Storm Water Pollution Prevention Plans *(SWPPP)*

Project: Ashokan Station Trailhead
Project Type: Parking Lot Construction
Town of Olive
Ulster County
Date: April 2019

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I. Introduction

A stormwater management assessment has been conducted for the proposed project in order to reduce potential adverse impacts of stormwater runoff during construction and post construction. This report is being used to aid in the development of the Stormwater Management Plan to be included in the project's contract documents and to ensure conformance with the New York State Department of Environmental Conservation (NYSDEC) State Pollution Discharge Elimination System (SPDES) General Permit for Stormwater Discharges from Construction Activity Permit No. GP-0-15-002 (attached in Appendix E, from this point forward referred to as SPDES Permit). The project is located within the West of Hudson New York City water supply system. More specifically, the project is located within the drainage basin of the Ashokan Reservoir and as such, the project will also have to be prepared in accordance with the NYCDEP *Rules and Regulations for the Protection from Contamination, Degradation and Pollution of the New York City Water Supply and Its Sources* (from this point forward referred to as the *Watershed Regulations*). The project type is a parking lot construction and is listed in Table 2 of Appendix B of the SPDES Permit and disturbs more than one acre. Project types listed in Table 2 of Appendix B of the SPDES Permit require the preparation of a Stormwater Pollution Prevention Plan (SWPPP) that includes both an erosion and sediment control plan and post-construction stormwater management practices.

As mentioned above, the project is a regulated activity (#10 - Construction of an impervious surface, Section 18-14 of the *Watershed Regulations*) and does require review by the NYCDEP. Section 18-39 Part (b)(3) lists activities requiring SWPPP approval by the NYCDEP. Part (i) of this section requires plans for development or sale of land that will result in the disturbance of five (5) or more acres of total land area for which a stormwater pollution prevention plan must be prepared. Although the construction of the Ashokan Station Trailhead does not itself propose to disturb more than 5 acres, the entire length of the Ashokan Rail Trail will result in the disturbance of more than 5 acres and as such preparation of a SWPPP in accordance with the *Watershed Regulations* is also required.

This SWPPP has been developed in accordance with the SPDES Permit. The SWPPP and accompanying plans/details identify temporary erosion control measures, post-construction stormwater management, pollution prevention measures and inspection requirements for the duration of construction from initial disturbances to final stabilization (as defined in the SPDES Permit). This SWPPP must be implemented at the start of construction.

Limited ROW and space within the project site while providing ample parking necessary to accommodate anticipated volume of users of the Ashokan Rail Trail introduced many challenges in meeting the stormwater requirements. Existing soil conditions, and the need to discharge downhill of the existing railbed added to these challenges. The entire site within the property boundary has been considered in determining the feasibility of siting stormwater management practices (SMP). All useable area outside the paved parking area has been utilized to its fullest extent to overcome these challenges. It is the intent of this document to describe stormwater management practices utilized as part of the paved trailhead construction in meeting the stormwater requirements as stated in the SPDES Permit. Technical requirements in meeting the stormwater requirements of the SPDES Permit are contained in the New York State Stormwater Management Design

Manual (from this point forward referred as the NYSSMDM). It is also the intent of this document to describe the sediment and erosion control measures being utilized during construction to reduce/minimize impacts associated with the movement of sediment from the project location. The erosion and sediment control part (both permanent and temporary practices) of the plan has been designed from standards set forth in the New York State Standards and Specifications for Erosion and Sediment Control (November 2016), referred to from this point forward as the Blue Book.

The five step process outlined in Chapter 3 of the NYSSMDM has been followed to ensure conformance with the SPDES Permit. The five step process is as outlined below:
1.Site planning to minimize disturbed areas and impervious areas
–Preservation of Undisturbed Areas – All areas south of the Ashokan Rail Trail will be left undisturbed to avoid clearing undisturbed downhill forested areas. Native soils will be left in an undisturbed condition allowing the natural flow paths to be maintained maximizing the potential benefits and storage capacity from minor undulations in the surrounding terrain.
-Preservation of Buffers – NYSDEC mapped stream identified as a tributary to the Ashokan Reservoir (Waters Index Number H-171-P 848-10) is in close proximity to the project and is located just to the west of the project limits. The NYSDEC protected stream is Class A with A(t) standards. The stream is routed under NYS Route 28 via a concrete culvert flowing south then turning east south of the Ashokan Rail Trail adjacent to the proposed Ashokan Station Trailhead. Existing wooded buffer between the Ashokan Rail Trail and the stream will be maintained in its existing condition to maintain naturally vegetated buffer on its uphill border. The NYCDEP owns lands beyond the limits of disturbance to the Ashokan Reservoir and will be protected in perpetuity for the protection of the drinking water supply. Any work in the stream requires a Stream Disturbance Permit from the NYSDEC.
-Reduction of Clearing and Grading – Minimum parking lot widths were utilized in the parking layout in accordance with design standards. Minimum lane widths and a one way entrance /exit are proposed to reduce impervious surfaces/limits of clearing and grading necessary to maintain traffic flow into and out of the trailhead parking area.
-Locating Development in Less Sensitive Areas – Proposed location of the Ashokan Station Trailhead is located between the abandoned rail bed to the south and NYS Route 28 to the north. The eastern and western limits are two existing heavily compacted utility roads consisting mainly of gravel. Both roads show evidence of heavy use. The gore area contained within is grassed and sparsely wooded and also shows signs of continued use for storage purposes varying in nature. Until recently a building occupied the site. Due to its recent and continued uses, it is obvious the current proposed location is ideal location as far as sensitivity is concerned.
-Soil Restoration – Due to repeated and prolonged use of the area for storage and access to the abandoned rail bed, the site is heavily compacted and the soils natural ability to allow infiltration at the surface has been reduced. Proposed pervious areas surrounding the paved Ashokan Station Trailhead will undergo soil restoration in varying degrees. The proposed bioretention practice location will undergo soil restoration during its construction by the excavation of its heavily compacted upper horizons and the installation of engineered filter media designed to promote and sustain a robust vegetative growth while also being permeable enough to allow runoff to filter down through its media. Other pervious areas surrounding the paved lot will undergo soil restoration in accordance with Table 5.3 of the NYSSMDM.

2. Calculation of the WQv for the drainage area - As mentioned above, the construction

of trailhead parking includes reconstruction of an existing gravel driveway for NYCDEP personnel and the construction of additional impervious for trailhead parking. Gravel surfaces are not by definition considered impervious by NYCDEP *Watershed Regulations,* and therefore, is not in itself a regulated activity. All new impervious associated with the paved parking area are routed to standard stormwater management practices, including a wet swale, a bioretention practice, and a shallow wetland pond. 100% of the WQv from all impervious surfaces draining to the stormwater management area will be treated with standard practices. This includes all additional impervious areas created from the construction of the paved parking area. The WQv was calculated in accordance with Section 4.2 of the NYSSMDM. As mentioned previously, the project is located within the drainage basin of the Ashokan Reservoir. The Ashokan Reservoir is a terminal reservoir as defined in the NYCDEP *Watershed Regulations.* The proposed activity can be classified as an activity listed in Section 18-39(b)(3)(i) of the Watershed Regulations. The construction of the Ashokan Station Trailhead would be considered part of a larger common plan of development as defined in Appendix A of the General Permit due to the inextricable link to the construction of the Ashokan Rail Trail. Although the construction of the Ashokan Station Trailhead results in the disturbance of less than 2 acres (approximately 1.5 acres), construction of the Ashokan Rail Trail exceeds the 5 acres threshold. Additional requirements for projects proposed in the drainage basin of a terminal reservoir are listed in Section 18-39(c) of the *Watershed Regulations*. Pursuant to this section of the *Watershed Regulations*, all SWPPP's prepared shall include measures to capture and treat the volume of runoff generated by the 1-year, 24 hour storm event.

3. Runoff Reduction by applying Green Infrastructure (GI) techniques and standard stormwater management practices with Runoff Reduction (RRv) capacity – As site constraints limit the ability to reduce 100% of the WQv through runoff reduction techniques, a reduction of runoff from a percentage of the new impervious area constructed as part of the project using standard SMP's with RRv capacity (bioretention). The entire project corridor was analyzed and all useable areas of the site for standard SMP's with RRv capacity have been utilized. Practices have been dispersed uniformly throughout the site to maximize the potential improvement provided by the water quality treatment practices.

4. Apply standard or alternative stormwater management practices to address remaining WQv – The bioretention pond and vegetated swale will contribute to the RRv. As only a percentage of the WQv provided by the practice can be applied to RRv for each practice, the remaining percentage of the WQv provided by the practice has been applied to meeting the WQv. A wet swale and shallow wetland pond are also proposed to provide water quality treatment.

5. Apply Volume and Peak Rate Control Practices - SMP's have been sized following *Section 9.3.2 Sizing Criteria* of the NYSSMDM. As mentioned above, the existing site is heavily compacted so the resulting increase in CN value from pre-developed to post-developed is not substantially higher. The CN value is increased a modest amount and the resulting increase in runoff rates/runoff volumes will be mitigated for by a shallow wetland practice. It is the intent of this report to document that runoff from the increase in impervious created is detained for the Channel Protection Volume (CPv, 1-year storm event) and attenuation for peak flows associated with the Overbank Flood Control (Qp, 10-year storm event) and the Extreme Flood Control (Qf, 100-year storm event) from increased runoff created by increasing the overall CN of the project site.

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A Notice Of Intent (NOI) will be submitted to the New York State Department of Environmental Conservation (NYSDEC). It is anticipated that coverage under the SPDES General Permit will be begin five (5) business days from the date the NYSDEC receives a complete NOI.

The project was designed in accordance with the *Watershed Regulations*. Due to the project location within the basin of a terminal reservoir (and the impervious surface covers more than 20% of the drainage area to proposed stormwater management practices), two stormwater practices in series are required unless the practice is an infiltration practice or the project location is within a village, hamlet, village extension or area zoned for commercial or industrial uses. Bioretention practices are filtration practices sometimes utilizing infiltration from the bottom of the practices. The analysis does not credit losses from infiltration that may occur due to site conditions and therefore the practice (for the sake of analysis) is purely a filtration practice. The project location is not within a village, hamlet, village extension or area zoned for commercial or industrial uses. The project proposes the use of two stormwater management practices (bioretention basin and shallow wetland) in series to adhere to this requirement.

The completed NOI and Acknowledgement of NOI from the NYSDEC will be attached in Appendix F and will become part of the SWPPP.

(1) *Scope of the Project:* The proposed project consists of the construction of the Ashokan Station Trailhead consisting of one way entry and exit with approximately 55 parking spots (see location maps in Appendix A). Post-construction stormwater management practices are also being constructed to control the quality and rate of runoff from the project location. The Ashokan Station Trailhead was included in the environmental review for the Ashokan Rail Trail project. Ulster County Legislature acting as the lead agency, has made a Determination of Non-Significance. Appropriate documentation has been prepared to fulfill the requirements of National Environmental Policy Act (NEPA) and the State Environmental Quality Review Act (SEQRA). The Notice of Determination and supporting documents are available as separate documents and should be considered an integral component of the background information to be included as part of the SWPPP. This information should be kept on site as part of the SWPPP during construction.

(2) *Location of Project:* This project involves the construction of a paved trailhead on the south side of NYS Route 28 at the intersection of Mountain Road (County Route 44) in the Town of Olive, Ulster County, New York. The project is within the drainage basin of the Ashokan Reservoir, a watershed area for the New York City water supply. Although the project location does not directly discharge (as defined in the SPDES Permit) into the Ashokan Reservoir, this waterbody is on the list of 303 (d) segments contained in Appendix E of the SPDES Permit. The project location is not located within a watershed area listed in Appendix C, Watersheds Where Enhanced Phosphorous Removal Standards are Required, of the SPDES Permit. As mentioned above, the project is not located in a village, hamlet, village extension or area zoned for commercial or industrial uses.

The project location is not within a mapped FEMA floodplain. FEMA Flood Insurance Rate Map of the area is included in Appendix A.

Table 1 below provides the coordinates at the approximate center of the project. Coordinates of three different coordinates systems are provided as in indicated in the NYCDEP *Applicant's Guide for Stormwater Pollution Prevention Plans*. Project location maps are shown in Figures 1 and 2 and included in Appendix A.

Table 1 - Location Table

Approximate Coordinate Position At:				
		Western Limits	Center	Eastern Limits
UTM Zone 18	Easting	566380	566454	566536
	Northing	4647265	4647300	4647344
SP	Easting	574038	574312	574536
	Northing	1144424	1144560	1144664
Longitude		-74.199	-74.198	-74.197
Latitude		41.975	41.975	41.975

(3) *Project Type and Size:* As mentioned in the Introduction, the project type is listed in Table 2 of Appendix B in the SPDES Permit. The project is a parking lot construction project. The approximate total soil disturbance area for the construction of the paved parking area is 1.5 acres. The new impervious area within the disturbed area is 0.60 acres.

(4) *Permit Requirements:* The following permits will be required for the construction of the Ashokan Station Trailhead:

a) NYSDEC SPDES General Permit for Stormwater Discharges from Construction Activity Permit No GP-0-15-002
b) NYCDEP approval of a Stormwater Pollution Prevention Plan
c) NYSDOT Highway Work Permit
d) NYSDEC Protection of Waters Stream Disturbance Permit
e) Army Corps of Engineers Nationwide Permit

(5) *Consultation with the NYS Office of Parks, Recreation and Historic Preservation:* Construction activities that have the potential to affect an historic property, unless there is documentation that such impacts have been resolved, are not eligible for coverage under the SPDES Permit. The Ashokan Station Trailhead parking lot was included in the SEQR review performed for the Ashokan Rail Trail. During preliminary design phase of the Ashokan Rail Trail, a State Historic Preservation Office (SHPO) Cultural Resource Information System query was submitted. A letter was received on October 3, 2016 stating that the proposed project will have No Adverse Impact upon the historic Ulster and Delaware Railroad Corridor provided that certain conditions listed in the letter were met. This letter is included in the supporting documents for the Notice of Determination as part of the environmental review in Appendix F.

II. Project Maps and Plans

(1) *Location Map*: Project location maps of the area are located in Appendix A.

(2) *Contract Plans:* A complete set of construction drawings (Contract plans) and specifications (NYSDOT Standard Specifications) are available as separate documents, and should be considered an integral component of the SWPPP.

(3) *Description of Existing Site Conditions*: The visual environment along NYS Route 28 east and west of the project location is a mixed residential and commercial area. The Ashokan Station Trailhead abuts the abandoned railway at the Project location. To the south of the abandoned railway between the Ashokan Reservoir and project location, mature and mid-successional forests consisting of deciduous and non-deciduous vegetation exists.

The project site generally drains from north to the south. As mentioned above the project is bounded to the west by a tributary to the Ashokan Reservoir that is a NYSDEC mapped stream Class A with A(t) standards. Just east of the gravel parking on the eastern limits of the project site there is a depression collecting roadway runoff that routes stormwater across the abandoned railway via a 15” SICPP. These two features on its eastern and western border isolate the project site hydrologically.

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III. Project Soils

(1) A Soil Map of the project corridor can be found in Appendix C. Delineations of different soil types encountered within the project limits was obtained from the Web Soil Survey through the National Resource Conservation Service (NRCS).

Table 2 below includes a brief summary of pertinent information for on-site soils indicated on the NRCS website.

Table 2 – Project Soils

Soils Map Unit Symbol/Name	% Slope Range	Hydrologic Soil Group (HSG)	Texture	% within disturbed area	Whole Soil K factor
VAB – Valois	Gently sloping	B	Very bouldery soils, surface texture rating was moderately decomposed plant material	80	
CgA - Castile	0 to 3 percent slopes	A/D	Gravelly silt loam	20	0.17

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors in the Universal Soil Loss Equation (USLE) and the Revised Universal Soil Loss Equation (RUSLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter and on soil structure and saturated hydraulic conductivity. Values range from 0.02 to 0.69. Other factors being equal, the higher the value, the more susceptible the soil is to sheet and rill erosion by water.

Soil samples were collected at locations of proposed stormwater management practices at varying depths including two to three feet below the bottom of the practices. Samples were processed in accordance with ASTM C 136 and ASTM C 117 to determine the Unified Soil Classification textures near the proposed bottom of the practices and the results are included in Appendix C. Seeps were noticed at varying depths at different locations. Streaking of soils as sometimes displayed in locations that have highly fluctuating water tables was not evident. The moisture content of the samples collected were also tested and results indicate they were typical for on-site unsaturated soils.

Soil testing was performed with NYCDEP for witness and verification. During this testing, it was confirmed that there was a high water table present in the project area, especially to the area west of the parking lot. The high water table presented the opportunity for wet stormwater practices in the area. However, for filtering practices in the area, an impermeable liner at the bottom of the practice was required to allow for the required 2 foot separation from the water table. The soil tests revealed the soil profiles of the test pits to be primarily made up of silts and sands. Seeps in the soil profile were also observed. Subsurface drains are proposed under the proposed parking area to ensure longevity and reduce future maintenance on the pavement surface.

Underdrains are also proposed to aid in draining the Bioretention Basin. Infiltration from the bottom of the Bioretention Basin will not be factored into the runoff reduction requirements, hence, infiltration rates of the existing soils are not relevant.

IV. Construction Phasing

(1) *Sequence of Construction Activities:* The Contractor shall follow the proposed plan of erosion and sediment control and water pollution control. Any changes to the approved plan shall be submitted to the DEP for review after the Engineer has accepted it. The Contractor shall modify the sequence of construction operations to match their intended schedule. The plan shall include a construction/progress schedule showing the order in which the Contractor proposes to carry on the work, the date on which the work will start, the major items of work (earth work, excavation, stripping, embankment, fill, grading and other operations that create soil disturbance), the critical features and the completion dates for each task. No related work shall be started until the erosion and sediment control plans and progress schedule have been approved by the Engineer. As conditions change during construction or work is not progressed in accordance with the schedule, the Contractor shall regularly submit a progress schedule update in accordance with Section 108-01 *Progress Schedule* and an updated erosion and sedimentation control plan, as necessary, for approval by the Engineer.

The Contractor's work schedule and methods shall be consistent with the SWPPP or amended SWPPP. Once approved, the progress schedule shall become a part of the SWPPP. After initial disturbances commenced, construction operations should progress diligently until final stabilization is achieved. The most effective way to minimize erosion is to limit the amount of exposed soil at any given time.

Please note that any changes to the approved SWPPP shall be submitted to the NYCDEP for review after the Engineer has accepted it and prior to construction.

Due to limited space at the project location and sensitive nature of the lands surrounding the project impact area, the Contract plans do not provide for areas for equipment staging, storage and stockpile areas to be used for the construction of the Ashokan Station Trailhead parking. The Contractor will more than likely have to use one of the other staging areas along the Ashokan Rail Trail corridor for stockpiles and storage of materials as the project area is too constricted between the existing rail bed and NYS Route 28 to store and stockpile materials and continuously work the site to a stabilized condition. If the Contractor secures locations abutting the right of way within the contract limits, or that have significant impacts, the Contractor must arrange for permit coverage for these areas through the landowner (the landowner must sign the NOI, Section 107-08 *Protection and Restoration of Property and Landscape*). If the impacts to the site are considered temporary, the required SWPPP will likely only include the Erosion and Sediment Control Plan for the site. The Contractor should provide a copy of the NOI submitted by the Contractor to the NYSDEC and any other permits required. The Engineer should receive a grading plan and ensure that areas have been stabilized upon contract completion.

The following list outlines a general sequence of construction activities:

1. Prior to beginning work, the Contractor, all subcontractors performing soil disturbing activities (including construction of stormwater management practices, installation of temporary erosion and sediment control measures and any subcontractors performing temporary and permanent stabilization) E.I.C., all individuals performing construction inspection (including individuals performing

weekly SPDES inspections), the County and NYCDEP personnel will have a pre-construction meeting to discuss permit requirements. Important natural resources in the area and the sensitive nature of performing earth disturbing activities within the NYC Watershed will be discussed. The maintenance of the temporary erosion and control measures to protect adjacent resources in accordance with all environmental permits will also be discussed. The role and responsibility of all parties involved will be clearly outlined in order to protect these resources.

2. Construction sequencing outlined below and listed in the Contract plans indicate the intended sequence of construction activities in order to minimize the amount of disturbed area at any given time. The order of construction activities should be progressed by the Contractor in a similar fashion. The Contractor shall submit to the Engineer for approval any changes to the proposed plan of erosion and sediment control to match their intended schedule showing the order in which the Contractor proposes to carry on their work, the date on which the work will start, the major items of work, the critical features and the completion date for each task. No related work shall begin until the erosion and sediment control has been approved by the Engineer and by the DEP. As conditions change during construction or work is not progressed in accordance with the schedule, the Contractor shall regularly submit a progress schedule update and an updated erosion and sediment control plan.
3. Install perimeter sediment control measures along with temporary construction fencing shown on in the Contract plans. Install stabilized construction entrances/exits to/from the project location from NYS Route 28.
4. Excavate Bioretention Basin to approximate finished grade elevation without installing planting soil and underdrain. Temporarily stabilize the bioretention basin. Install DS 1-2 and outlet pipe. Install sediment filter log at outlet of end section. Install outlet control structure with temporary outlet configuration.
5. Install DS 1-1 in accordance with Contract plans. Install stone check dam at outlet of DS 1-1 across entire flow path of basin.
6. Excavate shallow wetland and wet swale areas to approximate finished grade. Install DS 1-3 and storm drain to stream. Temporarily stabilize shallow wetland and wet swale. Construct slopes from Bioretention Basin to adjacent Ashokan Rail Trail and permanently stabilize slopes between the bioretention on one side of the concrete paths and the land on the other side of the paths and trail in accordance with Contract plans.
7. Excavate for and install subbase for Ashokan Station Trailhead and excavate for and install underdrain UD-3 and UD-4.
8. Install sewer manhole and sanitary sewer pipe. Install electrical conduit and electrical boxes.
9. Pour concrete pad and sidewalks from parking area to Ashokan Rail Trail. Install benches and amenities.
10. Excavate/install Bioretention Basin underdrain UD-1 and UD-2, soil planting material and DS 1-2. Install storm drain from DS 1-5. Install plantings and mulch for Bioretention. Install stone diaphragm, timber rail fence and grass filter strip between parking area and Bioretention Basin.
11. Excavate/install shallow wetland and soil planting material. Install plantings and mulch for shallow wetland area
12. Remove construction entrance/exit to project location from NYS Route 28. Place asphalt to finished grade elevation.
13. Perform striping.

14. Upon completion of final stabilization (as defined in the SPDES Permit), remove any temporary perimeter sediment control measures by hand and the disturbed area shall be seeded and mulched.
15. Construction shall progress to completed condition without interruption until final stabilization is achieved.

V. Erosion and Sediment Control Measures

(1) *Erosion Control Plan:* An erosion control plan has been developed in accordance with the New York State Department of Environmental Conservation (NYSDEC) technical standards which are contained in the "New York Standards and Specifications for Erosion and Sediment Control" November 2016 edition. The erosion control plan is employed in three main components: runoff control, soil stabilization and sediment control.

Containment of runoff from the site will be managed to protect adjacent natural resources. The existing collection and discharge points to the east and west of the site will be maintained to allow for the passage of clean runoff to be routed around the site. Runoff Control will also be applied by the use of rock outlet protection/flow diffusers at final discharge points from the site. DS 1-2 and DS 1-4 outlet all project site runoff to a stabilized outlet with a level stone berm spillway maintaining existing sheet flow conditions in the proposed/post-construction scenario. Details and guidance contained in the Blue Book are also included in Appendix B. Details and location tables are also included in the contract plans.

Runoff control will also be performed by hardening overflow from the Bioretention Basin with a stone lined spillway to the Shallow Wetland practice. Subsurface drains will also be utilized as described in previous section. Details and guidance contained in the Blue Book are also included in Appendix B. Details and location tables are also included in the contract plans.

The second component of the erosion and sediment control plan is soil stabilization. The following soil stabilization measures will be utilized:

Stone Stabilization – The project proposes multiple areas receiving stone for stabilization, including stone slopes, pipe discharge points, and spillways between stormwater management practices. Details and locations for stone stabilization are included in the contract plans.

Mulching - All locations receiving temporary or permanent seeding will also receive mulch. Under no circumstances shall earth material exposed by grubbing, excavation, and borrow or fill be left without the application of temporary or permanent erosion control for a period greater than 7 days. Mulching application rates will be in accordance with the Blue Book. Mulch shall be spread uniformly in a continuous blanket at an approximate rate of 2 tons/acre. For winter stabilization only, if straw mulch alone is used for temporary stabilization, it shall be applied at double the standard rate of 2 tons/acre. Other manufactured mulches should be applied at double the manufacturer's recommended rate (see standard specification for winter stabilization from the Blue Book attached in Appendix B). If the location is not yet ready for permanent stabilization, temporary seed will also be used if the location is to be unworked for more than 14 consecutive days. Details including guide to mulch materials, rates, uses and anchorage guide from the Blue Book are included in Appendix B.

Permanent Construction Area Planting - Permanent stabilization shall be performed in accordance with the Blue Book. After location has been graded to its finished condition, topsoil shall be applied along with permanent seeding as well as any other stabilization measures as provided in the plans or Specifications. Slopes steeper than a 1V:3H as well as slopes adjacent to Bioretention practices and slopes along the swales will also receive rolled erosion control blankets. All other areas shall be covered with mulch and receive mulch anchorage in accordance with the above referenced specification.

Surface Roughening - Section 610-3.01.A requires the Contractor to scarify or till the surface of the subsoil to a depth of 6 inches before the topsoil is re-applied to permit bonding the topsoil with the subsoil. The standard specifications for surface roughening from the Blue Book are included in Appendix B.

Temporary Seeding for Construction Areas - Temporary seeding will be applied on temporarily disturbed areas not yet ready for permanent stabilization. Temporary seeding will be placed along with mulch in disturbed locations unworked for more than 14 consecutive days. The standard specifications for temporary seeding for construction areas from the Blue Book are included in Appendix B.

Topsoiling and Amendments - The project proposes 6" topsoil placement in all areas to be vegetated and will be considered in conformance with the soil restoration requirements of the SPDES Permit. The standard specifications for topsoiling from the Blue Book are included in Appendix B.

Dust Control - The control of dust resulting from land disturbing activities, to prevent surface and air movement of dust from disturbed soil surfaces that may cause off-site damage will be the responsibility of the Contractor. If necessary, payment for this work will be included in the unit bid price for various 209 items. The standard specifications for dust control from the Blue Book are included in Appendix B.

Soil Restoration – Soil restoration as a required practice will be performed in accordance with the standards. The method of soil restoration will differ depending on future buildout. The existing soil in the area of the Shallow Wetland has undergone heavy compaction from its historical uses as an access road and storage site for uses associated with the operation and maintenance along the existing abandoned rail bed. For this reason, the Shallow Wetland area will undergo full soil restoration by decompaction and compost enhancement methods outlined in the Blue Book and the NYSSMDM. The proposed Bioretention Basin will undergo soil restoration by the removal of existing heavily compacted soils and placement of underdrain stone and soil planting material. All other areas of cut/fill will receive 6” of topsoil and establishment of turf establishment meeting the intent of the requirement. Details and guidance contained in the Blue Book are also included in Appendix B. The Erosion Control Notes in the Contract plans outline restoration to be performed.

Trees, Shrubs and Plantings – The Bioretention and Shallow Wetland areas will receive plantings in accordance with guidance contained in the NYSSMDM. Plantings will improve the soil stability and increases the attractiveness of the area while providing water quality treatment by the uptake of stormwater runoff. Details and guidance contained in the Blue Book are also included in Appendix B. The Contract plans also provide details for plantings and maintenance to ensure continued effectiveness as originally intended.

Winter Stabilization - An enhanced erosion and sediment control plan to manage runoff and sediment during construction activities in the winter months has been considered and incorporated in this SWPPP to the extent practical and necessary. If during the course of construction, it becomes apparent that a winter shutdown will be necessary and completion of work left undone will be completed in the next construction season, temporary stabilization with temporary seeding and mulch must be performed to allow time for the establishment of a vegetative cover. Under no circumstances shall slopes receiving sheet flow runoff be left disturbed without a substantial vegetative cover. The Contractor must consider this when preparing their schedule in accordance with Section 108-01 *Progress Schedule*. The E.I.C. should not approve any schedule that does not provide adequate time to allow for establishment of vegetation of these slopes prior to winter months. The standard specifications for winter stabilization from the Blue Book are included in Appendix B.

The third component of the erosion and sediment control plan is sediment control. The following sediment control methods will be utilized:

Perimeter Sediment Control – Silt fence will be placed at the toe of disturbance limits to minimize sediment movement offsite. Locations of silt fence are shown on the Contract plans. Details are also provided in the Contract plans.

Geotextile Sediment Collection Bags – Sediment collection bag item is included in the Contract but are not shown on the plans. Notes on the plans indicate when the use of geotextile sediment collection bags should be used. Details and guidance contained in the Blue Book are also included in Appendix B.

The contractor is responsible for protecting any locations of material, waste, borrow or equipment storage used offsite for operations associated with the construction of the trail head parking in accordance with applicable laws (see Section IV Construction Phasing for further guidance on these locations).

Construction and waste materials expected to be stored on-site consists of materials and equipment typically used in the construction of parking lots. Materials generally consist of soil, stone, drainage pipes, and concrete drainage structures. Any and all work necessary to restore staging/storage areas shall be included in the unit bid price for various items. No separate payment will be made to satisfactorily restore areas the Contractor uses to its benefit.

Construction equipment expected to be entering the project area during construction generally consists of heavy earth moving equipment and paving machines. Construction entry/exit points to the project site will be stabilized in accordance with the Contract plans and remain stabilized for the duration of the construction phases until paving operations begins. The projects Erosion Control Notes in the construction plans on DWG. NO. ECN-1 (contained in the Contract documents) provides general notes and guidance to minimize erosion and control sediment from leaving the project area. Requirements for the temporary and permanent stabilization of disturbed areas are also included in the Erosion Control Notes.

(2) *Applicable Standard Sheets:* Dimensions and installation details for temporary erosion and sediment control practices employed on this project can be found in the Blue Book under Standard and Specifications for Silt Fence. These details are also included in the Contract plans.

(3) *Stabilization Requirements:* The Contractor shall follow the sequence of construction activities submitted/approved by the E.I.C. as part of their erosion and sediment control as stated in Section IV above. The Contractor may deviate from the sequence by submitting a proposed sequence to the E.I.C. for approval. Locations of disturbed areas will be constructed to completed condition and brought to permanent stabilization as soon as possible after completion of grading. In accordance with the Blue Book, where land disturbances are necessary and disturbed area is not yet ready for permanent stabilization, temporary seeding and mulching (and or soil stabilizers) must be used on areas that will be exposed for more than 14 days. Soil stabilizers should be applied to areas in accordance with the Blue Book. The contractor must be aware of anticipated storm events. Disturbed areas should be protected with mulch prior to a rain event even if area is to be left exposed for less than 7 days. Areas of disturbances should be reseeded and mulched as necessary to establish growth. Maintenance must be performed as necessary to ensure continued stabilization.

Final stabilization should be performed as soon as possible after completion of grading. The contract plans, details and typical sections in the contract plans indicate the provisions for permanent stabilization. Topsoil requirements shall be as indicated in the Blue Book. Water, seeds, mulch, mulch anchorage and straw (Section 610-2.03) and application rates (Section 610-3.03) are defined in the specification. Waiting until all areas of disturbance are ready for permanent stabilization is not acceptable. Permanent seeding should optimally be undertaken in the spring from March through May, and in late summer and early fall from September to October 15. During the peak summer months and in the fall after October 15, when seeding is found to be impracticable, an appropriate mulch shall be used. Permanent seeding can take place during the summer months if continued watering/monitoring is performed. Temporary seeding with rye can be utilized through November.

All slopes steeper than 3:1 (h:v) or 33.3% upon completion of grading shall immediately receive rolled erosion control product (RECP) to reduce erosion and promote grass growth. RECP should also be used in all slopes adjacent to the Wet swale, Shallow Wetland, Bioretention practice, and Vegetated Swale Installation should be in accordance with the manufacturer’s guidelines.

Final stabilization as defined by the SPDES Permit is the following:

a. All construction and soil disturbing activity has been completed
b. A uniform perennial vegetative cover with a density of 80% has been established on all unpaved areas, or permanent gravel or mulch is applied
c. Post construction controls have been constructed, are operational, and conform to the SWPPP
d. A Qualified Site Inspector (hired by the Permitee/Owner) certifies on the NOT that the site has been stabilized

(4) *Pollution Prevention Measures:* Prior to the start of construction, the Contractor shall submit a project specific Safety and Health Plan in accordance with Section 107-05 *Safety and Health Requirements.* The Safety and Health plan shall specifically address spill prevention and a response plan. The plan shall detail the steps needed to be followed 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.

All pollutants, including waste materials and demolition debris, that occur onsite shall be handled and disposed of in a manner that conforms to all applicable Federal and State regulations that does not cause contamination of stormwater. Soil testing has been performed at various locations in the project corridor for the Ashokan Rail Trail and common pollutants associated with abandoned rail beds were encountered in various concentrations. These test results are included in supporting documents for the Notice of Determination included in the environmental review. The Contractor and any subcontractors should familiarize themselves with known pollutants and should handle the material appropriately. Due to the limited available space with the project location of the Ashokan Station Trailhead, all excavated materials from the project location will be disposed of within the corridor of the Ashokan Rail Trail. Any excavated materials relocated to other locations in the corridor will be stabilized immediately after placement to reduce the migration of these pollutants to adjacent areas. Good housekeeping and preventative measures will be taken to ensure that the site will be kept clean, well organized, and free of debris.

No fuel storage, except for what is necessary for one day of work, will be allowed on City property. Spill control kits containing absorbents must be kept on site at all times whenever work is conducted on City property. No releasing, dumping, spilling or overnight storage of any petroleum-based oil, hydraulic fluid, fuels or chemicals shall be permitted on City property. All spills and releases must be immediately reported to the DEP Police at 914-593-7500 or 888-426-7433.

Vehicles, construction equipment, and/or petroleum product storage/dispensing:

a) All vehicles, equipment, and petroleum product storage/dispensing area will be observed regularly during site inspections to detect any leaks or spills, and to identify maintenance needs to prevent leaks or spills.
b) On-site fueling tanks and petroleum product storage containers shall include secondary containment.
c) Spill prevention measures, such as drip pans, will be used when conducting maintenance and repair of vehicles or equipment.
d) In order to perform emergency repairs on site, temporary plastic will be placed beneath and, if raining, over the vehicle.
e) Contaminated surfaces shall be cleaned immediately following any discharges or spill incident. Contaminated soil shall be removed from the site and disposed of in accordance with all current Federal and State Regulations. The County will be notified if any spills over the reportable limit occur. The Town of Olive/Ulster County/NYSDOT/NYCDEP will also be notified if any spills occur which may enter the MS4's drainage facilities. The NYSDEC guidance on spill requirements are contained in the technical field guidance, Spill Reporting and Initial Notification Requirements, attached in Appendix E.

Chemical Storage:

a) Any chemicals stored in the construction areas will conform to the appropriate manufacturers recommendations and or the appropriate State/Federal

Regulations. All chemicals shall have cover, containment, and protection provided on site, per all Federal and New York State DEC regulations

b) Application of agricultural chemicals, including fertilizers and pesticides, shall be conducted in a manner and at application rates that will not result in loss of chemical to stormwater runoff. Manufacturers' recommendations for application procedures and rates shall be followed.

Excavated Materials:

a) All dewatering from open cut excavation shall be discharged into a controlled conveyance system, temporary sediment basin or prefabricated sediment geotextile bag. Discharge will be allowed to be pumped directly to surface waters if the discharge is as free and clear of sediment as surrounding waters if approved by the Engineer. Discharge points will be stabilized prior to use.

Demolition:

a) Dust released from on site grading operations will be controlled using standards and specifications for dust control from the Blue Book and specifications for Erosion and Sediment Control Manual, attached in Appendix B.
b) Storm drain inlets vulnerable to stormwater discharge carrying dust, soil, or debris will be protected using storm drain inlet protection.

Concrete and Grout:

a) Process water and slurry resulting from concrete work will be prevented from entering the waters of the State and any closed drainage facility by the use of concrete wash areas. Details are included in the Contract plans.

Sanitary Wastewater:

a) Portable sanitation facilities will be firmly secured, regularly maintained, and emptied when necessary.

Litter/Trash:

a) Litter and trash shall be cleaned and disposed of in secure clearly marked dumpsters or trash receptacles.
b) Site is to be cleaned daily of debris and disposed of on a daily basis.

(5) *SWPPP Implementation Responsibilities*: The owner and operator shall ensure that the provisions of the SWPPP are implemented from the commencement of construction until all areas of disturbance have achieved final stabilization and the Notice of Termination (NOT) has been submitted to the NYSDEC in accordance with Part V. of the SPDES Permit. This includes any changes made to the SWPPP pursuant to Part III.A.4 of the Permit. A copy of the NOT is included in Appendix F.

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

The owner/operator shall not disturb more than five (5) acres of soil at any one time without prior written authorization from the Department or, in areas under the jurisdiction of a regulated, traditional land use control MS4, the MS4 (provided the MS4 is not the owner/operator of the construction activity). Requirements to disturb greater than five acres can be found in the Part II.C.3 of the SPDES Permit.

Prior to 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 control measures 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/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/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/operator shall have each of the contractors and subcontractors identified above sign a CONR 5 Contractor/Subcontractor SPDES Permit Certification prior to any soil disturbing activities. A copy of the CONR 5 is attached in Appendix F. Copies of the signed CONR 5 by the Contractor and all subcontractors will be attached to the Appendix and included as part of the SWPPP.

