek Reach 1, Branch 10 Wappinger Creek Reach 1, Casper Kill Creek, Clove Creek, East Branch Wappinger Creek Reach 1, Fishkill Creek, Great Spring Creek, Sprout Creek # 1, Sylvan Lake Outlet, Tributary 1 to Fishkill Creek, Wappinger Creek Reach 1, Wells Brook, and Whortle Kill Reach 1 are lower than the regulatory flood elevations in that area, which must take into account the 1-percent annual chance flooding due to backwater from other sources.

The area between the floodway and 1-percent annual chance floodplain boundaries is termed the floodway fringe. The floodway fringe encompasses the portion of the floodplain that could be completely obstructed without increasing the water-surface elevation of the 1-percent annual chance flood by more than 1.0 foot at any point. Typical relationships between the floodway and the floodway fringe and their significance to floodplain development are shown in Figure 1.



FLOODWAY SCHEMATIC

Figure 1

5.0 INSURANCE APPLICATIONS

For flood insurance rating purposes, flood insurance zone designations are assigned to a community based on the results of the engineering analyses. The zones are as follows:

Zone A

Zone A is the flood insurance rate zone that corresponds to the 1-percent annual chance floodplains that are determined in the FIS by approximate methods. Because detailed hydraulic analyses are not performed for such areas, no base flood elevations or depths are shown within this zone.

Zone AE

Zone AE is the flood insurance rate zone that corresponds to the 1-percent annual chance floodplains that are determined in the FIS by detailed methods. In most instances, whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone AH

Zone AH is the flood insurance rate zone that corresponds to the areas of 1-percent annual chance shallow flooding (usually areas of ponding) where average depths are between 1 and 3 feet. Whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone AO

Zone AO is the flood insurance rate zone that corresponds to the areas of 1-percent annual chance shallow flooding (usually sheet flow on sloping terrain) where average depths are between 1 and 3 feet. Average whole-foot depths derived from the detailed hydraulic analyses are shown within this zone.

Zone AR

Area of special flood hazard formerly protected from the 1-percent annual chance flood event by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1-percent annual chance or greater flood event.

Zone A99

Zone A99 is the flood insurance rate zone that corresponds to areas of the 1-percent annual chance floodplain that will be protected by a Federal flood protection system where construction has reached specified statutory milestones. No base flood elevations or depths are shown within this zone.

Zone V

Zone V is the flood insurance rate zone that corresponds to the 1-percent annual chance coastal floodplains that have additional hazards associated with storm waves. Because approximate hydraulic analyses are performed for such areas, no base flood elevations are shown within this zone.

Zone VE

Zone VE is the flood insurance rate zone that corresponds to the 1-percent annual chance coastal floodplains that have additional hazards associated with storm waves. Whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone X

Zone X is the flood insurance rate zone that corresponds to areas outside the 0.2-percent annual chance floodplain, areas within the 0.2-percent annual chance floodplain, and to areas of 1-percent annual chance flooding where average depths are less than 1 foot, areas of 1-percent annual chance flooding where the contributing drainage area is less than 1 square mile, and areas protected from the 1-percent annual chance flood by levees. No base flood elevations or depths are shown within this zone.

Zone D

Zone D is the flood insurance rate zone that corresponds to unstudied areas where flood hazards are undetermined, but possible.

6.0 FLOOD INSURANCE RATE MAP

The FIRM is designed for flood insurance and floodplain management applications.

For flood insurance applications, the map designates flood insurance rate zones as described in Section 5.0 and, in the 1-percent annual chance floodplains that were studied by detailed methods, shows selected whole-foot base flood elevations or average depths. Insurance agents use the zones and base flood elevations in conjunction with information on structures and their contents to assign premium rates for flood insurance policies.

For floodplain management applications, the map shows by tints, screens, and symbols, the 1- and 0.2-percent annual chance floodplains. Floodways and the locations of selected cross sections used in the hydraulic analyses and floodway computations are shown where applicable.

The current FIRM presents flooding information for the entire geographic area of Dutchess County. Previously, separate Flood Hazard Boundary Maps and/or FIRMs were prepared for each incorporated community with identified flood hazard areas within the county. Historical map dates relating to the pre-countywide FIRMs for each community are presented in Table 11, "Community Map History."

COMMUNITY NAME	INITIAL IDENTIFICATION	FLOOD HAZARD BOUNDARY MAP REVISIONS DATE	FIRM EFFECTIVE DATE	FIRM REVISIONS DATE
Amenia, Town of	October 18, 1974	May 21, 1976 January 21, 1977	September 24, 1984	November 15, 1989
Beacon, City of	July 26, 1974	January 30, 1976	March 1, 1984	
Beekman, Town of	October 18, 1974	August 13, 1976 April 15, 1977	September 5, 1984	
Clinton, Town of	December 20, 1974	August 20, 1976 July 1, 1977	July 5, 1984	
Dover, Town of	December 6, 1974	None	August 15, 1984	July 4, 1988
East Fishkill, Town of	November 1, 1974	July 9, 1976	June 15, 1984	
Fishkill, Town of	December 20, 1974	None	June 1, 1984	
Fishkill, Village of	June 21, 1974	June 18, 1976	March 15, 1984	
Hyde Park, Town of	December 20, 1974	October 22, 1976	June 15, 1984	
Lagrange, Town of	November 1, 1974	April 16, 1976	September 28, 1979	November 5, 1986 September 8, 1999
Milan, Town of	October 18, 1974	May 28, 1976	August 10, 1979	
Millbrook, Village of	May 31, 1974	April 30, 1976	February 27, 1984	

TABLE 11

FEDERAL EMERGENCY MANAGEMENT AGENCY

DUTCHESS COUNTY, NY
(ALL JURISDICTIONS)

COMMUNITY MAP HISTORY

COMMUNITY NAME	INITIAL IDENTIFICATION	FLOOD HAZARD BOUNDARY MAP REVISIONS DATE	FIRM EFFECTIVE DATE	FIRM REVISIONS DATE
Millerton, Village of	June 21, 1974	June 25, 1976	January 3, 1985	
Northeast, Town of	October 18, 1974	January 9, 1976	September 5, 1984	
Pawling, Town of	October 25, 1974	August 6, 1976	January 3, 1985	
Pawling, Village of	February 7, 1975	None	August 1, 1984	
Pine Plains, Town of	December 20, 1974	December 19, 1975	October 5, 1984	
Pleasant Valley, Town of	July 26, 1974	November 21, 1975	January 16, 1980	
Poughkeepsie, City of	June 28, 1974	July 9, 1976	January 5, 1984	
Poughkeepsie, Town of	November 29, 1974	None	November 15, 1978	August 2, 1990 September 8, 1999
Red Hook, Town of	October 18, 1974	August 6, 1976	October 16, 1984	
Rhinebeck, Town of	October 18, 1974	February 13, 1976	September 5, 1984	
Rhinebeck, Village of	January 5, 1984	None	February 1, 1985	
Stanford, Town of	October 18, 1974	July 9, 1976	January 21, 1983	December 17, 1991
Tivoli, Village of	December 20, 1974	None	August 1, 1984	

TABLE 11

FEDERAL EMERGENCY MANAGEMENT AGENCY

DUTCHESS COUNTY, NY
(ALL JURISDICTIONS)

COMMUNITY MAP HISTORY

COMMUNITY NAME	INITIAL IDENTIFICATION	FLOOD HAZARD BOUNDARY MAP REVISIONS DATE	FIRM EFFECTIVE DATE	FIRM REVISIONS DATE
Union Vale, Town of	November 15, 1974	None	September 2, 1988	
Wappinger, Town of	November 29, 1974	None	June 15, 1979	September 22, 1999
Wappinger Falls, Village of	November 21, 1975	None	September 1, 1978	September 22, 1999
Washington, Town of	November 1, 1974	July 9, 1976 April 22, 1977	August 17, 1979	

TABLE 11

FEDERAL EMERGENCY MANAGEMENT AGENCY

DUTCHESS COUNTY, NY
(ALL JURISDICTIONS)

COMMUNITY MAP HISTORY

7.0 OTHER STUDIES

Information pertaining to revised and unrevised flood hazards for each jurisdiction within Dutchess County has been compiled into this FIS. Therefore, this FIS supersedes all previously printed FIS Reports, FHBMs, FBFMs, and FIRMs for all of the incorporated areas within Dutchess County.

This is a multi-volume FIS. Each volume may be revised separately, in which case it supersedes the previously printed volume. Users should refer to the Table of Contents in Volume 1 for the current effective date of each volume; volumes bearing these dates contain the most up-to-date flood hazard data.

8.0 LOCATION OF DATA

Information concerning the pertinent data used in preparation of this FIS can be obtained by contacting FEMA, Federal Insurance and Mitigation Division, 26 Federal Plaza, Room 1337, New York, New York 10278.

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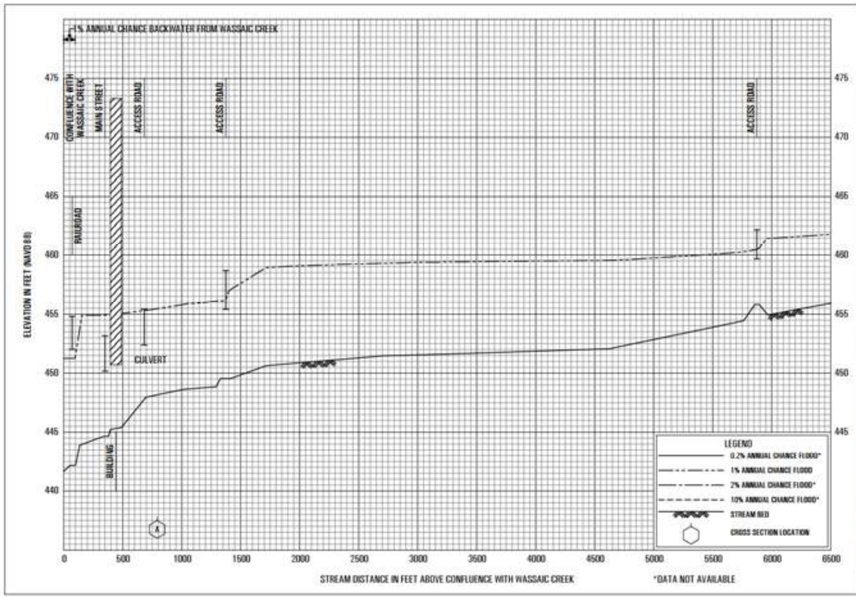


FLOOD PROFILES

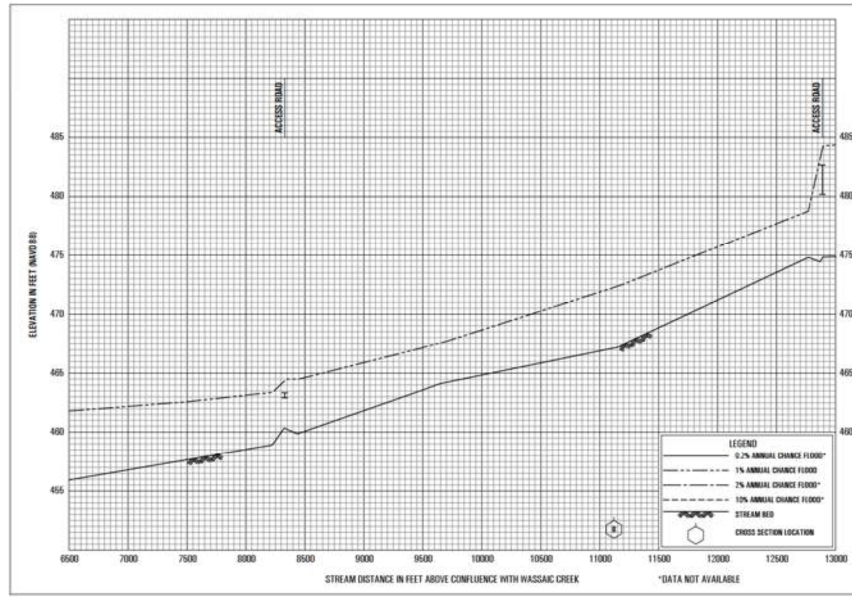
AMENIA STREAM

FEDERAL EMERGENCY MANAGEMENT AGENCY

DUTCHESS COUNTY, NY

(ALL JURISDICTIONS)

01P



FLOOD PROFILES

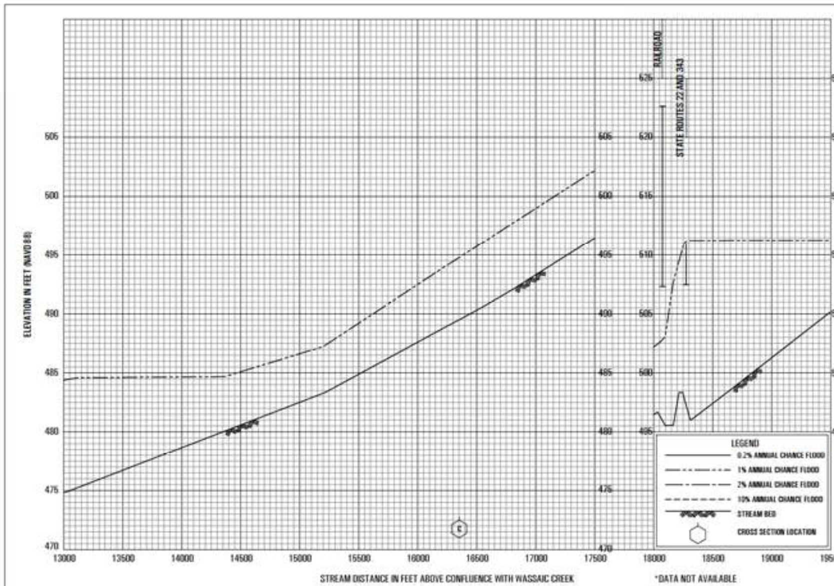
AMENIA STREAM

FEDERAL EMERGENCY MANAGEMENT AGENCY

DUTCHESS COUNTY, NY

(ALL JURISDICTIONS)

02P



FLOOD PROFILES

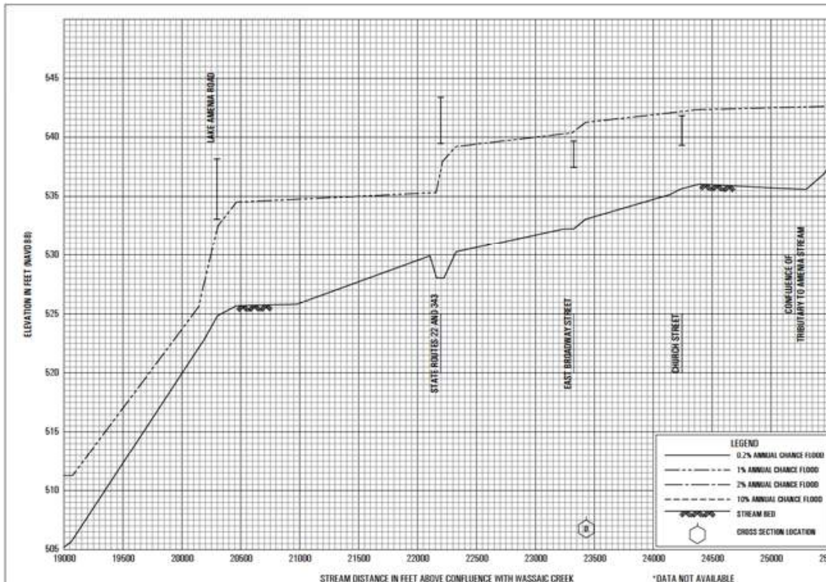
AMENIA STREAM

FEDERAL EMERGENCY MANAGEMENT AGENCY

DUTCHESS COUNTY, NY

(ALL JURISDICTIONS)

03P



FLOOD PROFILES

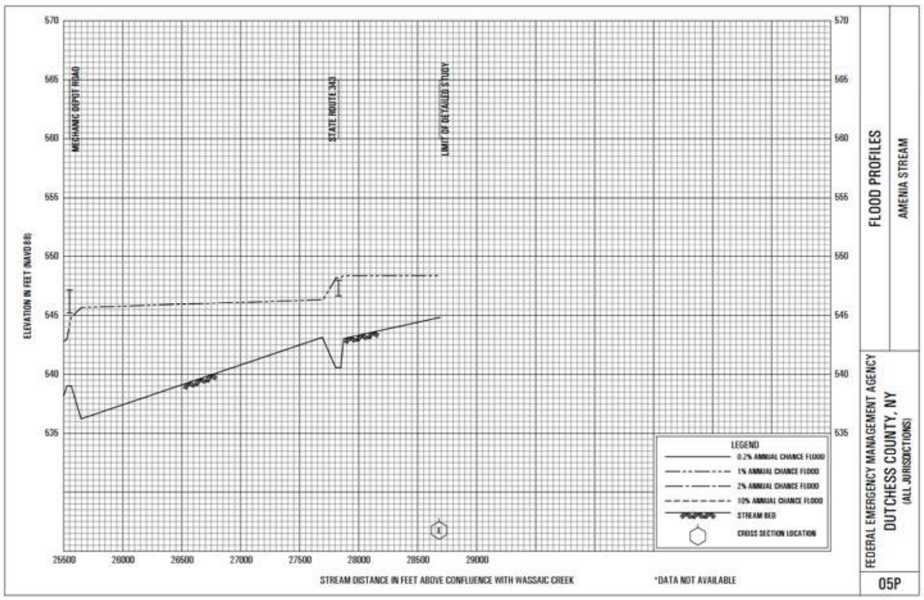
AMENIA STREAM

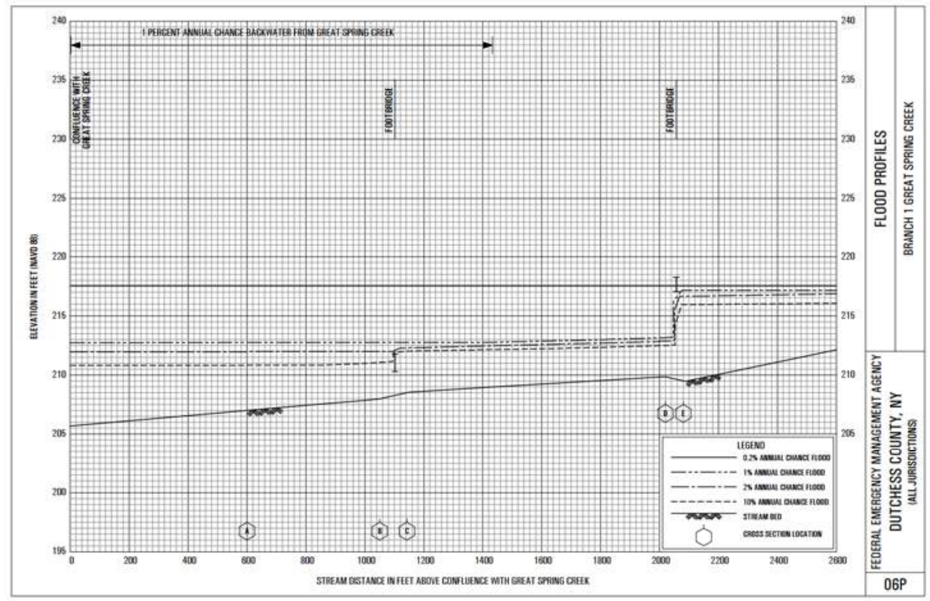
FEDERAL EMERGENCY MANAGEMENT AGENCY

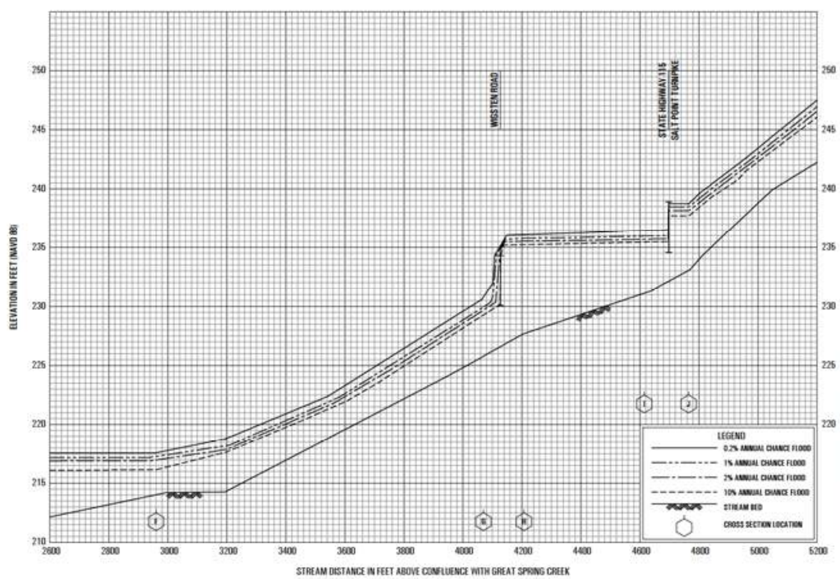
DUTCHESS COUNTY, NY

(ALL JURISDICTIONS)