(6) *Inspection and Maintenance Schedule:* The contractor shall be responsible to ensure that all erosion and sediment control practices and all post-construction stormwater management facilities identified in this SWPPP are maintained in effective operating condition at all times. All temporary control shall be inspected by the Contractor at least every seven calendar days and after each runoff event to determine if the practices are functioning as intended. All inspections shall be completed within one calendar day. Within one work day from completion of the inspection, the Contractor shall 1) rebuild or repair the practice to function as originally intended and 2) remove sediment deposition with reaches one half the height of the practice. All inspection requirements shall be performed in accordance with the most current version of Appendix F of the Blue Book. Appendix F is included in this SWPPP in Appendix F.

The Contractor shall have a qualified professional conduct an assessment of the site prior to commencement of construction and certify in accordance with Appendix F that the appropriate erosion and sediment controls described in the SWPPP have been adequately installed or implemented to ensure overall preparedness of the site for the commencement of major construction activities.

For the entire duration of construction and through to final stabilization and submission of the Notice of Intent to the NYSDEC, the Contractor shall continue site inspections conducted by the qualified professional at least every 7 calendar days (Construction Duration Inspections of Appendix F). The Contractor shall maintain the Construction Site Log Book (in accordance with Appendix F) that shall be maintained on site and be made available to the permitting authorities upon request.

Furthermore, the NYCDEP will be responsible for overseeing and inspecting the contractors operations. These inspections (performed by a qualified inspector as defined in the SPDES Permit) shall be in accordance with their own policies but must be at least as frequent as stated in Part IV of the SPDES Permit. For construction sites where the soil disturbances are on-going, the qualified inspector shall conduct a site inspection at least every 7 calendar days. Although the Ashokan Reservoir is one of the 303(d) listed bodies of water, the site does not directly discharge to it and therefore increased frequency is not required by the SPDES Permit. The project location is also not located in a watershed listed in Appendix C of the SPDES Permit requiring at least 2 inspections weekly. At a minimum, the qualified inspector shall inspect all erosion and sediment control measures to ensure integrity and effectiveness, all post-construction stormwater management facilities under construction to be sure they are constructed in conformance with the plans and details in the contract plans, 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. Construction inspection checklists from Appendix F of the NYSSMDM are included in this SWPPP in Appendix D.

The qualified inspector shall prepare an inspection report subsequent to each inspection. A MURK 6 SPDES Stormwater Inspection Report is attached in Appendix F. Within one business day of the completion of the inspection, the qualified inspector shall notify the owner and Contractor of any corrective actions that need to be taken. The contractor shall begin implementing the corrective actions within one business day of this notification and shall complete the corrective actions in a reasonable time frame.

Inspection reports shall be signed by the qualified inspector. Pursuant to Part II.C.2. of the SPDES General Permit, the inspection reports will be maintained on site with the SWPPP.

Table 3 – Maintenance Plan for Temporary Erosion Control Measures

Facilities to be Maintained	Maintenance Requirements
Silt Fence	1) Measures shall be inspected once every seven calendar days, after each rainfall of 0.5 inches within a 24-hour period and daily during prolonged rainfall. 2) Sediment shall be removed when the accumulation reaches one-half of the measure height or when bulges develop in the silt fence. 3) Torn or punctured silt fence fabric may be repaired by the placement of a patch, on the upstream side, consisting of an additional layer of fabric over the damaged area, or replacement of the damaged section.
Temporary mulch and temporary seed	1) Seeded areas should be inspected periodically and after each runoff event. Rills should be filled and reseeded. Areas that have lost mulch prior to vegetation establishment will be remulched to the satisfaction of the E.I.C..
Temporary prefabricated check dam	1) Measures shall be inspected once every seven calendar days, after each runoff event and daily during prolonged rainfall. Correct all damage immediately. 2) Sediment shall be removed when the accumulation reaches one-half of the measure height.

	3) If significant erosion occurs between check dams, a liner of stone or other suitable material should be installed in that portion of the channel or additional check dams added.
Winter Stabilization	1) The site shall be inspected frequently to ensure that the erosion and sediment control plan is performing its winter stabilization function. If the site will not have earth disturbing activities ongoing during the "winter season", all bare exposed soil must be stabilized by established vegetation, straw, or other acceptable mulch, matting, rock, or other approved material such as rolled erosion control product. Seeding of areas with mulch cover is preferred but seeding alone is not acceptable for proper stabilization. 2) Compliance inspections must be performed, and reports filed properly in accordance with the SWPPP for all sites under a winter shutdown.
Dust Control	1) Maintain dust control measures through dry weather periods until all disturbed areas are stabilized.
Stabilized Construction Entrance	1) The access shall be maintained in a condition which will prevent tracking of sediment onto public rights-of-way or streets. 2) Periodic top dressing with additional aggregate may be necessary. 3) Sediment spilled, dropped or washed onto public rights-of-way must be removed immediately. 4) When necessary, wheels must be cleaned to remove sediment prior to entrance onto public right-of-way. All sediment shall be prevented from entering storm drains, ditches, or watercourses.
Geotextile Sediment Collection Bag	1) During installation the Contractor shall place with lifting straps under the unit to facilitate removal after use. 2) Replace/dispose when remaining bag flow area has been reduced by 75% or when the unit is half full or sediment or when the flow rate of the pump discharge has been reduced to an impractical rate.

VI. Existing Sub-Watershed Information

(1) *Existing Discharge Points from Site:* The only stormwater draining onto the site is half of NYS Route 28 (due to normal crown). Otherwise the project site bounded on the west by a NYSDEC classified A stream with a standard A(t), NYS Route 28 to the north, the abandoned rail bed to the south and a depression that collects stormwater from the east. The storm drain in the depression routes stormwater under the abandoned rail bed just south of the project limits. Runoff from the project corridor drains generally to the south and is collected by the stream. Approximately 100' to 120' south of the abandoned rail bed adjacent to the proposed parking lot, the stream takes a turn flowing east for a short distance before turning south again. The stream meanders generally south and west outletting to the Ashokan Reservoir almost 0.5 miles (straight line distance) from the project site.

In accordance with Part III.B.1.b, stormwater discharge points from the site should be identified in the SWPPP. In accordance with Part IV.C.4.d, weekly inspection reports performed by owner (NYCDEP) should include a description of the condition at all points of discharge from the site during construction. Both the stream as it crosses NYS Route 28 and pipe outlet from the depression identified above should be monitored during construction. Future discharge points from DS 1-2 and DS 1-4 should also be inspected for the duration of construction until final stabilization.

All stormwater from the project location discharges to surrounding surface via one of the above described outlets. These locations must be inspected during construction for evidence of turbid stormwater discharges.

(2) *Receiving Waterbodies:* The paragraph above describes receiving surface waters.

VII. Post Construction Quality and Quantity Stormwater Control Practices

A stormwater analysis was performed on the site to determine flow rates pre-development and post-development. HydroCAD Version 10 was used to perform the analysis. Rainfall data for applicable 24 hour storm events was obtained from figures contained in the NYSSMDM January 2015. Storm data is provided in Appendix I.

(1) *Tables of Pre- vs. Post Construction Hydrology:* As mentioned in the Introduction, the project is a parking lot construction project and disturbs more than one acre. Overbank and Extreme flood criteria has been met by providing storage to attenuate the post-development discharge rates from the site for the 1-year, 10-year and 100-year 24 hour storm events. Flow rates were maintained from pre- to post- construction with the use of a shallow wetland. Quantity controls were applied for the increase in CN value from the construction of newly created impervious surfaces. Approximately 0.6 acres of existing highly compacted grassy areas were converted to new impervious area for the Ashokan Station Trailhead. The existing CN value for the entire site within the project limits was calculated to be 74. Post-construction the CN for the entire site within the project limits increased to 80. It is the intent of the stormwater management plan to attenuate flow rates for the 1-YR, 10-YR and 100-YR 24 hour storm event for this increase. Flow rates were analyzed in the pre and post condition for the project site. Table 4 and 5 below summarizes the flow rates from project site's disturbed area within the drainage area discharging from the site. Calculations of flowrates for subareas and stage storage/outlet tables are provided for the stormwater quantity control pond are will be included in Appendix I for reference.

Table 4 – Pre-Developed Site Hydrology

Pre-Developed Site Hydrology			
	Q 1-YR Storm (cfs)	Q 10-YR Storm (cfs)	Q 100-YR Storm (cfs)
Discharging from site	1.02	3.48	8.49

Table 5 – Post-Developed Site Hydrology

Post- Developed Site Hydrology			
	Q 1-YR Storm (cfs)	Q 10-YR Storm (cfs)	Q 100-YR Storm (cfs)
Discharging from site	0.44	1.98	7.33

Stream Channel Protection Volume (Cpv) requirements for the project have been fulfilled with the use of the standard stormwater management facilities. Calculations of the Cpv required and Cpv provided are included in Appendix I.

(2) Water Quality Volume and RRv Requirements: Water quality volume (WQv) calculations were performed and are included in Appendix H. The project's water quality volume for the 90% storm is calculated at 3,349 cubic feet. As mentioned previously, the location of the project site and its location in a terminal reservoir basin requires that the volume of runoff for the 1-YR 24 hour storm event be treated. The reduction of the total WQv by application of green infrastructure techniques and standard SMP's to replicate pre-development hydrology is called the Runoff Reduction Volume (RRv) and is best achieved through the reduction of the impervious area and minimization of the disturbed area. Reduction of the entire WQv is not possible due to site conditions, namely poorly draining existing soils. The General Permit requires that a minimum RRv must be achieved through the use of GI techniques and standard stormwater management practices with runoff reduction potential. During preliminary design phases all available treatment options were considered. Due to the high water table after the observed soil test pits, a combination of a practice with a permanent pool (the shallow wetland) and a practice with RRv capacity (bioretention) were designed in series. This also satisfies the *Watershed Regulations* 20% rule. The bioretention and the vegetated swale along Route 28 were used to meet RRv requirements.

In order to meet the Runoff Reduction requirements, the bioretention practice was selected as the best available practice to meet storage requirements to meet both the runoff reduction and water quality treatment necessary. The volume of runoff associated with the 1-YR 24 hour storm event is treated with the use of a bioretention basin and the vegetated swale along Route 28. The SPDES Permit requires that a minimum RRv must be achieved through the use of GI techniques and standard stormwater management practices with runoff reduction potential. Minimum RRv calculations were performed and are included in Appendix H. The required minimum RRv calculated for the Ashokan Station Trailhead is 1,326 CuFT.

The WQv for the project is being treated using a vegetated swale as pretreatment that eventually empties into the bioretention practice that captures runoff from the impervious paved parking area and adjacent roadway. Table 5 below is a summary of the volume stored within each practice and the percentage of volume that can be credited towards RRv. After runoff reduction is applied, the remainder of the storage volume is applied to the WQv.

Table 6 –RRv/WQv and Storage Associated with Individual Practices

Stormwater Management Practice	WQv Storage	% WQv contributing to RRv	RRv
	(CuFT)	(%)	(CuFT)
Bioretention	2135	40	854
Vegetated Swale	3036	20	607
			1461

The minimum RRv was applied through the use of standard practices with RRv potential. A total RRv of 1,461 CuFT was achieved through the use of standards practices. A WQv of 3,710 CuFT was achieved through the use of standard practices and is assumed to be in conformance with the technical requirements. The volume detained in the respective stormwater practices was calculated in HydroCADD. These calculations are provided in Appendix I.

Construction details of the stormwater management practices are provided in the contract plans.

A coliform analysis was also performed in accordance with the *Watershed Regulations* to be included in Appendix H.

(3) Soil Restoration: The technical standard for soil restoration is defined in the NYSDEC manual on Deep Ripping and De-Compaction dated April 2008 (manual attached in Appendix E). Full soil restoration will be performed at the Shallow Wetland area. All other areas of cut and fill will receive 6” topsoil and be vegetated and are assumed to be in compliance with the requirements. Locations of GI practices (Bioretention Basin) do not required restoration in accordance with the NYSSMDM due to the excavation of the highly compacted existing soils and replacement with a deep layer of planting soil. The five step process listed in Section 5.1.6 of the NYSSMDM will be adhered to for the Shallow Wetland. Steps to restore soil for the Shallow Wetland area is listed in the contract plans on the erosion control notes. The five step process contained in the contract plans is also listed below. During periods of relatively low to moderate subsoil moisture, the disturbed subsoils are returned to rough grade and the following steps are applied:
a) Apply 3” of compost (Item 610.10) over subsoil.
b) Till compost into subsoil to a depth of at least 12 inches using a Cat mounted ripper, tractor mounted disc, or tiller, mixing and circulating air and compost into subsoils.
c) Rock-pick until uplifted stone/rock materials of four inches and larger size are cleaned off of restoration area.
d) Re-apply 6” of topsoil (Item 610.1402). Seed and mulch to establish permanent vegetative cover (Item 610.1601).
e) The location should be kept clear of vehicular and heavy loads to avoid re-compaction of underlying soils. Inspection of the area should be performed prior to acceptance of restoration area. The inspector should be able to push a 3/8" metal bar 12" into the soil just with body weight. The Standard Specification for soil restoration from the Blue Book are included in Appendix B.

(4) Maintenance Schedule of Post-construction Stormwater Management Facilities: All stormwater control practices will be maintained in accordance with the table provided in the contract plans and in accordance with the Maintenance Inspection Checklists from the NYSSMDM included in Appendix D. In addition, the specifications and testing requirements for the bioretention soil media as detailed in Appendix C of the NYSSMDM have been included in Appendix B of this report.

NYCDEP is the entity responsible for long term maintenance to ensure continued operation of constructed stormwater management practices. The point of contact for required maintenance is Charles P. Laing located 71 Smith Avenue in Kingston, NY. Phone number for contact is 845-340-7218.

Table 7 – Maintenance Schedule of Post-Construction Stormwater Management Facilities

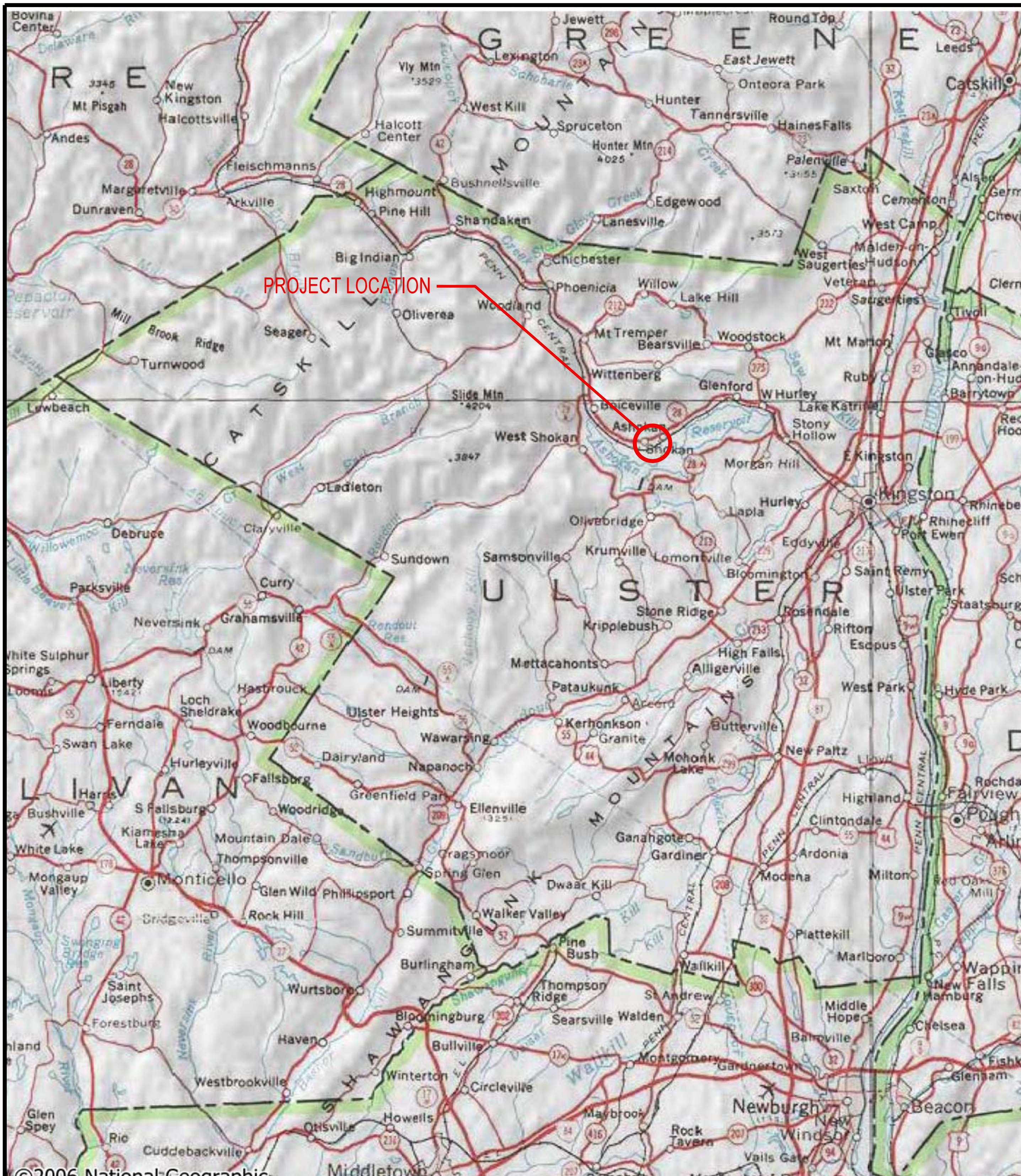
Facilities to be Maintained	Maintenance Requirements
Bioretention Basins	1) Mow filter strip at least twice a year. Ensure runoff enters the practice via sheet flow and easily enters practice without getting concentrated. Clear edge of pavement and entire width of grass filter strip of any grit, grass clippings or debris that may be preventing clear pathway for sheet flow from the parking area. Sparsely vegetated areas should be reseeded. Filling may require topsoil placement along with re-seeding and temporary stabilization until vegetation is established. 2) Remove sediment buildup within the bottom of the practice when 10% of the storage volume is exceeded. Remove trash or other debris accumulating in the practice at least annually. 3) Vegetation within the practice requires regular maintenance: pulling weeds, removing dead and diseased plants, adding/replacing plants to fill in areas that are not well vegetated. The owner should be familiar with the plants that have been initially planted. Any plants that are not part of the planting plan should be eliminated, preferably by hand pulling. Any replacement plants should be native. Refer to Table H.5 in Appendix H of the NYSDEC Stormwater Management Design Manual for a listing of native plants for stormwater management areas. Vegetation that was intended to be present should be pruned and thinned in accordance with document NA-FR-01-95 from the USDA Forest Service. This document is attached in this SWPPP. 4) Mulch should be applied twice a year (if necessary, but at least annually) in the late spring and during leaf fall. Add or remove as required to maintain approximately 3" deep layer of mulch. Mulch later around stems or tree trunks should be inspected. Mulch should not be placed within several inches of the stems or tree trunks to expose the base of the trunk. 5) Stone diaphragm should be inspected annually and replaced as needed. Replacement of stone will be required when voids within stone become filled with sediment. 6) Outlet structure and outlet pipe should be inspected annually for blockages. Any blockages should be removed immediately. 7) Check for evidence of standing water and ensure dewatering between storm events monthly.
Open Channel Ditches/ Grassed Swales	1) Inspected annually and/or after major storm event. Any obstruction that decreases the carrying capacity of the ditch should be removed immediately. 2) Removal of sediment build-up within the bottom of the channel when 25% of the original WQv has been exceeded. 3) Periodically remove debris and litter. 4) Mow vegetation as required during the growing season to

	maintain grass heights in the 4" to 6" range.
Wet Swales	1) Removal of sediment build-up within the bottom of the channel when 25% of the original WQv has been exceeded. 2) Annual inspection of the pea gravel diaphragm. Stone should be replaced as necessary if sediment fills the voids in the stone.
Shallow Wetlands	1) Inspected biannually and/or after major storm event. 2) Sediment removal from forebay every five to six years or when 50% full. 3) Sediment should be removed when 10% of the pond capacity is lost. 4) Periodically remove debris and litter. 5) Mow at least annually, preferably after August. 6) Inlet and outlet structures should be replaced as necessary.
Closed Drainage Facilities	1) Inspected annually and/or after major storm event. Any obstruction that decreases the carrying capacity of the pipe should be removed immediately.

APPENDIX A

Regional Location Map

Project Location Map



0 5 10 15 20 miles

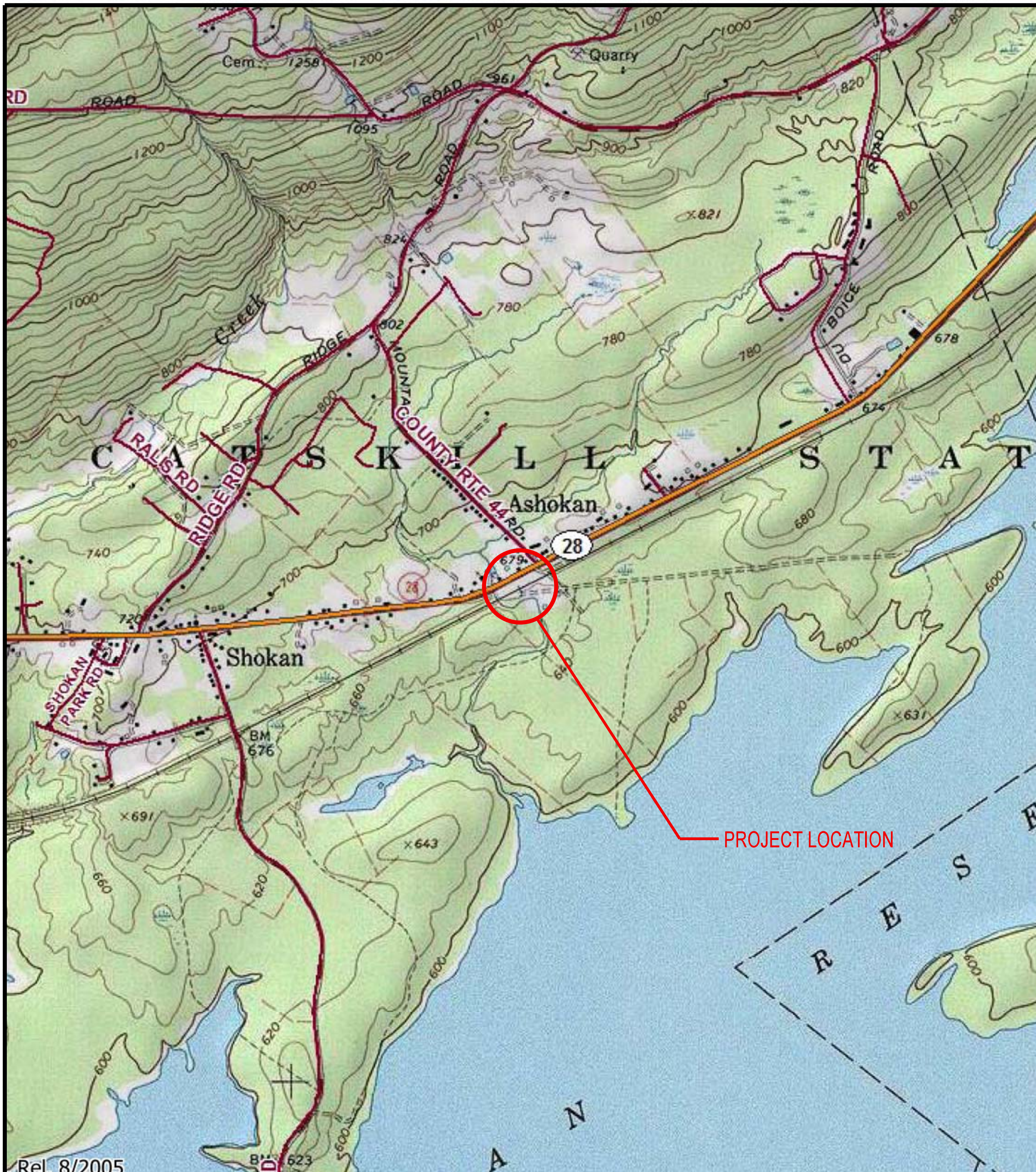
0 5 10 15 20 25 30 km

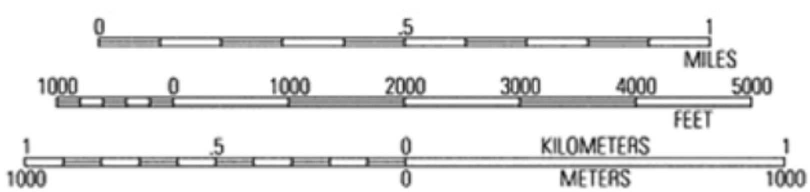
ASHOKAN STATION TRAILHEAD
TOWN OF OLIVE
ULSTER COUNTY, NEW YORK

HVEA ENGINEERS
BEACON, NEW YORK 12508
(845) 838-3600
www.hveapc.com

FIGURE 1

FEB 2018





ASHOKAN STATION TRAILHEAD
TOWN OF OLIVE
ULSTER COUNTY, NEW YORK

HVEA ENGINEERS
BEACON, NEW YORK 12508
(845) 838-3600
www.hveapc.com

FIGURE 2

FEB 2018

MAP SCALE 1" = 1000'

500 0 1000 2000 FEET

METER

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0430F

FIRM

FLOOD INSURANCE RATE MAP

for ULSTER COUNTY, NEW YORK
(ALL JURISDICTIONS)

CONTAINS:

COMMUNITY	NUMBER
HURLEY, TOWN OF	360857
OLIVE, TOWN OF	360860

PANEL 430 OF 910
MAP SUFFIX: F
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

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

MAP NUMBER
36111C0430F

MAP REVISED
NOVEMBER 18, 2016

Federal Emergency Management Agency

APPENDIX B

Details from the New York State Standards and Specifications for Erosion and Sediment Control

Specifications and Testing Requirements for Bioretention Soil Media from New York State Stormwater Management Design Manual

STANDARD AND SPECIFICATIONS FOR CONCRETE TRUCK WASHOUT

Definition & Scope

A temporary excavated or above ground lined constructed pit where concrete truck mixers and equipment can be washed after their loads have been discharged, to prevent highly alkaline runoff from entering storm drainage systems or leaching into soil.

Conditions Where Practice Applies

Washout facilities shall be provided for every project where concrete will be poured or otherwise formed on the site. This facility will receive highly alkaline wash water from the cleaning of chutes, mixers, hoppers, vibrators, placing equipment, trowels, and screeds. Under no circumstances will wash water from these operations be allowed to infiltrate into the soil or enter surface waters.

Design Criteria

Capacity: The washout facility should be sized to contain solids, wash water, and rainfall and sized to allow for the evaporation of the wash water and rainfall. Wash water shall be estimated at 7 gallons per chute and 50 gallons per hopper of the concrete pump truck and/or discharging drum. The minimum size shall be 8 feet by 8 feet at the bottom and 2 feet deep. If excavated, the side slopes shall be 2 horizontal to 1 vertical.

Location: Locate the facility a minimum of 100 feet from drainage swales, storm drain inlets, wetlands, streams and other surface waters. Prevent surface water from entering the structure except for the access road. Provide appropriate access with a gravel access road sloped down to the structure. Signs shall be placed to direct drivers to the facility after their load is discharged.

Liner: All washout facilities will be lined to prevent leaching of liquids into the ground. The liner shall be plastic sheeting with a minimum thickness of 10 mils with no holes or tears, and anchored beyond the top of the pit with an earthen berm, sand bags, stone, or other structural appurtenance except at the access point.

If pre-fabricated washouts are used they must ensure the capture and containment of the concrete wash and be sized based on the expected frequency of concrete pours. They shall be sited as noted in the location criteria.

Maintenance

- All concrete washout facilities shall be inspected daily. Damaged or leaking facilities shall be deactivated and repaired or replaced immediately. Excess rainwater that has accumulated over hardened concrete should be pumped to a stabilized area, such as a grass filter strip.
- Accumulated hardened material shall be removed when 75% of the storage capacity of the structure is filled. Any excess wash water shall be pumped into a containment vessel and properly disposed of off site.
- Dispose of the hardened material off-site in a construction/demolition landfill. On-site disposal may be allowed if this has been approved and accepted as part of the projects SWPPP. In that case, the material should be recycled as specified, or buried and covered with a minimum of 2 feet of clean compacted earthfill that is permanently stabilized to prevent erosion.
- The plastic liner shall be replaced with each cleaning of the washout facility.
- Inspect the project site frequently to ensure that no concrete discharges are taking place in non-designated areas.

STANDARD AND SPECIFICATIONS FOR DUST CONTROL

Definition & Scope

The control of dust resulting from land-disturbing activities, to prevent surface and air movement of dust from disturbed soil surfaces that may cause off-site damage, health hazards, and traffic safety problems.

Conditions Where Practice Applies

On construction roads, access points, and other disturbed areas subject to surface dust movement and dust blowing where off-site damage may occur if dust is not controlled.

Design Criteria

Construction operations should be scheduled to minimize the amount of area disturbed at one time. Buffer areas of vegetation should be left where practical. Temporary or permanent stabilization measures shall be installed. No specific design criteria is given; see construction specifications below for common methods of dust control.

Water quality must be considered when materials are selected for dust control. Where there is a potential for the material to wash off to a stream, ingredient information must be provided to the NYSDEC.

No polymer application shall take place without written approval from the NYSDEC.

Construction Specifications

A. **Non-driving Areas** – These areas use products and materials applied or placed on soil surfaces to prevent airborne migration of soil particles.

Vegetative Cover – For disturbed areas not subject to traffic, vegetation provides the most practical method of dust control (see Section 3).

Mulch (including gravel mulch) – Mulch offers a fast effective means of controlling dust. This can also include rolled erosion control blankets.

Spray adhesives – These are products generally composed of polymers in a liquid or solid form that are mixed with water to form an emulsion that is sprayed on the soil surface with typical hydroseeding equipment. The mixing ratios and application rates will be in accordance with the manufacturer's recommendations for the specific soils on the site. In no case should the application of these adhesives be made on wet soils or if there is a probability of precipitation within 48 hours of its proposed use. Material Safety Data Sheets will be provided to all applicators and others working with the material.

B. **Driving Areas** – These areas utilize water, polymer emulsions, and barriers to prevent dust movement from the traffic surface into the air.

Sprinkling – The site may be sprayed with water until the surface is wet. This is especially effective on haul roads and access route to provide short term limited dust control.

Polymer Additives – These polymers are mixed with water and applied to the driving surface by a water truck with a gravity feed drip bar, spray bar or automated distributor truck. The mixing ratios and application rates will be in accordance with the manufacturer's recommendations. Incorporation of the emulsion into the soil will be done to the appropriate depth based on expected traffic. Compaction after incorporation will be by vibratory roller to a minimum of 95%. The prepared surface shall be moist and no application of the polymer will be made if there is a probability of precipitation within 48 hours of its proposed use. Material Safety Data Sheets will be provided to all applicators working with the material.

Barriers – Woven geo-textiles can be placed on the driving surface to effectively reduce dust throw and particle migration on haul roads. Stone can also be used for construction roads for effective dust control.

Windbreak – A silt fence or similar barrier can control air currents at intervals equal to ten times the barrier height. Preserve existing wind barrier vegetation as much as practical.

Maintenance

Maintain dust control measures through dry weather periods until all disturbed areas are stabilized.

STANDARD AND SPECIFICATIONS FOR PROTECTING VEGETATION DURING CONSTRUCTION

Definition & Scope

The protection of trees, shrubs, ground cover and other vegetation from damage by construction equipment. In order to preserve existing vegetation determined to be important for soil erosion control, water quality protection, shade, screening, buffers, wildlife habitat, wetland protection, and other values.

Conditions Where Practices Applies

On planned construction sites where valued vegetation exists and needs to be preserved.

Design Criteria

1. Planning Considerations

   A. Inventory:

   1) Property boundaries, topography, vegetation and soils information should be gathered. Identify potentially high erosion areas, areas with tree windthrow potential, etc. A vegetative cover type map should be made on a copy of a topographic map which shows other natural and manmade features. Vegetation that is desirable to preserve because of its value for screening, shade, critical erosion control, endangered species, aesthetics, etc., should be identified and marked on the map.

   2) Based upon this data, general statements should be prepared about the present condition, potential problem areas, and unique features of the property.

   B. Planning:

   1) After engineering plans (plot maps) are prepared, another field review should take place and recommendations made for the vegetation to be saved. Minor adjustments in location of roads, dwellings, and utilities may be needed. Construction on steep slopes, erodible soils, wetlands, and streams should be avoided. Clearing limits should be delineated (See “Determine Limits of Clearing and Grading” on page 2.2).

   2) Areas to be seeded and planted should be identified. Remaining vegetation should blend with their surroundings and/or provide special function such as a filter strip, buffer zone, or screen.

   3) Trees and shrubs of special seasonal interest, such as flowering dogwood, red maple, striped maple, serviceberry, or shadbush, and valuable potential shade trees should be identified and marked for special protective treatment as appropriate.

   4) Trees to be cut should be marked on the plans. If timber can be removed for salable products, a forester should be consulted for marketing advice.

   5) Trees that may become a hazard to people, personal property, or utilities should be removed. These include trees that are weak-wooded, disease-prone, subject to windthrow, or those that have severely damaged root systems.

   6) The vigor of remaining trees may be improved by a selective thinning. A forester should be consulted for implementing this practice.

2. Measures to Protect Vegetation

   A. Limit soil placement over existing tree and shrub roots to a maximum of 3 inches. Soils with loamy texture and good structure should be used.

   B. Use retaining walls and terraces to protect roots of trees and shrubs when grades are lowered. Lowered grades should start no closer than the dripline of the tree. For narrow-canopied trees and shrubs, the stem diameter in inches is converted to feet and doubled, such that a 10 inch tree should be protected to 20 feet.

   C. Trenching across tree root systems should be the same minimum distance from the trunk, as in “B”. Tunnels under root systems for underground utilities should start 18 inches or deeper below the normal ground surface. Tree roots which must be severed should be cut clean. Backfill material that will be in contact with the roots should be topsoil or a prepared planting soil mixture.

   D. Construct sturdy fences, or barriers, of wood, steel, or other protective material around valuable vegetation for protection from construction equipment. Place barriers far enough away from trees, but not less than the specifications in "B", so that tall equipment such as backhoes and dump trucks do not contact tree branches.

E. Construction limits should be identified and clearly marked to exclude equipment.

F. Avoid spills of oil/gas and other contaminants.

G. Obstructive and broken branches should be pruned properly. The branch collar on all branches whether living or dead should not be damaged. The 3 or 4 cut method should be used on all branches larger than two inches at the cut. First cut about one-third the way through the underside of the limb (about 6-12 inches from the tree trunk). Then (approximately an inch further out) make a second cut through the limb from the upper side. When the branch is removed, there is no splintering of the main tree trunk. Remove the stub. If the branch is larger than 5-6 inches in diameter, use the four cut system. Cuts 1 and 2 remain the same and cut 3 should be from the underside of the limb, on the outside of the branch collar. Cut 4 should be from the top and in alignment with the 3rd cut. Cut 3 should be 1/4 to 1/3 the way through the limb. This will prevent the bark from peeling down the trunk. Do not paint the cut surface.

H. Penalties for damage to valuable trees, shrubs, and herbaceous plants should be clearly spelled out in the contract.

PROTECTING TREES IN HEAVY USE AREAS

The compaction of soil over the roots of trees and shrubs by the trampling of recreationists, vehicular traffic, etc., reduces oxygen, water, and nutrient uptake by feeder roots. This weakens and may eventually kill the plants. Table 2.6 rates the “Susceptibility of Tree Species to Compaction.”

Where heavy compaction is anticipated, apply and maintain a 3 to 4 inch layer of undecayed wood chips or 2 inches of No. 2 washed, crushed gravel. In addition, use of a wooden or plastic mat may be used to lessen compaction, if applicable.

Table 2.6
Susceptibility of Tree Species to Compaction[1]

Resistant:

Box elder………………	*Acer negundo*	Willows…………………	*Salix spp.*
Green ash……………..	*Fraxinus pennsylvanica*	Honey locust……………	*Gleditsia triacanthos*
Red elm………………..	*Ulmus rubra*	Eastern cottonwood…….	*Populus deltoides*
Hawthornes……………	*Crataegus spp.*	Swamp white oak……….	*Quercus bicolor*
Bur oak………………..	*Quercus macrocarpa*	Hophornbeam……………	*Ostrya virginiana*
Northern white cedar….	*Thuja occidentalis*		

Intermediate:

Red maple…………….	*Acer rubrum*	Sweetgum……………….	*Liquidambar styraciflua*
Silver maple…………..	*Acer saccharinum*	Norway maple………….	*Acer platanoides*
Hackberry…………….	*Celtis occidentalis*	Shagbark hickory……….	*Carya ovata*
Black gum……………	*Nyssa sylvatica*	London plane…………..	*Platanus x hybrida*
Red oak………………	*Quercus rubra*	Pin oak………………….	*Quercus palustris*
Basswood…………….	*Tilia americana*		

Susceptible:

Sugar maple…………….	*Acer saccharum*	Austrian Pine……………	*Pinus nigra*
White pine………………	*Pinus strobus*	White ash……………….	*Fraxinus americana*
Blue spruce……………..	*Picea pungens*	Paper birch……………..	*Betula papyrifera*
White oak………………	*Quercus alba*	Moutain ash…………….	*Sorbus aucuparia*
Red pine………………..	*Pinus resinosa*	Japanese maple…………	*Acer palmatum*

[1] If a tree species does not appear on the list, insufficient information is available to rate it for this purpose.

STANDARD AND SPECIFICATIONS FOR SITE POLLUTION PREVENTION

Definition & Scope

A collection of management practices intended to control non-sediment pollutants associated with construction activities to prevent the generation of pollutants due to improper handling, storage, and spills and prevent the movement of toxic substances from the site into surface waters.

Conditions Where Practice Applies

On all construction sites where the earth disturbance exceeds 5,000 square feet, and involves the use of fertilizers, pesticides, petroleum based chemicals, fuels and lubricants, as well as sealers, paints, cleared woody vegetation, garbage, and sanitary wastes.

Design Criteria

The variety of pollutants on a particular site and the severity of their impacts depend on factors such as the nature of the construction activity, the physical characteristics of the construction site, and the proximity of water bodies and conveyances to the pollutant source.

1. All state and federal regulations shall be followed for the storage, handling, application, usage, and disposal of pesticides, fertilizers, and petroleum products.

2. Vehicle and construction equipment staging and maintenance areas will be located away from all drainage ways with their parking areas graded so the runoff from these areas is collected, contained and treated prior to discharge from the site.

3. Provide sanitary facilities for on-site personnel.

4. Store, cover, and isolate construction materials including topsoil, and chemicals, to prevent runoff of pollutants and contamination of groundwater and surface waters.

5. Develop and implement a spill prevention and control plan. The plan should include NYSDEC's spill reporting and initial notification requirements.

6. Provide adequate disposal for solid waste including woody debris, stumps, and other construction waste and include these methods and directions in the construction details on the site construction drawings. Fill, woody debris, stumps and construction waste shall not be placed in regulated wetlands, streams or other surface waters.

7. Distribute or post informational material regarding proper handling, spill response, spill kit location, and emergency actions to be taken, to all construction personnel.

8. Refueling equipment shall be located at least 100 feet from all wetlands, streams and other surface waters.

STANDARD AND SPECIFICATIONS FOR STABILIZED CONSTRUCTION ACCESS

Definition & Scope

A stabilized pad of aggregate underlain with geotextile located at any point where traffic will be entering or leaving a construction site to or from a public right-of-way, street, alley, sidewalk, or parking area. The purpose of stabilized construction access is to reduce or eliminate the tracking of sediment onto public rights-of-way or streets.

Conditions Where Practice Applies

A stabilized construction access shall be used at all points of construction ingress and egress.

Design Criteria

See Figure 2.1 on page 2.31 for details.

Aggregate Size: Use a matrix of 1-4 inch stone, or reclaimed or recycled concrete equivalent.

Thickness: Not less than six (6) inches.

Width: 12-foot minimum but not less than the full width of points where ingress or egress occurs. 24-foot minimum if there is only one access to the site.

Length: As required, but not less than 50 feet (except on a single residence lot where a 30 foot minimum would apply).

Geotextile: To be placed over the entire area to be covered with aggregate. Filter cloth will not be required on a single-family residence lot. Piping of surface water under entrance shall be provided as required. If piping is impossible, a mountable berm with 5:1 slopes will be permitted.

Criteria for Geotextile: The geotextile shall be woven or nonwoven fabric consisting only of continuous chain polymeric filaments or yarns of polyester. The fabric shall be inert to commonly encountered chemicals, hydro-carbons, mildew, rot resistant, and conform to the fabric properties as shown:

Fabric Properties[3]	Light Duty[1] Roads Grade Subgrade	Heavy Duty[2] Haul Roads Rough Graded	Test Method
Grab Tensile Strength (lbs)	200	220	ASTM D1682
Elongation at Failure (%)	50	60	ASTM D1682
Mullen Burst Strength (lbs)	190	430	ASTM D3786
Puncture Strength (lbs)	40	125	ASTM D751 Modified
Equivalent	40-80	40-80	US Std Sieve
Opening Size			CW-02215
Aggregate Depth	6	10	-

[1]Light Duty Road: Area sites that have been graded to subgrade and where most travel would be single axle vehicles and an occasional multi-axle truck. Acceptable materials are Trevira Spunbond 1115, Mirafi 100X, Typar 3401, or equivalent.

[2]Heavy Duty Road: Area sites with only rough grading, and where most travel would be multi-axle vehicles. Acceptable materials are Trevira Spunbond 1135, Mirafi 600X, or equivalent.

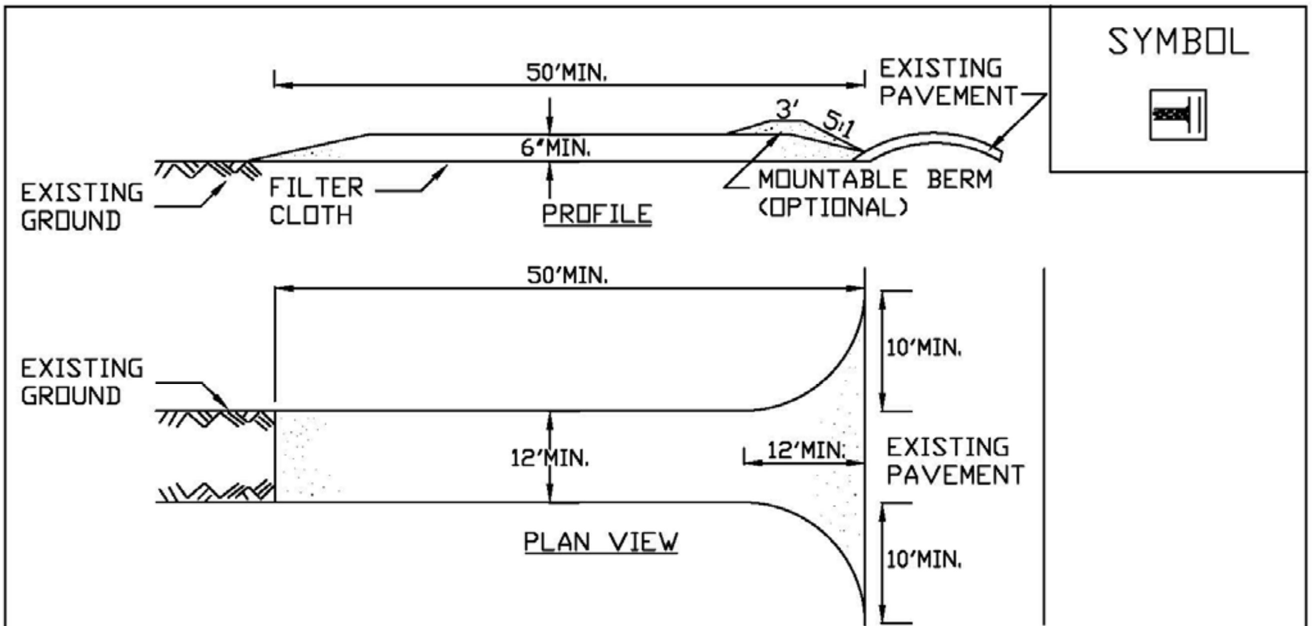
[3]Fabrics not meeting these specifications may be used only when design procedure and supporting documentation are supplied to determine aggregate depth and fabric strength.

Maintenance

The access shall be maintained in a condition which will prevent tracking of sediment onto public rights-of-way or streets. This may require periodic top dressing with additional aggregate. All sediment spilled, dropped, or washed onto public rights-of-way must be removed immediately.

When necessary, wheels must be cleaned to remove sediment prior to entrance onto public rights-of-way. When washing is required, it shall be done on an area stabilized with aggregate, which drains into an approved sediment-trapping device. All sediment shall be prevented from entering storm drains, ditches, or watercourses.

Figure 2.1
Stabilized Construction Access



CONSTRUCTION SPECIFICATIONS

1. STONE SIZE - USE 1-4 INCH STONE, OR RECLAIMED OR RECYCLED CONCRETE EQUIVALENT.
2. LENGTH - NOT LESS THAN 50 FEET (EXCEPT ON A SINGLE RESIDENCE LOT WHERE A 30 FOOT MINIMUM LENGTH WOULD APPLY).
3. THICKNESS - NOT LESS THAN SIX (6) INCHES.
4. WIDTH - TWELVE (12) FOOT MINIMUM, BUT NOT LESS THAN THE FULL WIDTH AT POINTS WHERE INGRESS OR EGRESS OCCURS. TWENTY-FOUR (24) FOOT IF SINGLE ENTRANCE TO SITE.
5. GEOTEXTILE - WILL BE PLACED OVER THE ENTIRE AREA PRIOR TO PLACING OF STONE.
6. SURFACE WATER - ALL SURFACE WATER FLOWING OR DIVERTED TOWARD CONSTRUCTION ACCESS SHALL BE PIPED BENEATH THE ENTRANCE. IF PIPING IS IMPRACTICAL, A MOUNTABLE BERM WITH 5:1 SLOPES WILL BE PERMITTED.
7. MAINTENANCE - THE ENTRANCE SHALL BE MAINTAINED IN A CONDITION WHICH WILL PREVENT TRACKING OR FLOWING OF SEDIMENT ONTO PUBLIC RIGHTS-OF-WAY, ALL SEDIMENT SPILLED, DROPPED, WASHED OR TRACKED ONTO PUBLIC RIGHTS-OF-WAY MUST BE REMOVED IMMEDIATELY.
8. WHEN WASHING IS REQUIRED, IT SHALL BE DONE ON A AREA STABILIZED WITH STONE AND WHICH DRAINS INTO AN APPROVED SEDIMENT TRAPPING DEVICE.
9. PERIODIC INSPECTION AND NEEDED MAINTENANCE SHALL BE PROVIDED AFTER EACH RAIN.

ADAPTED FROM DETAILS PROVIDED BY: USDA - NRCS, NEW YORK STATE DEPARTMENT OF TRANSPORTATION, NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION, NEW YORK STATE SOIL & WATER CONSERVATION COMMITTEE	STABILIZED CONSTRUCTION ACCESS

STANDARD AND SPECIFICATIONS FOR WINTER STABILIZATION

Definition & Scope

A temporary site specific, enhanced erosion and sediment control plan to manage runoff and sediment at the site during construction activities in the winter months to protect off-site water resources.

Conditions Where Practice Applies

This standard applies to all construction activities involved with ongoing land disturbance and exposure between November 15th to the following April 1st.

Design Criteria

1. Prepare a snow management plan with adequate storage for snow and control of melt water, requiring cleared snow to be stored in a manner not affecting ongoing construction activities.

2. Enlarge and stabilize access points to provide for snow management and stockpiling. Snow management activities must not destroy or degrade installed erosion and sediment control practices.

3. A minimum 25 foot buffer shall be maintained from all perimeter controls such as silt fence. Mark silt fence with tall stakes that are visible above the snow pack.

4. Edges of disturbed areas that drain to a waterbody within 100 feet will have 2 rows of silt fence, 5 feet apart, installed on the contour.

5. Drainage structures must be kept open and free of snow and ice dams. All debris, ice dams, or debris from plowing operations, that restrict the flow of runoff and meltwater, shall be removed.

6. Sediment barriers must be installed at all appropriate perimeter and sensitive locations. Silt fence and other practices requiring earth disturbance must be installed before the ground freezes.

7. Soil stockpiles must be protected by the use of established vegetation, anchored straw mulch, rolled stabilization matting, or other durable covering. A barrier must be installed at least 15 feet from the toe of the stockpile to prevent soil migration and to capture loose soil.

8. In areas where soil disturbance activity has temporarily or permanently ceased, the application of soil stabilization measures should be initiated by the end of the next business day and completed within three (3) days. Rolled erosion control blankets must be used on all slopes 3 horizontal to 1 vertical or steeper.

9. If straw mulch alone is used for temporary stabilization, it shall be applied at double the standard rate of 2 tons per acre, making the application rate 4 tons per acre. Other manufactured mulches should be applied at double the manufacturer's recommended rate.

10. To ensure adequate stabilization of disturbed soil in advance of a melt event, areas of disturbed soil should be stabilized at the end of each work day unless:

    a. work will resume within 24 hours in the same area and no precipitation is forecast or;

    b. the work is in disturbed areas that collect and retain runoff, such as open utility trenches, foundation excavations, or water management areas.

11. Use stone paths to stabilize access perimeters of buildings under construction and areas where construction vehicle traffic is anticipated. Stone paths should be a minimum 10 feet in width but wider as necessary to accommodate equipment.

Maintenance

The site shall be inspected frequently to ensure that the erosion and sediment control plan is performing its winter stabilization function. If the site will not have earth disturbing activities ongoing during the "winter season", **all** bare exposed soil must be stabilized by established vegetation, straw or other acceptable mulch, matting, rock, or other approved material such as rolled erosion control products. Seeding of areas with mulch cover is preferred but seeding alone is not acceptable for proper stabilization.

Compliance inspections must be performed and reports filed properly in accordance with the SWPPP for all sites under a winter shutdown.

STANDARD AND SPECIFICATIONS FOR DEWATERING SUMP PIT

Discharge of turbid water pumped from the standpipe should be to a sediment trap, sediment basin, filter bag or stabilized area, such as a filter strip. If water from the sump pit will be pumped directly to a storm drain system, filter cloth with an equivalent sieve size between 40-80 should be wrapped around the standpipe to ensure clean water discharge. It is recommended that ¼ to ½ inch hardware cloth be wrapped around and secured to the standpipe prior to attaching the filter cloth. This will increase the rate of water seepage into the standpipe.

Definition & Scope

A **temporary** pit which is constructed using pipe and stone for pumping excessive water from excavations to a suitable discharge area.

Conditions Where Practice Applies

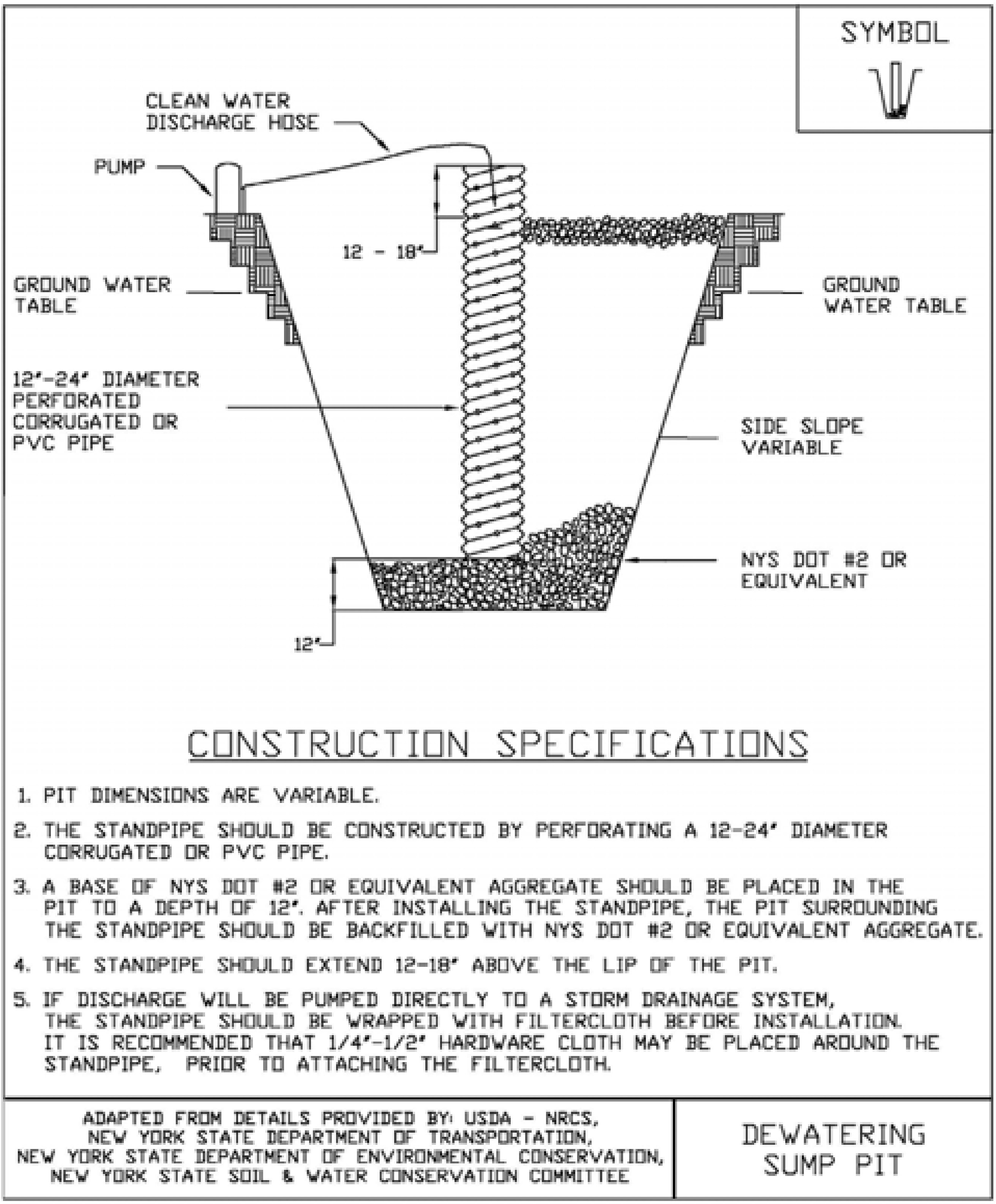
Sump pits are constructed when water collects during the excavation phase of construction. This practice is particularly useful in urban areas during excavation for building foundations. It may also be necessary during construction activities that encounter high ground water tables in floodplain locations.

Design Criteria

The number of sump pits and their locations shall be determined by the contractor/engineer. A design is not required, but construction should conform to the general criteria outlined on Figure 3.3 on page 3.8.

A perforated vertical standpipe is placed in the center of the pit and surrounded with a stone screening material to collect filtered water. Water is then pumped from the center of the pipe to a suitable discharge area.

Figure 3.3
Dewatering Sump Pit Detail



STANDARD AND SPECIFICATIONS FOR FLOW DIFFUSER

Definition & Scope

A permanent non-erosive outlet for concentrated runoff constructed to diffuse flow uniformly through a stone matrix onto a stablilized area in the form of shallow, low velocity, sheet flow.

Conditions Where Practice Applies

Where sediment-free stormwater runoff can be released in low velocity sheet flow down stabilized areas without causing erosion; where the ground slope at the outlet of the diffuser is less than 30% and the runoff will not re-concentrate after release; and where construction of a flow spreader is not practicable.

Design Criteria

1. **Drainage area:** The maximum drainage area to the diffuser may not exceed 0.10 acre per foot length of the flow diffuser. The drainage area served by the diffuser discharging directly cannot be 10-20% more than half the size of the receiving buffer area.

2. **Discharge from diffuser onto receiving area:** The peak stormwater flow rate from a flow diffuser onto a receiving area from a 10-year 24-hour storm must be less than 0.25 cubic feet per second (0.25 cfs) per linear foot of weir crest length.

3. **Receiving area of buffer:** Each flow diffuser shall have a vegetated receiving area with a minimum continuous length of 150 feet and the capacity to pass the flow without erosion. The receiving area shall be stable prior to the construction of the flow diffuser. The receiving area shall have topography regular enough to prevent undue flow concentration before entering a stable watercourse but it shall have a slope that is less than 30%. If the receiving area is not presently stable, then the receiving area shall be stabilized prior to construction of the flow diffuser. The receiving area below the flow diffuser shall be protected from harm during construction. Sodding and/or turf reinforcement mat (TRM) in combination with vegetative measures shall stabilize disturbed areas. The receiving area shall not be used by the flow diffuser until stabilization has been accomplished. A temporary diversion may be necessary in this case.

4. **Cross-section:** The minimum stone diffuser cross-section shall be trapezoidal with a height of 1 foot above natural ground; top width equal to 2 foot and side slope equal to 1 horizontal to 1 vertical. The storage area behind the diffuser shall be excavated to a depth of 1 foot and overall width of storage area equal to 6 feet minimum.

5. **Sizing the diffuser:** The length of the stone diffuser is governed by the size of the stone in the structure, the height of the diffuser, and the flow length through it. The following equation is used to establish the design of the diffuser:

$$Q_d = \frac{h^{3/5} W}{[(\frac{L}{D}) + 2.5 + L^2]^{0.5}}$$

Where:

Q_d = Outflow through the stone diffuser (cfs)
h = Ponding depth behind the diffuser (ft.)
W = Linear length of the diffuser along centerline (ft.)
L = Average horizontal flow length through the diffuser perpendicular to the centerline (ft.)
D = Average stone diameter (d_{50}) in the structure (ft.)

The maximum d_{50} size shall be 9” or 0.75’.

The designer shall calculate the length of diffuser needed depending on the geometry of the cross-section and rock size to be used recognizing that the maximum allowable discharge through the diffuser shall be 0.25 cfs per foot of length.

Once the discharge is calculated for the 10 year storm for the drainage area to the diffuser (Q_{10}) it can be divided by the design discharge of the diffuser to determine the diffuser length as follows:

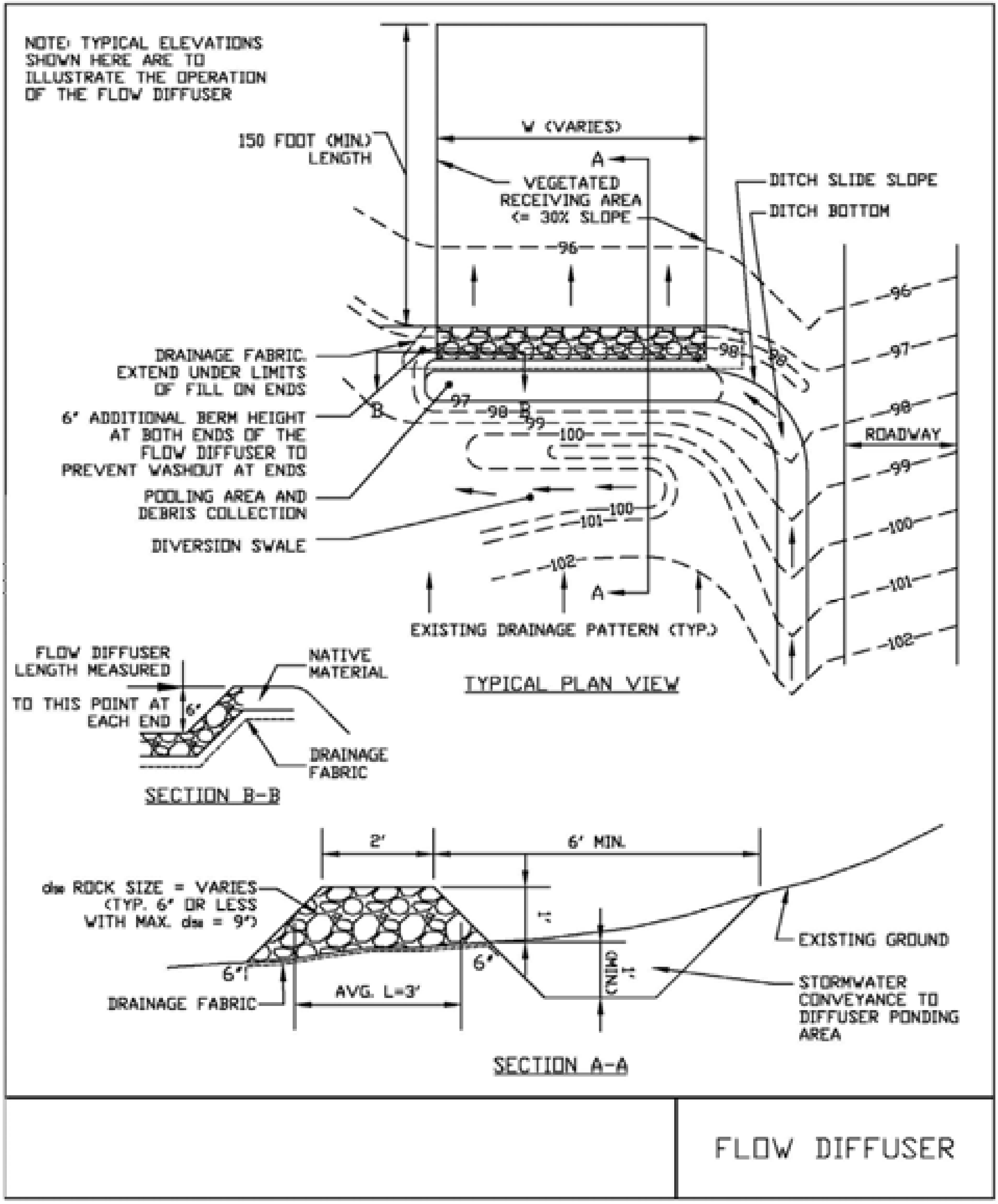
$$W = \frac{Q_{10}}{Q_d}$$

Where:

Q_d = Outflow through the stone diffuser (cfs/ft)
Q_{10} = Discharge rate for the 10 year storm (cfs)
W = Linear length of the diffuser along centerline (ft.)

Design examples are shown in Appendix B.

Figure 3.6
Flow Diffuser Detail



STANDARD AND SPECIFICATIONS FOR FLOW SPREADER

Definition & Scope

A **permanent or temporary,** non-erosive outlet for concentrated runoff, constructed to disperse concentrated flow uniformly over a hardened weir into a stabilized area as shallow, low velocity, sheet flow.

Conditions Where Practice Applies

Where sediment-free storm runoff can be released in sheet flow down a stabilized slope without causing erosion; where a hardened level weir can be constructed without filling; where the area below the weir is uniform with a slope of 10% or less and the runoff will not re-concentrate after release; and where no traffic will disturb the flow spreader.

Design Criteria

1. **Drainage area:** The maximum drainage area to the spreader may not exceed 5 acres.

2. **Discharge to a flow spreader:** The peak stormwater flow rate to a flow spreader due to runoff from a 10-year 24-hour storm must be less than 0.5 cubic feet per second (0.5 cfs) per foot length of flow spreader lip.

3. **Length of flow spreader:** The flow spreader length may not be more than 30 feet if flow is entering from one end of the spreader. Longer lengths require flow to split evenly from the center of the spreader.

4. **Receiving area of buffer:** Each flow spreader shall have a vegetated receiving area with the capacity to pass the flow without erosion. The receiving area shall be stable prior to the construction of the flow spreader. The receiving area shall have topography regular enough to prevent undue flow concentration before entering a stable watercourse but it shall have a slope that is less than 10%. If the receiving area is not presently stable, then the receiving area shall be stabilized prior to construction of the flow spreader. The receiving area below the flow spreader shall be protected from harm during construction. Sodding and/or turf reinforced mat in combination with vegetative measures shall stabilize disturbed areas. The receiving area shall not be used by the flow spreader until stabilization has been accomplished. A temporary diversion may be necessary in this case.

5. **Weir:** The weir of the flow spreader should consist of a pressure treated 2”x12” timber plank laid on edge and set at level elevation perpendicular to flow. Alternate hardened weir structures may be used as long as a hard, durable, continuous weir is maintained.

6. **Channel:** The flow spreader entrance channel shall be a minimum of 1 foot deep with a minimum 2 foot bottom width to trap sediment and reduce lateral flow velocities. Side slopes shall be 2:1 or flatter. The channel shall be constructed with a 0% grade to ensure uniform flow distribution. Velocity entering the channel shall be reduced to ensure non-erosive low approach velocity in the weir.

7. **Maintenance:** Long term maintenance of the flow spreader is essential to ensure its continued effectiveness. The following provisions should be followed. In the first year the flow spreader should be inspected semi annually and following major storm events for any signs of channelization and should be immediately repaired. After the first year, annual inspection should be sufficient. Spreaders constructed of wood, asphalt, stone or concrete curbing require periodic inspection to check for damage and to be repaired as needed.

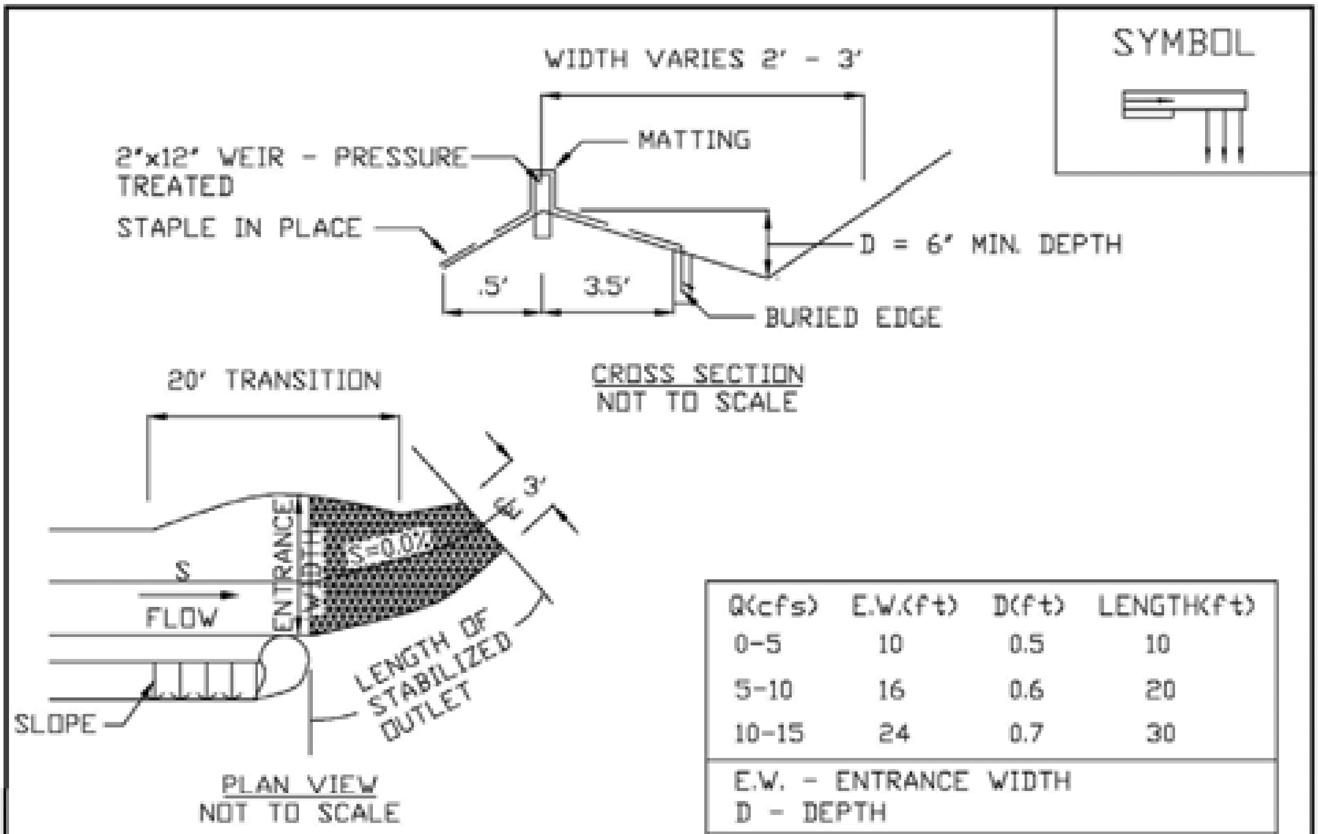
   A. **Inspections:** At least once a year, the spreader pool should be inspected for sand accumulation and debris that may reduce capacity.

   B. **Maintenance Access:** Flow spreaders should be sited to provide easy access for removal of accumulated sediment and rehabilitation of the berm.

   C. **Debris Removal:** Debris buildup within the channel should be removed when it has accumulated to approximately 10 to 20% of design volume or channel capacity. Remove debris such as leaf litter, branches, tree growth and any sediment build-up from the spreader and dispose of appropriately.

   D. **Mowing:** Vegetated spreaders may require mowing.

Figure 3.7
Flow Spreader Detail



Q(cfs)	E.W.(ft)	D(ft)	LENGTH(ft)
0-5	10	0.5	10
5-10	16	0.6	20
10-15	24	0.7	30

E.W. - ENTRANCE WIDTH
D - DEPTH

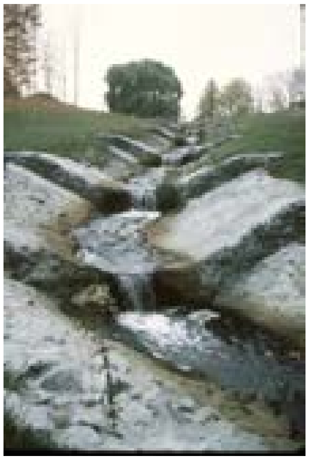
CONSTRUCTION SPECIFICATIONS

1. THE MATTING SHOULD BE A MINIMUM OF 4FT. WIDE EXTENDING 6 INCHES OVER THE WEIR AND BURIED 6 INCHES DEEP IN A VERTICAL TRENCH ON THE LOWER EDGE. THE UPPER EDGE SHOULD BUTT AGAINST SMOOTHLY CUT SOD AND BE SECURELY HELD IN PLACE WITH CLOSELY SPACED HEAVY DUTY WIRE STAPLES AT LEAST 12 INCHES IN LENGTH.
2. ENSURE THAT THE WEIR IS LEVEL TO UNIFORMLY SPREAD DISCHARGE.
3. THE WEIR SHALL BE PLACED IN UNDISTURBED SOIL NOT FILL.
4. A 20 FOOT TRANSITION SECTION WILL BE CONSTRUCTED FROM THE DIVERSION CHANNEL TO THE SPREADER TO SMOOTHLY BLEND THE DIFFERENT DIMENSION AND GRADES.
5. THE RUNOFF DISCHARGE WILL BE OUTLETED ONTO A STABILIZED VEGETATED SLOPE NOT EXCEEDING 10%.
6. SEED AND MULCH THE DISTURBED AREA IMMEDIATELY AFTER CONSTRUCTION.

ADAPTED FROM DETAILS PROVIDED BY: USDA - NRCS,
NEW YORK STATE DEPARTMENT OF TRANSPORTATION,
NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
NEW YORK STATE SOIL & WATER CONSERVATION COMMITTEE

FLOW SPREADER

STANDARD AND SPECIFICATIONS FOR GRADE STABILIZATION STRUCTURE



Definition & Scope

A **permanent** structure to stabilize the grade or to control head cutting in artificial channels by reduction of velocities and grade in the watercourse or by providing channel linings or structures that can withstand the higher velocities.

Conditions Where Practice Applies

This practice applies to sites where the capability of earth and vegetative measures is exceeded in the safe handling of water at permissible velocities, where excessive grades or overfall conditions are encountered, or where water is to be lowered structurally from one elevation to another. These structures should generally be planned and installed along with, or as a part of, other practices in an overall surface water management system.

Design Criteria

Compliance with Laws and Regulations

Design and construction shall be in compliance with state and local laws and regulations. Such compliance is the responsibility of the landowner or developer.

General

Designs and specifications shall be prepared for each structure on an individual job basis depending on its purpose, site conditions, and the basic criteria of the conservation practice with which the structure is planned. Typical structures are as follows:

1. Channel linings of concrete, asphalt, half round metal pipe or other suitable lining materials. These linings should generally be used where channel velocities exceed safe velocities for vegetated channels due to increased grade or a change in channel cross section or where durability of vegetative lining is adversely affected by seasonal changes. Adequate protection will be provided to prevent erosion or scour of both ends of the channel lining.

2. Overfall structures of concrete, metal, rock riprap, or other suitable material is used to lower water from one elevation to another. These structures are applicable where it is desirable to drop the watercourse elevation over a very short horizontal distance. Adequate protection will be provided to prevent erosion or scour upstream, downstream and along sides of overfall structures. Structures should be located on straight sections of channel with a minimum of 100 feet of straight channel each way.

3. Pipe drops of metal pipe with suitable inlet and outlet structures. The inlet structure may consist of a vertical section of pipe or similar material, an embankment, or a combination of both. The outlet structure will provide adequate protection against erosion or scour at the pipe outlet.

Capacity

Structures that are designed to operate in conjunction with other erosion control practices shall have, as a minimum, capacity equal to the bankfull capacity of the channel delivering water to the structures. The minimum design capacity for structures that are not designed to perform in conjunction with other practices shall be that required to handle the peak rate of flow from a 10-year, 24-hour frequency storm or bankfull, whichever is greater. Peak rates of runoff used in determining the capacity requirements shall be determined by appropriate methods.

Set the rest of the structure at an elevation that will stabilize the grade of the upstream channel. The outlet should be set at an elevation to assure stability. Outlet velocities should be kept within the allowable limits for the receiving stream. Structural drop spillways need to include a foundation drainage system to reduce hydrostatic loads.

Permanent structures which involve the retarding of floodwater or the impoundment of water shall be designed using the criteria set forth in the New York State DEC Guidelines for the Design of Dams.

Construction Specifications

Structures shall be installed according to lines and grades shown on the plan. The foundation for structures shall be cleared of all undesirable materials prior to the installation of the structure. Materials used in construction shall be in conformance with the design frequency and life expectancy of the practice. Earth fill, when used as a part of the structure, shall be placed in 4-inch lifts and hand compacted within 2 feet of the structure.

Seeding, fertilizing, and mulching shall conform to the applicable standards and specifications in Section 4.

Construction operations shall be carried out in such a manner that erosion and air and water pollution will be minimized. State and local laws concerning pollution abatement shall be complied with at every site.

Locate emergency bypass areas so that floods in excess of structural capacity enter the channel far enough downstream so as not to cause damage to the structure.

Maintenance

Once properly installed, the maintenance for the grade stabilization structure should be minimal. Inspect the structure periodically and after major storm events. Check fill for piping or extreme settlement. Ensure a good vegetative cover. Check the channel for scour or debris and loss of rock from aprons. Repair or replace failing structures immediately.

STANDARD AND SPECIFICATIONS FOR LINED WATERWAY

Definition & Scope

A **permanent** waterway or outlet with a lining of concrete, stone, or other durable, hardened material. The lined section extends up the side slopes to the designed depth. The earth above the permanent lining may be vegetated or otherwise protected.

The lined waterway is constructed to provide for the disposal of concentrated runoff without damage from erosion or flooding, where grassed waterways would be inadequate due to high velocities.

Conditions Where Practice Applies

This standard applies to waterways or outlets with linings of cast-in-place concrete, flagstone mortared in place, rock riprap, gabions, or similar permanent linings. It does not apply to irrigation ditch or canal linings, grassed waterways with stone centers or small lined sections that carry prolonged low flows, or to reinforced concrete channels. Lined waterways should not be used if they are directly discharging to C(T) or higher streams unless thermal impacts are mitigated by biotechnical practices (Section 4). The maximum capacity of the waterway flowing at design depth shall not exceed 100 cubic feet per second.