04P


FLOOD PROFILES
AMENIA STREAM
FEDERAL EMERGENCY MANAGEMENT AGENCY
DUTCHESS COUNTY, NY
(ALL JURISDICTIONS)
05P
ELEVATION IN FEET (NAVD 88)
STREAM DISTANCE IN FEET ABOVE CONFLUENCE WITH WASSAIC CREEK
*DATA NOT AVAILABLE
MECHANIC DEPOT ROAD
STATE ROUTE 343
LIMIT OF DETAILED STUDY
LEGEND
0.2% ANNUAL CHANCE FLOOD
1% ANNUAL CHANCE FLOOD
2% ANNUAL CHANCE FLOOD
10% ANNUAL CHANCE FLOOD
STREAM BED
CROSS SECTION LOCATION

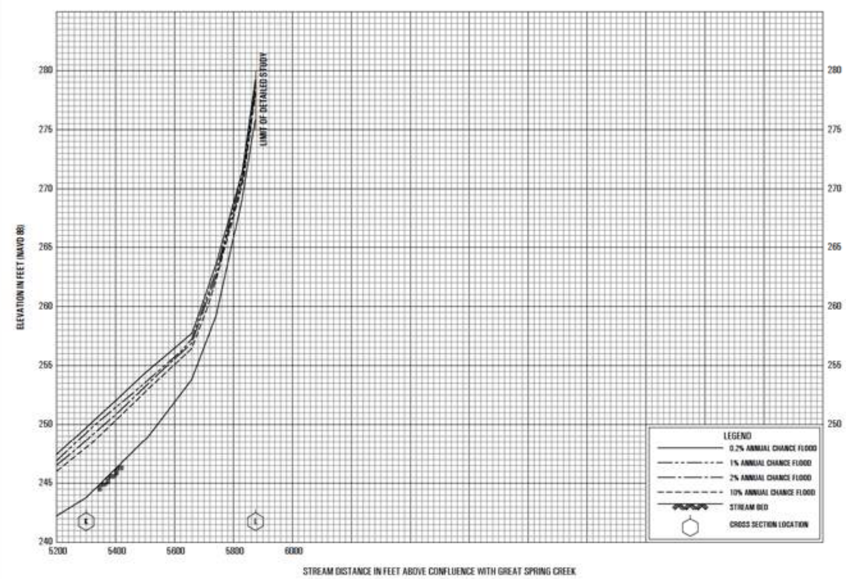

FLOOD PROFILES
BRANCH 1 GREAT SPRING CREEK
FEDERAL EMERGENCY MANAGEMENT AGENCY
DUTCHESS COUNTY, NY
(ALL JURISDICTIONS)
06P
ELEVATION IN FEET (NAVD 88)
STREAM DISTANCE IN FEET ABOVE CONFLUENCE WITH GREAT SPRING CREEK
1 PERCENT ANNUAL CHANCE BACKWATER FROM GREAT SPRING CREEK
CONFLUENCE WITH GREAT SPRING CREEK
FOOTBRIDGE
FOOTBRIDGE
LEGEND
0.2% ANNUAL CHANCE FLOOD
1% ANNUAL CHANCE FLOOD
2% ANNUAL CHANCE FLOOD
10% ANNUAL CHANCE FLOOD
STREAM BED
CROSS SECTION LOCATION



FEDERAL EMERGENCY MANAGEMENT AGENCY
DUTCHESS COUNTY, NY
(ALL JURISDICTIONS)

FLOOD PROFILES
BRANCH 1 GREAT SPRING CREEK

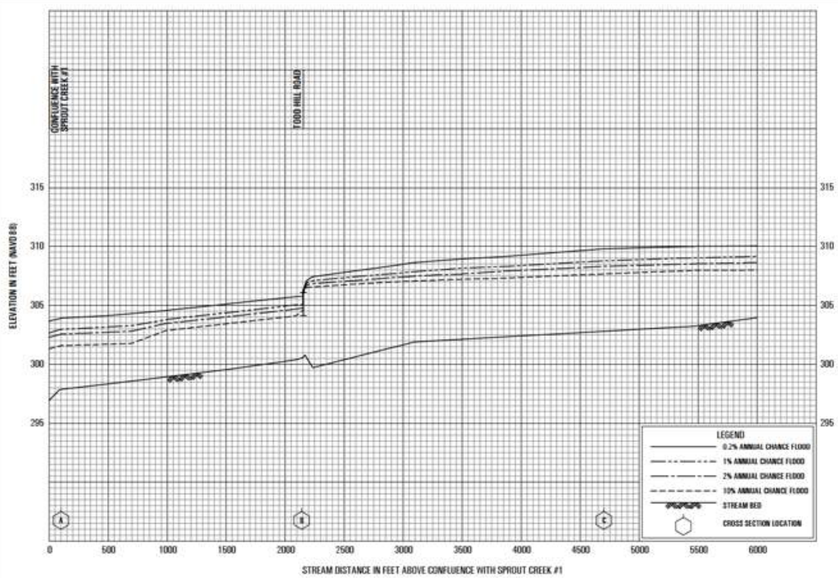
07P



FEDERAL EMERGENCY MANAGEMENT AGENCY
DUTCHESS COUNTY, NY
(ALL JURISDICTIONS)

FLOOD PROFILES
BRANCH 1 GREAT SPRING CREEK

08P



FLOOD PROFILES

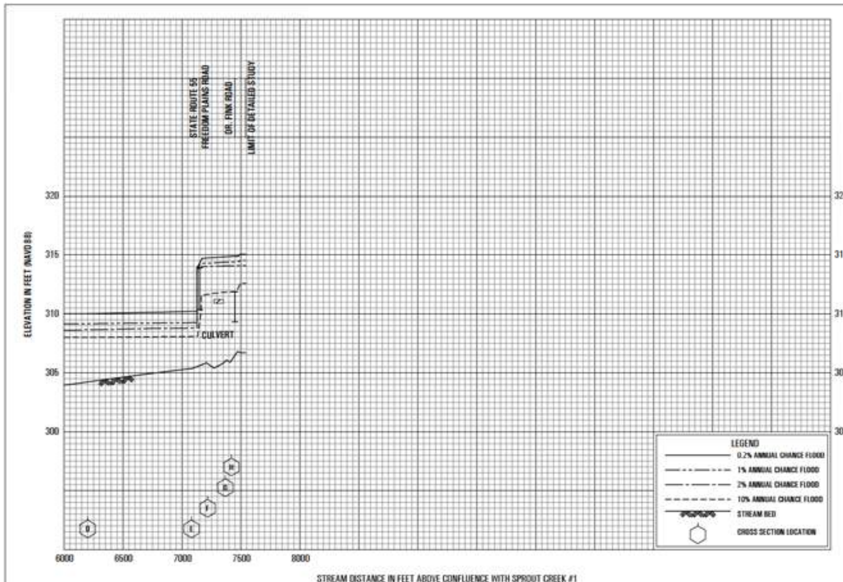
BRANCH 1 SPROUT CREEK # 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

DUTCHESS COUNTY, NY

(ALL JURISDICTIONS)