This practice applies where the following or similar conditions exist:

1. Concentrated runoff is such that a lining is required to control erosion.

2. Steep grades, wetness, prolonged base flow, seepage, or piping that would cause erosion.

3. The location is such that damage from use by people or animals precludes use of vegetated waterways or outlets.

4. Soils are highly erosive or other soil and climate conditions preclude using vegetation.

5. High value property or adjacent facilities warrant the extra cost to contain design runoff in a limited space.

Design Criteria

Capacity

1. The minimum capacity shall be adequate to carry the peak rate of runoff from a 10-year, 24-hour storm. Velocity shall be computed using Manning's equation with a coefficient of roughness "n" as follows:

Lined Material	"n"
Concrete (Type):	
Trowel Finish	0.015
Float Finish	0.019
Gunite	0.019
Flagstone	0.022
Riprap	Determine from Figure 3.11 on page 3.30
Gabion	0.030

2. Riprap gradation and filter (bedding) are generally designed in accordance with criteria set forth in the National Cooperative Highway Research Program Report 108, available from the University Microfilm International, 300 N. Zeeb Road, Ann Arbor, Michigan 48106, Publication No. PB-00839; or the Hydraulic Engineering Circular No. 11, prepared by the U.S. Bureau of Public Roads, available from Federal Highway Administration, 400 7th Street, S.W., Washington, D.C. 20590, HNG-31, or the procedure in the USDA-NRCS's Engineering Field Manual, Chapter 16.

Velocity

1. Maximum design velocity shall be as shown below. Except for short transition sections, flow with a channel gradient within the range of 0.7 to 1.3 of this flow's critical slope must be avoided unless the channel is straight. Velocities exceeding critical will be restricted to straight reaches.

Design Flow Depth (ft.)	Maximum Velocity (ft./sec.)
0.0 - 0.5	25
0.5 - 1.0	15
Greater than 1.0	10

2. Waterways or outlets with velocities exceeding critical shall discharge into an energy dissipater to reduce velocity to less than critical, or to a velocity the downstream soil and vegetative conditions will allow.

Cross Section

The cross section shall be triangular, parabolic, or trapezoidal. Monolithic concrete or gabions may be rectangular.

Freeboard

The minimum freeboard for lined waterways or outlets shall be 0.25 feet above design high water in areas where erosion resistant vegetation cannot be grown adjacent to the paved side slopes. No freeboard is required where good vegetation can be grown and is maintained.

Side Slope

Steepest permissible side slopes, horizontal to vertical will be as follows:

1. Non-Reinforced Concrete
   Hand-placed, formed concrete
   Height of lining, 1.5 ft or less .... Vertical
   Hand placed screened concrete or mortared
   In-place flagstone
   Height of lining, less than 2 ft .... 1 to 1
   Height of lining, more than 2 ft .... 2 to 1
2. Slip form concrete:
   Height of lining, less than 3 ft .... 1 to 1
3. Rock Riprap .... 2 to 1
4. Gabions .... Vertical
5. Pre-cast Concrete Sections .... Vertical

Lining Thickness

Minimum lining thickness shall be as follows:

1. Concrete .... 4 in. (In most problem areas, shall be 5 in. with welded wire fabric reinforcing)

2. Rock Riprap .... 1.5 x maximum stone size plus thickness of filter or bedding.

3. Flagstone .... 4 in. including mortar bed.

Related Structures

Side inlets, drop structures, and energy dissipaters shall meet the hydraulic and structural requirements of the site.

Filters or Bedding

Filters or bedding to prevent piping, reduce uplift pressure, and collect water will be used as required and will be designed in accordance with sound engineering principles. Weep holes and drains should be provided as needed.

Concrete

Concrete used for lining shall be so proportioned that it is plastic enough for thorough consolidation and stiff enough to stay in place on side slopes. A dense product will be required. A mix that can be certified as suitable to produce a minimum strength of at least 3,000 pounds per square inch will be required. Cement used shall be Portland Cement, Type I, II, IV, or V. Aggregate used shall have a maximum diameter of 1 ½ inches.

Weep holes should be provided in concrete footings and retaining walls to allow free drainage of water. Pipe used for weep holes shall be non-corrosive.

Mortar

Mortar used for mortared in-place flagstone shall consist of a mix of cement, sand, and water. Follow directions on the bag of mortar for proper mixing of mortar and water.

Contraction Joints

Contraction joints in concrete linings, where required, shall be formed transversely to a depth of about one third the thickness of the lining at a uniform spacing in the range of 10 to 15 feet.

Rock Riprap or Flagstone

Stone used for riprap or gabions shall be dense and hard enough to withstand exposure to air, water, freezing, and thawing. Flagstone shall be flat for ease of placement and have the strength to resist exposure and breaking. Rock riprap maximum size shall be as follows:

Velocity (f.p.s.)	d_{max} (in.)
5.0	6
8.5	12
10	18
12	24
15	36

A complete listing riprap gradations is provided in Table 4.1, page 4.9.

Cutoff Walls

Cutoff walls shall be used at the beginning and ending of concrete lining. For rock riprap lining, cutoff walls shall be keyed into the channel bottom and at both ends of the lining.

Construction Specifications

1. The foundation area shall be cleared of trees, stumps, roots, sod, loose rock, or other objectionable material.

2. The cross-section shall be excavated to the neat lines and grades as shown on the plans. Over-excavated areas shall be backfilled with moist soil compacted to the density of the surrounding material.

3. No abrupt deviations from design grade or horizontal alignment shall be permitted.

4. Concrete linings shall be placed to the thickness shown on the plans and trowel finished. Adequate precautions shall be taken to protect freshly placed concrete from extreme (hot or cold) temperatures, to ensure proper curing.

5. Filter bedding and rock riprap shall be placed to line and grade in the manner specified.

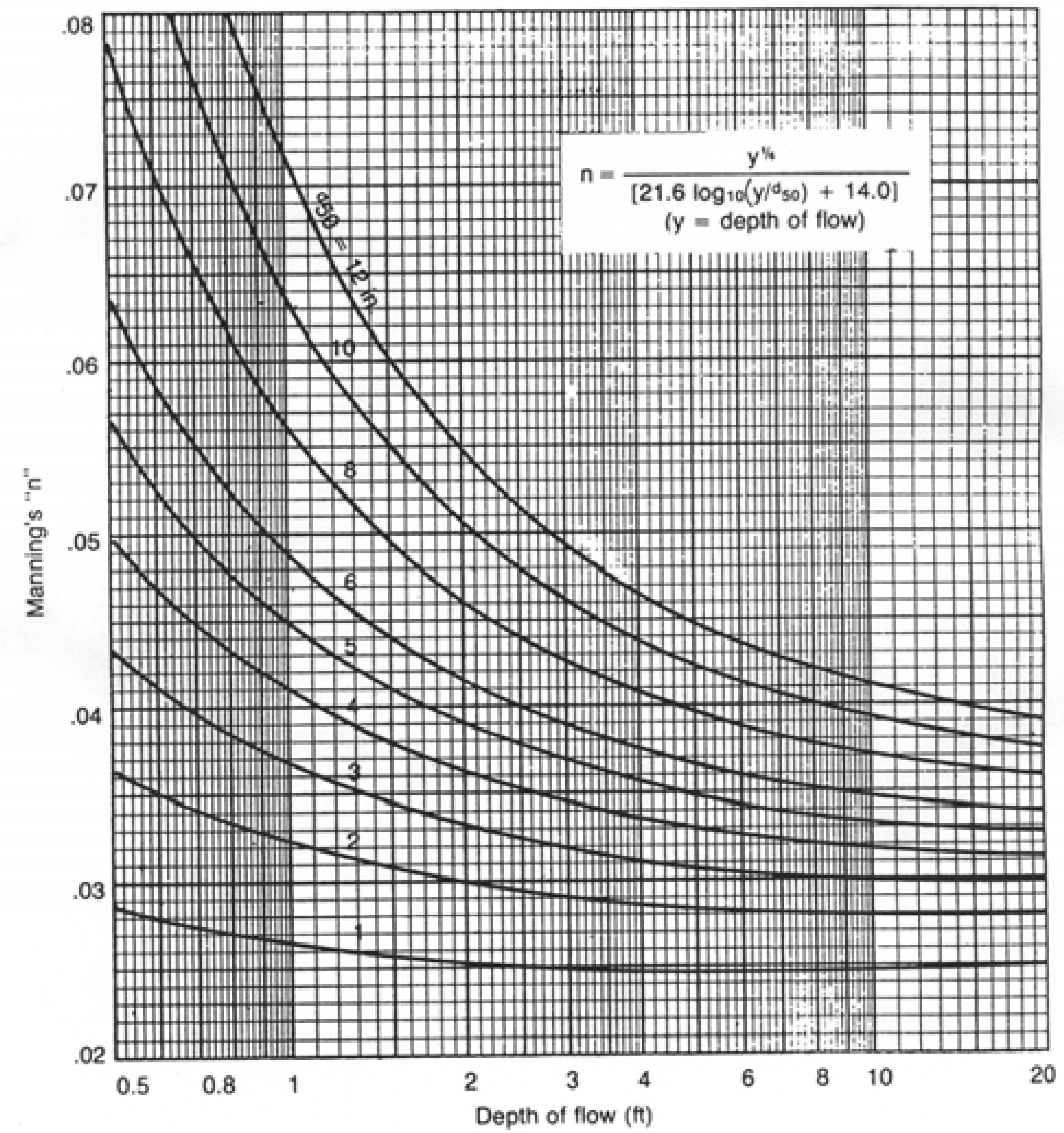
6. Construction operation shall be done in such a manner that erosion, air pollution, and water pollution will be minimized and held within legal limits. The completed job shall meet all design requirements for the appropriate finish. All disturbed areas shall be vegetated or otherwise protected against soil erosion.

Maintenance

Pavement or lining should be maintained as built to prevent undermining and deterioration. Existing trees next to pavements should be removed, as roots can cause uplift damage.

Vegetation next to pavement should be maintained in good condition to prevent scouring if the pavement is overtopped. See Standard and Specifications for Permanent Construction Area Planting on page 4.42.

Figure 3.11
Determining "n" for Riprap Lined Channel using Depth of Flow Chart
(USDA - NRCS)



STANDARD AND SPECIFICATIONS FOR ROCK OUTLET PROTECTION

Definition & Scope

A **permanent** section of rock protection placed at the outlet end of the culverts, conduits, or channels to reduce the depth, velocity, and energy of water, such that the flow will not erode the receiving downstream reach.

Conditions Where Practice Applies

This practice applies where discharge velocities and energies at the outlets of culverts, conduits, or channels are sufficient to erode the next downstream reach. This applies to:

1. Culvert outlets of all types.
2. Pipe conduits from all sediment basins, dry storm water ponds, and permanent type ponds.
3. New channels constructed as outlets for culverts and conduits.

Design Criteria

The design of rock outlet protection depends entirely on the location. Pipe outlet at the top of cuts or on slopes steeper than 10 percent, cannot be protected by rock aprons or riprap sections due to re-concentration of flows and high velocities encountered after the flow leaves the apron.

Many counties and state agencies have regulations and design procedures already established for dimensions, type and size of materials, and locations where outlet protection is required. Where these requirements exist, they shall be followed.

Tailwater Depth

The depth of tailwater immediately below the pipe outlet must be determined for the design capacity of the pipe. If the tailwater depth is less than half the diameter of the outlet pipe, and the receiving stream is wide enough to accept divergence of the flow, it shall be classified as a Minimum Tailwater Condition; see Figure 3.16 on page 3.42 as an example. If the tailwater depth is greater than half the pipe diameter and the receiving stream will continue to confine the flow, it shall be classified as a Maximum Tailwater Condition; see Figure 3.17 on page 3.43 as an example. Pipes which outlet onto flat areas with no defined channel may be assumed to have a Minimum Tailwater Condition; see Figure 3.16 on page 3.42 as an example.

Apron Size

The apron length and width shall be determined from the curves according to the tailwater conditions:

Minimum Tailwater – Use Figure 3.16 on page 3.42
Maximum Tailwater – Use Figure 3.17 on page 3.43

If the pipe discharges directly into a well defined channel, the apron shall extend across the channel bottom and up the channel banks to an elevation one foot above the maximum tailwater depth or to the top of the bank, whichever is less.

The upstream end of the apron, adjacent to the pipe, shall have a width two (2) times the diameter of the outlet pipe, or conform to pipe end section if used.

Bottom Grade

The outlet protection apron shall be constructed with no slope along its length. There shall be no overfall at the end of the apron. The elevation of the downstream end of the apron shall be equal to the elevation of the receiving channel or adjacent ground.

Alignment

The outlet protection apron shall be located so that there are no bends in the horizontal alignment.

Materials

The outlet protection may be done using rock riprap, grouted riprap, or gabions. Outlets constructed on the bank of a stream or wetland shall not use grouted rip-rap, gabions or concrete.

Riprap shall be composed of a well-graded mixture of rock size so that 50 percent of the pieces, by weight, shall be larger than the d_{50} size determined by using the charts. A well-graded mixture, as used herein, is defined as a mixture composed primarily of larger rock sizes, but with a sufficient mixture of other sizes to fill the smaller voids between the rocks. The diameter of the largest rock size in such a mixture shall be 1.5 times the d_{50} size.

Thickness

The minimum thickness of the riprap layer shall be 1.5 times the maximum rock diameter for d_{50} of 15 inches or less; and 1.2 times the maximum rock size for d_{50} greater than 15 inches. The following chart lists some examples:

D_{50} (inches)	d_{max} (inches)	Minimum Blanket Thickness (inches)
4	6	9
6	9	14
9	14	20
12	18	27
15	22	32
18	27	32
21	32	38
24	36	43

Rock Quality

Rock for riprap shall consist of field rock or rough unhewn quarry rock. The rock shall be hard and angular and of a quality that will not disintegrate on exposure to water or weathering. The specific gravity of the individual rocks shall be at least 2.5.

Filter

A filter is a layer of material placed between the riprap and the underlying soil surface to prevent soil movement into and through the riprap. Riprap shall have a filter placed under it in all cases.

A filter can be of two general forms: a gravel layer or a plastic filter cloth. The plastic filter cloth can be woven or non-woven monofilament yarns, and shall meet these base requirements: thickness 20-60 mils, grab strength 90-120 lbs; and shall conform to ASTM D-1777 and ASTM D-1682.

Gravel filter blanket, when used, shall be designed by comparing particle sizes of the overlying material and the base material. Design criteria are available in Standard and Specification for Anchored Slope and Channel Stabilization on page 4.7.

Gabions

Gabions shall be made of hexagonal triple twist mesh with heavily galvanized steel wire. The maximum linear dimension of the mesh opening shall not exceed 4 ½ inches and the area of the mesh opening shall not exceed 10 square inches.

Gabions shall be fabricated in such a manner that the sides, ends, and lid can be assembled at the construction site into a rectangular basket of the specified sizes. Gabions shall be of single unit construction and shall be installed according to manufacturer's recommendations.

The area on which the gabion is to be installed shall be graded as shown on the drawings. Foundation conditions shall be the same as for placing rock riprap, and filter cloth shall be placed under all gabions. Where necessary, key, or tie, the structure into the bank to prevent undermining of the main gabion structure.

Maintenance

Once a riprap outlet has been installed, the maintenance needs are very low. It should be inspected after high flows for evidence of scour beneath the riprap or for dislodged rocks. Repairs should be made immediately.

Design Procedure

1. Investigate the downstream channel to assure that nonerosive velocities can be maintained.

2. Determine the tailwater condition at the outlet to establish which curve to use.

3. Use the appropriate chart with the design discharge to determine the riprap size and apron length required. It is noted that references to pipe diameters in the charts are based on full flow. For other than full pipe flow, the parameters of depth of flow and velocity must be used to adjust the design discharges.

4. Calculate apron width at the downstream end if a flare section is to be employed.

Design Examples are demonstrated in Appendix B.

Construction Specifications

1. The subgrade for the filter, riprap, or gabion shall be prepared to the required lines and grades. Any fill required in the subgrade shall be compacted to a density of approximately that of the surrounding undisturbed material.

2. The rock or gravel shall conform to the specified grad-

ing limits when installed respectively in the riprap or filter.

3. Filter cloth shall be protected from punching, cutting, or tearing. Any damage other than an occasional small hole shall be repaired by placing another piece of cloth over the damaged part or by completely replacing the cloth. All overlaps, whether for repairs or for joining two pieces of cloth shall be a minimum of one foot.

4. Rock for the riprap or gabion outlets may be placed by equipment. Both shall each be constructed to the full course thickness in one operation and in such a manner as to avoid displacement of underlying materials. The rock for riprap or gabion outlets shall be delivered and placed in a manner that will ensure that it is reasonably homogenous with the smaller rocks and spalls filling the voids between the larger rocks. Riprap shall be placed in a manner to prevent damage to the filter blanket or filter cloth. Hand placement will be required to the extent necessary to prevent damage to the permanent works.

Figure 3.16
Outlet Protection Design—Minimum Tailwater Condition Chart (Design of Outlet Protection from a Round Pipe Flowing Full, Minimum Tailwater Condition: $T_w < 0.5D_o$) (USDA - NRCS)

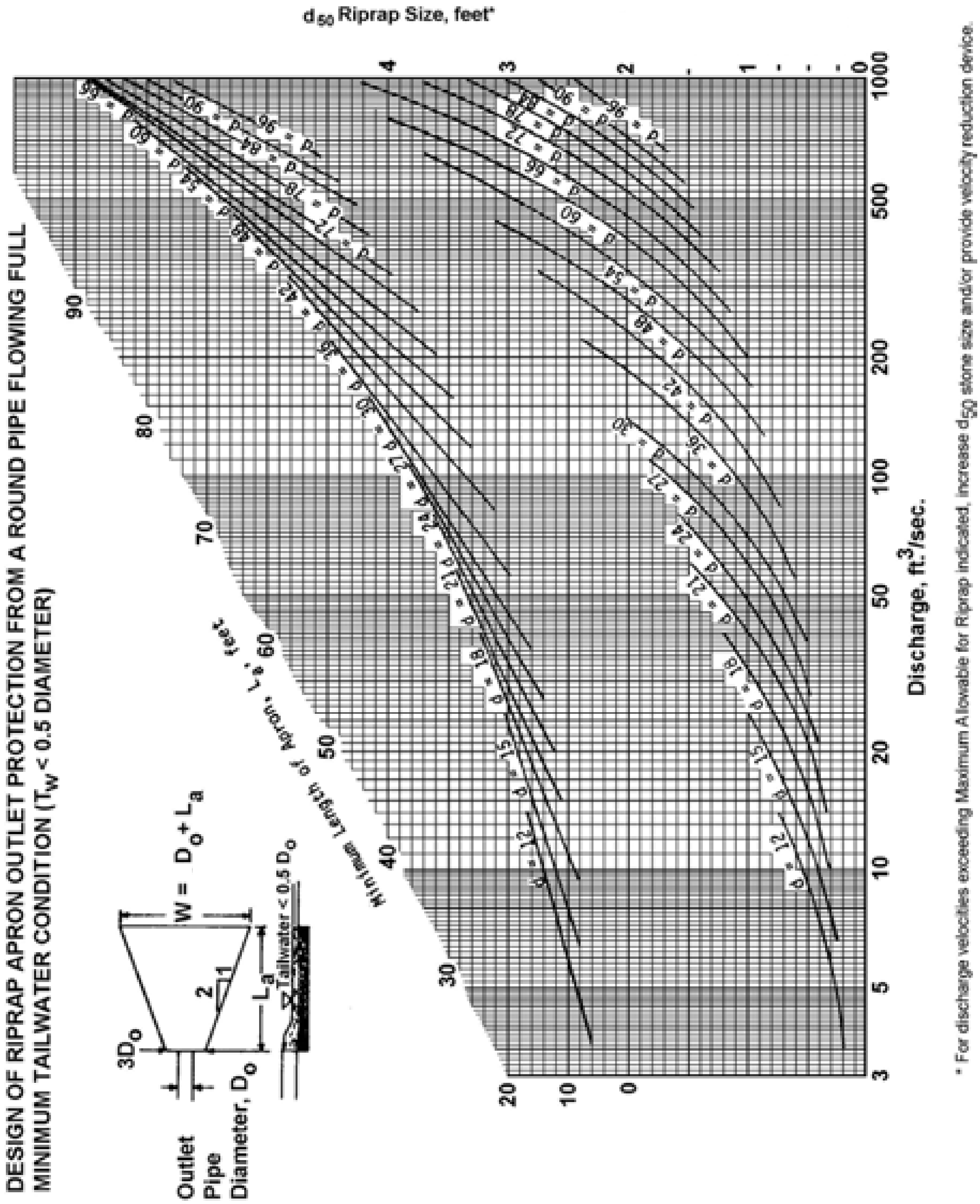


Figure 3.17
Outlet Protection Design—Maximum Tailwater Condition Chart
(Design of Outlet Protection from a Round Pipe Flowing Full, Maximum Tailwater Condition: $T_w \geq 0.5D_o$) (USDA - NRCS)

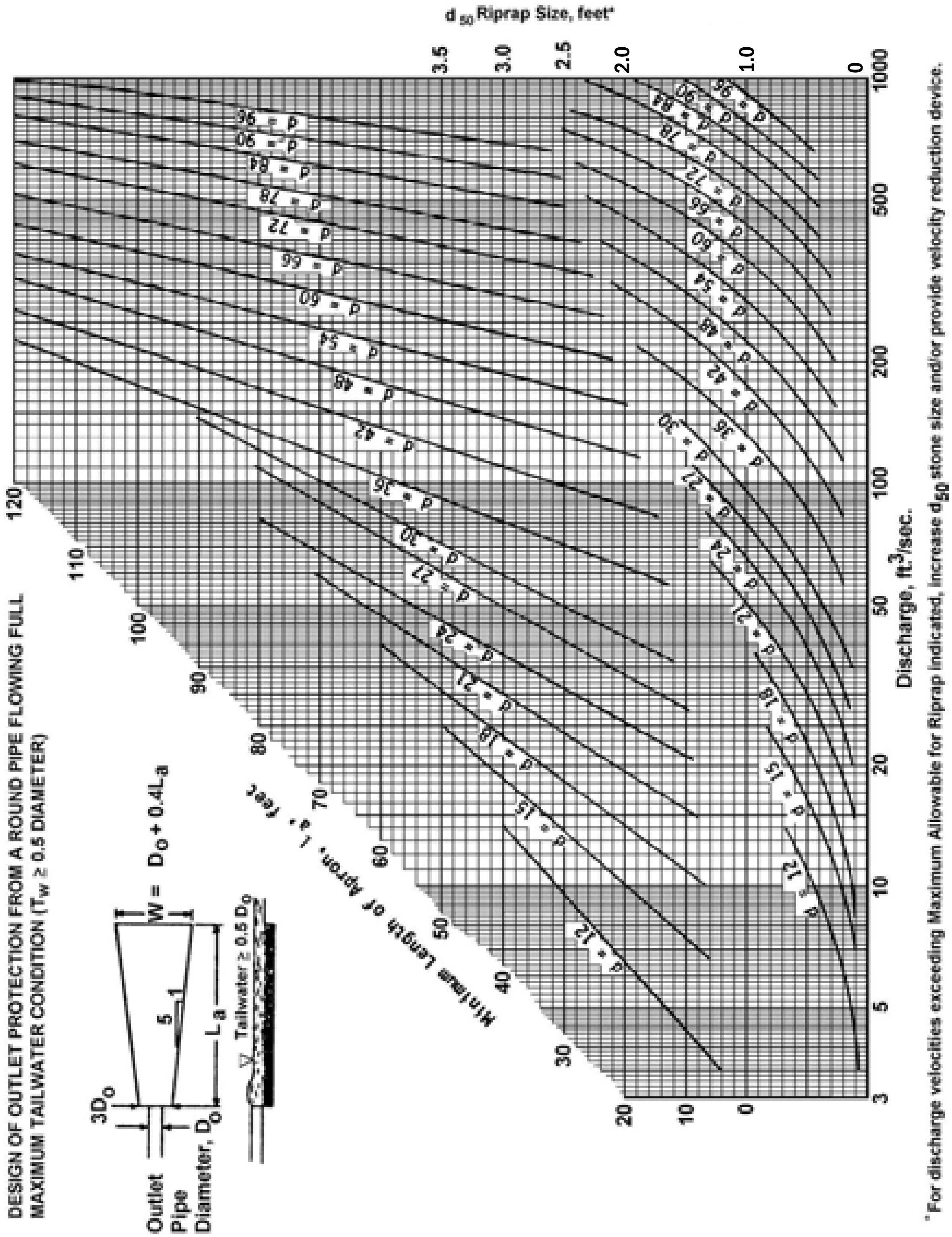


Figure 3.18
Riprap Outlet Protection Detail (1)

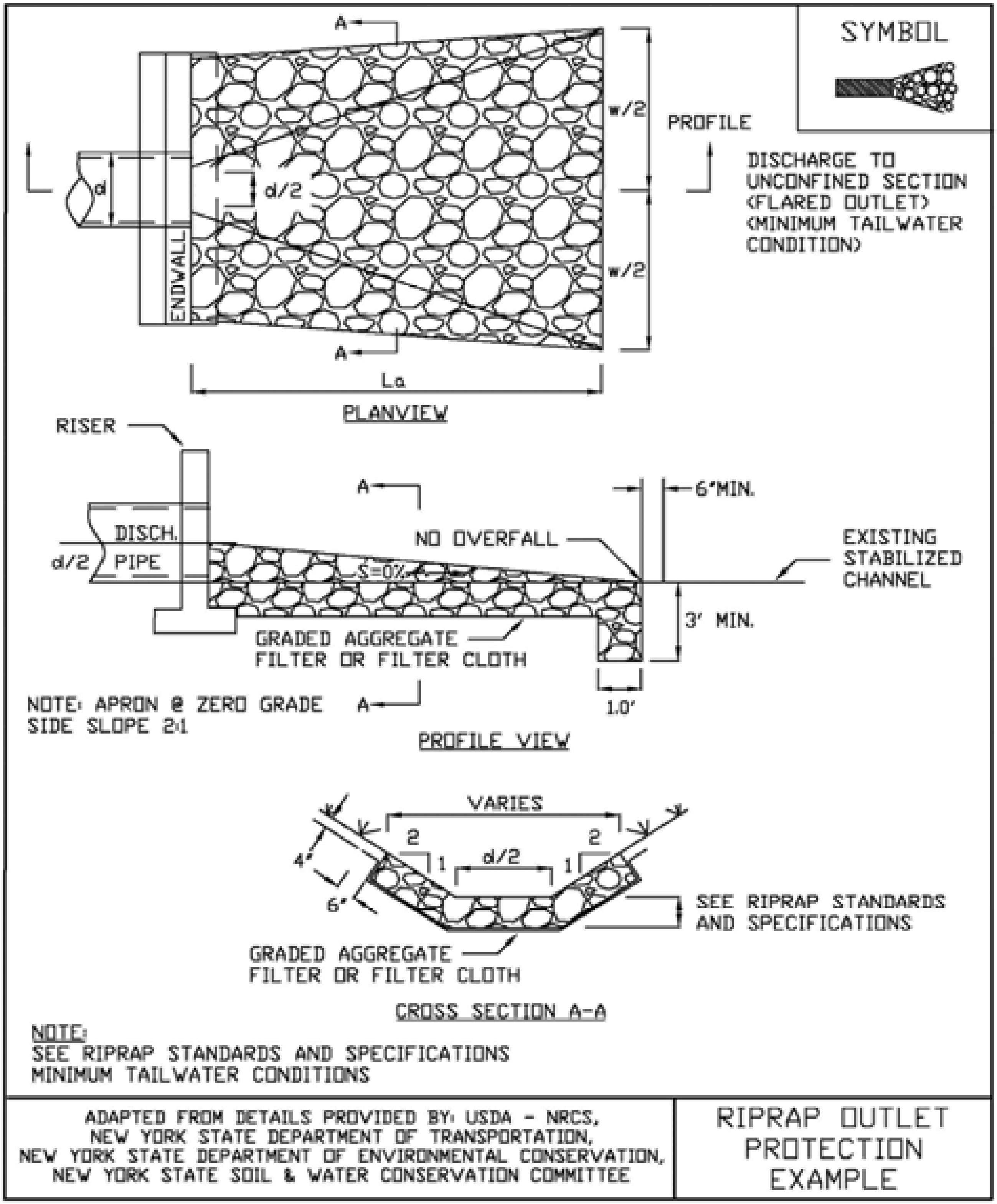


Figure 3.19
Riprap Outlet Protection Detail (2)

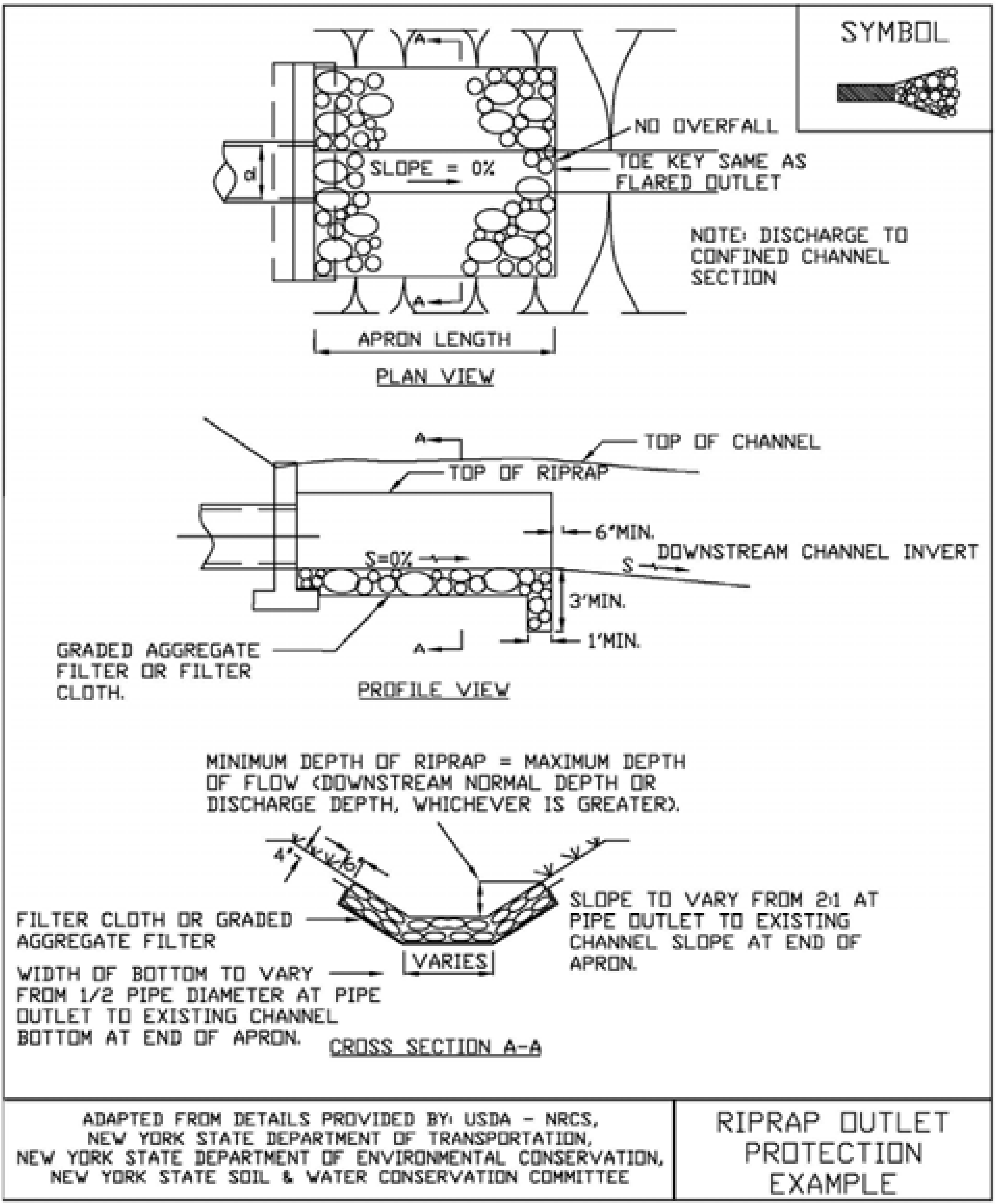
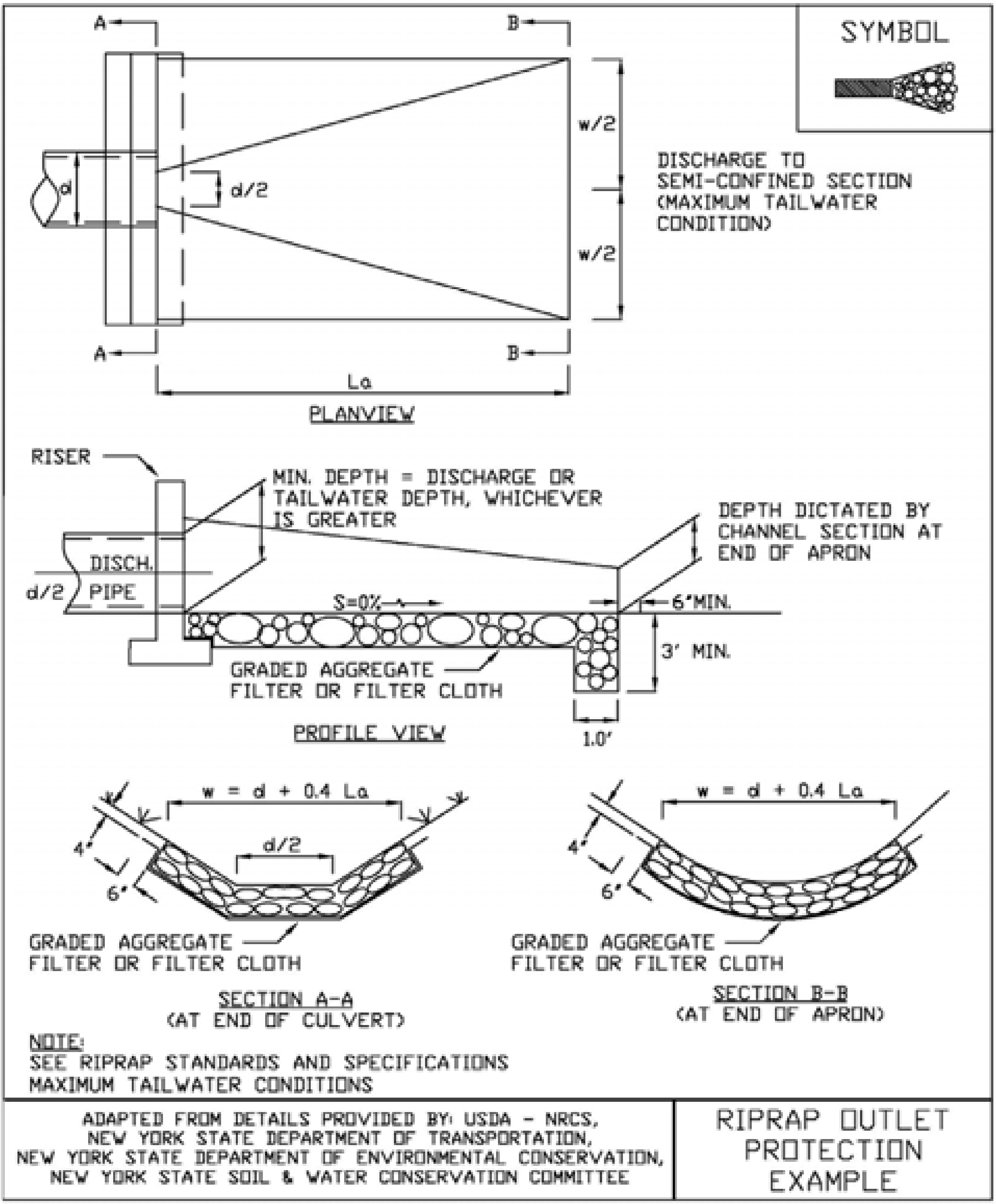


Figure 3.20
Riprap Outlet Protection Detail (3)



STANDARD AND SPECIFICATIONS FOR SUBSURFACE DRAIN

Definition & Scope

A **permanent** conduit, such as tile, pipe, or tubing, installed beneath the ground surface, which intercepts, collects, and/or conveys drainage water to serve one or more of the following purposes:

1. Improve the environment for vegetative growth by regulating the water table and groundwater flow.
2. Intercept and prevent water movement into a wet area.
3. Relieve artesian pressures.
4. Remove surface runoff.
5. Provide internal drainage of slopes to improve their stability and reduce erosion.
6. Provide internal drainage behind bulkheads, retaining walls, etc.
7. Replace existing subsurface drains that are interrupted or destroyed by construction operations.
8. Provide subsurface drainage for dry storm water management structures.
9. Improve dewatering of sediment in sediment basins. (See Standard and Specification for Sediment Basins in Section 5).

Conditions Where Practice Applies

Subsurface drains are used in areas having a high water table or where subsurface drainage is required. The soil shall have enough depth and permeability to permit installation of an effective system. This standard does not apply to storm drainage systems or foundation drains. Regulatory restrictions may apply if wetlands are present.

An outlet for the drainage system shall be available, either by gravity flow or by pumping. The outlet shall be adequate for the quantity of water to be discharged without causing damage above or below the point of discharge and shall comply with all state and local laws.

Design Criteria

The design and installation shall be based on adequate surveys and on-site soils investigations.

Required Capacity of Drains

The required capacity shall be determined by one or more of the following:

1. Where sub-surface drainage is to be uniform over an area through a systematic pattern of drains, a drainage coefficient of 1 inch to be removed in 24 hours shall be used; see Drain Chart, Figure 3.21 on page 3.51.

2. Where sub-surface drainage is to be by a random interceptor system, a minimum inflow rate of 0.5 cfs per 1,000 feet of line shall be used to determine the required capacity. If actual field tests and measurements of flow amounts are available, they may be used for determining capacity.

   For interceptor subsurface drains on sloping land, increase the inflow rate as follows:

Land Slope	Increase Inflow Rate By
2-5 percent	10 percent
5-12 percent	20 percent
Over 12 percent	30 percent

3. Additional design capacity must be provided if surface water is allowed to enter the system.

Size of Subsurface Drain

The size of subsurface drains shall be determined from the drain chart found on Figures 3.21 on page 3.51. All subsurface drains shall have a nominal diameter, which equals or exceeds four (4) inches.