09P



FLOOD PROFILES

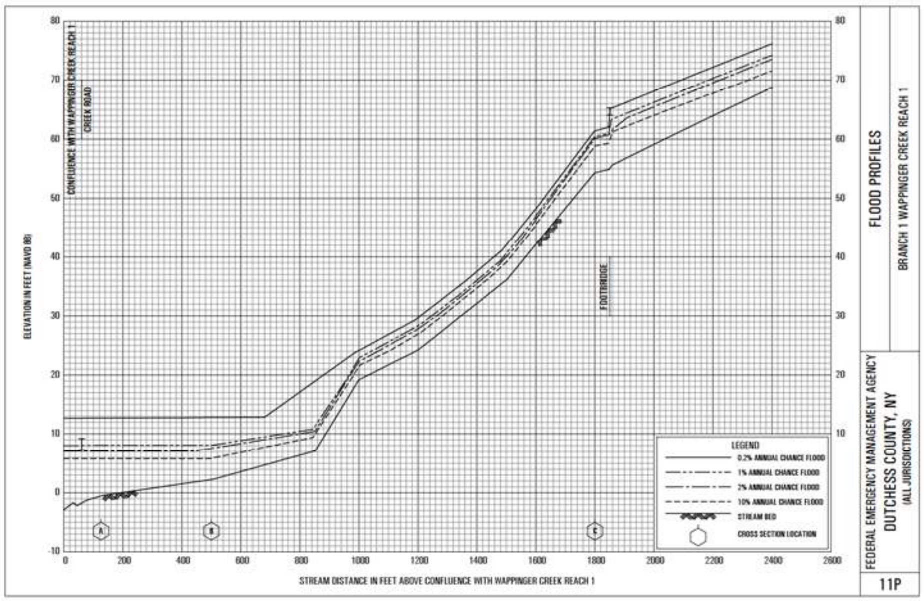
BRANCH 1 SPROUT CREEK # 1

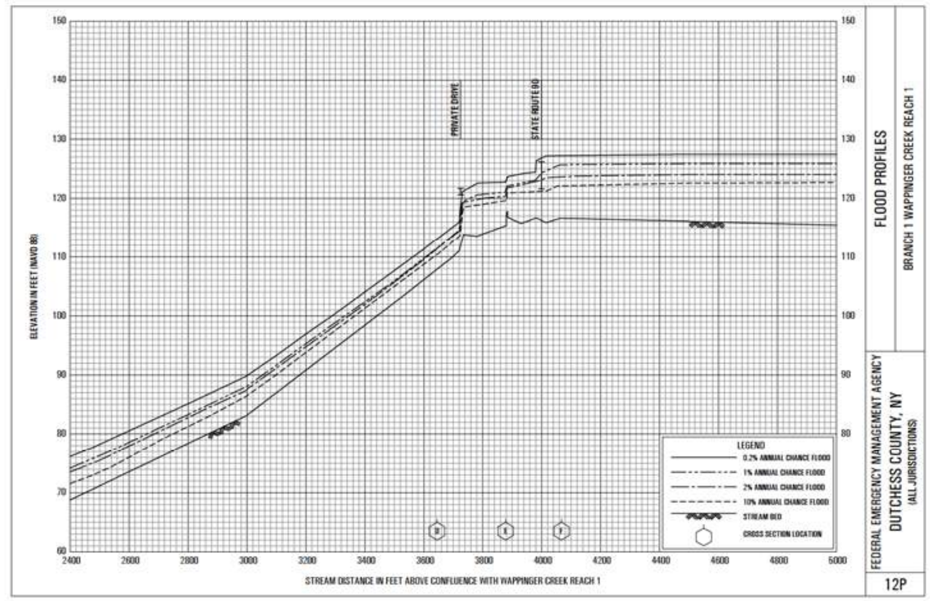
FEDERAL EMERGENCY MANAGEMENT AGENCY

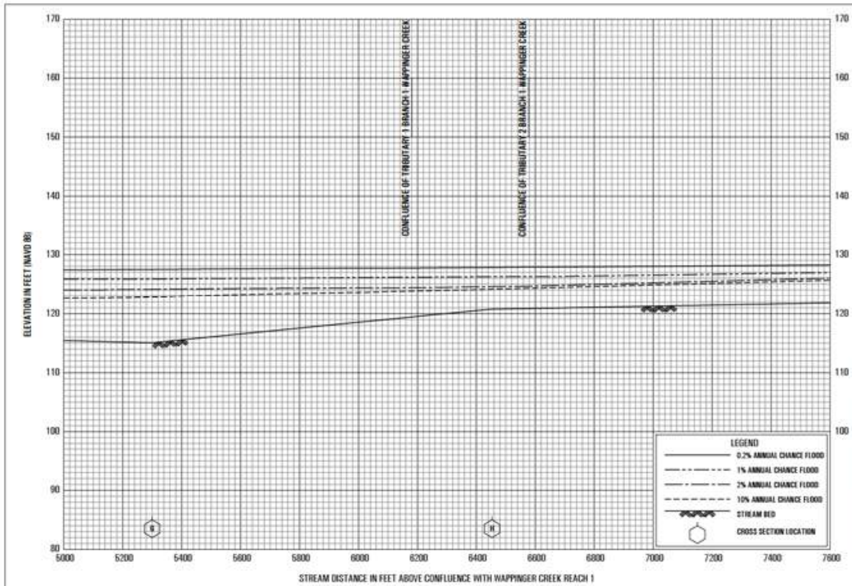
DUTCHESS COUNTY, NY

(ALL JURISDICTIONS)

10P


FLOOD PROFILES
BRANCH 1 WAPPINGER CREEK REACH 1
FEDERAL EMERGENCY MANAGEMENT AGENCY
DUTCHESS COUNTY, NY
(ALL JURISDICTIONS)
11P
ELEVATION IN FEET (NAVD 88)
STREAM DISTANCE IN FEET ABOVE CONFLUENCE WITH WAPPINGER CREEK REACH 1
CONFLUENCE WITH WAPPINGER CREEK REACH 1
CREEK ROAD
FOOTBRIDGE
LEGEND
0.2% ANNUAL CHANCE FLOOD
1% ANNUAL CHANCE FLOOD
2% ANNUAL CHANCE FLOOD
10% ANNUAL CHANCE FLOOD
STREAM BED
CROSS SECTION LOCATION


FLOOD PROFILES
BRANCH 1 WAPPINGER CREEK REACH 1
FEDERAL EMERGENCY MANAGEMENT AGENCY
DUTCHESS COUNTY, NY
(ALL JURISDICTIONS)
12P
ELEVATION IN FEET (NAVD 88)
STREAM DISTANCE IN FEET ABOVE CONFLUENCE WITH WAPPINGER CREEK REACH 1
PRIVATE DRIVE
STATE ROUTE 9D
LEGEND
0.2% ANNUAL CHANCE FLOOD
1% ANNUAL CHANCE FLOOD
2% ANNUAL CHANCE FLOOD
10% ANNUAL CHANCE FLOOD
STREAM BED
CROSS SECTION LOCATION



FLOOD PROFILES

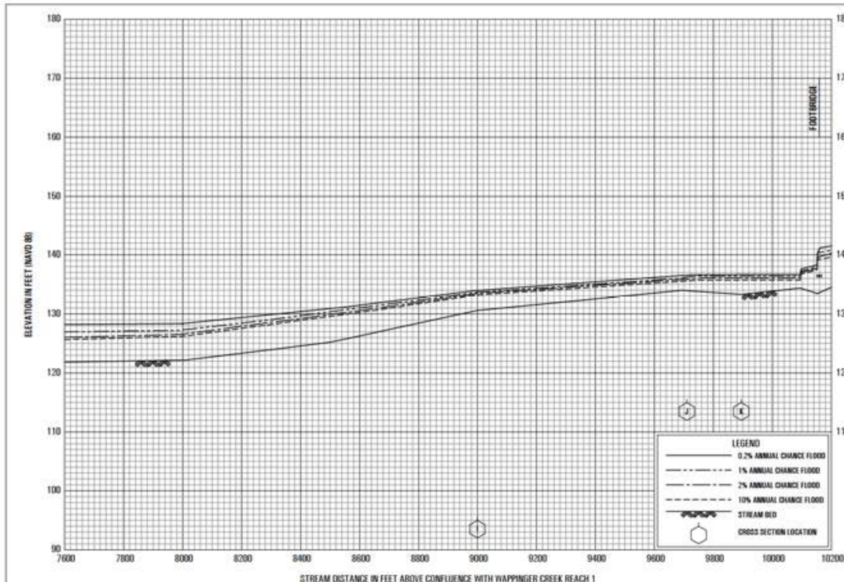
BRANCH 1 WAPPINGER CREEK REACH 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

DUTCHESS COUNTY, NY

(ALL JURISDICTIONS)

13P



FLOOD PROFILES

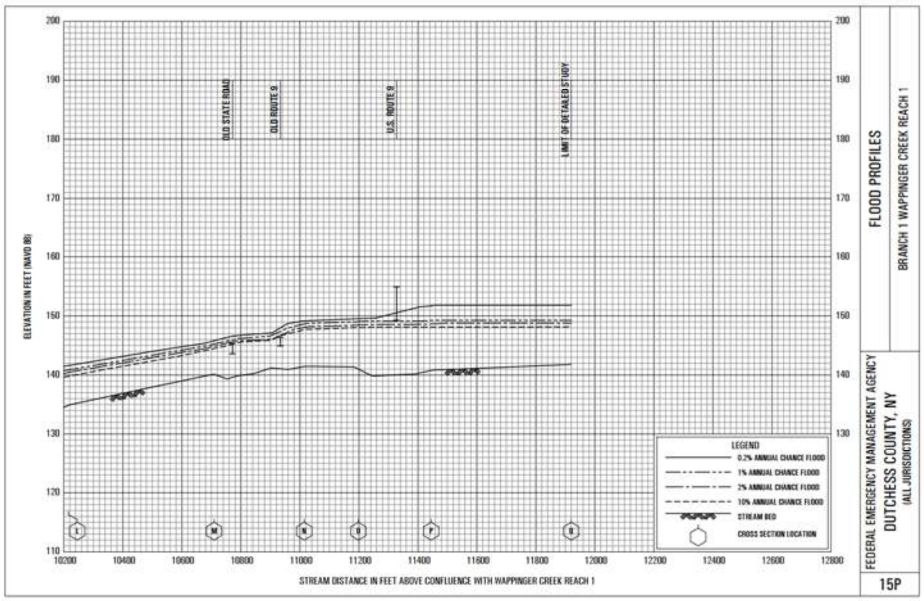
BRANCH 1 WAPPINGER CREEK REACH 1

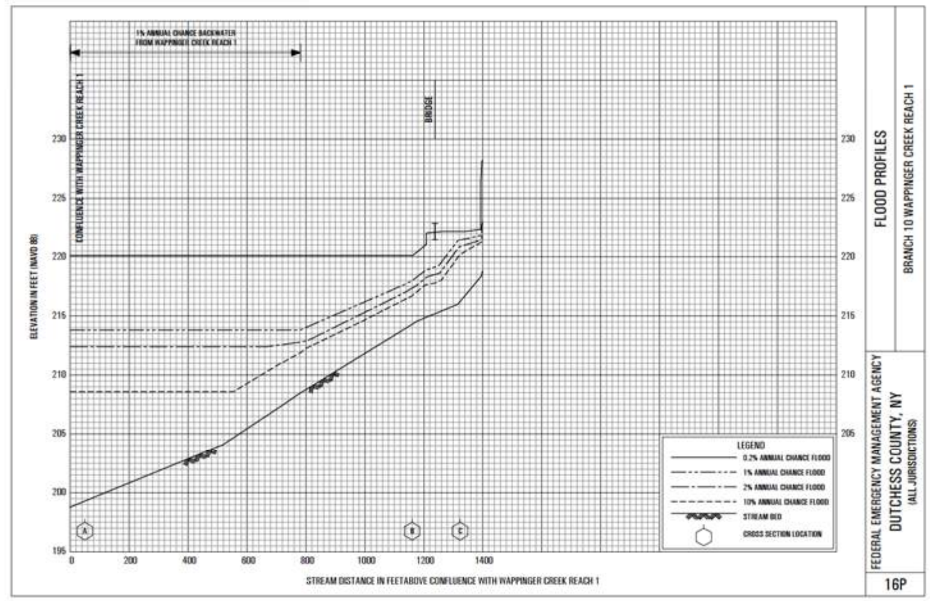
FEDERAL EMERGENCY MANAGEMENT AGENCY

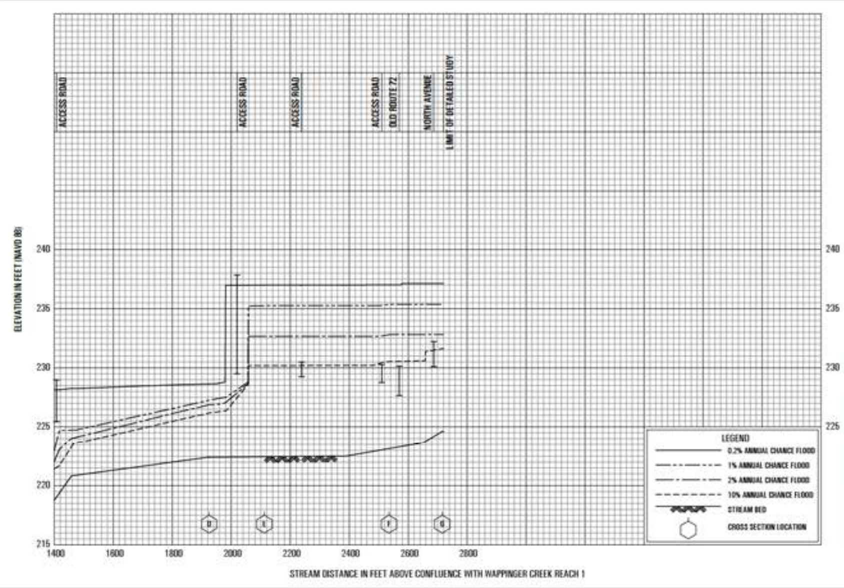
DUTCHESS COUNTY, NY

(ALL JURISDICTIONS)

14P


FLOOD PROFILES
BRANCH 1 WAPPINGER CREEK REACH 1
FEDERAL EMERGENCY MANAGEMENT AGENCY
DUTCHESS COUNTY, NY
(ALL JURISDICTIONS)
15P
ELEVATION IN FEET (NAVD 88)
STREAM DISTANCE IN FEET ABOVE CONFLUENCE WITH WAPPINGER CREEK REACH 1
OLD STATE ROAD
OLD ROUTE 9
U.S. ROUTE 9
LIMIT OF DETAILED STUDY
LEGEND
0.2% ANNUAL CHANCE FLOOD
1% ANNUAL CHANCE FLOOD
2% ANNUAL CHANCE FLOOD
10% ANNUAL CHANCE FLOOD
STREAM BED
CROSS SECTION LOCATION
110
120
130
140
150
160
170
180
190
200
10200
10400
10600
10800
11000
11200
11400
11600
11800
12000
12200
12400
12600
12800
L
M
N
O
P
Q

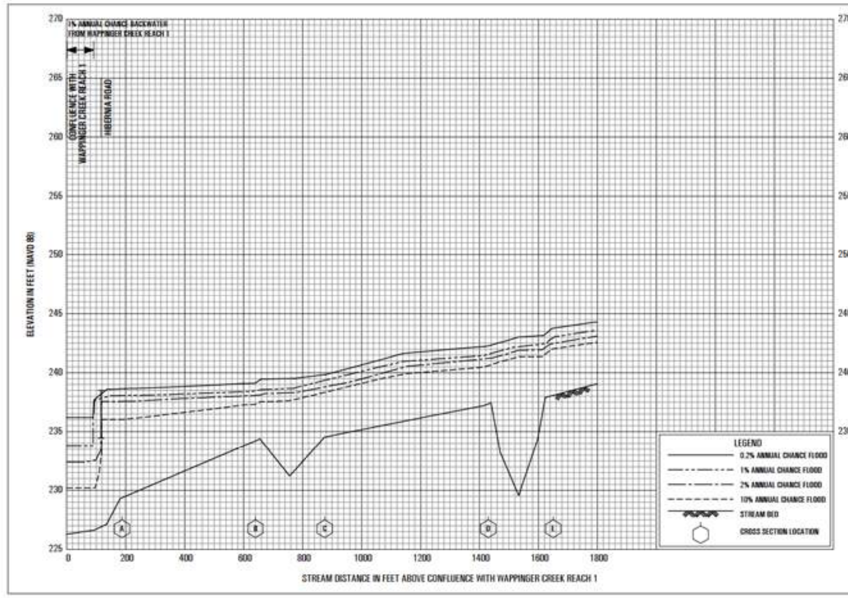

FLOOD PROFILES
BRANCH 10 WAPPINGER CREEK REACH 1
FEDERAL EMERGENCY MANAGEMENT AGENCY
DUTCHESS COUNTY, NY
(ALL JURISDICTIONS)
16P
ELEVATION IN FEET (NAVD 88)
STREAM DISTANCE IN FEETABOVE CONFLUENCE WITH WAPPINGER CREEK REACH 1
1% ANNUAL CHANCE BACKWATER FROM WAPPINGER CREEK REACH 1
CONFLUENCE WITH WAPPINGER CREEK REACH 1
BRIDGE
LEGEND
0.2% ANNUAL CHANCE FLOOD
1% ANNUAL CHANCE FLOOD
2% ANNUAL CHANCE FLOOD
10% ANNUAL CHANCE FLOOD
STREAM BED
CROSS SECTION LOCATION
195
200
205
210
215
220
225
230
0
200
400
600
800
1000
1200
1400
A
B
C



FEDERAL EMERGENCY MANAGEMENT AGENCY
DUTCHESS COUNTY, NY
(ALL JURISDICTIONS)

FLOOD PROFILES
BRANCH 10 WAPPINGER CREEK REACH 1

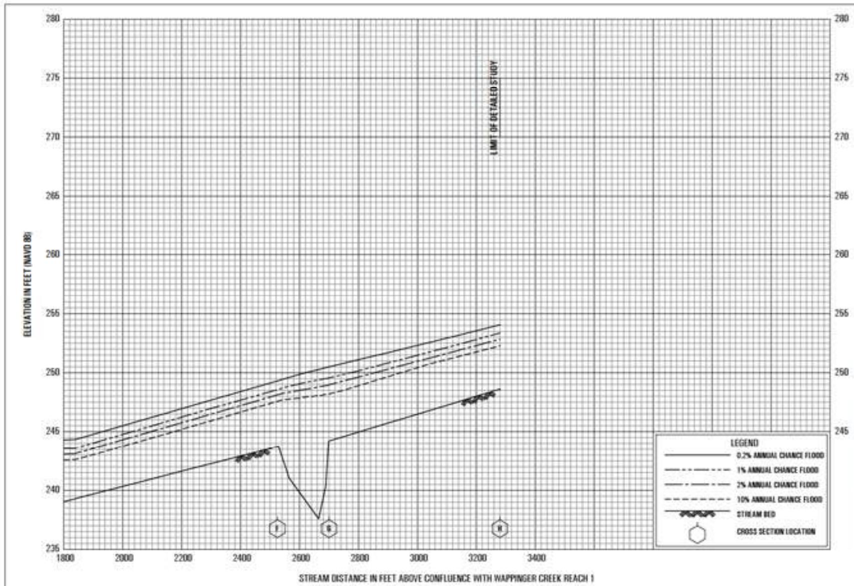
17P



FEDERAL EMERGENCY MANAGEMENT AGENCY
DUTCHESS COUNTY, NY
(ALL JURISDICTIONS)

FLOOD PROFILES
BRANCH 11 WAPPINGER CREEK REACH 1

18P



FLOOD PROFILES

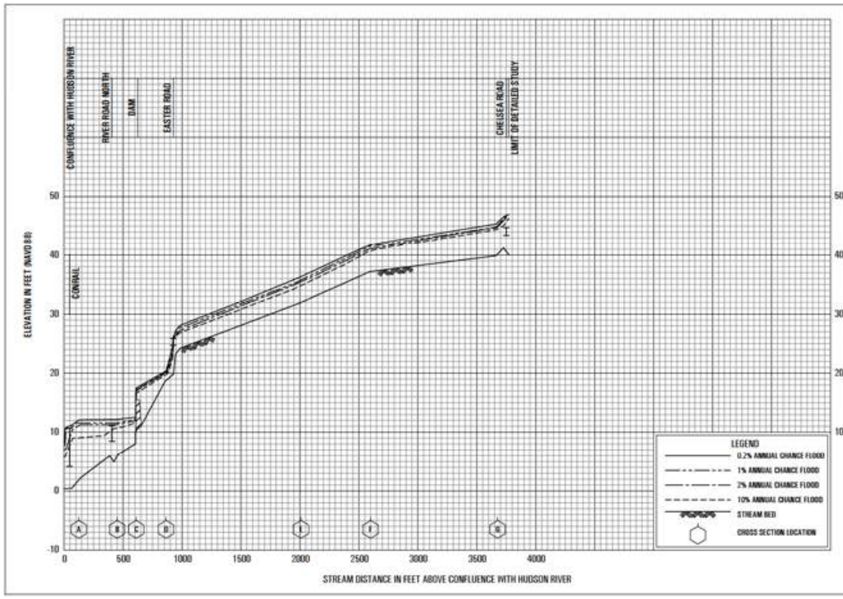
BRANCH 11 WAPPINGER CREEK REACH 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

DUTCHESS COUNTY, NY

(ALL JURISDICTIONS)

19P



FLOOD PROFILES

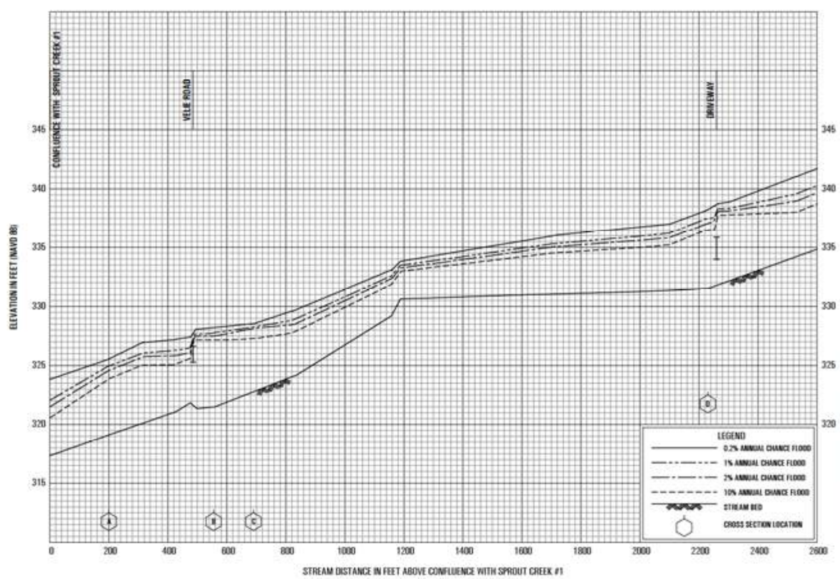
BRANCH 1A HUDSON RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

DUTCHESS COUNTY, NY

(ALL JURISDICTIONS)