Depth and Spacing

The minimum depth of cover of subsurface drains shall be 24 inches where possible. The minimum depth of cover may be reduced to 15 inches where it is not possible to attain the 24 inch depth and where the drain is not subject to equipment loading or frost action. Roots from some types of vegetation can plug drains, as the drains get closer to the surface.

The spacing of drain laterals will be dependent on the permeability of the soil, the depth of installation of the drains and degree of drainage required. Generally, drains installed 36 inches deep and spaced 50 feet center-to-center will be adequate. For more specific information, see the New York Drainage Guide (USDA-NRCS).

Minimum Velocity and Grade

The minimum grade for subsurface drains shall be 0.10 percent. Where surface water enters the system a velocity of not less than 2 feet per second shall be used to establish the minimum grades. Provisions shall be made for preventing debris or sediment from entering the system by means of filters or collection and periodic removal of sediment from installed traps.

Materials for Subsurface Drains

Acceptable subsurface drain materials include perforated, continuous closed joint conduits of polyethylene plastic, concrete, corrugated metal, polyvinyl chloride, and clay tile.

The conduit shall meet strength and durability requirements of the site.

Loading

The allowable loads on subsurface drain conduits shall be based on the trench and bedding conditions specified for the job. A factor of safety of not less than 1.5 shall be used in computing the maximum allowable depth of cover for a particular type of conduit.

Envelopes and Envelope Materials

Envelopes shall be used around subsurface drains for proper bedding and to provide better flow into the conduit. Not less than three inches of envelope material shall be used for sand/gravel envelopes. Where necessary to improve the characteristics of flow of groundwater into the conduit, more envelope material may be required.

Where county regulations do not allow sand/gravel envelopes, but require a special type and size of envelope material, they shall be followed.
Envelope material shall be placed to the height of the uppermost seepage strata. Behind bulkheads and retaining walls, it shall go to within twelve inches of the top of the structure. This standard does not cover the design of filter materials where needed.

Materials used for envelopes shall not contain materials which will cause an accumulation of sediment in the conduit or render the envelope unsuitable for bedding of the conduit. Envelope materials shall consist of either filter cloth or sand/gravel material, which shall pass a 1 ½ inch sieve, 90 to 100 percent shall pass a ¾ inch sieve, and not more than 10 percent shall pass a No. 60 sieve.

Filter cloth envelope can be either woven or non-woven monofilament yarns and shall have a sieve opening ranging from 40 to 80. The envelope shall be placed in such a manner that once the conduit is installed, it shall completely encase the conduit.

The conduit shall be placed and bedded in a sand/gravel envelope. A minimum of three inches depth of envelope materials shall be placed on the bottom of a conventional trench. The conduit shall be placed on this and the trench completely filled with envelope material to minimum depth of 3 inches above the conduit.

Soft or yielding soils under the drain shall be stabilized where required and lines protected from settlement by adding gravel or other suitable material to the trench, by placing the conduit on plank or other rigid support, or by using long sections of perforated or watertight pipe with adequate strength to ensure satisfactory subsurface drain performance.

Use of Heavy Duty Corrugated Plastic Drainage Tubing

Heavy duty corrugated drainage tubing shall be specified where rocky or gravelly soils are expected to be encountered during installation operations. The quality of tubing will also be specified when cover over this tubing is expected to exceed 24 inches for 4, 5, 6, or 8 inch tubing. Larger size tubing designs will be handled on an individual job basis.

Auxiliary Structure and Subsurface Drain Protection

The outlet shall be protected against erosion and undermining of the conduit, against damaging periods of submergence, and against entry of rodents or other animals into the subsurface drain. An animal guard shall be installed on the outlet end of the pipe. A swinging animal guard shall be used if surface water enters the pipe.

A continuous 10-foot section of corrugated metal, cast iron, polyvinyl chloride, or steel pipe without perforations shall be used at the outlet end of the line and shall outlet 1.0 foot above the normal elevation of low flow in the outlet ditch or above mean high tide in tidal areas. No envelope material shall be used around the 10-foot section of pipe. Two-thirds of the pipe shall be buried in the ditch bank and the cantilevered section shall extend to a point above the toe of the ditch side slope. If not possible, the side slope shall be protected from erosion.

Conduits under roadways and embankments shall be watertight and designed to exclude debris and prevent sediment from entering the conduit. Lines flowing under pressure shall be designed to withstand the resulting pressures and velocity of flow. Surface waterways shall be used where feasible.

The upper end of each subsurface drain line shall be capped with a tight fitting cap of the same material as the conduit or other durable material unless connected to a structure.

Construction Specifications

1. Deformed, warped, or otherwise damaged pipe or tubing shall not be used.

2. All subsurface drains shall be laid to a uniform line and covered with envelope material. The pipe or tubing shall be laid with the perforations down and oriented symmetrically about the vertical centerline. Connections will be made with manufactured appurtenances comparable in strength with the specified pipe or tubing unless otherwise specified. The method of placement and bedding shall be as specified on the drawing.

3. Envelope material shall consist of filter cloth or a sand/gravel (which shall pass the 1 ½ inch sieve, 90 to 100 percent shall pass ¾ inch sieve, and not more than 10 percent shall pass the No. 60 sieve).

4. The upper end of each subsurface drain line shall be capped with a tight fittings cap of the same material as the conduit or other durable material unless connected to a structure.

5. A continuous 10-foot section of corrugated metal, cast iron, polyvinyl chloride, or steel pipe without perforations shall be used at the outlet end of the line. No envelope material shall be used around the 10-foot section of the pipe. An animal guard shall be installed on the outlet end of the pipe.

6. Earth backfill material shall be placed in the trench in such a manner that displacement of the drain will not occur.

7. Where surface water is entering the system, the pipe outlet section of the system shall contain a swing type trash and animal guard.

Figure 3.21
Drain Chart - Corrugated Plastic Drain Tubing (USDA-NRCS)

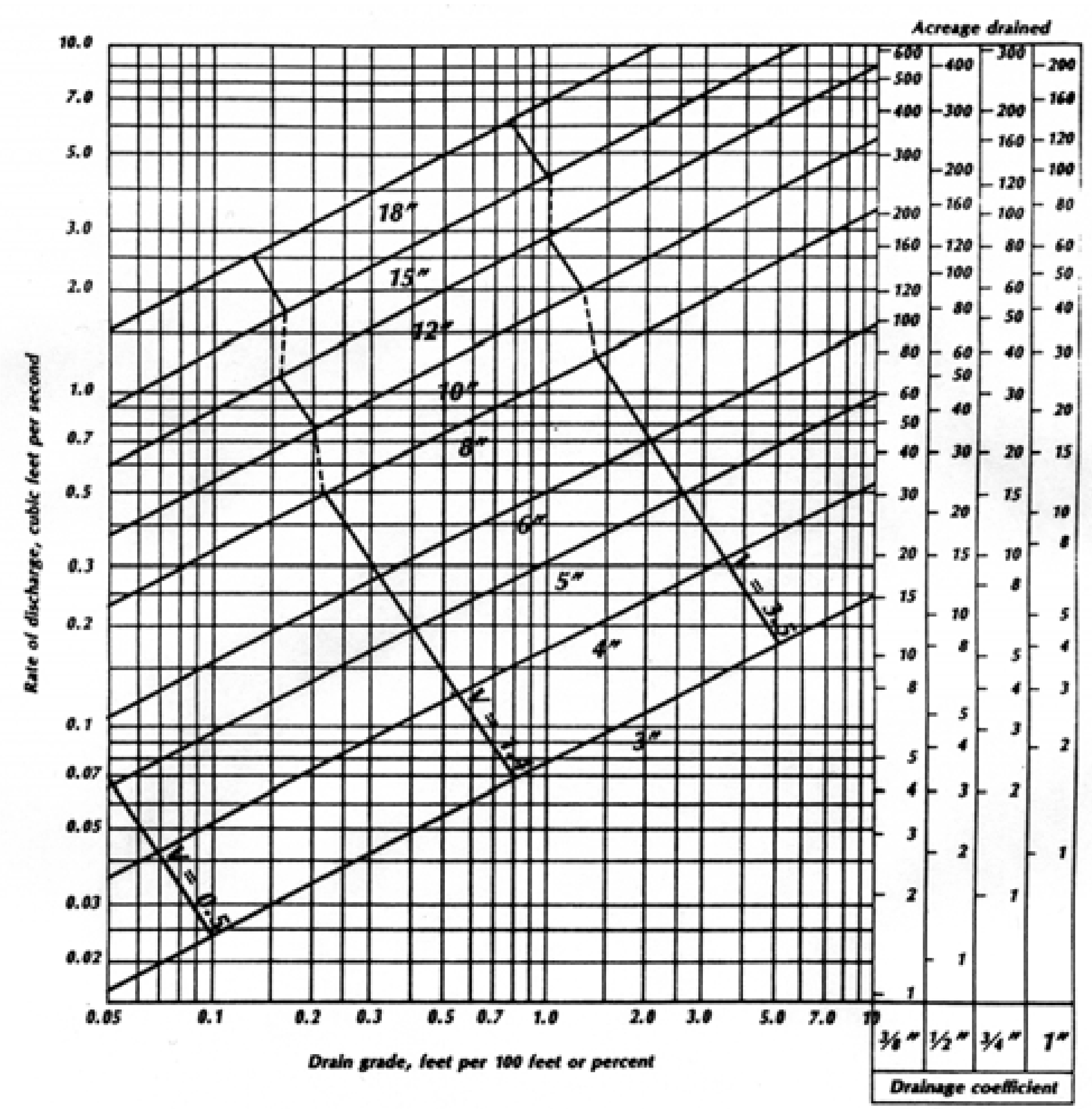
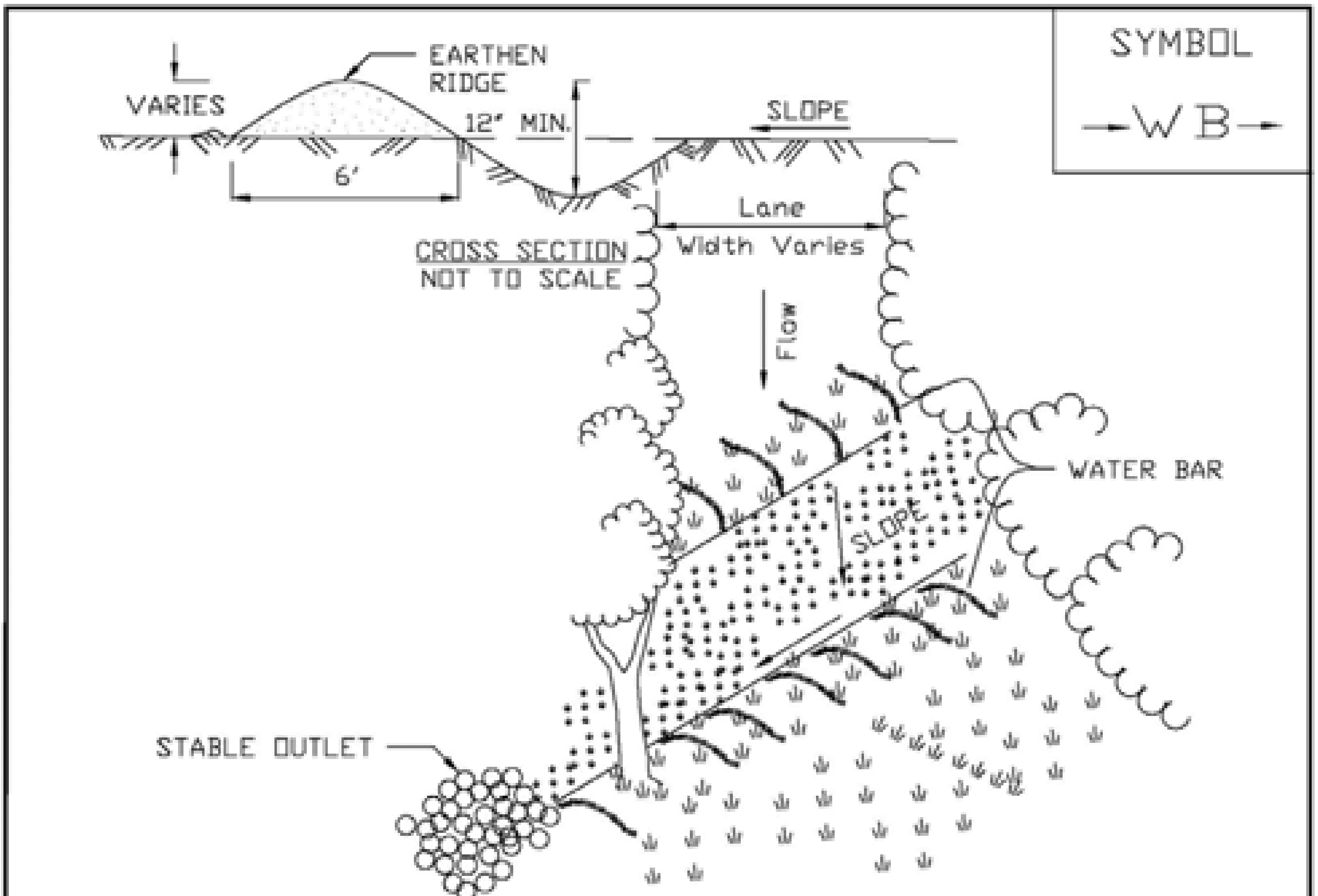


Figure 3.22
Water Bar Detail



CONSTRUCTION SPECIFICATIONS

1. INSTALL THE WATER BAR AS SOON AS THE RIGHT OF WAY IS CLEARED AND GRADED.
2. DISK OR STRIP THE SOD FROM THE BASE FOR THE CONSTRUCTED RIDGE BEFORE PLACING FILL.
3. TRACK THE RIDGE TO COMPACT IT TO THE DESIGN CROSS SECTION.
4. THE UNRESTRICTED OUTLET SHALL BE LOCATED ON AN UNDISTURBED AREA. FIELD SPACING WILL BE ADJUSTED TO USE THE MOST STABLE OUTLET AREAS. OUTLET PROTECTION WILL BE PROVIDED WHEN NATURAL AREAS ARE NOT ADEQUATE.
5. VEHICLE CROSSING SHALL BE STABILIZED WITH GRAVEL. EXPOSED AREAS SHALL BE SEEDED AND MULCHED WITHIN 2 DAYS.
6. PERIODICALLY INSPECT WATER BARS FOR EROSION DAMAGE AND SEDIMENT. CHECK OUTLET AREAS AND MAKE REPAIRS AS NEEDED TO RESTORE OPERATION.

ADAPTED FROM DETAILS PROVIDED BY: USDA - NRCS, NEW YORK STATE DEPARTMENT OF TRANSPORTATION, NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION, NEW YORK STATE SOIL & WATER CONSERVATION COMMITTEE	WATER BARS

STANDARD AND SPECIFICATIONS FOR ANCHORED STABILIZATION MATTING

Definition and Scope

A **temporary** or **permanent** protective covering placed on a prepared, seeded planting area that is anchored in place by staples or other means to aid in controlling erosion by absorbing rain splash energy and withstand overland flow as well as provide a microclimate to protect and promote seed establishment.

Conditions Where Practice Applies

Anchored stabilization mats are required for seeded earthen slopes steeper than 3 horizontal to 1 vertical; in vegetated channels where the velocity of the design flow exceeds the allowable velocity for vegetation alone (usually greater than 5 feet per second); on streambanks and shorelines where moving water is likely to erode newly seeded or planted areas; and in areas where wind prevents standard mulching with straw. This standard does not apply to slopes stabilized with sod, rock riprap or hard armor material.

Design Criteria

Slope Applications - Anchored stabilization mats for use on slopes are primarily used as mulch blankets where the mesh material is within the blanket or as a netting over previously placed mulch. These stabilization mats are NOT effective in preventing slope failures.

1. Required on all slopes steeper than 3:1
2. Matting will be designed for proper longevity need and strength based on intended use.
3. All installation details and directions will be included on the site erosion and sediment control plan and will follow manufactures specifications.

Channel Applications - Anchored stabilization mats, for use in supporting vegetation in flow channels, are generally a non-degradable, three dimensional plastic structure which can be filled with soil prior to planting. This structure provides a medium for root growth where the matting and roots become intertwined forming a continuous anchor for the vegetated lining.

1. Channel stabilization shall be based on the tractive force method.
2. For maximum design shear stresses less than 2 pounds per square foot, a temporary or bio-degradable mat may be used.
3. The design of the final matting shall be based on the mats ability to resist the tractive shear stress at bank full flow.
4. The installation details and procedures shall be included on the site erosion and sediment control plan and will follow manufacturers specifications.

Construction Specifications

1. Prepare soil before installing matting by smoothing the surface, removing debris and large stone, and applying lime, fertilizer and seed. Refer to manufacturers installation details.
2. Begin at the top of the slope by anchoring the mat in a 6” deep x 6” wide trench. Backfill and compact the trench after stapling.
3. In channels or swales, begin at the downslope end, anchoring the mat at the bottom and top ends of the blanket. When another roll is needed, the upslope roll

should overlay the lower layer, shingle style, so that channel flows do not peel back the material.

4. Roll the mats down a slope with a minimum 4” overlap. Roll center mat in a channel in direction of water flow on bottom of the channel. Do not stretch blankets. Blankets shall have good continuous contact with the underlying soil throughout its entire length.

5. Place mats end over end (shingle style) with a 6” overlap, use a double row of staggered staples 4” apart to secure mats.

6. Full length edge of mats at top of side slopes must be anchored in 6” deep x 6” wide trench; backfill and compact the trench after stapling.

7. Mats on side slopes of a channel must be overlapped 4” over the center mat and stapled.

8. In high flow channel applications, a staple check slot is recommended at 30 to 40 foot intervals. Use a row of staples 4” apart over entire width of the channel. Place a second row 4” below the first row in a staggered pattern.

9. The terminal end of the mats must be anchored in a 6”x6” wide trench. Backfill and compact the trench after stapling.

10. Stapling and anchoring of blanket shall be done in accordance with the manufactures recommendations.

Maintenance

Blanketed areas shall be inspected weekly and after each runoff event until perennial vegetation is established to a minimum uniform 80% coverage throughout the blanketed area. Damaged or displaced blankets shall be restored or replaced within 2 calendar days.

STANDARD AND SPECIFICATIONS FOR FIBER ROLL

Definition & Scope

A fiber roll is a coir (coconut fiber), straw, or excelsior roll encased in netting of jute, nylon, or burlap to dissipate energy along streambanks, channels, and bodies of water and to reduce sheet flow on slopes.

Conditions Where Practice Applies

Fiber rolls are used where the water surface levels are relatively constant. Artificially controlled streams for hydropower are not good candidates for this technique. The rolls provide a good medium for the introduction of herbaceous vegetation. Planting in the fiber roll is appropriate where the roll will remain continuously wet.

Design Criteria

1. The roll is placed in a shallow trench dug below baseflow or in a 4 inch trench on the slope contour and anchored by 2" x 2", 3-foot long posts driven on each side of the roll (see Figure 4.8).

2. The roll is contained by a 9-gauge non-galvanized wire placed over the roll from post to post. Braided nylon rope (1/8" thick) may be used.

3. The anchor posts shall be spaced laterally 4 feet on center on both sides of the roll and driven down to the top of the roll.

4. Soil is placed behind the roll and planted with suitable herbaceous or woody vegetation. If the roll will be continuously saturated, wetland plants may be planted into voids created in the upper surface of the roll.

5. Where water levels may fall below the bottom edge of the roll, a brush layer of willow should be installed so as to lay across the top edge of the roll.

6. Where fiber rolls are used to reduce sheet flow on slopes they should be at least 12" in diameter and spaced according to the straw bale dike standard for sediment control.

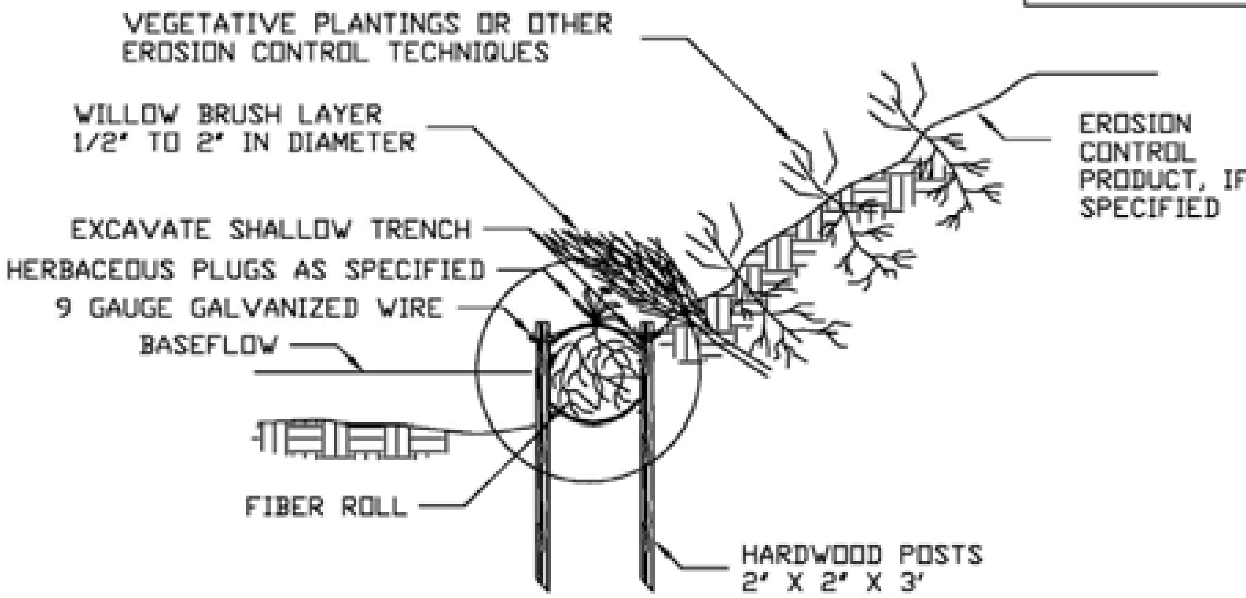
Maintenance

Due to the susceptibility of plant materials to the physical constraints of the site, climate conditions, and animal populations, it is necessary to inspect installations frequently. This is especially important during the first year or two of establishment. Plant materials missing or damaged should be replaced as soon as possible. Sloughs or breaks in drainage pattern should be reestablished for the site as quickly as possible to maintain stability.

Figure 4.8
Fiber Roll

SYMBOL

FR



CROSS SECTION
NOT TO SCALE

CONSTRUCTION SPECIFICATIONS

1. EXCAVATE A SHALLOW TRENCH SLIGHTLY BELOW BASEFLOW OR A 4" TRENCH ON SLOPE CONTOURS.
2. PLACE THE ROLL IN THE TRENCH AND ANCHOR WITH 2" x 2" POSTS PLACED ON BOTH SIDES OF THE ROLL AND SPACED LATERALLY ON 2' TO 4' CENTERS. TRIM THE TOP OF THE POSTS EVEN WITH THE EDGE OF THE ROLL, IF NECESSARY.
3. NOTCH THE POSTS AND TIE TOGETHER, ACROSS THE ROLL, WITH 9 GAUGE GALVANIZED WIRE OR 1/8" DIAMETER BRAIDED NYLON ROPE..
4. PLACE SOIL EXCAVATED FROM THE TRENCH BEHIND THE ROLL AND HAND TAMP. PLANT WITH SUITABLE HERBACEOUS OR WOODY VEGETATION AS SPECIFIED ELSEWHERE IN THE CONTRACT DOCUMENTS. VEGETATION SHALL BE PLACED IMMEDIATELY ADJACENT TO THE ROLL TO PROMOTE ROOT GROWTH INTO THE FIBER. HERBACEOUS VEGETATION, IF SPECIFIED, SHALL BE PLANTED INTO THE FIBER ROLL.

ADAPTED FROM DETAILS PROVIDED BY: USDA - NRCS, NEW YORK STATE DEPARTMENT OF TRANSPORTATION, NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION, NEW YORK STATE SOIL & WATER CONSERVATION COMMITTEE	FIBER ROLL

STANDARD AND SPECIFICATIONS FOR LANDGRADING

Definition & Scope

Permanent reshaping of the existing land surface by grading in accordance with an engineering topographic plan and specification to provide for erosion control and vegetative establishment on disturbed, reshaped areas.

Design Criteria

The grading plan should be based upon the incorporation of building designs and street layouts that fit and utilize existing topography and desirable natural surrounding to avoid extreme grade modifications. Information submitted must provide sufficient topographic surveys and soil investigations to determine limitations that must be imposed on the grading operation related to slope stability, effect on adjacent properties and drainage patterns, measures for drainage and water removal, and vegetative treatment, etc.

Many municipalities and counties have regulations and design procedures already established for land grading and cut and fill slopes. Where these requirements exist, they shall be followed.

The plan must show existing and proposed contours of the area(s) to be graded. The plan shall also include practices for erosion control, slope stabilization, safe disposal of runoff water and drainage, such as waterways, lined ditches, reverse slope benches (include grade and cross section), grade stabilization structures, retaining walls, and surface and subsurface drains. The plan shall also include phasing of these practices. The following shall be incorporated into the plan:

1. Provisions shall be made to safely convey surface runoff to storm drains, protected outlets, or to stable water courses to ensure that surface runoff will not damage slopes or other graded areas; see standards and specifications for Grassed Waterway, Diversion, or Grade Stabilization Structure.

2. Cut and fill slopes that are to be stabilized with grasses shall not be steeper than 2:1. When slopes exceed 2:1, special design and stabilization consideration are required and shall be adequately shown on the plans. (Note: Where the slope is to be mowed, the slope should be no steeper than 3:1, although 4:1 is preferred because of safety factors related to mowing steep slopes.)

3. Reverse slope benches or diversion shall be provided whenever the vertical interval (height) of any 2:1 slope exceeds 20 feet; for 3:1 slope it shall be increased to 30 feet and for 4:1 to 40 feet. Benches shall be located to divide the slope face as equally as possible and shall convey the water to a stable outlet. Soils, seeps, rock outcrops, etc., shall also be taken into consideration when designing benches.

   A. Benches shall be a minimum of six feet wide to provide for ease of maintenance.

   B. Benches shall be designed with a reverse slope of 6:1 or flatter to the toe of the upper slope and with a minimum of one foot in depth. Bench gradient to the outlet shall be between 2 percent and 3 percent, unless accompanied by appropriate design and computations.

   C. The flow length within a bench shall not exceed 800 feet unless accompanied by appropriate design and computations; see Standard and Specifications for Diversion on page 3.9

4. Surface water shall be diverted from the face of all cut and/or fill slopes by the use of diversions, ditches and swales or conveyed downslope by the use of a designed structure, except where:

   A. The face of the slope is or shall be stabilized and the face of all graded slopes shall be protected from surface runoff until they are stabilized.

   B. The face of the slope shall not be subject to any concentrated flows of surface water such as from natural drainage ways, graded ditches, downspouts, etc.

   C. The face of the slope will be protected by anchored stabilization matting, sod, gravel, riprap, or other stabilization method.

5. Cut slopes occurring in ripable rock shall be serrated as shown in Figure 4.9 on page 4.26. The serrations shall be made with conventional equipment as the excavation is made. Each step or serration shall be constructed on the contour and will have steps cut at nominal two-foot intervals with nominal three-foot horizontal shelves. These steps will vary depending on the slope ratio or the cut slope. The nominal slope line is 1 ½: 1. These steps will weather and act to hold moisture, lime, fertilizer, and seed thus producing a much quicker and longer-lived vegetative cover and better slope stabilization. Overland flow shall be diverted from the top of all serrated cut slopes and carried to a suitable outlet.

6. Subsurface drainage shall be provided where necessary to intercept seepage that would otherwise adversely affect slope stability or create excessively wet site conditions.

7. Slopes shall not be created so close to property lines as to endanger adjoining properties without adequately protecting such properties against sedimentation, erosion, slippage, settlement, subsidence, or other related damages.

8. Fill material shall be free of brush, rubbish, rocks, logs, stumps, building debris, and other objectionable material. It should be free of stones over two (2) inches in diameter where compacted by hand or mechanical tampers or over eight (8) inches in diameter where compacted by rollers or other equipment. Frozen material shall not be placed in the fill nor shall the fill material be placed on a frozen foundation.

9. Stockpiles, borrow areas, and spoil shall be shown on the plans and shall be subject to the provisions of this Standard and Specifications.

10. All disturbed areas shall be stabilized structurally or vegetatively in compliance with the Permanent Construction Area Planting Standard on page 4.42.

Construction Specifications

See Figures 4.9 and 4.10 for details.

1. All graded or disturbed areas, including slopes, shall be protected during clearing and construction in accordance with the erosion and sediment control plan until they are adequately stabilized.

2. All erosion and sediment control practices and measures shall be constructed, applied and maintained in accordance with the erosion and sediment control plan and these standards.

3. Topsoil required for the establishment of vegetation shall be stockpiled in amount necessary to complete finished grading of all exposed areas.

4. Areas to be filled shall be cleared, grubbed, and stripped of topsoil to remove trees, vegetation, roots, or other objectionable material.

5. Areas that are to be topsoiled shall be scarified to a minimum depth of four inches prior to placement of topsoil.

6. All fills shall be compacted as required to reduce erosion, slippage, settlement, subsidence, or other related problems. Fill intended to support buildings, structures, and conduits, etc., shall be compacted in accordance with local requirements or codes.

7. All fill shall be placed and compacted in layers not to exceed 9 inches in thickness.

8. Except for approved landfills or nonstructural fills, fill material shall be free of frozen particles, brush, roots, sod, or other foreign objectionable materials that would interfere with, or prevent, construction of satisfactory fills.

9. Frozen material or soft, mucky or highly compressible materials shall not be incorporated into fill slopes or structural fills.

10. Fill shall not be placed on saturated or frozen surfaces.

11. All benches shall be kept free of sediment during all phases of development.

12. Seeps or springs encountered during construction shall be handled in accordance with the Standard and Specification for Subsurface Drain on page 3.48 or other approved methods.

13. All graded areas shall be permanently stabilized immediately following finished grading.

14. Stockpiles, borrow areas, and spoil areas shall be shown on the plans and shall be subject to the provisions of this Standard and Specifications.

Figure 4.9
Typical Section of Serrated Cut Slope

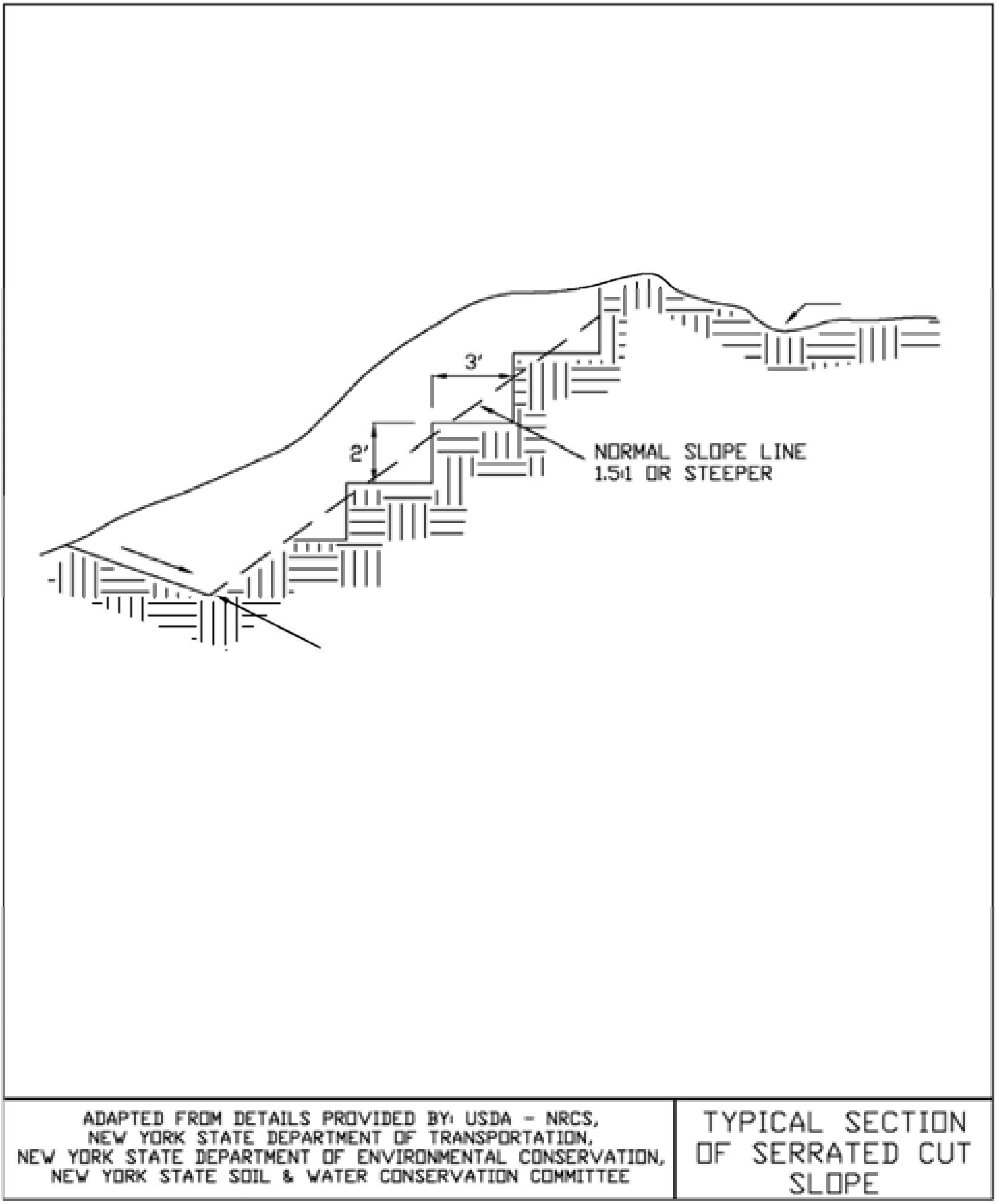
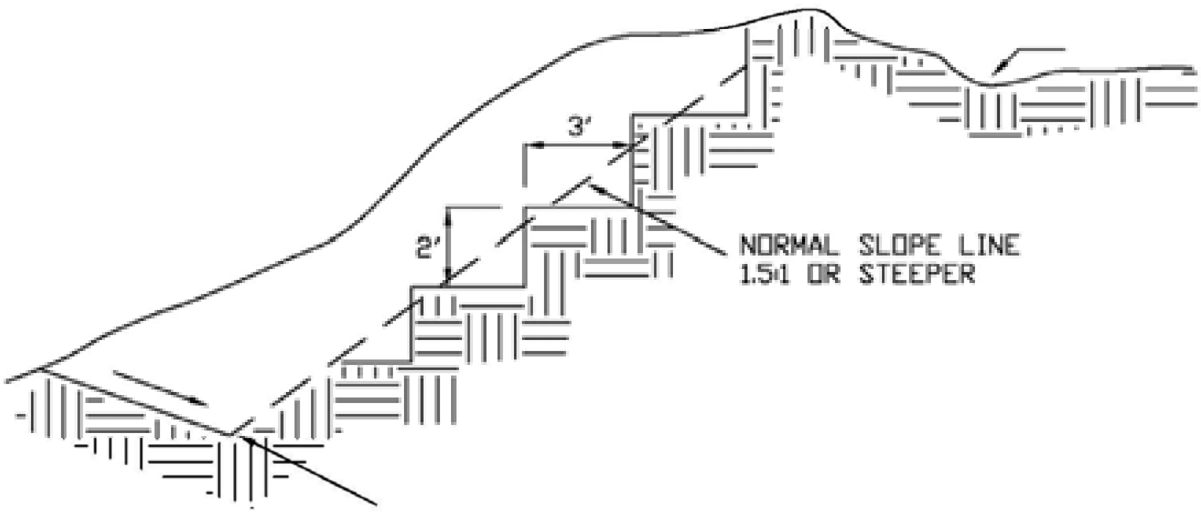


Figure 4.9
Typical Section of Serrated Cut Slope



ADAPTED FROM DETAILS PROVIDED BY: USDA - NRCS, NEW YORK STATE DEPARTMENT OF TRANSPORTATION, NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION, NEW YORK STATE SOIL & WATER CONSERVATION COMMITTEE	TYPICAL SECTION OF SERRATED CUT SLOPE

Figure 4.10
Landgrading

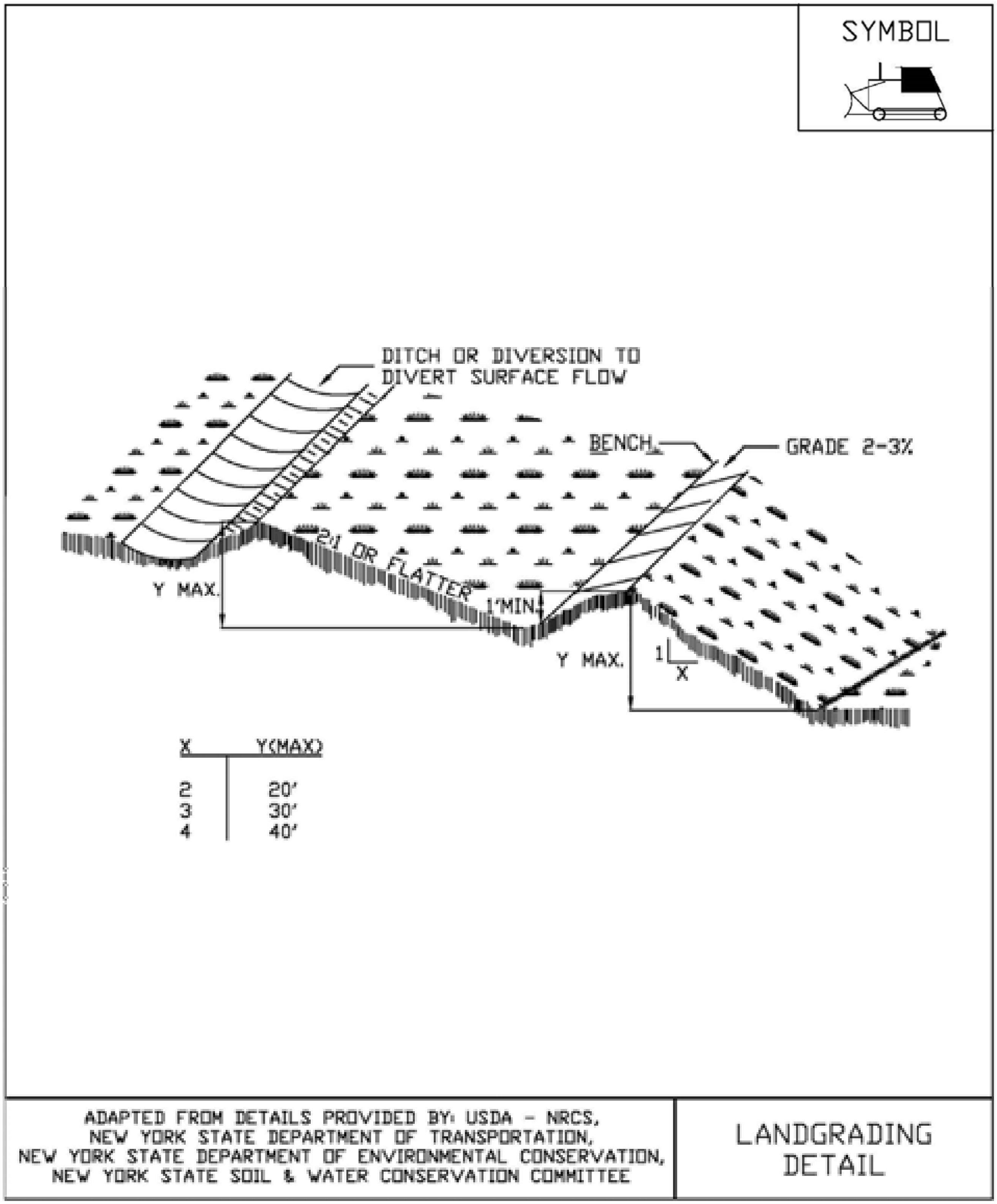


Figure 4.11
Landgrading - Construction Specifications

CONSTRUCTION SPECIFICATIONS

1. ALL GRADED OR DISTURBED AREAS INCLUDING SLOPES SHALL BE PROTECTED DURING CLEARING AND CONSTRUCTION IN ACCORDANCE WITH THE APPROVED EROSION AND SEDIMENT CONTROL PLAN UNTIL THEY ARE PERMANENTLY STABILIZED.
2. ALL SEDIMENT CONTROL PRACTICES AND MEASURES SHALL BE CONSTRUCTED, APPLIED AND MAINTAINED IN ACCORDANCE WITH THE APPROVED EROSION AND SEDIMENT CONTROL PLAN.
3. TOPSOIL REQUIRED FOR THE ESTABLISHMENT OF VEGETATION SHALL BE STOCKPILED IN AMOUNT NECESSARY TO COMPLETE FINISHED GRADING OF ALL EXPOSED AREAS.
4. AREAS TO BE FILLED SHALL BE CLEARED, GRUBBED, AND STRIPPED OF TOPSOIL TO REMOVE TREES, VEGETATION, ROOTS OR OTHER OBJECTIONABLE MATERIAL.
5. AREAS WHICH ARE TO BE TOPSOILED SHALL BE SCARIFIED TO A MINIMUM DEPTH OF FOUR INCHES PRIOR TO PLACEMENT OF TOPSOIL.
6. ALL FILLS SHALL BE COMPACTED AS REQUIRED TO REDUCE EROSION, SLIPPAGE, SETTLEMENT, SUBSIDENCE OR OTHER RELATED PROBLEMS. FILL INTENDED TO SUPPORT BUILDINGS, STRUCTURES AND CONDUITS, ETC. SHALL BE COMPACTED IN ACCORDANCE WITH LOCAL REQUIREMENTS OR CODES.
7. ALL FILL SHALL BE PLACED AND COMPACTED IN LAYERS NOT TO EXCEED 9 INCHES IN THICKNESS.
8. EXCEPT FOR APPROVED LANDFILLS, FILL MATERIAL SHALL BE FREE OF FROZEN PARTICLES, BRUSH, ROOTS, SOD, OR OTHER FOREIGN OR OTHER OBJECTIONABLE MATERIALS THAT WOULD INTERFERE WITH OR PREVENT CONSTRUCTION OF SATISFACTORY FILLS.
9. FROZEN MATERIALS OR SOFT, MUCKY OR HIGHLY COMPRESSIBLE MATERIALS SHALL NOT BE INCORPORATED IN FILLS.
10. FILL SHALL NOT BE PLACED ON SATURATED OR FROZEN SURFACES.
11. ALL BENCHES SHALL BE KEPT FREE OF SEDIMENT DURING ALL PHASES OF DEVELOPMENT.
12. SEEPS OR SPRINGS ENCOUNTERED DURING CONSTRUCTION SHALL BE HANDLED IN ACCORDANCE WITH THE STANDARD AND SPECIFICATION FOR SUBSURFACE DRAIN OR OTHER APPROVED METHOD.
13. ALL GRADED AREAS SHALL BE PERMANENTLY STABILIZED IMMEDIATELY FOLLOWING FINISHED GRADING.
14. STOCKPILES, BORROW AREAS AND SPOIL AREAS SHALL BE SHOWN ON THE PLANS AND SHALL BE SUBJECT TO THE PROVISIONS OF THIS STANDARD AND SPECIFICATION.

ADAPTED FROM DETAILS PROVIDED BY: USDA - NRCS, NEW YORK STATE DEPARTMENT OF TRANSPORTATION, NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION, NEW YORK STATE SOIL & WATER CONSERVATION COMMITTEE	LANDGRADING SPECIFICATIONS

Figure 4.10
Landgrading

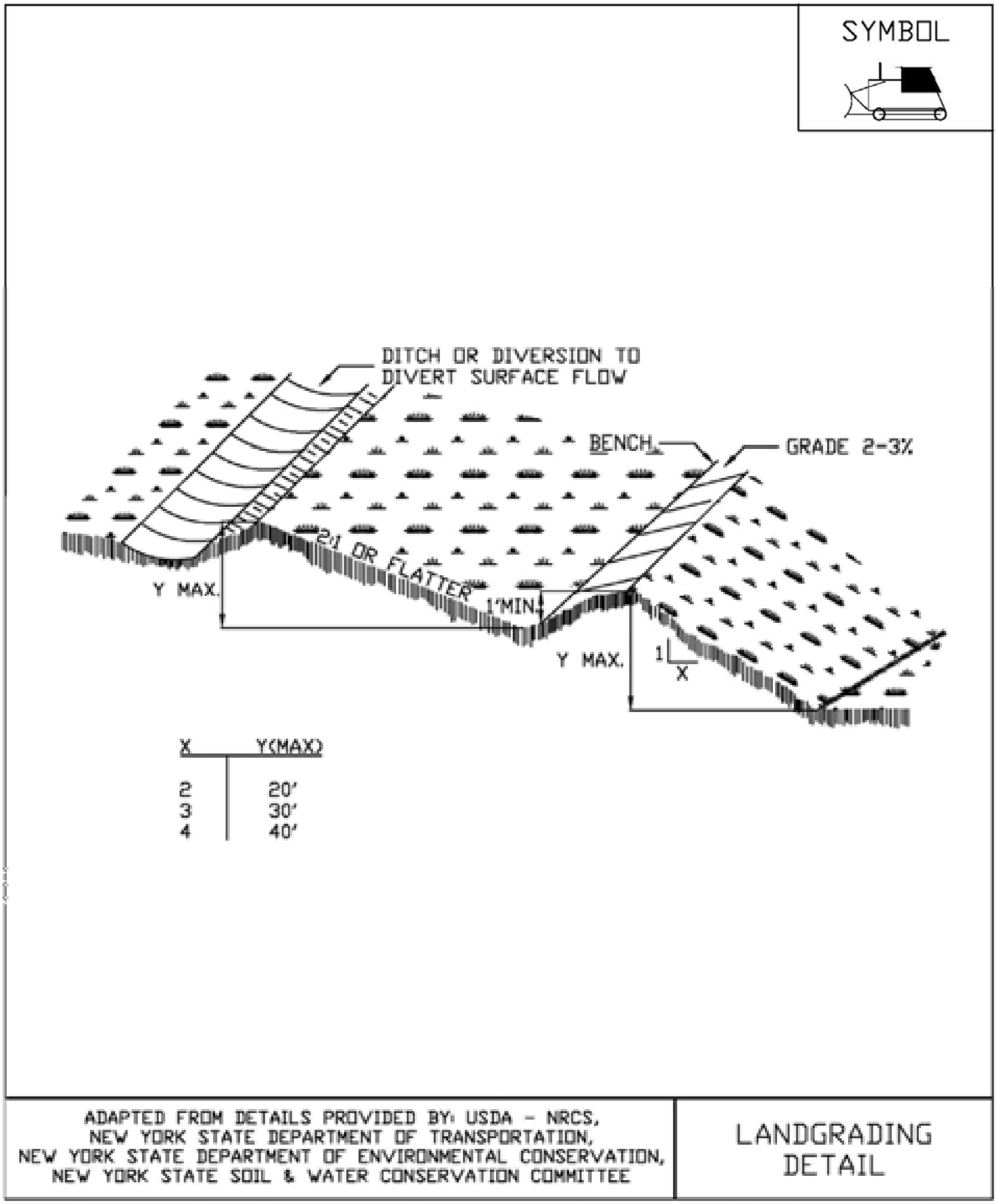


Figure 4.11
Landgrading - Construction Specifications

CONSTRUCTION SPECIFICATIONS

1. ALL GRADED OR DISTURBED AREAS INCLUDING SLOPES SHALL BE PROTECTED DURING CLEARING AND CONSTRUCTION IN ACCORDANCE WITH THE APPROVED EROSION AND SEDIMENT CONTROL PLAN UNTIL THEY ARE PERMANENTLY STABILIZED.
2. ALL SEDIMENT CONTROL PRACTICES AND MEASURES SHALL BE CONSTRUCTED, APPLIED AND MAINTAINED IN ACCORDANCE WITH THE APPROVED EROSION AND SEDIMENT CONTROL PLAN.
3. TOPSOIL REQUIRED FOR THE ESTABLISHMENT OF VEGETATION SHALL BE STOCKPILED IN AMOUNT NECESSARY TO COMPLETE FINISHED GRADING OF ALL EXPOSED AREAS.
4. AREAS TO BE FILLED SHALL BE CLEARED, GRUBBED, AND STRIPPED OF TOPSOIL TO REMOVE TREES, VEGETATION, ROOTS OR OTHER OBJECTIONABLE MATERIAL.
5. AREAS WHICH ARE TO BE TOPSOILED SHALL BE SCARIFIED TO A MINIMUM DEPTH OF FOUR INCHES PRIOR TO PLACEMENT OF TOPSOIL.
6. ALL FILLS SHALL BE COMPACTED AS REQUIRED TO REDUCE EROSION, SLIPPAGE, SETTLEMENT, SUBSIDENCE OR OTHER RELATED PROBLEMS. FILL INTENDED TO SUPPORT BUILDINGS, STRUCTURES AND CONDUITS, ETC. SHALL BE COMPACTED IN ACCORDANCE WITH LOCAL REQUIREMENTS OR CODES.
7. ALL FILL SHALL BE PLACED AND COMPACTED IN LAYERS NOT TO EXCEED 9 INCHES IN THICKNESS.
8. EXCEPT FOR APPROVED LANDFILLS, FILL MATERIAL SHALL BE FREE OF FROZEN PARTICLES, BRUSH, ROOTS, SOD, OR OTHER FOREIGN OR OTHER OBJECTIONABLE MATERIALS THAT WOULD INTERFERE WITH OR PREVENT CONSTRUCTION OF SATISFACTORY FILLS.
9. FROZEN MATERIALS OR SOFT, MUCKY OR HIGHLY COMPRESSIBLE MATERIALS SHALL NOT BE INCORPORATED IN FILLS.
10. FILL SHALL NOT BE PLACED ON SATURATED OR FROZEN SURFACES.
11. ALL BENCHES SHALL BE KEPT FREE OF SEDIMENT DURING ALL PHASES OF DEVELOPMENT.
12. SEEPS OR SPRINGS ENCOUNTERED DURING CONSTRUCTION SHALL BE HANDLED IN ACCORDANCE WITH THE STANDARD AND SPECIFICATION FOR SUBSURFACE DRAIN OR OTHER APPROVED METHOD.
13. ALL GRADED AREAS SHALL BE PERMANENTLY STABILIZED IMMEDIATELY FOLLOWING FINISHED GRADING.
14. STOCKPILES, BORROW AREAS AND SPOIL AREAS SHALL BE SHOWN ON THE PLANS AND SHALL BE SUBJECT TO THE PROVISIONS OF THIS STANDARD AND SPECIFICATION.

ADAPTED FROM DETAILS PROVIDED BY: USDA - NRCS, NEW YORK STATE DEPARTMENT OF TRANSPORTATION, NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION, NEW YORK STATE SOIL & WATER CONSERVATION COMMITTEE	LANDGRADING SPECIFICATIONS

STANDARD AND SPECIFICATIONS FOR LOOSE STABILIZATION BLANKETS

Definition and Scope

Blankets of various materials placed pneumatically, hydraulically, or other means on a prepared planting area or a critical area where existing vegetation can remain to reduce rain splash and sheet erosion and promote vegetative stabilization.

Conditions Where Practice Applies

Loose blankets are an appropriate stabilization practice for any soil surface that is rocky, frozen, flat, or steep. They can be used on streambanks, road cuts and embankments, and construction site areas where stormwater runoff occurs as sheet flow. They should not be used in areas of concentrated flow.

Design Criteria

Compost Blanket

Material: The compost infill shall be well decomposed (matured at least 3 months), weed-free, organic matter. It shall be aerobically composted, possess no objectionable odors, and contain less than 1%, by dry weight, of man-made foreign matter. The physical parameters of the compost shall meet the standards listed in Table 5.2 - Compost Standards Table. **Note: All biosolids composts produced in New York State (or approved for importation) must meet NYS DEC's 6 NYCRR Part 360 (Soild Waste Management Facilities) requirements. The Part 360 requirements are equal to or more stringent than 40 CFR Part 503 which ensure safe standards for pathogen reduction and heavy metal content. When using compost blankets adjacent to surface waters, the compost should have a low nutrient value.**

Placement: The method of application and depth of compost depend upon site conditions. Vegetation of the compost blanket is generally archived by incorporating seed into the compost before it is applied. However, seeding may occur after the application if needed.

The compost application rate will be in accordance with the following table. Compost is not recommended for slopes steeper than 2H:1V. Slopes with problem soils and more runoff will require greater application rates.

Compost Application Rates		
Slope Length (ft)	<3H:1V Slopes	3H:1V to 2H:1V Slopes
20 or less	270 cy/acre (2" Layer)	540 cy/acre (4" Layer)
20 to 60	405 cy/acre (3" Layer)	675 cy/acre (5" Layer)
60 to 100	540 cy/acre (4" Layer)	810 cy/acre (6" Layer)*
* For slopes between 2H:1V and 1H:1V use this rate with a max. slope length of 40 ft.		

Construction Specifications

1. Compost shall be placed evenly and must provide 100% soil coverage (no soil visible). On highly unstable soils, use compost in conjunction with appropriate structural measures.

2. Spread the compost uniformly to the design thickness by hand or mechanically (e.g. with a manure spreader, front end loader, dozer, pneumatic blower, etc.) and then track (compact) the compost layer using a bulldozer or other appropriate equipment.

3. When using a pneumatic (blower) unit, shoot the compost directly at soil, to provide a tighter interface between the soil and compost and prevent water from moving between the two layers.

4. Apply compost layer approximately 3 feet beyond the top of the slope or overlap it into existing vegetation.

5. Follow by seeding or ornamental planting as specified.

6. When planting immediate grass, wildflower, or legume seeding or ornamental planting, use only a well composted product that contains no substances toxic to plants.

7. Very coarse composts should be avoided if the slope is to be landscaped or seeded, as it will make planting and crop establishment more difficult. Composts containing fibrous particles that range in size produce a more stable mat.

Hydraulically Applied Blankets

These blankets are formed by mixing different types of materials with water and are then applied using standard hydroseeding equipment. These blankets should not be used in areas of concentrated flow such as ditches and channels.

A. Bonded Fiber Matrix (BFM) - This method makes use of a cross-linked hydrocolloid tackifier to bond thermally processed wood fibers. Application rates vary according to site conditions. For slopes up to 3H:1V the BFM should be applied at a rate of 3,000 lb/acre. Steeper slopes may need as much as 4,000 lb/acre in accordance with the manufacturer's recommendations.

   BFMs should only be used when no rain is forecast for at least 48 hours following the application. This is to allow the tackifier sufficient time to cure properly. Once properly applied, a BFM is very effective in preventing accelerated erosion. **Bonded Fiber Matrix should not be applied between September 30 and April 1 to allow for proper curing of the polymer.**

B. Flexible Growth Medium (FGM) - This method has the added component of 1/2 inch long, crimped manmade fibers which add a mechanical bond to the chemical bond provided by BFMs. This increases the blanket's resistance to both raindrop impact and erosion due to runoff. Unlike BFMs, a flexible growth medium typically does not require a curing time to be effective. Properly applied, an FGM is also very effective.

   There is no need to smooth the slope prior to application. In fact some roughening of the surface (either natural or mechanically induced) is preferable. However, large rocks (≥ 9 inches) and existing rills should be removed prior to application. Mixing and application rates should follow manufacturer's recommendations.

C. Polymer Stabilized Fiber Matrix (PSFM) - PSFMs make use of a linear soil stabilization tackifier that works directly on soil to maintain soil structure, maintain pore space capacity and flocculate dislodged sediment that will significantly reduce runoff turbidity. PSFMs can be used in re-vegetation applications and for site winterization and/or dormant seeding - fall planting for spring germination - applications. Application rates vary according to site conditions and should be in accordance with manufacturers recommendations.

Construction Specifications

BFMs, FGMs and PSFMs are typically applied in two stages. Unless specifically recommended to be applied in one application by the manufacturer, the seed mixture and soil amendments should be applied first. If the seed is applied at the same time as the hydraulically applied blankets, the bonded fibers may keep the seed from making sufficient contact with the soil to germinate. After the seed mixture is applied, the hydraulically applied blankets should be sprayed over the area at the required application rate, according to the manufactures recommendations.

STANDARD AND SPECIFICATIONS FOR MULCHING

Definition and Scope

Applying coarse plant residue or chips, or other suitable materials, to cover the soil surface to provide initial erosion control while a seeding or shrub planting is establishing. Mulch will conserve moisture and modify the surface soil temperature and reduce fluctuation of both. Mulch will prevent soil surface crusting and aid in weed control. Mulch can also be used alone for temporary stabilization in non-growing months. Use of stone as a mulch could be more permanent and should not be limited to non-growing months.

Conditions Where Practice Applies

On soils subject to erosion and on new seedings and shrub plantings. Mulch is useful on soils with low infiltration rates by retarding runoff.

Criteria

Site preparation prior to mulching requires the installation of necessary erosion control or water management practices and drainage systems.

Slope, grade and smooth the site to fit needs of selected mulch products.

Remove all undesirable stones and other debris to meet the needs of the anticipated land use and maintenance required.

Apply mulch after soil amendments and planting is accomplished or simultaneously if hydroseeding is used.

Select appropriate mulch material and application rate or material needs. Hay mulch shall not be used in wetlands or in areas of permanent seeding. Clean straw mulch is preferred alternative in wetland application. Determine local availability.

Select appropriate mulch anchoring material.

NOTE: The best combination for grass/legume establishment is straw (cereal grain) mulch applied at 2 ton/acre (90 lbs./1000sq.ft.) and anchored with wood fiber mulch (hydromulch) at 500 – 750 lbs./acre (11 – 17 lbs./1000 sq. ft.). The wood fiber mulch must be applied through a hydroseeder immediately after mulching.

Table 4.2
Guide to Mulch Materials, Rates, and Uses

Mulch Material	Quality Standards	per 1000 Sq. Ft.	per Acre	Depth of Application	Remarks
Wood chips or shavings	Air-dried. Free of objectionable coarse material	500-900 lbs.	10-20 tons	2-7”	Used primarily around shrub and tree plantings and recreation trails to inhibit weed competition. Resistant to wind blowing. Decomposes slowly.
Wood fiber cellulose (partly digested wood fibers)	Made from natural wood usually with green dye and dispersing agent	50 lbs.	2,000 lbs.	—	Apply with hydromulcher. No tie down required. Less erosion control provided than 2 tons of hay or straw.
Gravel, Crushed Stone or Slag	Washed; Size 2B or 3A—1 1/2”	9 cu. yds.	405 cu. yds.	3”	Excellent mulch for short slopes and around plants and ornamentals. Use 2B where subject to traffic. (Approximately 2,000 lbs./cu. yd.). Frequently used over filter fabric for better weed control.
Hay or Straw	Air-dried; free of undesirable seeds & coarse materials	90-100 lbs. 2-3 bales	2 tons (100-120 bales)	cover about 90% surface	Use small grain straw where mulch is maintained for more than three months. Subject to wind blowing unless anchored. Most commonly used mulching material. Provides the best micro-environment for germinating seeds.
Jute twisted yarn	Undyed, unbleached plain weave. Warp 78 ends/yd., Weft 41 ends/yd. 60-90 lbs./roll	48” x 50 yds. or 48” x 75 yds.	—	—	Use without additional mulch. Tie down as per manufacturers specifications. Good for center line of concentrated water flow.
Excelsior wood fiber mats	Interlocking web of excelsior fibers with photodegradable plastic netting	4’ x 112.5’ or 8’ x 112.5’.	—	—	Use without additional mulch. Excellent for seeding establishment. Anchor as per manufacturers specifications. Approximately 72 lbs./roll for excelsior with plastic on both sides. Use two sided plastic for centerline of waterways.
Straw or coconut fiber, or combination	Photodegradable plastic net on one or two sides	Most are 6.5 ft. x 3.5 ft.	81 rolls	—	Designed to tolerate higher velocity water flow, centerlines of waterways, 60 sq. yds. per roll.

Table 4.3
Mulch Anchoring Guide

Anchoring Method or Material	Kind of Mulch to be Anchored	How to Apply
1. Peg and Twine	Hay or straw	After mulching, divide areas into blocks approximately 1 sq. yd. in size. Drive 4-6 pegs per block to within 2" to 3" of soil surface. Secure mulch to surface by stretching twine between pegs in criss-cross pattern on each block. Secure twine around each peg with 2 or more tight turns. Drive pegs flush with soil. Driving stakes into ground tightens the twine.
2. Mulch netting	Hay or straw	Staple the light-weight paper, jute, wood fiber, or plastic nettings to soil surface according to manufacturer's recommendations. Should be biodegradable. Most products are not suitable for foot traffic.
3. Wood cellulose fiber	Hay or straw	Apply with hydroseeder immediately after mulching. Use 500 lbs. wood fiber per acre. Some products contain an adhesive material ("tackifier"), possibly advantageous.
4. Mulch anchoring tool	Hay or straw	Apply mulch and pull a mulch anchoring tool (blunt, straight discs) over mulch as near to the contour as possible. Mulch material should be "tucked" into soil surface about 3".
5. Tackifier	Hay or straw	Mix and apply polymeric and gum tackifiers according to manufacturer's instructions. Avoid application during rain. A 24-hour curing period and a soil temperature higher than 45^0 Fahrenheit are required.

STANDARD AND SPECIFICATIONS FOR PERMANENT CONSTRUCTION AREA PLANTING

Definition & Scope

Establishing **permanent** grasses with other forbs and/or shrubs to provide a minimum 80% perennial vegetative cover on areas disturbed by construction and critical areas to reduce erosion and sediment transport. Critical areas may include but are not limited to steep excavated cut or fill slopes as well as eroding or denuded natural slopes and areas subject to erosion.

Conditions Where Practice Applies

This practice applies to all disturbed areas void of, or having insufficient, cover to prevent erosion and sediment transport. See additional standards for special situations such as sand dunes and sand and gravel pits.

Criteria

All water control measures will be installed as needed prior to final grading and seedbed preparation. Any severely compacted sections will require chiseling or disking to provide an adequate rooting zone, to a minimum depth of 12", see Soil Restoration Standard. The seedbed must be prepared to allow good soil to seed contact, with the soil not too soft and not too compact. Adequate soil moisture must be present to accomplish this. If surface is powder dry or sticky wet, postpone operations until moisture changes to a favorable condition. If seeding is accomplished within 24 hours of final grading, additional scarification is generally not needed, especially on ditch or stream banks. Remove all stones and other debris from the surface that are greater than 4 inches, or that will interfere with future mowing or maintenance.

Soil amendments should be incorporated into the upper 2 inches of soil when feasible. **The soil should be tested to determine the amounts of amendments needed.** Apply ground agricultural limestone to attain a pH of 6.0 in the upper 2 inches of soil. If soil must be fertilized before results of a soil test can be obtained to determine fertilizer needs, apply commercial fertilizer at 600 lbs. per acre of 5-5-10 or equivalent. If manure is used, apply a quantity to meet the nutrients of the above fertilizer. This requires an appropriate manure analysis prior to applying to the site. Do not use manure on sites to be planted with birdsfoot trefoil or in the path of concentrated water flow.

Seed mixtures may vary depending on location within the state and time of seeding. Generally, warm season grasses should only be seeded during early spring, April to May. These grasses are primarily used for vegetating excessively drained sands and gravels. See Standard and Specification for Sand and Gravel Mine Reclamation. Other grasses may be seeded any time of the year when the soil is not frozen and is workable. When legumes such as birdsfoot trefoil are included, spring seeding is preferred. See Table 4.4, "Permanent Construction Area Planting Mixture Recommendations" for additional seed mixtures.

General Seed Mix:	**Variety**	**lbs./ acre**	**lbs/1000 sq. ft.**
Red Clover[1] OR	Acclaim, Rally, Red Head II, Renegade	8[2]	0.20
Common white clover[1]	Common	8	0.20
PLUS			
Creeping Red Fescue	Common	20	0.45
PLUS			
Smooth Bromegrass OR	Common	2	0.05
Ryegrass (perennial)	Pennfine/Linn	5	0.10
[1] add inoculant immediately prior to seeding [2] Mix 4 lbs each of Empire and Pardee OR 4 lbs of Birdsfoot and 4 lbs white clover per acre. All seeding rates are given for Pure Live Seed (PLS)			

Pure Live Seed, or (PLS) refers to the amount of live seed in a lot of bulk seed. Information on the seed bag label includes the type of seed, supplier, test date, source of seed, purity, and germination. Purity is the percentage of pure seed. Germination is the percentage of pure seed that will produce normal plants when planted under favorable conditions.

To compute Pure Live Seed multiply the "germination percent" times the "purity" and divide that by 100 to get Pure Live Seed.

$$\text{Pure Live Seed (PLS)} = \frac{\%\,\text{Germination} \times \%\,\text{Purity}}{100}$$

For example, the PLS for a lot of Kentucky Blue grass with 75% purity and 96% germination would be calculated as follows:

$$\frac{(96) \times (75)}{100} = 72\%\ \text{Pure Live Seed}$$

For 10lbs of PLS from this lot =

$$\frac{10}{0.72} = 13.9\ \text{lbs}$$

Therefore, 13.9 lbs of seed is the actual weight needed to meet 10lbs PSL from this specific seed lot.

80% Perennial Vegetative Cover

50% Perennial Vegetative Cover

Time of Seeding: The optimum timing for the general seed mixture is early spring. Permanent seedings may be made any time of year if properly mulched and adequate moisture is provided. Late June through early August is not a good time to seed, but may facilitate covering the land without additional disturbance if construction is completed. Portions of the seeding may fail due to drought and heat. These areas may need reseeding in late summer/fall or the following spring.

Method of seeding: Broadcasting, drilling, cultipack type seeding, or hydroseeding are acceptable methods. Proper soil to seed contact is key to successful seedings.

Mulching: Mulching is essential to obtain a uniform stand of seeded plants. Optimum benefits of mulching new seedings are obtained with the use of small grain straw applied at a rate of 2 tons per acre, and anchored with a netting or tackifier. See the Standard and Specifications for Mulching for choices and requirements.

Irrigation: Watering may be essential to establish a new seeding when a drought condition occurs shortly after a new seeding emerges. Irrigation is a specialized practice and care must be taken not to exceed the application rate for the soil or subsoil. When disconnecting irrigation pipe, be sure pipes are drained in a safe manor, not creating an erosion concern.

Table 4.4
Permanent Construction Area Planting Mixture Recommendations

Seed Mixture	Variety	Rate in lbs./acre (PLS)	Rate in lbs./ 1, 000 ft^2
Mix #1			
Creeping red fescue	Ensylva, Pennlawn, Boreal	10	.25
Perennial ryegrass	Pennfine, Linn	10	.25
*This mix is used extensively for shaded areas.			
Mix #2			
Switchgrass	Shelter, Pathfinder, Trailblazer, or Blackwell	20	.50
*This rate is in pure live seed, this would be an excellent choice along the upland edge of a wetland to filter runoff and provide wildlife benefits. In areas where erosion may be a problem, a companion seeding of sand lovegrass should be added to provide quick cover at a rate of 2 lbs. per acre (0.05 lbs. per 1000 sq. ft.).			
Mix #3			
Switchgrass	Shelter, Pathfinder, Trailblazer, or Blackwell	4	.10
Big bluestem	Niagara	4	.10
Little bluestem	Aldous or Camper	2	.05
Indiangrass	Rumsey	4	.10
Coastal panicgrass	Atlantic	2	.05
Sideoats grama	El Reno or Trailway	2	.05
Wildflower mix		.50	.01
*This mix has been successful on sand and gravel plantings. It is very difficult to seed without a warm season grass seeder such as a Truax seed drill. Broadcasting this seed is very difficult due to the fluffy nature of some of the seed, such as bluestems and indiangrass.			
Mix #4			
Switchgrass	Shelter, Pathfinder, Trailblazer, or Blackwell	10	.25
Coastal panicgrass	Atlantic	10	.25
*This mix is salt tolerant, a good choice along the upland edge of tidal areas and roadsides.			
Mix #5			
Saltmeadow cordgrass (Spartina patens)—This grass is used for tidal shoreline protection and tidal marsh restoration. It is planted by vegetative stem divisions. 'Cape' American beachgrass can be planted for sand dune stabilization above the saltmeadow cordgrass zone.			
Mix #6			
Creeping red fescue	Ensylva, Pennlawn, Boreal	20	.45
Chewings Fescue	Common	20	.45
Perennial ryegrass	Pennfine, Linn	5	.10
Red Clover	Common	10	.45
*General purpose erosion control mix. Not to be used for a turf planting or play grounds.			

STANDARD AND SPECIFICATIONS FOR RECREATION AREA SEEDING

Definition & Scope

Establishing **permanent** grasses, legumes, vines, shrubs, trees, or other plants, or selectively reducing stand density and trimming woody plants, to improve an area for recreation. To increase the attractiveness and usefulness of recreation areas and to protect the soil and plant resources.

Conditions Where Practice Applies

On any area planned for recreation use, lawns, and areas that will be maintained in a closely mowed condition.

Specifications

ESTABLISHING GRASSES (Turfgrass)

The following applies for playgrounds, parks, athletic fields, camping areas, picnic areas, passive recreation areas such as lawns, and similar areas.

1. Time of Planting

Fall planting is preferred. Seed after August 15. In the spring, plant until May 15.

If seeding is done between May 15 and August 15, irrigation may be necessary to ensure a successful seeding.

2. Site Preparation

   A. Install needed water and erosion control measures and bring area to be seeded to desired grades. A minimum of 4 in. topsoil is required.

   B. Prepare seedbed by loosening soil to a depth of 4-6 inches and decompacting required areas per Soil Restoration Standard.

   C. See Standard and Specification of Topsoiling.

   D. Lime to a pH of 6.5. See Lime Application Standard.

   E. **Fertilize as per soil test** or, if soil must be fertilized before results of a soil test can be obtained to determine fertilizer needs, apply commercial fertilizer at 850 pounds of 5-5-10 or equivalent per acre (20 lbs/1,000 sq. ft.). See Fertilizer Application Standard.

   F. Incorporate lime and fertilizer in top 2-4 inches of topsoil.

   G. Smooth. Remove sticks, foreign matter, and stones over 1 inch in diameter, from the surface. Firm the seedbed.

3. Planting

Use a cultipacker type seeder if possible. Seed to a depth of 1/8 to 1/4 inch. If seed is to be broadcast, cultipack or roll after seeding. If hyroseeded, lime and fertilizer may be applied through the seeder, and rolling is not practical.

4. Mulching

Mulch all seedings in accordance with Standard and Specifications for Mulching. Small grain straw is the best material.

5. Seed Mixtures

Select seed mixture for site conditions and intended use from Table 4.5.

6. Contact Cornell Cooperative Extension Turf Specialist for suitable varieties.

Turf-type tall fescues have replaced the old KY31 tall fescues. New varieties have finer leaves and are the most resistant grass to foot traffic. Do not mix it with fine textured grasses such as bluegrass and red fescue.

Common ryegrass and redtop, which are relatively short lived species, provide quick green cover. Improved lawn cultivars of perennial ryegrass provide excellent quality turf, but continue to lack winter hardiness.

Common white clover can be added to mixtures at the rate of 1-2 lbs/acre to help maintain green color during the dry summer period; however, they will not withstand heavy traffic. Avoid using around swimming areas as flowers attract bees which can be easily stepped on.

Table 4.5
Recreation Turfgrass Seed Mixture

Site - Use	Species (% by weight)	lbs/1.000 ft^2 (PLS)	lbs/acre (PLS)
Sunny Sites (well, moderately well, and somewhat poorly drained soils)	***Athletic fields and similar areas***		
	80% Hard fescue	2.4-3.2	105-138
	20% Perennial ryegrass	0.6-0.8	25-37
		3.0-4.0	130-175
	OR, for southern and eastern, NY 50% Hard fescue	1.5-2.0	65-88
	50% perennial ryegrass	1.5-2.0	65-87
		3.0-4.0	130-175
	OR, 100% Creeping Red Fescue	3.4-4.6	150-200
	General recreation areas and lawns (Medium to high maintenance)		
	65% Creeping red fescue	2.0-2.6	85-114
	20% Perennial ryegrass	0.6-0.8	26-35
	15% Fine fescue	0.4-0.6	19-26
		3.0-4.0	130-175
	OR, 100% Creeping red fescue	3.4-4.6	150-200
Sunny Droughty Sites (general recreation areas and lawns, low maintenance) (somewhat excessively to excessively drained soils, excluding Long Island)	65% Fine fescue	2.6-3.3	114-143
	15% Perennial ryegrass	0.6-0.7	26-33
	20% Creeping red fescue	0.8-1.0	35-44
		4.0-5.0	175-220
	OR, 100% Creeping red fescue	3.4-4.6	150-200
Shady Dry Sites (well to somewhat poorly drained soils)	65% fine fescue	2.6-3.3	114-143
	15% perennial ryegrass	0.6-0.7	26-33
	20% Creeping red fescue	0.8-1.0	35-44
	OR	4.0-5.0	174-220
	80% blend of shade-tolerant Ceral rye	2.4-3.2	105-138
	20% perennial ryegrass	0.6-0.8	25-37
	OR	3.0-4.0	130-175
	100% Creeping red fescue	3.4-4.6	150-200
Shady Wet Sites (somewhat poor to poorly drained soils)	70% Creeping red fescue	1.4-2.1	60-91
	30% blend of shade-tolerant Hard fescue	0.6-0.9	25-39
	OR	2.0-3.0	85-130
	100% Chewings fescue	3.4-4.6	150-200

For varieties suitable for specific locations, contact Cornell Cooperative Extension Turf Specialist.
Reference: Thurn, M.C., N.W. Hummel, and A.M. Petrovic. Cornell Extension Pub. Info. Bulletin 185 Revised. HomeLawns Establishment and Maintenance. 1994.

7. Fertilizing—First Year

Apply fertilizer as indicated by the soil test three to four weeks after germination (spring seedlings). If test results have not been obtained, apply 1 pound nitrogen/1,000 square feet using a complete fertilizer with a 2-1-1 or 4-1-3 ratio. Summer and early fall seedings, apply as above unless air temperatures are above 85ºF for an extended period. Wait for cooler temperatures to fertilize. Late fall/ winter seedings, fertilize in spring.

8. Restrict Use

New seedlings should be protected from use for one full year or a spring and fall growth cycle where possible to allow development of a dense sod with good root structure.

MAINTAINING GRASSES

1. Maintain a pH of 6.0 - 7.0.

2. Fertilize in late May to early June as follows with 5-5-10 analysis fertilizer at the rate of 5 lbs./1,000 sq. ft. and repeat in late August if sod density is not adequate. Avoid fertilizing when heat is greater than 85ºF. Top dress weak sod annually in the spring, but at least once every 2 to 3 years. **Fertilize in accordance with soil test analysis**, after determining adequate topsoil depth exists.

3. Aerate compacted or heavily used areas, like athletic fields, annually as soon as soil moisture conditions permit. Aerate area six to eight times using a spoon or hollow tine type aerator. Do not use solid spike equipment.

4. Reseed bare and thin areas annually with original seed mix.

STANDARD AND SPECIFICATIONS FOR SOIL RESTORATION

Definition & Scope

The decompaction of areas of a development site or construction project where soils have been disturbed to recover the original properties and porosity of the soil; thus providing a sustainable growth medium for vegetation, reduction of runoff and filtering of pollutants from stormwater runoff.

Conditions Where Practice Applies

Soil restoration is to be applied to areas whose heavy construction traffic is done and final stabilization is to begin. This is generally applied in the cleanup, site restoration, and landscaping phase of construction followed by the permanent establishment of an appropriate ground cover to maintain the soil structure. Soil restoration measures should be applied over and adjacent to any runoff reduction practices to achieve design performance.