20P



FLOOD PROFILES

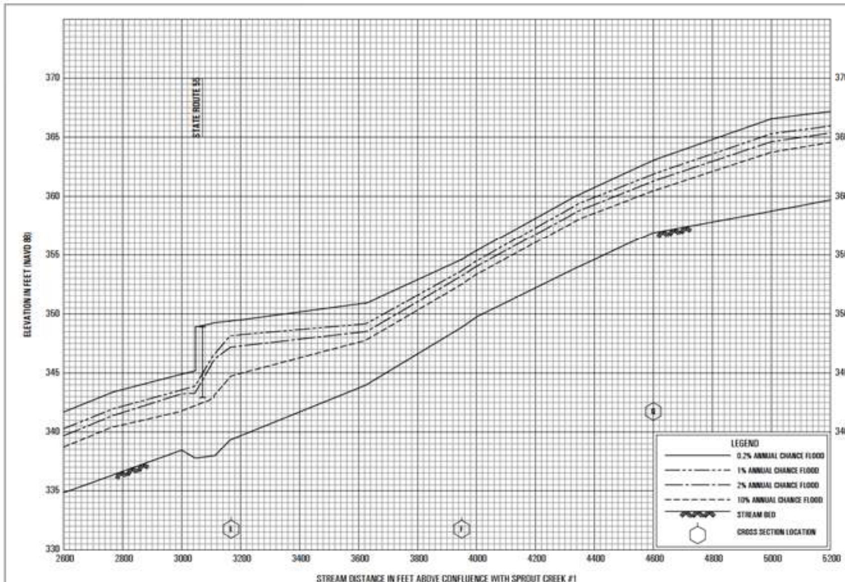
BRANCH 2 SPROUT CREEK #1

FEDERAL EMERGENCY MANAGEMENT AGENCY

DUTCHESS COUNTY, NY

(ALL JURISDICTIONS)

21P



FLOOD PROFILES

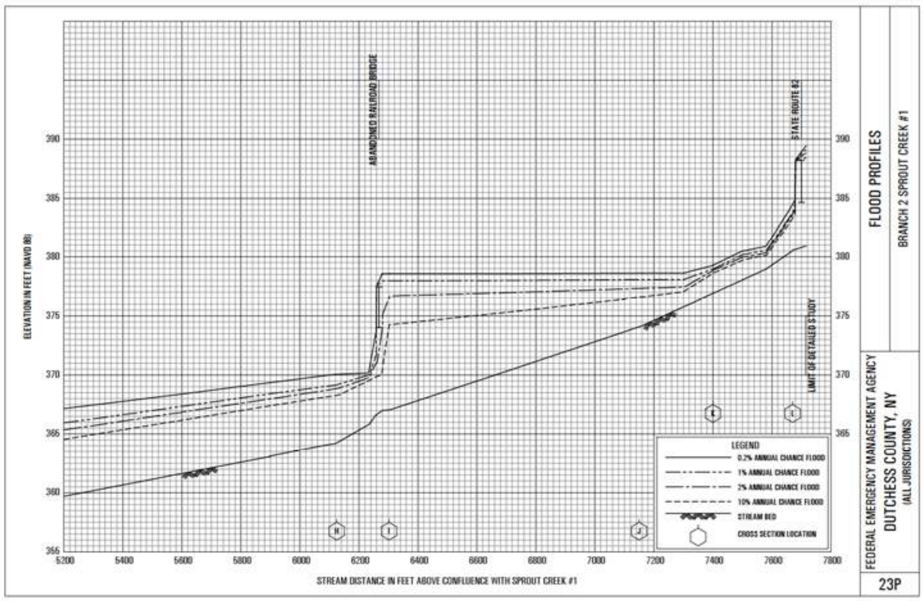
BRANCH 2 SPROUT CREEK #1

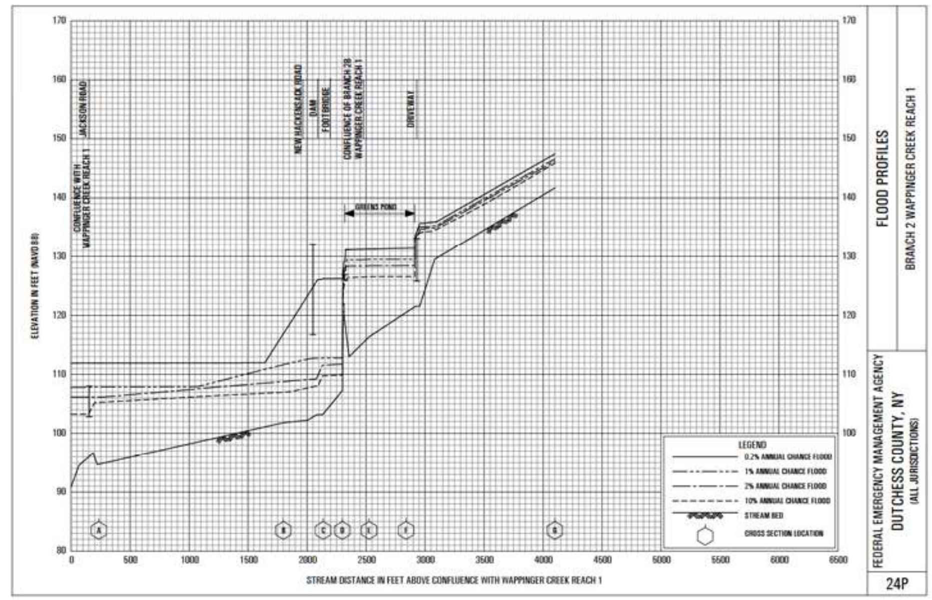
FEDERAL EMERGENCY MANAGEMENT AGENCY

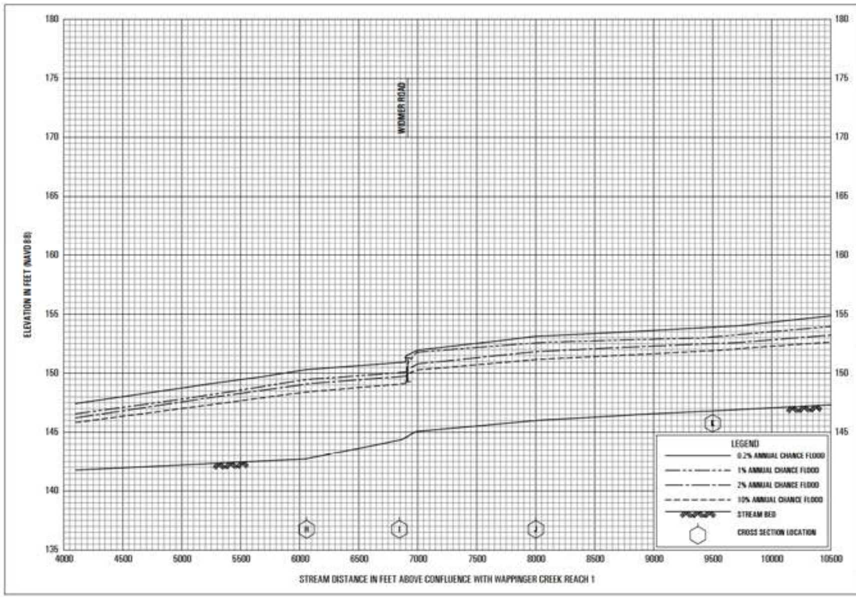
DUTCHESS COUNTY, NY

(ALL JURISDICTIONS)

22P


ABANDONED RAILROAD BRIDGE
STATE ROUTE 82
LIMIT OF DETAILED STUDY
ELEVATION IN FEET (NAVD 88)
STREAM DISTANCE IN FEET ABOVE CONFLUENCE WITH SPROUT CREEK #1
LEGEND
0.2% ANNUAL CHANCE FLOOD
1% ANNUAL CHANCE FLOOD
2% ANNUAL CHANCE FLOOD
10% ANNUAL CHANCE FLOOD
STREAM BED
CROSS SECTION LOCATION
FEDERAL EMERGENCY MANAGEMENT AGENCY
DUTCHESS COUNTY, NY
(ALL JURISDICTIONS)
FLOOD PROFILES
BRANCH 2 SPROUT CREEK #1
23P

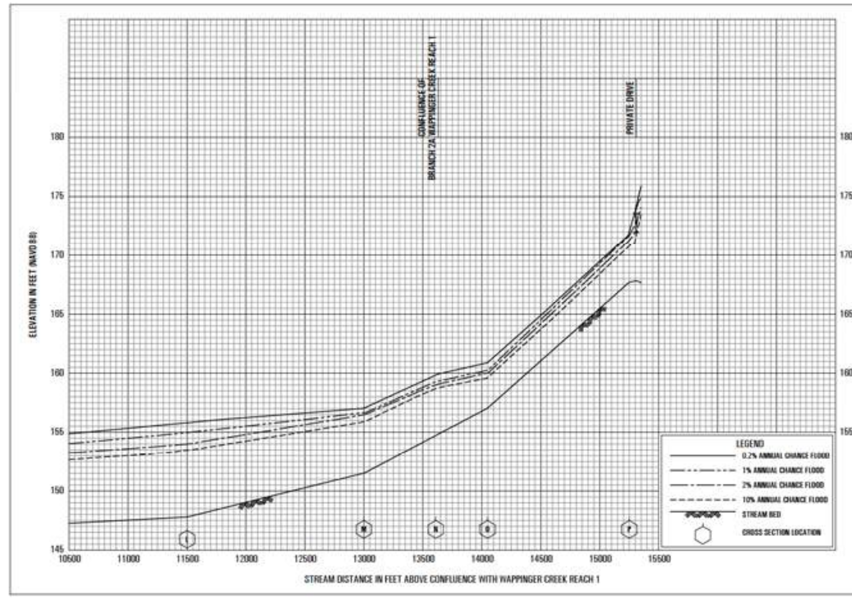

CONFLUENCE WITH WAPPINGER CREEK REACH 1
JACKSON ROAD
NEW HACKENSACK ROAD
DAM
FOOTBRIDGE
CONFLUENCE OF BRANCH 2B WAPPINGER CREEK REACH 1
DRIVEWAY
GREENS POND
ELEVATION IN FEET (NAVD 88)
STREAM DISTANCE IN FEET ABOVE CONFLUENCE WITH WAPPINGER CREEK REACH 1
LEGEND
0.2% ANNUAL CHANCE FLOOD
1% ANNUAL CHANCE FLOOD
2% ANNUAL CHANCE FLOOD
10% ANNUAL CHANCE FLOOD
STREAM BED
CROSS SECTION LOCATION
FEDERAL EMERGENCY MANAGEMENT AGENCY
DUTCHESS COUNTY, NY
(ALL JURISDICTIONS)
FLOOD PROFILES
BRANCH 2 WAPPINGER CREEK REACH 1
24P



FEDERAL EMERGENCY MANAGEMENT AGENCY
DUTCHESS COUNTY, NY
(ALL JURISDICTIONS)