Design Criteria

1. Soil restoration areas will be designated on the plan views of areas to be disturbed.
2. Soil restoration will be completed in accordance with Table 4.6 on page 4.53.

Specification for Full Soil Restoration

During periods of relatively low to moderate subsoil moisture, the disturbed subsoils are returned to rough grade and the following Soil Restoration steps applied:

1. Apply 3 inches of compost over subsoil. The compost shall be well decomposed (matured at least 3 months), weed-free, organic matter. It shall be aerobically composted, possess no objectionable odors, and contain less than 1%, by dry weight, of man-made foreign matter. The physical parameters of the compost shall meet the standards listed in Table 5.2 - Compost Standards Table, except for "Particle Size" 100% will pass the 1/2" sieve. **Note: All biosolids compost produced in New York State (or approved for importation) must meet NYS DEC's 6 NYCRR Part 360 (Solid Waste Management Facilities) requirements. The Part 360 requirements are equal to or more stringent than 40 CFR Part 503 which ensure safe standards for pathogen reduction and heavy metals content.**

2. Till compost into subsoil to a depth of at least 12 inches using a cat-mounted ripper, tractor mounted disc, or tiller, to mix and circulate air and compost into the subsoil.
3. Rock-pick until uplifted stone/rock materials of four inches and larger size are cleaned off the site.
4. Apply topsoil to a depth of 6 inches.
5. Vegetate as required by the seeding plan. Use appropriate ground cover with deep roots to maintain the soil structure.
6. Topsoil may be manufactured as a mixture or a mineral component and organic material such as compost.

At the end of the project an inspector should be able to push a 3/8" metal bar 12 inches into the soil just with body weight. This should not be performed within the drip line of any existing trees or over utility installations that are within 24 inches of the surface.

Maintenance

Keep the site free of vehicular and foot traffic or other weight loads. Consider pedestrian footpaths.

Table 4.6
Soil Restoration Requirements

<table>
<tr><th>Type of Soil Disturbance</th><th colspan="2">Soil Restoration Requirement</th><th>Comments/Examples</th></tr>
<tr><td>No soil disturbance</td><td colspan="2">Restoration not permitted</td><td>Preservation of Natural Features</td></tr>
<tr><td>Minimal soil disturbance</td><td colspan="2">Restoration not required</td><td>Clearing and grubbing</td></tr>
<tr><td rowspan="2">Areas where topsoil is stripped only - no change in grade</td><td>HSG A&B</td><td>HSG C&D</td><td rowspan="2">Protect area from any ongoing construction activities.</td></tr>
<tr><td>Apply 6 inches of topsoil</td><td>Aerate* and apply 6 inches of topsoil</td></tr>
<tr><td rowspan="2">Areas of cut or fill</td><td>HSG A&B</td><td>HSG C&D</td><td rowspan="2"></td></tr>
<tr><td>Aerate* and apply 6 inches of topsoil</td><td>Apply full Soil Restoration**</td></tr>
<tr><td>Heavy traffic areas on site (especially in a zone 5-25 feet around buildings but not within a 5 foot perimeter around foundation walls)</td><td colspan="2">Apply full Soil Restoration (decompaction and compost enhancement)</td><td></td></tr>
<tr><td>Areas where Runoff Reduction and/or Infiltration practices are applied</td><td colspan="2">Restoration not required, but may be applied to enhance the reduction specified for appropriate practices.</td><td>Keep construction equipment from crossing these areas. To protect newly installed practice from any ongoing construction activities construct a single phase operation fence area</td></tr>
<tr><td>Redevelopment projects</td><td colspan="2">Soil Restoration is required on redevelopment projects in areas where existing impervious area will be converted to pervious area.</td><td></td></tr>
<tr><td colspan="4">* Aeration includes the use of machines such as tractor-drawn implements with coulters making a narrow slit in the soil, a roller with many spikes making indentations in the soil, or prongs which function like a mini-subsoiler.
** Per "Deep Ripping and De-compaction, DEC 2008".</td></tr>
</table>

STANDARD AND SPECIFICATIONS FOR SURFACE ROUGHENING

Definition & Scope

Roughening a bare soil surface whether through creating horizontal grooves across a slope, stair-stepping, or tracking with construction equipment to aid the establishment of vegetative cover from seed, to reduce runoff velocity and increase infiltration, and to reduce erosion and provide for trapping of sediment.

Conditions Where Practice Applies

All construction slopes require surface roughening to facilitate stabilization with vegetation, particularly slopes steeper than 3:1.

Design Criteria

There are many different methods to achieve a roughened soil surface on a slope. No specific design criteria is required. However, the selection of the appropriate method depends on the type of slope. Methods include tracking, grooving, and stair-stepping. Steepness, mowing requirements, and/or a cut or fill slope operation are all factors considered in choosing a roughening method.

Construction Specifications

1. Cut Slope, No mowing.

   A. Stair-step grade or groove cut slopes with a gradient steeper than 3:1 (Figure 4.18).

   B. Use stair-step grading on any erodible material soft enough to be ripped with a bulldozer. Slopes of soft rock with some soil are particularly suited to stair-step grading.

   C. Make the vertical cut distance less than the horizontal distance, and slightly slope the horizontal position of the "step" to the vertical wall.

   D. Do not make vertical cuts more than 2 feet in soft materials or 3 feet in rocky materials.

Grooving uses machinery to create a series of ridges and depressions that run perpendicular to the slope following the contour. Groove using any appropriate implement that can be safely operated on the slope, such as disks, tillers, spring harrows, or the teeth of a front-end loader bucket. Do not make the grooves less than 3 inches deep or more than 15 inches apart.

2. Fill Slope, No mowing

   A. Place fill to create slopes with a gradient no steeper than 2:1 in lifts 9 inches or less and properly compacted. Ensure the face of the slope consists of loose, uncompacted fill 4 to 6 inches deep. Use grooving as described above to roughen the slope, if necessary.

   B. Do not back blade or scrape the final slope face.

3. Cuts/Fills, Mowed Maintenance

   A. Make mowed slopes no steeper than 3:1.

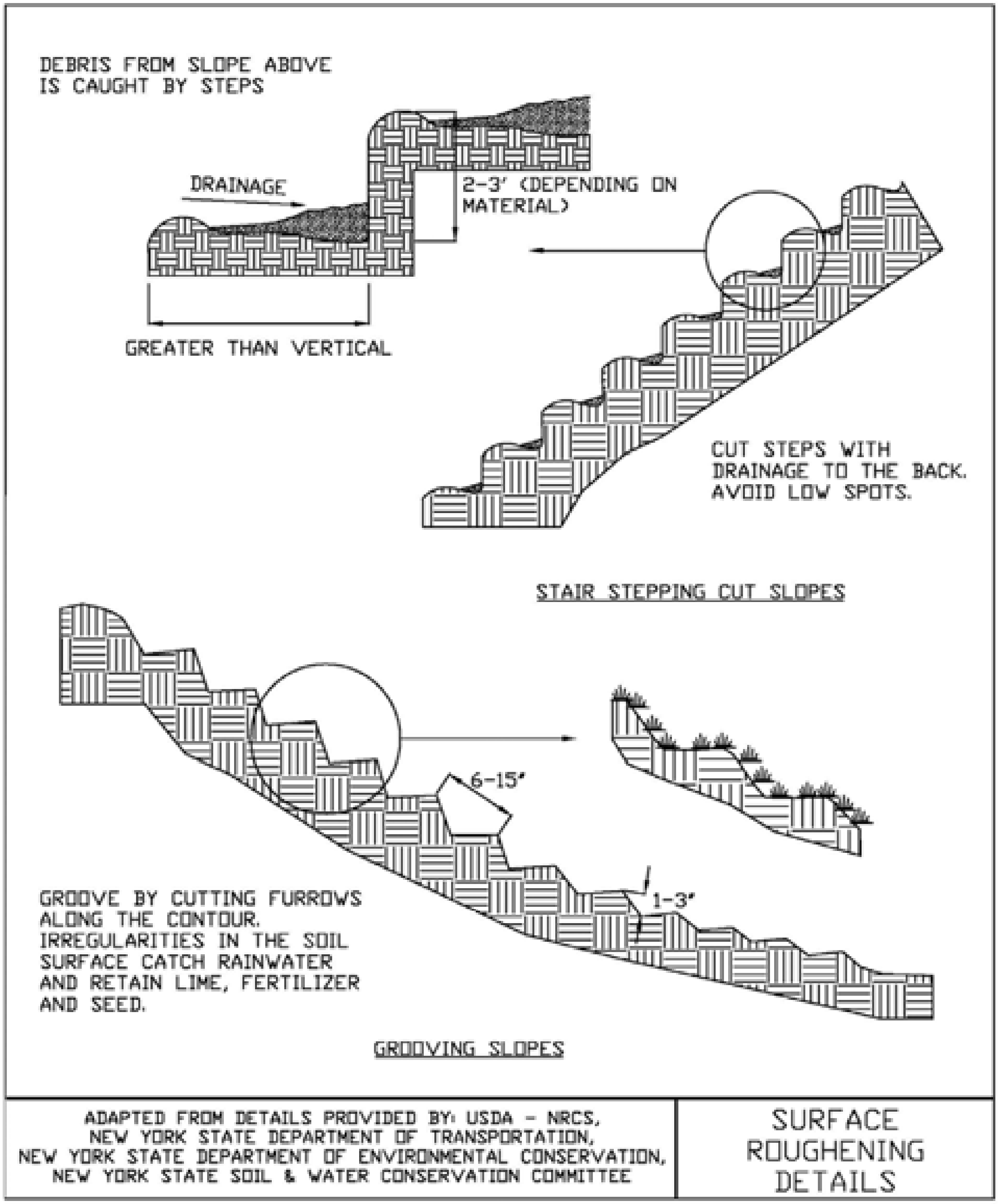
   B. Roughen these areas to shallow grooves by normal tilling, disking, harrowing, or use of cultipacker-seeder. Make the final pass of such tillage equipment on the contour.

   C. Make grooves at least 1 inch deep and a maximum of 10 inches apart.

   D. Excessive roughness is undesirable where mowing is planned.

Tracking should be used primarily in sandy soils to avoid undue compaction of the soil surface. Tracking is generally not as effective as the other roughening methods described. (It has been used as a method to track down mulch.) Operate tracked machinery up and down the slope to leave horizontal depressions in the soil. Do not back-blade during the final grading operation.

Figure 4.18
Surface Roughening



STANDARD AND SPECIFICATIONS FOR TEMPORARY CONSTRUCTION AREA SEEDING

Definition & Scope

Providing temporary erosion control protection to disturbed areas and/or localized critical areas for an interim period by covering all bare ground that exists as a result of construction activities or a natural event. Critical areas may include but are not limited to steep excavated cut or fill slopes and any disturbed, denuded natural slopes subject to erosion.

Conditions Where Practice Applies

Temporary seedings may be necessary on construction sites to protect an area, or section, where final grading is complete, when preparing for winter work shutdown, or to provide cover when permanent seedings are likely to fail due to mid-summer heat and drought. The intent is to provide temporary protective cover during temporary shutdown of construction and/or while waiting for optimal planting time.

Criteria

Water management practices must be installed as appropriate for site conditions. The area must be rough graded and slopes physically stable. Large debris and rocks are usually removed. Seedbed must be seeded within 24 hours of disturbance or scarification of the soil surface will be necessary prior to seeding.

Fertilizer or lime are not typically used for temporary seedings.

IF: Spring or summer or early fall, then seed the area with ryegrass (annual or perennial) at 30 lbs. per acre (Approximately 0.7 lb./1000 sq. ft. or use 1 lb./1000 sq. ft.).

IF: Late fall or early winter, then seed Certified 'Aroostook' winter rye (cereal rye) at 100 lbs. per acre (2.5 lbs./1000 sq. ft.).

Any seeding method may be used that will provide uniform application of seed to the area and result in relatively good soil to seed contact.

Mulch the area with hay or straw at 2 tons/acre (approx. 90 lbs./1000 sq. ft. or 2 bales). Quality of hay or straw mulch allowable will be determined based on long term use and visual concerns. Mulch anchoring will be required where wind or areas of concentrated water are of concern. Wood fiber hydromulch or other sprayable products approved for erosion control (nylon web or mesh) may be used if applied according to manufacturers' specification. Caution is advised when using nylon or other synthetic products. They may be difficult to remove prior to final seeding and can be a hazard to young wildlife species.

STANDARD AND SPECIFICATIONS FOR TOPSOILING

Definition & Scope

Spreading a specified quality and quantity of topsoil materials on graded or constructed subsoil areas to provide acceptable plant cover growing conditions, thereby reducing erosion; to reduce irrigation water needs; and to reduce the need for nitrogen fertilizer application.

Conditions Where Practice Applies

Topsoil is applied to subsoils that are droughty (low available moisture for plants), stony, slowly permeable, salty or extremely acid. It is also used to backfill around shrub and tree transplants. This standard does not apply to wetland soils.

Design Criteria

1. Preserve existing topsoil in place where possible, thereby reducing the need for added topsoil.
2. Conserve by stockpiling topsoil and friable fine textured subsoils that must be stripped from the excavated site and applied after final grading where vegetation will be established. Topsoil stockpiles must be stabilized. Stockpile surfaces can be stabilized by vegetation, geotextile or plastic covers. This can be aided by orientating the stockpile lengthwise into prevailing winds.
3. Refer to USDA Natural Resource Conservation Service soil surveys or soil interpretation record sheets for further soil texture information for selecting appropriate design topsoil depths.

Site Preparation

1. As needed, install erosion and sediment control practices such as diversions, channels, sediment traps, and stabilizing measures, or maintain if already installed.
2. Complete rough grading and final grade, allowing for depth of topsoil to be added.
3. Scarify all compact, slowly permeable, medium and fine textured subsoil areas. Scarify at approximately right angles to the slope direction in soil areas that are steeper than 5 percent. Areas that have been overly compacted shall be decompacted in accordance with the Soil Restoration Standard.
4. Remove refuse, woody plant parts, stones over 3 inches in diameter, and other litter.

Topsoil Materials

1. Topsoil shall have at least 6 percent by weight of fine textured stable organic material, and no greater than 20 percent. Muck soil shall not be considered topsoil.
2. Topsoil shall have not less than 20 percent fine textured material (passing the NO. 200 sieve) and not more than 15 percent clay.
3. Topsoil treated with soil sterilants or herbicides shall be so identified to the purchaser.
4. Topsoil shall be relatively free of stones over 1 1/2 inches in diameter, trash, noxious weeds such as nut sedge and quackgrass, and will have less than 10 percent gravel.
5. Topsoil containing soluble salts greater than 500 parts per million shall not be used.
6. Topsoil may be manufactured as a mixture of a mineral component and organic material such as compost.

Application and Grading

1. Topsoil shall be distributed to a uniform depth over the area. It shall not be placed when it is partly frozen, muddy, or on frozen slopes or over ice, snow, or standing water puddles.
2. Topsoil placed and graded on slopes steeper than 5 percent shall be promptly fertilized, seeded, mulched, and stabilized by “tracking” with suitable equipment.
3. Apply topsoil in the amounts shown in Table 4.7 below:

Table 4.7 - Topsoil Application Depth		
Site Conditions	**Intended Use**	**Minimum Topsoil Depth**
1. Deep sand or loamy sand	Mowed lawn	6 in.
	Tall legumes, unmowed	2 in.
	Tall grass, unmowed	1 in.
2. Deep sandy loam	Mowed lawn	5 in.
	Tall legumes, unmowed	2 in.
	Tall grass, unmowed	none
3. Six inches or more: silt loam, clay loam, loam, or silt	Mowed lawn	4 in.
	Tall legumes, unmowed	1 in.
	Tall grass, unmowed	1 in.

STANDARD AND SPECIFICATIONS FOR TREES, SHRUBS, AND VINES

Definition & Scope

Establishing trees, shrubs, and vines or selectively reducing stand density and trimming woody plants to protect the soil and plant resources, improve an area for recreation and increase the attractiveness and usefulness of areas.

Conditions Where Practice Applies

On any area planned for recreation or landscape use such as yard areas, leisure areas, picnic areas, and park lands providing outdoor recreational opportunities.

Criteria and Specifications

1. Planting nursery stock

   A. Select species to serve the intended purpose. See Appendix G, Table G.1, "Trees Suitable for Landscape and Conservation Plantings in New York." Where planting of trees is to be done in recreation areas, use those species resistant to compaction listed in Table G.2, "Susceptibility of Tree Species to Compaction" whenever possible.

   B. Plant Materials

   1) Plants shall conform to the species, variety, size, number, and conditions as stated in a conservation plan or on a plant list shown on landscape drawings. "American Standard for Nursery Stock," by American Association of Nurserymen, shall be used to develop the plant list for landscape drawings and to check quality of plant materials.

   2) Durable, legible labels with the scientific and common name and cultivar shall be securely attached to plants, bundles of seedlings, containers, and/or flats.

   C. Plant Protection

   Prior to delivery, the trunk, branches, and foliage of the plants shall be sprayed with non-toxic antidesiccant, applied according to the manufacturer's recommendations. This does not apply to state nursery seedlings.

   D. Planting Time

   Deciduous trees and shrubs: April 1 to June 1 and October 15 to December 15. Evergreen trees and shrubs: April 1 to June 1 and September 1 to November 15.

   E. Spacing

   Plant all trees and shrubs well back from buildings to allow for mature crown size. The following are guides for planning:

Large Trees	50-60 feet apart
Small Trees	20-30 feet apart
Columnar Species	6-8 feet apart
Hedges	1-4 feet apart
Shrubs	For clumps, plan spacing so mature shrubs will be touching or overlap-ping by only 1 or 2 feet

   F. Site Preparation

   1) Individual sites for planting seedlings can be prepared by scalping the sod away from a four foot square area where the seedling is to be planted.

   2) All planting beds shall be cultivated to a depth of 8 inches, or chemically treated for weed control. Remove objectionable objects that will interfere with maintenance of site.

   G. Planting

   1) Plants shall be located as shown on plans and/or drawings and, where necessary, located on the site by stakes, flags or other means.

   2) Prior to planting, remove galvanized wire basket securing root ball, untie and roll down burlap covering from around the stem.

3) The plants shall be set upright in holes as illustrated in Figure G.1 in Appendix G.

4) All plants shall be thoroughly watered on the same day of planting. Plants that have settled shall be reset to grade.

H. Wrapping

Immediately after planting, wrap deciduous tree trunks from the bottom to the first limb with a 4 inch wide bituminous impregnated, insect resistant tape or paper manufactured for that purpose. Tie with jute (bag strings) at top and bottom. The wrap should be removed per nursery recommendations.

I. Mulching

Mulch the disturbed area around individual trees and shrubs with a 2-3" layer of wood chips. Pull wood chips 1 inch away from the base of shrubs to avoid fungus development.

J. Pruning

After planting, prune to remove injured twigs and branches. The natural shape of the plant should not be changed.

K. Cleanup and Maintenance

1) After all work is complete, all excess soil, peat moss, debris, etc., shall be removed from the site.

2) Water plants two weeks after planting. For two years, water plants every two weeks during dry periods, which exceed three weeks without a good soaking rain, or water as needed in accordance with local conditions. Shrubs may require 5 to 10 gallons and trees, 20 to 30 gallons for each watering.

3) Remove trunk wrap per nursery recommendation.

2. Transplanting "Wild" Stock

Successful transplanting of wild stock will require heavy equipment and considerable labor as a large weight of soil must be moved with the roots.

A. Select trees and shrubs with good form and full crowns.

B. Transplant only when plants are dormant and soil is moist. Wrap soil ball with burlap to prevent soil from separating from roots.

C. Table 4.8 shows minimum diameter and approximate weight of soil ball that must be moved with each size plant.

D. Plant and maintain as described above for nursery stock.

PRUNING AND THINNING

Use	Cleared Width Each Side of Trail Tread (ft.)	Cleared Height (ft.)
TRAILS		
Hiking	1	8
Bicycle	2	10
Motorbike	2	10
Horse	2	12
X-Country Ski	Total: 3-12	12[1]
Snowmobile	Total: 6-12	12[1]
PICNIC & CAMPING AREAS		
Campfire/Grill	10 ft. diam.	15
[1] Includes allowance for snow depth and snow load on branches		

1. Pruning

A. Remove trees, limbs, and limb stubs to the above widths and heights specified for the intended use.

B. Remove dead, diseased, or dying limbs that may fall.

C. Do not remove more than one-third of the live crown of a tree in a year.

D. Cut limbs flush to the branch bark ridge.

E. Use the 3 or 4 cut pruning method on all branches over 2 inches in diameter: First cut about one-third the way through the underside of the limb (about 6-12 inches from the tree trunk). Then (approximately an inch further out) make a second cut through the limb from the upper side. When the branch is removed, there is no splintering of the main tree trunk. Remove the stub. If the branch is larger than 5-6 inches in diameter, use the four cut system. Cuts 1 and 2 remain the same and cut 3 should be from the underside of the limb, on the outside of the branch collar. Cut 4 should be from the top and in alignment with the 3rd cut. Cut 3 should be 1/4 to 1/3 the way through the limb. This will prevent the bark from peeling down the trunk. Do not paint the cut surface.

2. Thinning

   A. Remove dead, diseased, dying, poorly anchored, or ice damaged trees that pose a hazard to recreationists or that interfere with intended use.

   B. To maintain grass cover in a wooded area, thin according to formula Dx3 (average diameter of the trunk of overstory trees, in inches, times three—the answer is the spacing between trees to be left, in feet). For example, for trees with average diameter of 6 inches, spacing after thinning should leave trees 18 feet apart on average. Crown cover after thinning should be about 50 percent.

   C. Selectively thin as needed to favor those trees that are most "resistant" to compaction around their roots. See Table G.2**,** "Susceptibility of Tree Species to Compaction" in Appendix G. If the soil on the site is naturally well drained, those species in the "intermediate" group may also be favored.

Table 4.8
Size and Weight of Earth Ball Required to Transplant Wild Stock

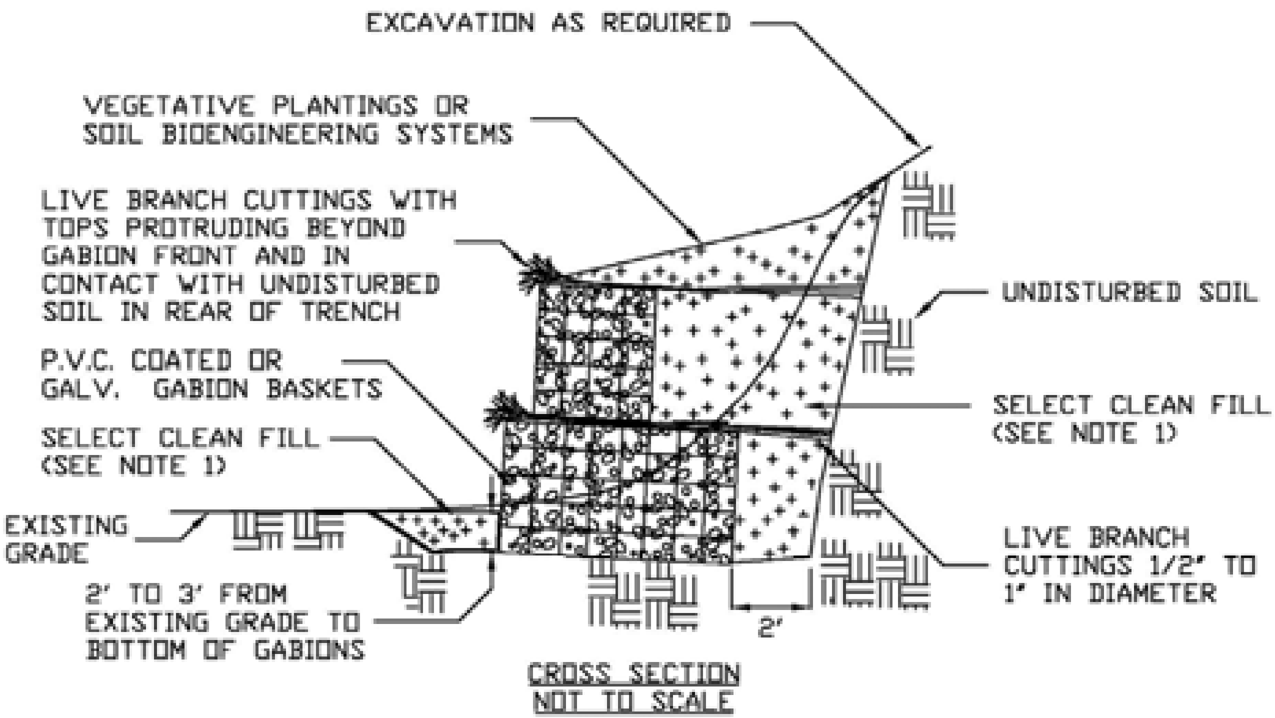
Shade Trees (Maple, Ash, Oak, Birch, etc.)			Small Trees & Shrubs (Crabapple, Thornapple, Viburnum, Dogwood, etc.)		
Caliper[1] (Inches)	Minimum Diameter Ball (Inches)	Weight of Ball (lbs.)	Up to 6 ft. Height — 6 ft. and Caliper[1]	Minimum Diameter Ball (Inches)	Weight of Ball (lbs.)
1/2	14	88	2	12	55
3/4	16	130	3	14	88
1	18	186	4	16	130
1-1/4	20	227	5	18	186
1-1/2	22	302	3/4	18	186
1-3/4	24	390	1	20	227
2	28	621	1-1/2	22	302
3	32	836	1-3/4	24	390
3-1/2	38	1,400	2	28	621
4	42	1,887	2-1/2	32	836
			3	38	1,400

[1]Caliper is a diameter measurement of trees at a height of 6 inches above the ground.

Figure 4.20
Vegetated Rock Gabions

SYMBOL

VRG



CONSTRUCTION SPECIFICATIONS

1. ALL SELECT CLEAN FILL FOR GABIONS SHALL BE HAND TAMPED IN 6" LIFTS.
2. A 1" LAYER OF BACKFILL SHALL BE PLACED ON TOP OF THE ROW OF GABIONS AND RAKED. THE CUTTINGS SHALL BE PLACED ON THE BACKFILL MATERIAL AND ANOTHER 1" LAYER OF BACKFILL SHALL BE PLACED ON THE CUTTINGS BETWEEN THE GABIONS.
3. CLASS 2, TYPE B OR C, INTERMEDIATE EROSION CONTROL PRODUCT SHALL BE INSTALLED ON THE FRONT INSIDE FACE AND ANY OTHER EXPOSED VERTICAL SURFACE OF THE GABIONS.

ADAPTED FROM DETAILS PROVIDED BY: USDA - NRCS, NEW YORK STATE DEPARTMENT OF TRANSPORTATION, NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION, NEW YORK STATE SOIL & WATER CONSERVATION COMMITTEE	VEGETATED ROCK GABIONS

STANDARD AND SPECIFICATIONS FOR COMPOST FILTER SOCK

Definition & Scope

A **temporary** sediment control practice composed of a degradable geotextile mesh tube filled with compost filter media to filter sediment and other pollutants associated with construction activity to prevent their migration offsite.

Condition Where Practice Applies

Compost filter socks can be used in many construction site applications where erosion will occur in the form of sheet erosion and there is no concentration of water flowing to the sock. In areas with steep slopes and/or rocky terrain, soil conditions must be such that good continuous contact between the sock and the soil is maintained throughout its length. For use on impervious surfaces such as road pavement or parking areas, proper anchorage must be provided to prevent shifting of the sock or separation of the contact between the sock and the pavement. Compost filter socks are utilized both at the site perimeter as well as within the construction areas. These socks may be filled after placement by blowing compost into the tube pneumatically, or filled at a staging location and moved into its designed location.

Design Criteria

1. Compost filter socks will be placed on the contour with both terminal ends of the sock extended 8 feet upslope at a 45 degree angle to prevent bypass flow.

2. Diameters designed for use shall be 12" – 32" except that 8" diameter socks may be used for residential lots to control areas less than 0.25 acres.

3. The flat dimension of the sock shall be at least 1.5 times the nominal diameter.

4. The **Maximum Slope Length** (in feet) above a compost filter sock shall not exceed the following limits:

Dia. (in.)	Slope %						
	2	**5**	**10**	**20**	**25**	**33**	**50**
8	225*	200	100	50	20	—	—
12	250	225	125	65	50	40	25
18	275	250	150	70	55	45	30
24	350	275	200	130	100	60	35
32	450	325	275	150	120	75	50

* Length in feet

5. The compost infill shall be well decomposed (matured at least 3 months), weed-free, organic matter. It shall be aerobically composted, possess no objectionable odors, and contain less than 1%, by dry weight, of man-made foreign matter. The physical parameters of the compost shall meet the standards listed in Table 5.2 - Compost Standards Table. **Note: All biosolids compost produced in New York State (or approved for importation) must meet NYS DEC's 6 NYCRR Part 360 (Solid Waste Management Facilities) requirements. The Part 360 requirements are equal to or more stringent than 40 CFR Part 503 which ensure safe standards for pathogen reduction and heavy metals content. When using compost filter socks adjacent to surface water, the compost should have a low nutrient value.**

6. The compost filter sock fabric material shall meet the

7. Compost filter socks shall be anchored in earth with 2" x 2" wooden stakes driven 12" into the soil on 10 foot centers on the centerline of the sock. On uneven terrain, effective ground contact can be enhanced by the placement of a fillet of filter media on the disturbed area side of the compost sock.

8. All specific construction details and material specifications shall appear on the erosion and sediment control constructions drawings when compost filter socks are included in the plan.

Maintenance

1. Traffic shall not be permitted to cross filter socks.

2. Accumulated sediment shall be removed when it reaches half the above ground height of the sock and disposed of in accordance with the plan.

3. Socks shall be inspected weekly and after each runoff event. Damaged socks shall be repaired in the manner required by the manufacturer or replaced within 24 hours of inspection notification.

4. Biodegradable filter socks shall be replaced after 6 months; photodegradable filter socks after 1 year. Polypropylene socks shall be replaced according to the manufacturer's recommendations.

5. Upon stabilization of the area contributory to the sock, stakes shall be removed. The sock may be left in place and vegetated or removed in accordance with the stabilization plan. For removal the mesh can be cut and the compost spread as an additional mulch to act as a soil supplement.

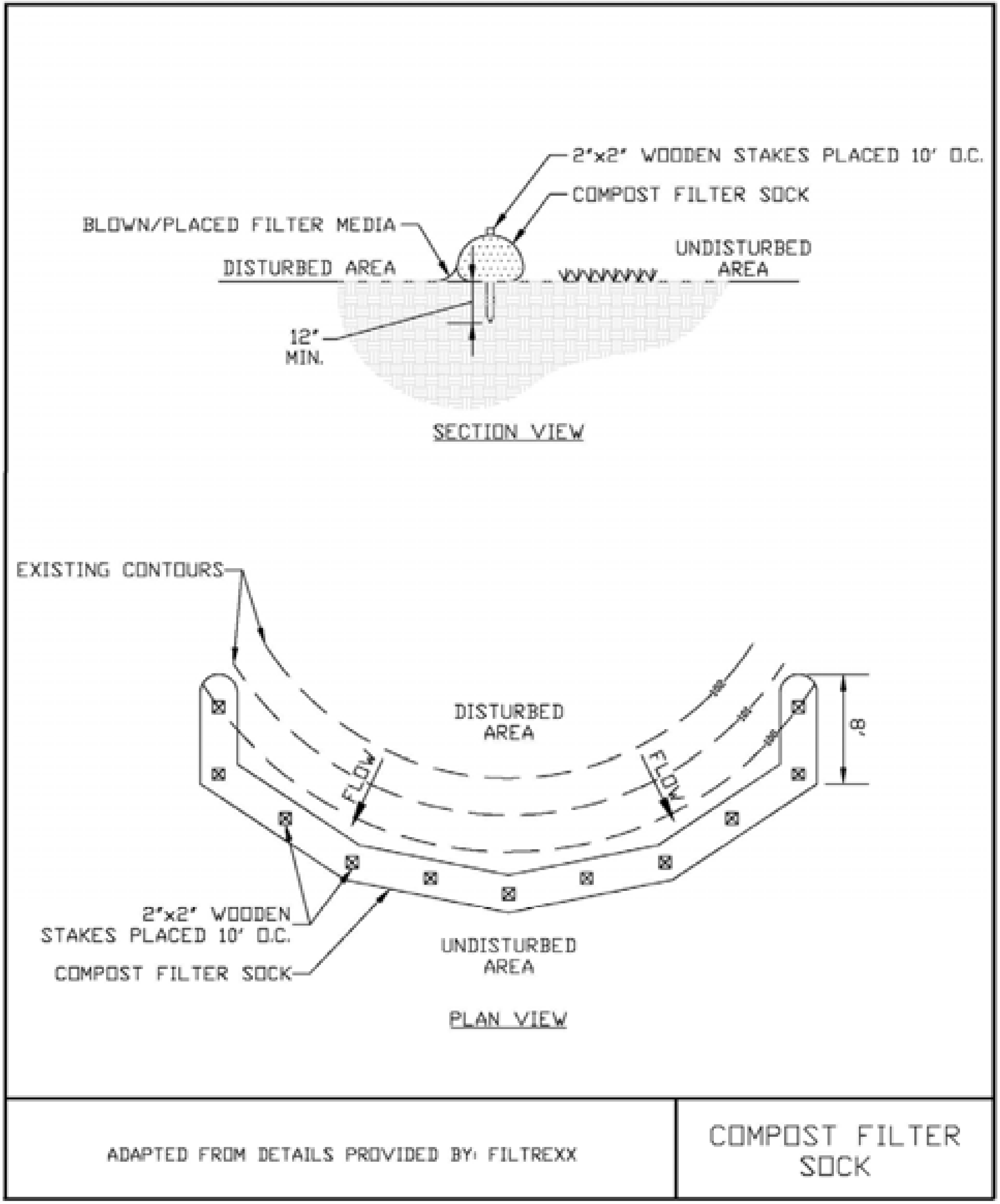
Table 5.1 - Compost Sock Fabric Minimum Specifications Table

Material Type	3 mil HDPE	5 mil HDPE	5 mil HDPE	Multi-Filament Polypropylene (MFPP)	Heavy Duty Multi-Filament Polypropylene (HDMFPP)
Material Characteristics	Photodegradable	Photodegradable	Biodegradable	Photodegradable	Photodegradable
Sock Diameters	12" 18"	12" 18" 24" 32"	12" 18" 24" 32"	12" 18" 24" 32"	12" 18" 24" 32"
Mesh Opening	3/8"	3/8"	3/8"	3/8"	1/8"
Tensile Strength		26 psi	26 psi	44 psi	202 psi
Ultraviolet Stability % Original Strength (ASTM G-155)	23% at 1000 hr.	23% at 1000 hr.		100% at 1000 hr.	100% at 1000 hr.
Minimum Functional Longevity	6 months	9 months	6 months	1 year	2 years

Table 5.2 - Compost Standards Table

Organic matter content	25% - 100% (dry weight)
Organic portion	Fibrous and elongated
pH	6.0 – 8.0
Moisture content	30% - 60%
Particle size	100% passing a 1" screen and 10 - 50% passing a 3/8" screen
Soluble salt concentration	5.0 dS/m (mmhos/cm) maximum

Figure 5.2
Compost Filter Sock



STANDARD AND SPECIFICATIONS FOR GEOTEXTILE FILTER BAG

Definition & Scope

A **temporary** portable device through which sediment laden water is pumped to trap and retain sediment prior to its discharge to drainageways or off-site.

Condition Where Practice Applies

On sites where space is limited such as urban construction or linear projects (e.g. roads and utility work) where rights-of-way are limited and larger de-silting practices are impractical.

Design Criteria

1. Location - The portable filter bag should be located to minimize interference with construction activities and pedestrian traffic. It should also be placed in a location that is vegetated, relatively level, and provides for ease of access by heavy equipment, cleanout, disposal of trapped sediment, and proper release of filtered water.

   The filter bag shall also be placed at least 50 feet from all wetlands, streams or other surface waters.

2. Size - Geotextile filter bag shall be sized in accordance with the manufacturers recommendations based on the pump discharge rate.

Materials and Installation

1. The geotextile material will have the following attributes:

Minimum Grab Tensile Strength	200 lbs.
Minimum Grab Tensile Elongation	50 %
Minimum Trapezoid Tear Strength	80 lbs.
Mullen Burst Strength	380 psi
Minimum Puncture Strength	130 lbs
Apparent Opening Size	40 - 80 US sieve
Minimum UV Resistance	70%
Minimum Flow Thru Rate	70 gpm/sq ft

2. The bag shall be sewn with a double needle machine using high strength thread, double stitched “Joe” type capable of minimum roll strength of 100 lbs/inch (ASTM D4884).

3. The geotextile filter bag shall have an opening large enough to accommodate a 4 inch diameter discharge hose with an attached strap to tie off the bag to the hose to prevent back flow.

4. The geotextile shall be placed on a gravel bed 2 inches thick, a straw mat 4 inches thick, or a vegetated filter strip to allow water to flow out of the bag in all directions.

Maintenance

1. The geotextile filter bag is considered full when remaining bag flow area has been reduced by 75%. At this point, it should be replaced with a new bag.

2. Disposal may be accomplished by removing the bag to an appropriate designated upland area, cut open, remove the geotextile for disposal, and spread sediment contents and seeded and mulched according to the vegetative plan.

STANDARD AND SPECIFICATIONS FOR SEDIMENT BASIN

Definition & Scope

A **temporary** basin with a barrier or dam constructed across a drainage way or at other suitable locations to intercept sediment-laden runoff and reduce the amount of sediment leaving the disturbed area in order to protect drainageways, properties, and rights-of-way below the sediment basin.

Conditions Where Practice Applies

A sediment basin is appropriate where physical site conditions or land ownership restrictions preclude the installation of other control measures to adequately control runoff, erosion, and sedimentation. However, it is required that other erosion control measures be used with the sediment basin. The basin may be used below construction operations which expose critical areas to soil erosion. The basin shall be maintained until the disturbed area is protected against erosion by permanent stabilization.