FLOOD PROFILES
BRANCH 2 WAPPINGER CREEK REACH 1

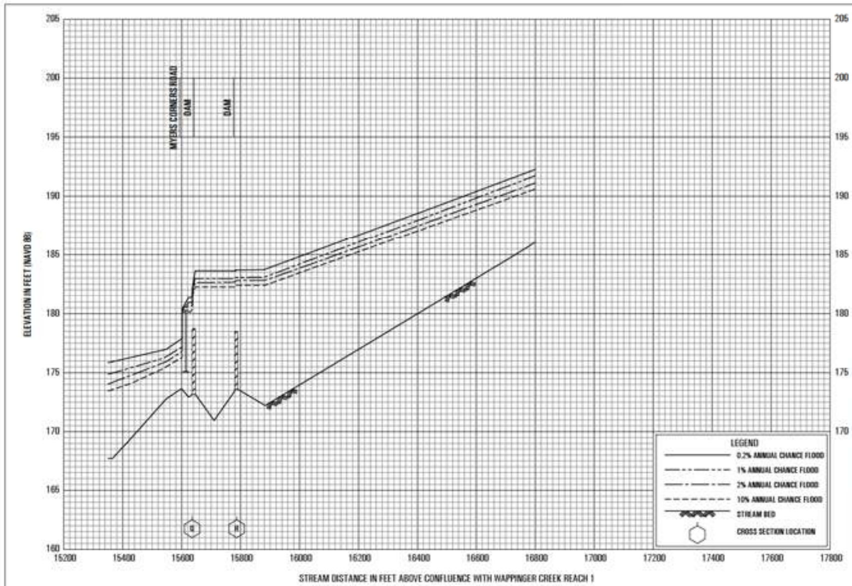
25P



FEDERAL EMERGENCY MANAGEMENT AGENCY
DUTCHESS COUNTY, NY
(ALL JURISDICTIONS)

FLOOD PROFILES
BRANCH 2 WAPPINGER CREEK REACH 1

26P



FLOOD PROFILES

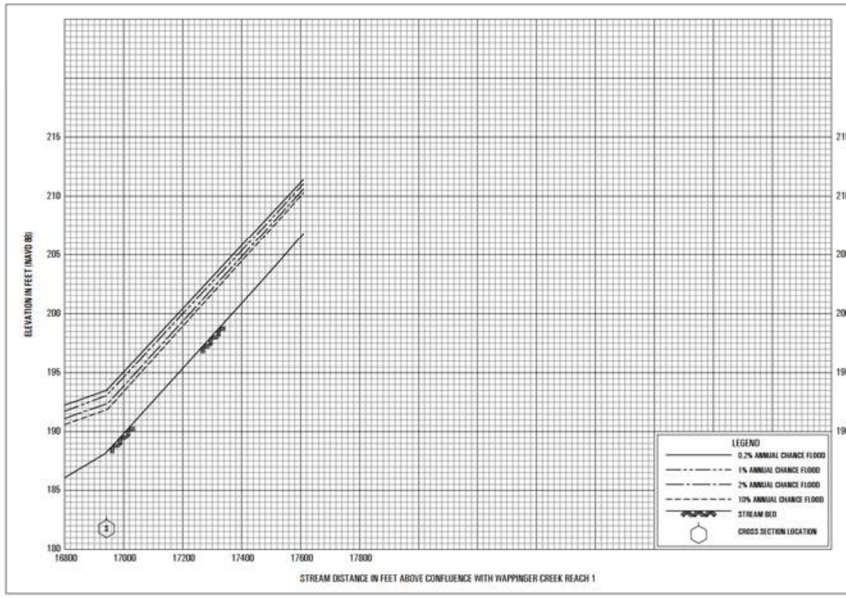
BRANCH 2 WAPPINGER CREEK REACH 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

DUTCHESS COUNTY, NY

(ALL JURISDICTIONS)

27P



FLOOD PROFILES

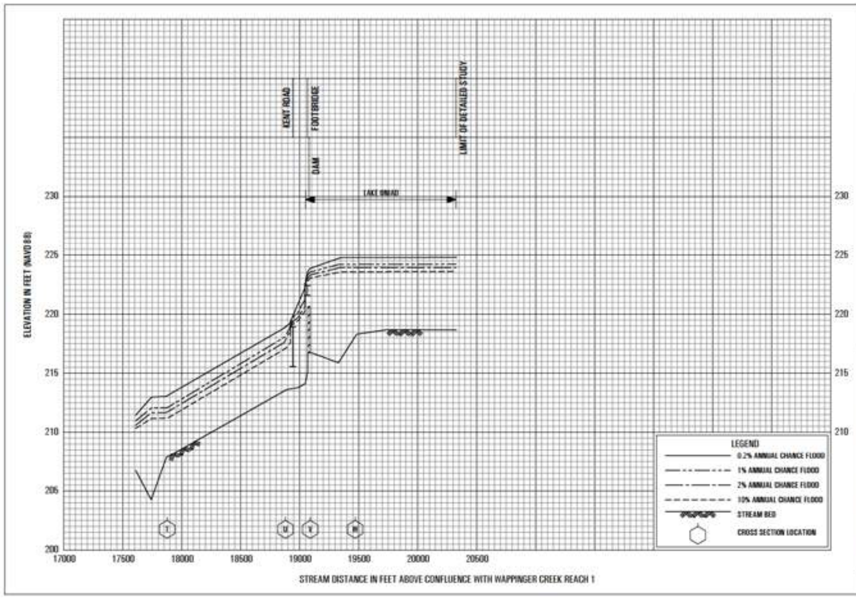
BRANCH 2 WAPPINGER CREEK REACH 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

DUTCHESS COUNTY, NY

(ALL JURISDICTIONS)

28P



FLOOD PROFILES

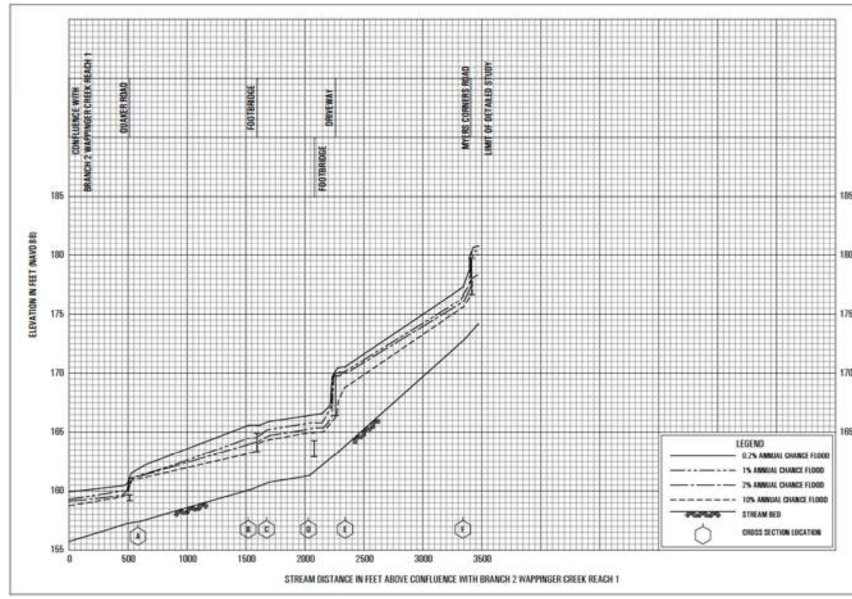
BRANCH 2 WAPPINGER CREEK REACH 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

DUTCHESS COUNTY, NY

(ALL JURISDICTIONS)

29P



FLOOD PROFILES

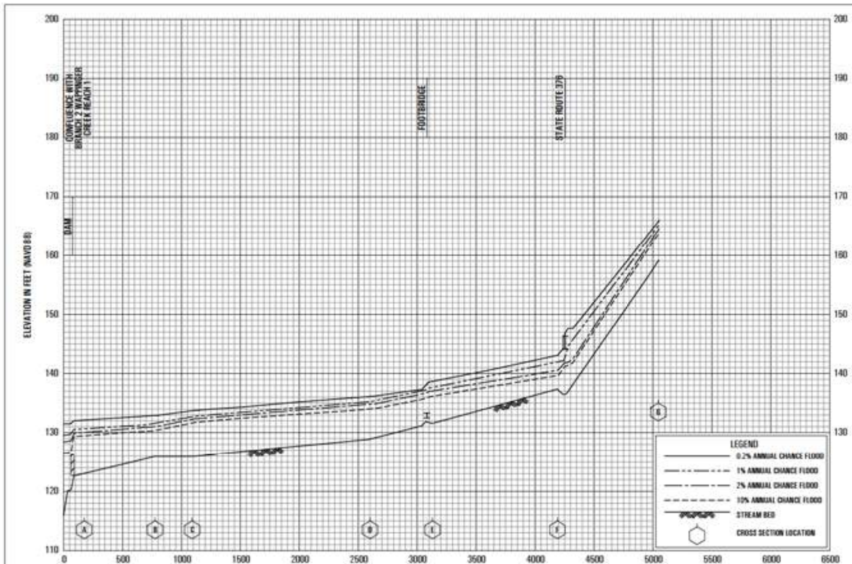
BRANCH 2A WAPPINGER CREEK REACH 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

DUTCHESS COUNTY, NY

(ALL JURISDICTIONS)

30P



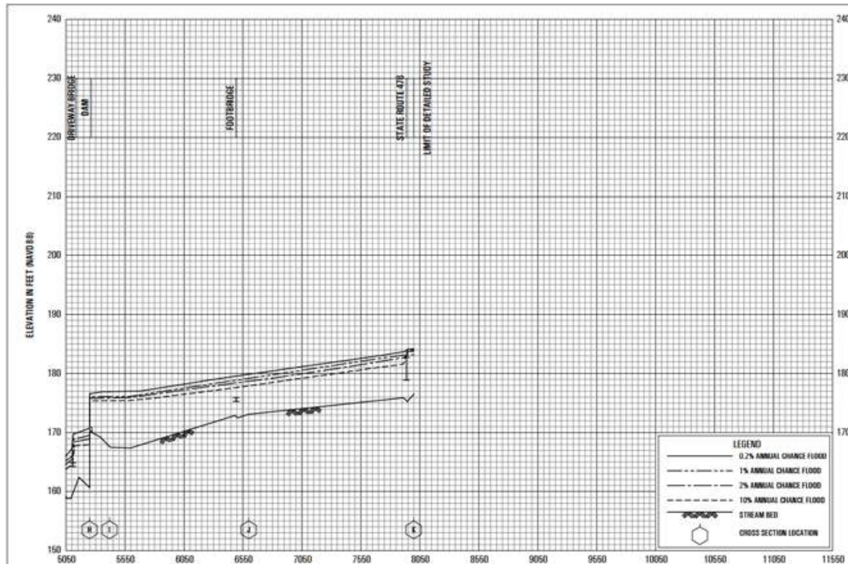
FLOOD PROFILES

BRANCH 2B WAPPINGER CREEK REACH 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

DUTCHESS COUNTY, NY (ALL JURISDICTIONS)

31P



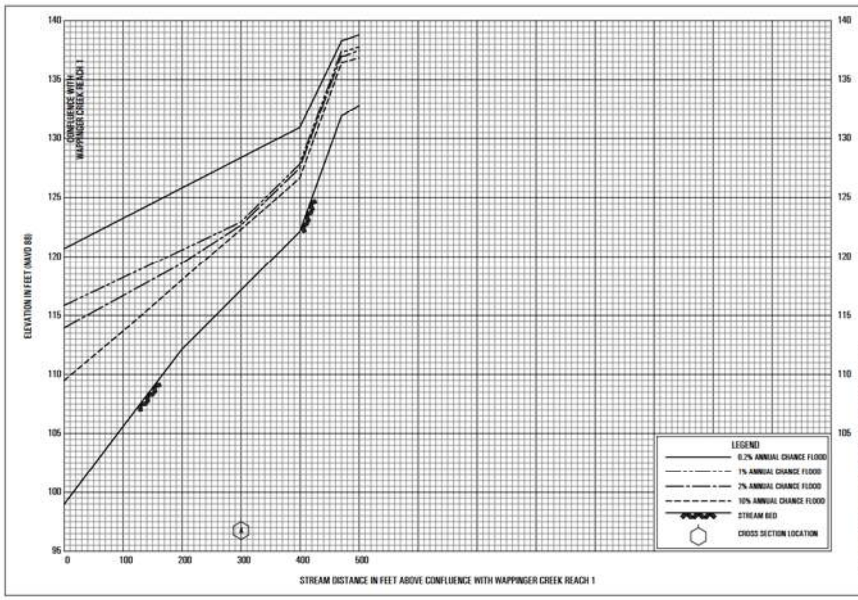
FLOOD PROFILES

BRANCH 2B WAPPINGER CREEK REACH 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

DUTCHESS COUNTY, NY (ALL JURISDICTIONS)

32P



FLOOD PROFILES

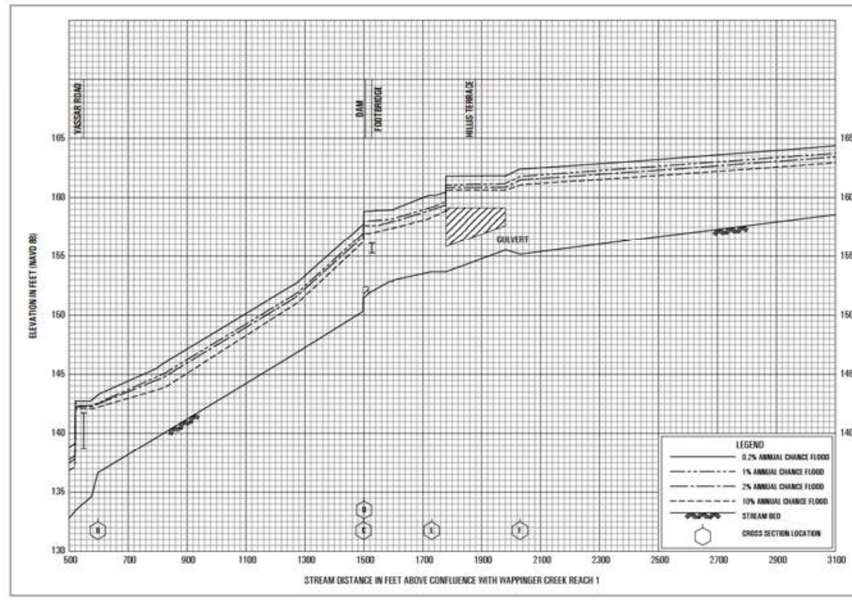
BRANCH 3 WAPPINGER CREEK REACH 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

DUTCHESS COUNTY, NY

(ALL JURISDICTIONS)

33P



FLOOD PROFILES

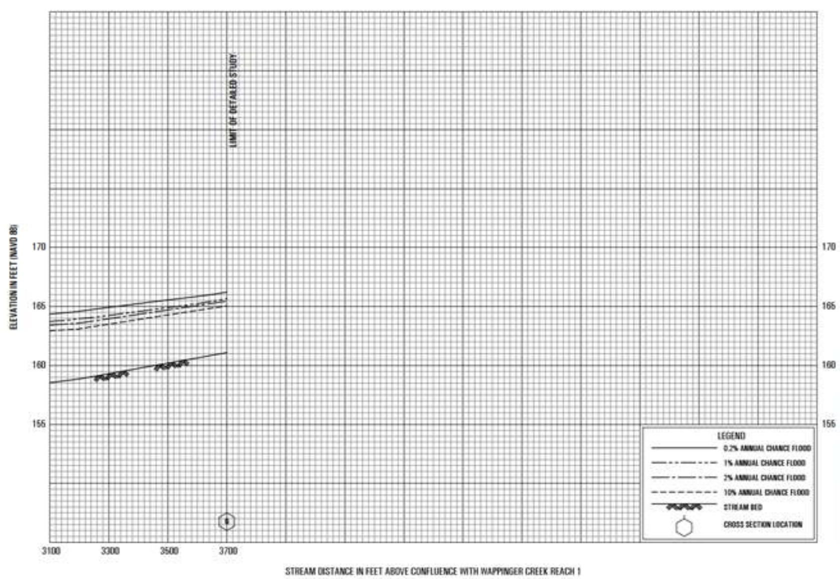
BRANCH 3 WAPPINGER CREEK REACH 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

DUTCHESS COUNTY, NY

(ALL JURISDICTIONS)

34P



FLOOD PROFILES

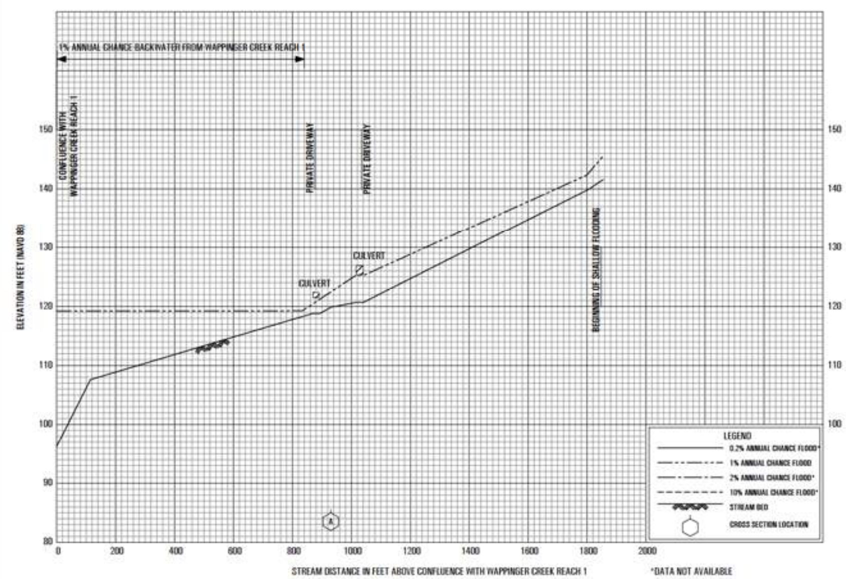
BRANCH 3 WAPPINGER CREEK REACH 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

DUTCHESS COUNTY, NY

(ALL JURISDICTIONS)

35P



FLOOD PROFILES

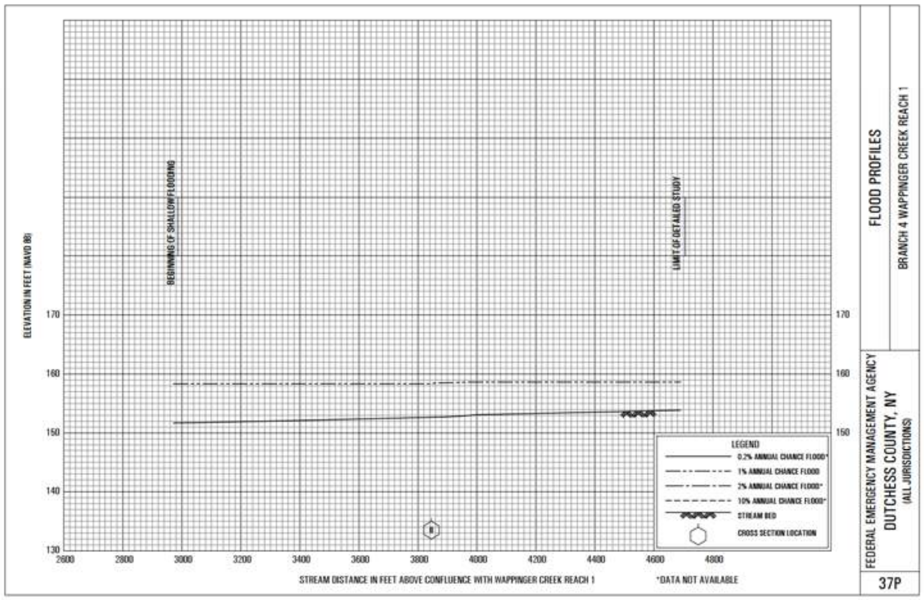
BRANCH 4 WAPPINGER CREEK REACH 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

DUTCHESS COUNTY, NY

(ALL JURISDICTIONS)

36P


ELEVATION IN FEET (NAVD 88)
BEGINNING OF SHALLOW FLOODING
LIMIT OF DETAILED STUDY
170
160
150
140
130
2600
2800
3000
3200
3400
3600
3800
4000
4200
4400
4600
4800
LEGEND
0.2% ANNUAL CHANCE FLOOD*
1% ANNUAL CHANCE FLOOD
2% ANNUAL CHANCE FLOOD*
10% ANNUAL CHANCE FLOOD*
STREAM BED
CROSS SECTION LOCATION
STREAM DISTANCE IN FEET ABOVE CONFLUENCE WITH WAPPINGER CREEK REACH 1
*DATA NOT AVAILABLE
FLOOD PROFILES
BRANCH 4 WAPPINGER CREEK REACH 1
FEDERAL EMERGENCY MANAGEMENT AGENCY
DUTCHESS COUNTY, NY
(ALL JURISDICTIONS)
37P