This standard applies to the installation of temporary sediment basins on sites where: (a) failure of the structure would not result in loss of life, damage to homes or buildings, or interruption of use or service of public roads or utilities; (b) the drainage area does not exceed 50 acres; and (c) the basin is to be removed within 36 months after the beginning of construction of the basin.

Permanent (to function more than 36 months) sediment basins, or structures that temporarily function as a sediment basin but are intended for use as a permanent pool shall be classified as **permanent** structures and shall conform to criteria appropriate for permanent structures. These structures shall be designed and constructed to conform to NRCS Standard And Specification No. 378 for Ponds in the National Handbook of Conservation Practices and the New York State Department of Environmental Conservation, "Guidelines for the Design of Dams."

Design Criteria

Compliance with Laws and Regulations

Design and construction shall comply with state and local laws, ordinances, rules and regulations, including permits.

Location - Maximum Drainage Area = 50 acres

The sediment basin should be located to obtain the maximum storage benefit from the terrain and for ease of cleanout of the trapped sediment. It should be located to minimize interference with construction activities and construction of utilities. Whenever possible, sediment basins should be located so that storm drains may outfall or be diverted into the basin. **Do not locate basins in perennial streams.**

Size and Shape of the Basin

The sediment basin will contain two separate zones. The lowest zone is the sediment storage zone. This zone is sized for a volume equal to 1,000 cubic feet per disturbed acre over the course of the life of the project, contributing to the basin as measured from the bottom of the basin to the bottom of the dewatering zone. It shall have a minimum depth of 1 foot. Layered above this zone is the dewatering zone. This zone is sized for a minimum volume equal to 3,600 cubic feet per each acre draining to the basin. This volume is temporarily stored between the sediment storage zone and the crest of the principal spillway. This zone should be a minimum of 3 feet deep. See Figures 5.8 and 5.9 on pages 5.26 and 5.27. This 3,600 cubic feet per acre is equivalent to one inch of sediment per acre of drainage area. The entire drainage area is used for this computation, rather than the disturbed area above, to maximize trapping efficiency. The length to width ratio shall be 2:1 or greater, where length is the distance between the inlet and outlet. A wedge shape shall be used with the inlet located at the narrow end. See Figure 5.22 on page 5.41.

Surface Area

Research studies (Barfield and Clar 1985; Pitt, 2003) indicate that the following relationship between surface area and peak inflow rate gives a trapping efficiency of 75% for silt loam soils, and greater than 90% for loamy sand soils:

$A = 0.01\ Qp$ or, $A = 0.015x\ D.A.$ (whichever is greater)

where,

A = the basin surface area, acres, measured at the service spillway crest; and

Qp = the peak inflow rate for the design storm. (The minimum design storm will be a 10 year, 24 hour storm under construction conditions).

D.A. = contributing drainage area.

Sediment basins shall be cleaned out when the sediment storage zone volume described above is reduced by 50 percent, except in no case shall the sediment level be permitted to build up higher than one foot below the bottom of the dewatering zone. At this elevation, cleanout shall be performed to restore the original design volume to the sediment storage zone.

The elevation corresponding to the maximum allowable sediment level shall be determined and shall be stated in the design data as a distance below the top of the riser and shall be clearly marked on the riser.

The basin dimensions necessary to obtain the required basin volume as stated above shall be clearly shown on the plans to facilitate plan review, construction, and inspection.

Spillway Design

Runoff shall be computed by standard accepted hydrologic methods noted previously in this book of standards. **Runoff computations shall be based upon the worst soil cover conditions expected to prevail in the contributing drainage area during the anticipated effective life of the structure.** The combined capacities of the principal and emergency spillway shall be sufficient to pass the peak rate of runoff from a ten (10) year frequency, 24 hour duration storm.

1. Principal spillway: A spillway consisting of a vertical pipe or box type riser joined (watertight connection) to a pipe (barrel) which shall extend through the embankment and outlet beyond the downstream toe of the fill. The minimum capacity of the principal spillway shall be 0.2 cfs per acre of drainage area when the water surface is at the emergency spillway crest elevation. For those basins with no emergency spillway, the principal spillway shall have the capacity to handle the peak flow from a ten-year frequency rainfall event. The minimum size of the barrel shall be 8 inches in diameter. See Figures 5.10, 5.11 and 5.12 on pages 5.28, 5.29, and 5.30 for principal spillway sizes and capacities.

   A. Crest elevation: When used in combination with an emergency spillway, the crest elevation of the riser shall be a minimum one foot below the elevation of the control section of the emergency spillway.

   B. Watertight riser and barrel assembly: The riser and all pipe connections shall be completely watertight except for the inlet opening at the top, or a dewatering opening. There shall not be other holes, leaks, rips, or perforations in the structure.

   C. Dewatering the basin:

   1) Preferred Method- The preferred method for dewatering sediment basins is by using surface skimmers to decant the cleaner top surface water from the basin as the sediment settles out. See Dewatering Device Standard, page 5.10.

   2) Alternative Method– A fixed vertical riser pipe configured with perforations and filter fabric with a cone of pea gravel or small crushed stone is an alternative option for use. See Figure 5.5 on page 5.14.

   The sediment basin dewatering system shall be designed to release the dewatering zone volume between 2 to 7 days in watersheds not impaired by sediment, and 4-7 days in sediment impaired watersheds (check the NYSDEC Waterbody Inventory/Priority Waterbody List - **http://www.dec.ny.gov/chemical/36730.html**, to see if your site is in an impaired watershed). The design performance range will depend on the percent of silt and clay in the soils tributary to the basin. If the performance of the basin does not meet water quality objectives after 7 days, chemical treatment may be necessary.

   D. Anti-vortex device and trash rack:

   An anti-vortex device and trash rack shall be securely installed on top of the riser and shall be the concentric type as shown in Figure 5.13 and 5.14 on pages 5.31 and 5.32.

   E. Base:

   The riser shall have a base attached with a watertight connection and shall have sufficient weight to prevent flotation of the riser. Two approved bases for risers ten feet or less in height are: 1) a concrete base 18 in. thick with the riser embedded 9 in. in the base, and 2) a ¼” minimum thickness steel plate attached to the riser by a continuous weld around the circumference of the riser to form a watertight connection. The plate shall have 2.5 feet of stone, gravel, or compacted earth placed on it to prevent flotation. In either case, each side of the square base shall be twice the riser diameter.

   For risers greater than ten feet high, computations shall be made to design a base which will prevent flotation. The minimum factor of safety shall be 1.20 (Downward forces = 1.20 x upward forces). See Figure 5.15 on page 5.33 for details.

F. Anti-Seep Collars: Anti-seep collars shall be installed around all conduits through earth fills of impoundment structures according to the following criteria:

1) Collars shall be placed to increase the seepage length along the conduit by a minimum of 15 percent of the pipe length located within the saturation zone.

2) Collar spacing shall be between 5 and 14 times the vertical projection of each collar.

3) All collars shall be placed within the saturation zone.

4) The assumed normal saturation zone (phreatic line) shall be determined by projecting a line at a slope of 4 horizontal to 1 vertical from the point where the normal water (riser crest) elevation touches the upstream slope of the fill to a point where this line intersects the invert of the pipe conduit. All fill located within this line may be assumed as saturated.

$$2(N)(P) = 1.15(L_s) \qquad N = (0.075)(L_s)/P$$

When anti-seep collars are used, the equation for revised seepage length becomes:

Where: Ls = Saturated length is length, in feet, of pipe between riser and intersection of phreatic line and pipe invert.

N = number of anti-seep collars.

P = vertical projection of collar from pipe, in feet.

5) All anti-seep collars and their connections shall be watertight. See Figures 5.16 and 5.17 on pages 5.34 and 5.35 for anti-seep collar design and Figure 5.18 on page 5.36 for construction details. Seepage diaphragms may be used in lieu of anti-seep collars. They shall be designed in accordance to USDA NRCS Pond Standard 378.

G. Outlet: An outlet shall be provided, including a means of conveying the discharge in an erosion free manner to an existing stable channel. Where discharge occurs at the property line, drainage easements will be obtained in accordance with local ordinances. Adequate notes and references will be shown on the erosion and sediment control plan.

Protection against scour at the discharge end of the pipe spillway shall be provided. Measures may include basin, riprap, revetment, excavated plunge pools, or other approved methods. See Standard and Specification for Rock Outlet Protection, Section 3, page 3.39.

2. Emergency Spillways: The entire flow area of the emergency spillway shall be constructed in undisturbed ground (not fill). The emergency spillway cross-section shall be trapezoidal with a minimum bottom width of eight feet. This spillway channel shall have a straight control section of at least 20 feet in length; and a straight outlet section for a minimum distance equal to 25 feet.

A. Capacity: The minimum capacity of the emergency spillway shall be that required to pass the peak rate of runoff from the 10 year 24-hour frequency storm, less any reduction due to flow in the pipe spillway. Emergency spillway dimensions may be determined by using the method described in Figure 5.19 on page 5.37 and the Design Tables in Figures 5.20 and 5.21 on pages 5.38 and 5.39.

B. Velocities: The velocity of flow in the exit channel shall not exceed 5 feet per second for vegetated channels. For channels with erosion protection other than vegetation, velocities shall be within the non-erosive range for the type of protection used.

C. Erosion Protection: Erosion protection shall be provided for by vegetation as prescribed in this publication or by other suitable means such as riprap, asphalt or concrete.

D. Freeboard: Freeboard is the difference between the design high water elevation in the emergency spillway and the top of the settled embankment. If there is no emergency spillway, it is the difference between the water surface elevation required to pass the design flow through the pipe and the top of the settled embankment. Freeboard shall be at least one foot.

Embankment Cross-Section

1. The maximum height of dam = 15 feet (measured from the low point of original ground at the downstream toe to the top of the dam).

2. Minimum top width of dam = 10 feet.

3. Side slopes shall be 2.5 to 1 or flatter.

Entrance of Runoff into Basin

Points of entrance of surface runoff into excavated sediment basins shall be protected to prevent erosion. Considerable care should be given to the major points of inflow into basins. In many cases the difference in elevation of the inflow and the bottom of the basin is considerable, thus creating a potential for severe gullying and sediment generation. Often a riprap drop at major points of inflow would eliminate gullying and sediment generation.

Diversions, grade stabilization structures or other water control devices shall be installed as necessary to ensure direction of runoff and protect points of entry into the basin. Points of entry should be located so as to ensure maximum travel distance of entering runoff to point of exit (the riser) from the basin.

Disposal

The sediment basin plans shall indicate the method (s) of disposing of the sediment removed from the basin. The sediment shall be placed in such a manner that it will not erode from the site. The sediment shall not be deposited downstream from the basin, adjacent to a stream or floodplain. Disposal sites will be covered by an approved sediment control plan.

The sediment basins plans shall also show the method of disposing of the sediment basin after the drainage area is stabilized, and shall include the stabilization of the sediment basin site. Water contained within the storage areas shall be removed from the basin by pumping, cutting the top of the riser, or other appropriate method prior to removing or breaching the embankment. **Sediment shall not be allowed to flush into a stream or drainageway.**

Chemical Treatment

Precipitation of sediment is enhanced with the use of specific chemical flocculants that can be applied to the sediment basin in liquid, powder, or solid form. Flocculants include anionic polyelectrolytes such as polyacrylimides, aluminum sulfate (alum), polyaluminum chloride and chitosan. Cationic polyelectrolytes have a greater toxicity to fish and other aquatic organisms than anionic polyelectrolytes because they bind to the gills of fish resulting in respiratory failure (Pitt, 2003).

Chemical treatment shall not be substituted for proper erosion and sediment control. To reduce the need for flocculants, proper controls include planning, phasing, sequencing and practice design in accordance to NY Standards. **Chemical applications shall not be applied without written approval from the NYSDEC.**

Safety

Sediment basins are attractive to children and can be very dangerous. Local ordinances and regulations must be adhered to regarding health and safety. The developer or owner shall check with local building officials on applicable safety requirements. If fencing of sediment basins is required, the location of and type of fence shall be shown on the plans.

Construction Specifications

Site Preparation

Areas under the embankment shall be cleared, grubbed, and stripped of topsoil to remove trees, vegetation, roots, or other objectionable material. In order to facilitate cleanout and restoration, the pool area (measured at the top of the pipe spillway) will be cleared of all brush, trees, and other objectionable materials.

Cutoff-Trench

A cutoff trench shall be excavated along the centerline of earth fill embankments. The minimum depth shall be two feet. The cutoff trench shall extend up both abutments to the riser crest elevation. The minimum bottom width shall be four feet, but wide enough to permit operation of excavation and compaction equipment. The side slopes shall be no steeper than 1:1. Compaction requirements shall be the same as those for embankment. The trench shall be dewatered during the back-filling/compaction operations.

Embankment

The fill material shall be taken from approved areas shown on the plans. It shall be clean mineral soil free of roots, woody vegetation, oversized stones, rocks, or other objectionable material. Relatively pervious materials such as sand or gravel (Unified Soil Classes GW, GP, SW & SP) shall not be placed in the embankment. Areas on which fill is to be placed shall be scarified prior to placement of fill. The fill material shall contain sufficient moisture so that it can be formed by hand into a ball without crumbling. If water can be squeezed out of a ball, it is too wet for proper compaction. Fill material shall be placed in six to eight-inch thick continuous layers over the entire length of the fill. Compaction shall be obtained by routing and hauling the construction equipment over the fill so that the entire surface of each layer of the fill is traversed by at least one wheel or tread track of the equipment or by the use of a compactor. The embankment shall be constructed to an elevation 10 percent higher than the design height to allow for settlement.

Pipe Spillway

The riser shall be securely attached to the barrel or barrel stub by welding the full circumference making a watertight structural connection. The barrel stub must be attached to the riser at the same percent (angle) of grade as the outlet conduit. The connection between the riser and the riser base shall be watertight. All connections between barrel sections must be achieved by approved watertight bank assemblies. The barrel and riser shall be placed on a firm, smooth foundation of impervious soil. Pervious materials such as sand, gravel, or crushed stone shall not be used as backfill around the pipe or anti-seep collars. The fill material around the pipe spillway shall be placed in four-inch layers and compacted under and around the pipe to at least the same density as the adjacent embankment.

A minimum depth of two feet of hand compacted backfill shall be placed over the pipe spillway before crossing it with construction equipment. Steel base plates on risers shall have at least 2 ½ feet of compacted earth, stone, or gravel placed over it to prevent flotation.

Emergency Spillway

The emergency spillway shall be installed in undisturbed ground. The achievement of planned elevations, grades, design width, entrance and exit channel slopes are critical to the successful operation of the emergency spillway and must be constructed within a tolerance of +/- 0.2 feet.

Vegetative Treatment

Stabilize the embankment and emergency spillway in accordance with the appropriate vegetative standard and specification immediately following construction. In no case shall the embankment remain unstabilized for more than three (3) days.

Erosion and Pollution Control

Construction operations shall be carried out in such a manner that erosion and water pollution will be minimized. State and local laws shall be complied with concerning pollution abatement.

Safety

State and local requirements shall be met concerning fencing and signs, warning the public of hazards of soft sediment and floodwater.

Maintenance

1. Repair all damages caused by soil erosion and construction equipment at or before the end of each working day.

2. Sediment shall be removed from the basin when it reaches the specified depth for cleanout noted on the plans which will not exceed 50% of the capacity of the sediment storage zone. This sediment shall be placed in such a manner that it will not erode from the site. The sediment shall not be deposited downstream from the embankment, adjacent to a stream or floodplain.

Final Disposal

When temporary structures have served their intended purpose and the contributing drainage area has been properly stabilized, the embankment and resulting sediment deposits are to be leveled or otherwise disposed of in accordance with the approved sediment control plan. The proposed use of a sediment basin site will often dictate final disposition of the basin and any sediment contained therein. If the site is scheduled for future construction, then the basin material and trapped sediments must be removed, safely disposed of, and backfilled with a structural fill. When the basin area is to remain open space, the pond may be pumped dry, graded, and backfilled.

Information to be Submitted

Sediment basin designs and construction plans submitted for review to a local municipality, New York State DEC, New York City DEP, Soil and Water Conservation District, or other agency shall include the following:

1. Specific location of the basin.

2. Plan view of the storage basin and emergency spillway, showing existing and proposed contours.

3. Cross section of dam, principal spillway, emergency spillway, and profile of emergency spillway.

4. Details of pipe connections, riser to pipe connections, riser base, anti-seep control, trash rack cleanout elevation, and anti-vortex device.

5. Runoff calculations for 1 and 10-year frequency storms, if required.

6. Storage Computations

   A. Zones total required

   B. Zones total Available

   C. Elevation of sediment at which cleanout shall be required; also stated as a distance from the riser

TEMPORARY SEDIMENT BASIN DESIGN DATA SHEET

Computed by ___________________________ Date _____________ Checked by ________________ Date _________

Project____ Basin #___________________________

Location ___________________________ Total Area draining to basin (≤50 Ac.) ______________________ Acres

BASIN SIZE DESIGN

1. Sediment storage zone volume = 1,000 cu. ft. x number of disturbed acres = _______ cu. ft., Top of Zone Elev. _____
2. Dewatering zone volume = 3,600 cu. ft. x number of drainage area acres = _______ cu. ft., Top of Zone Elev. _______
3. Length to width ratio = _____________
4. A. Cleanout at 50% of sediment storage zone volume, Elev. _____________
   B. Distance below top of riser ___________ feet
5. Minimum surface area is larger of 0.01 $Q_{(10)}$ _________ or, 0.015 DA = ___________ use ___________ acres

DESIGN OF SPILLWAYS & ELEVATIONS

Runoff

6. $Q_{p(10)}$ = _____________________________ cfs (Attach runoff computation sheets)

Pipe Spillway (Q_{ps})

7. Min. pipe spillway cap., Q_{ps} = 0.2 x _______ Drainage Area, acres = ________ cfs
   Note: If there is no emergency spillway, then required $Q_{ps} = Q_{p(10)}$ = ________ cfs.
8. H, head = ________ ft. Barrel length = ________ ft
9. Barrel: Diam. _______ inches; Q_{ps} = (Q) ___________ x (cor.fac.) ________ = _________ cfs.
10. Riser: Diam. _______ inches; Length ________ ft.; h = _________ ft. Crest Elev. _____________
11. Trash Rack: Diameter = ________ inches; H, height = __________ inches

Emergency Spillway Design

12. Emergency Spillway Flow, $Q_{es} = Q_p - Q_{ps}$ = ___________ - ____________ = ___________ cfs.
13. Width _______ ft.; H_p _________ ft Crest elevation ___________; Design High Water Elev. ___________
    Entrance channel slope ___________________________ % ; Top of Dam Elev. ________________
    Exit channel slope ______________________________ %

ANTI-SEEP COLLAR/SEEPAGE DIAPHRAGM DESIGN

Collars:

14. y = ________ ft.; z = _______ :1; pipe slope = ________ %, L_s = _______ ft.
    Use _______ collars, ______ - ______ inches square; projection = ________ ft.

Diaphragms:

_________ width _________ ft. height _________ ft.

DEWATERING ORIFICE SIZING

(Determined from the Dewatering Device Standard)

15. Dewatering orifice diameter = ________ inches. Skimmer ___ or Riser ____ (check one)
16. Design dewatering time ________ days (Min. 2 days required)

TEMPORARY SEDIMENT BASIN DESIGN DATA SHEET INSTRUCTIONS FOR USE OF FORM

1. Minimum required sediment storage zone volume is 1,000 cubic feet per acre from each disturbed acre within the total drainage area. Minimum required dewatering zone volume is 3,600 cubic feet per total area draining to the basin.

2. The volume of a naturally shaped basin (no excavation in basin) may be approximated by the formula V = (0.4)(A)(d), where V is in cubic feet, A is the surface area of the basin, in square feet, and d is the maximum depth of the basin, in feet. Volume may be computed from contour information or other suitable methods.

3. If volume of basin is not adequate for required storage, excavate to obtain the required zone volumes.

4. The minimum surface area of the basin pool at the storage volume elevation will be the larger of the two elevations shown.

5. Use of the NRCC hydrologic data at www.precip.net with an appropriate hydrologic model, is the preferred process for runoff computation. Runoff curve numbers will be computed for the drainage area that reflects the maximum construction condition.

6. Required minimum discharge from pipe spillway equals 0.2 cfs/ac. times total drainage area. (This is equivalent to a uniform runoff of 5 in. per 24 hours). The pipe shall be designed to carry Q_p if site conditions preclude installation of an emergency spillway to protect the structure.

7. Determine value of "H" from field conditions; "H" is the interval between the centerline of the outlet pipe and the emergency spillway crest, or if there is no emergency spillway, to the design high water.

8. See Pipe Flow Charts, Figures 5.11 and 5.12 on pages 5.29 and 5.30.

9. See Riser Inflow Curves, Figure 5.10 on page 5.28.

10. Compute the orifice size required to dewater the basin over a minimum 48 hour period. See the Dewatering Device Standard on page 5.10.

11. See Trash Rack and Anti-Vortex Device Design, Figures 5.13 and 5.14 on pages 5.31 and 5.32.

12. Compute Q_{es} by subtracting actual flow carried by the pipe spillway from the total inflow, Q_p.

13. Use appropriate tables to obtain values of H_p, bottom width, and actual Q_{es}. If no emergency spillway is to be used, so state, giving reason (s).

14. See Anti-Seep Collar / Seepage Diaphragm Design (see figures 5.16, 5.17 and 5.18 on pages 5.34, 5.35 and 5.36).

15. Fill in design elevations. The emergency spillway crest must be set no closer to riser crest than value of h, which causes pipe spillway to carry the minimum, required Q. Therefore, the elevation difference between spillways shall be equal to the value of h, or one foot, whichever is greater. Design high water is the elevation of the emergency spillway crest plus the value of H_p, or if there is no emergency spillway, it is the elevation of the riser crest plus h required to handle the 10-year storm. Minimum top of dam elevation requires 1.0 ft. of freeboard above design high water.

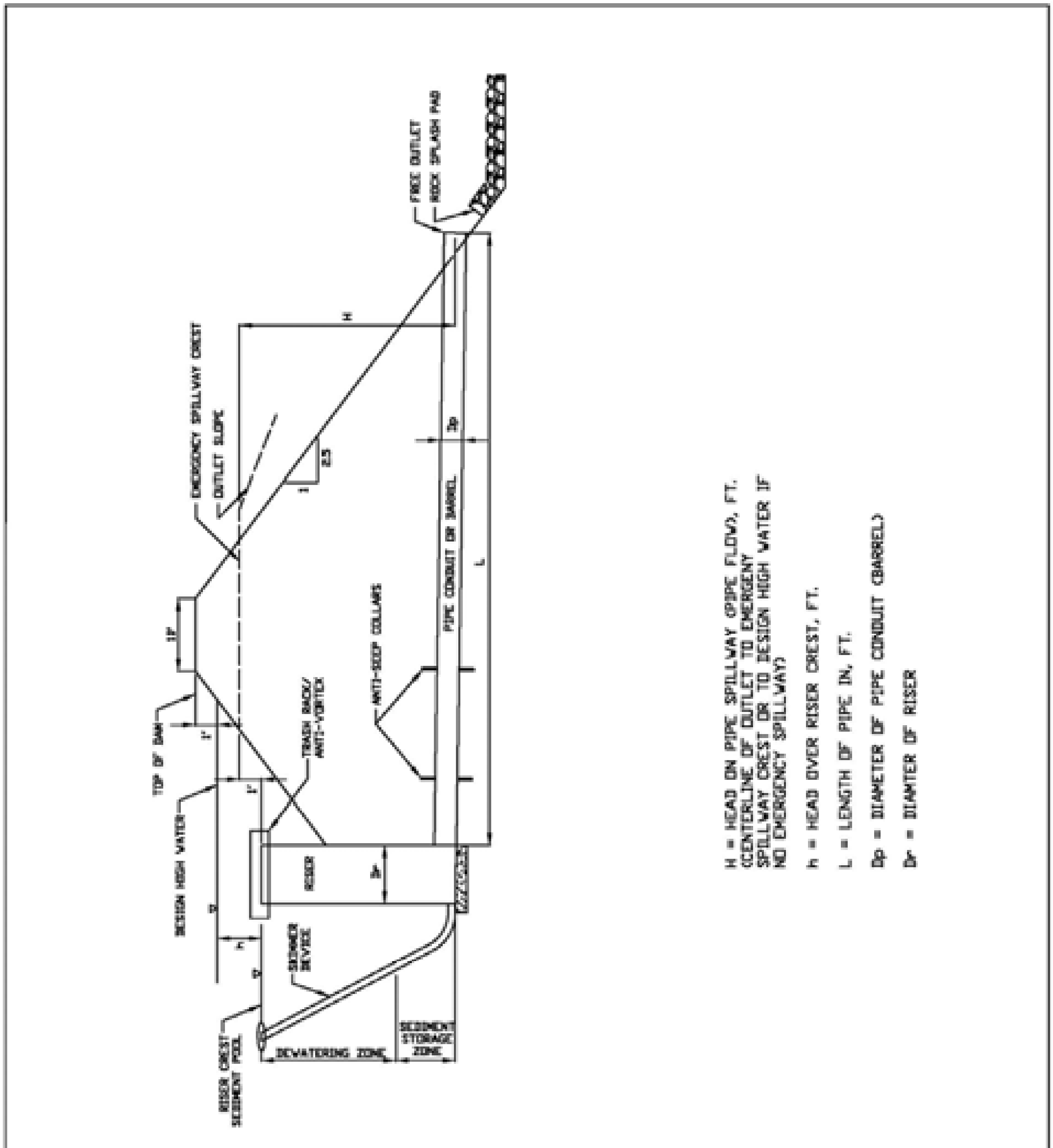
To use charts for pipe spillway design:

1. Enter chart, Figures 5.11 or 5.12 on pages 5.29 and 5.30 with H and required discharge.

2. Find diameter of pipe conduit that provides equal or greater discharge

3. Enter chart, Figure 5.10 on page 5.28 with actual pipe discharge. Read across to select smallest riser that provides discharge within weir flow portion of rating curve. Read down to find corresponding h required. This h must be 1 foot or less.

Figure 5.8
Pipe Spillway Design



ADAPTED FROM DETAILS PROVIDED BY: USDA - NRCS,
NEW YORK STATE DEPARTMENT OF TRANSPORTATION,
NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION,
NEW YORK STATE SOIL & WATER CONSERVATION COMMITTEE

PIPE SPILLWAY DESIGN

Figure 5.9
Sediment Basin

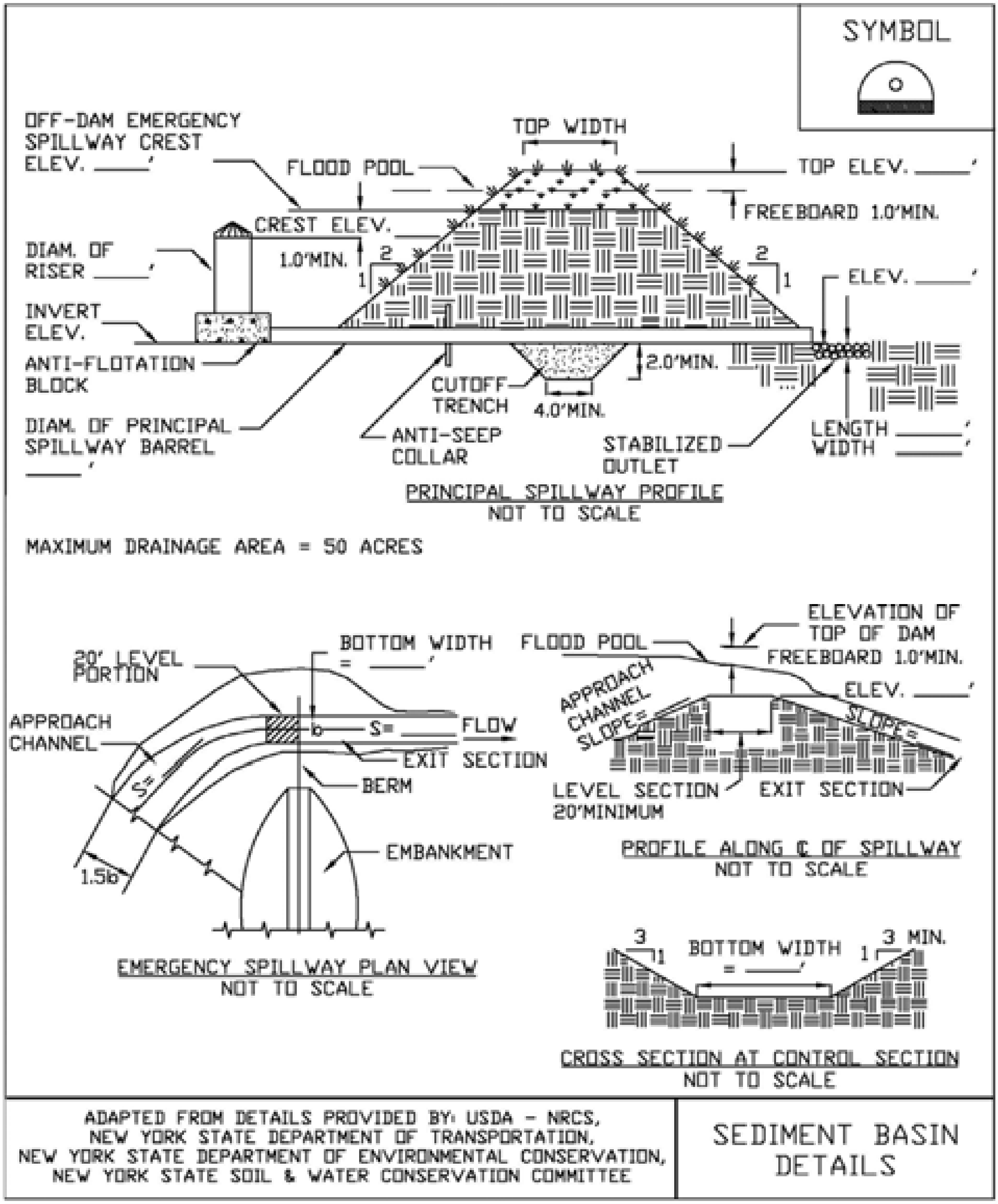


Figure 5.10
Riser Inflow Chart (USDA - NRCS)

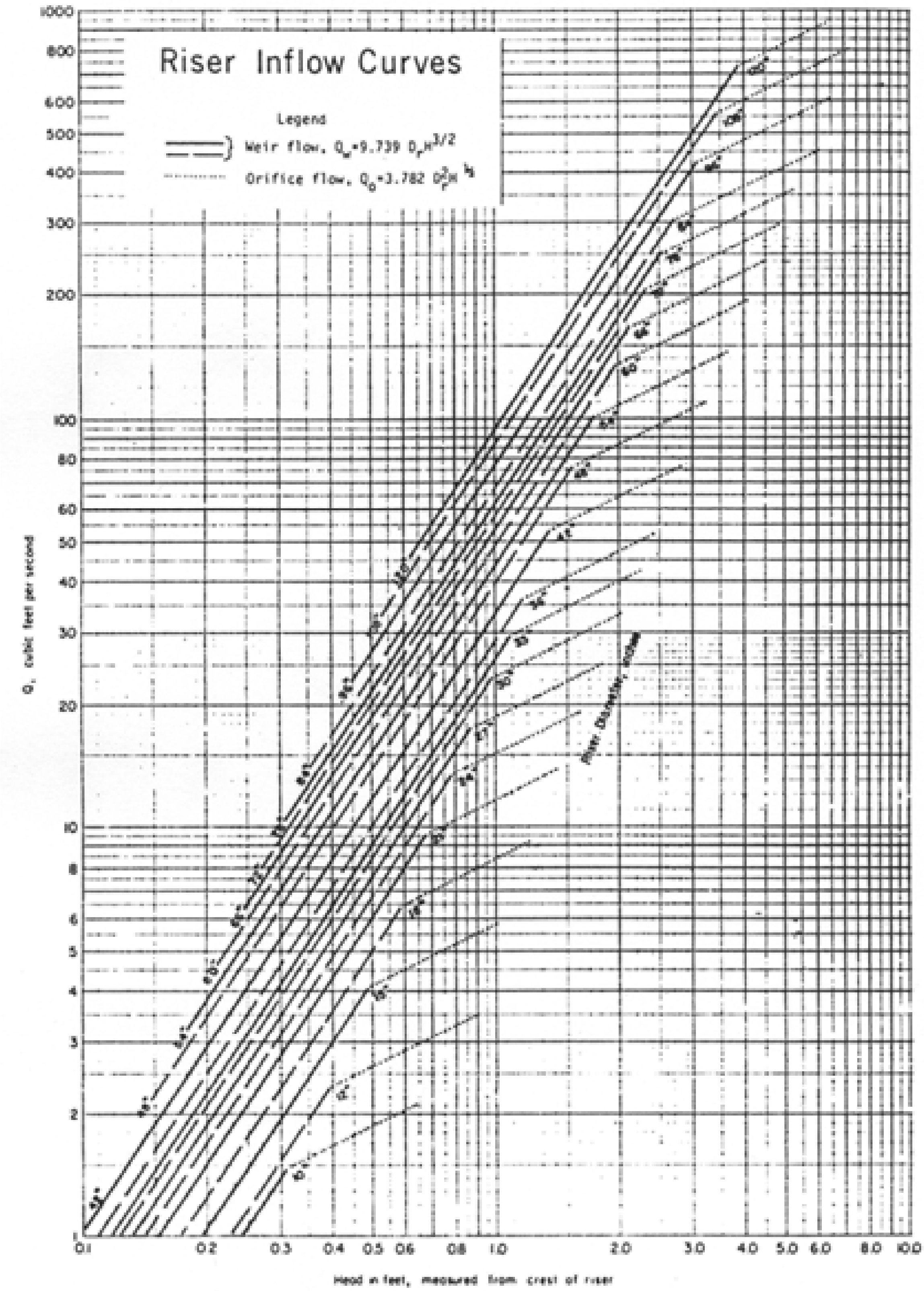


Figure 5.11
Pipe Flow Chart; “n” = 0.025 (USDA - NRCS)

PIPE FLOW CHART n = 0.025

FOR CORRUGATED METAL PIPE INLET $K_m = K_e + K_b = 1.0$ AND 70 FEET OF CORRUGATED METAL PIPE CONDUIT (full flow assumed)

Note correction factors for pipe lengths other than 70 feet

diameter of pipe in inches

H, in feet	6"	8"	10"	12"	15"	18"	21"	24"	30"	36"	42"	48"	54"	60"	66"	72"	78"	84"	90"	96"	102"
1	0.33	0.70	1.25	1.98	3.48	5.47	7.99	11.0	18.8	28.8	41.1	55.7	72.6	91.8	113	137	163	191	222	255	290
2	0.47	0.99	1.76	2.80	4.92	7.74	11.3	15.6	26.6	40.8	58.2	78.8	103	130	160	194	231	271	314	360	410
3	0.58	1.22	2.16	3.43	6.02	9.48	13.8	19.1	32.6	49.9	71.2	96.5	126	159	196	237	282	331	384	441	502
4	0.67	1.40	2.49	3.97	6.96	10.9	16.0	22.1	37.6	57.7	82.3	111	145	184	226	274	326	383	444	510	580
5	0.74	1.57	2.79	4.43	7.78	12.2	17.9	24.7	42.1	64.5	92.0	125	162	205	253	306	365	428	496	570	648
6	0.82	1.72	3.05	4.86	8.52	13.4	19.6	27.0	46.1	70.6	101	136	178	225	277	336	399	469	544	624	710
7	0.88	1.86	3.30	5.25	9.20	14.5	21.1	29.2	49.8	76.3	109	147	192	243	300	362	431	506	587	674	767
8	0.94	1.99	3.53	5.61	9.84	15.5	22.6	31.2	53.2	81.5	116	158	205	260	320	388	461	541	628	721	820
9	1.00	2.11	3.74	5.95	10.4	16.4	24.0	33.1	56.4	86.5	123	167	218	275	340	411	489	574	666	764	870
10	1.05	2.22	3.94	6.27	11.0	17.3	25.3	34.9	59.5	91.2	130	176	230	290	358	433	516	605	702	806	917
11	1.10	2.33	4.13	6.58	11.5	18.2	26.5	36.6	62.4	95.6	136	185	241	304	376	454	541	635	736	845	962
12	1.15	2.43	4.32	6.87	12.1	19.0	27.7	38.2	65.2	99.9	142	193	252	318	392	475	565	663	769	883	1004
13	1.20	2.53	4.49	7.15	12.6	19.7	28.8	39.8	67.8	104	148	201	262	331	408	494	588	690	800	919	1045
14	1.25	2.63	4.66	7.42	13.0	20.5	29.9	41.3	70.4	108	154	208	272	343	424	513	610	716	830	953	1085
15	1.29	2.72	4.83	7.68	13.5	21.2	30.9	42.8	72.8	112	159	216	281	355	439	531	631	741	860	987	1123
16	1.33	2.81	4.99	7.93	13.9	21.9	32.0	44.2	75.2	115	165	223	290	367	453	548	652	765	888	1019	1160
17	1.37	2.90	5.14	8.18	14.3	22.6	32.9	45.5	77.5	119	170	230	229	378	467	565	672	789	915	1051	1195
18	1.41	2.98	5.29	8.41	14.8	23.2	33.9	46.8	79.8	120	174	236	308	389	480	581	692	812	942	1081	1230
19	1.45	3.06	5.43	8.64	15.2	23.9	34.8	48.1	82.0	126	179	243	316	400	494	597	711	834	967	1111	1264
20	1.49	3.14	5.57	8.87	15.6	24.5	35.7	49.4	84.1	129	184	249	325	410	506	613	729	856	993	1139	1297
21	1.53	3.22	5.71	9.09	15.9	25.1	36.6	50.6	86.2	132	188	255	333	421	519	628	747	877	1017	1168	1329
22	1.56	3.29	5.85	9.30	16.3	25.7	37.5	51.8	88.2	135	193	261	341	430	531	643	765	898	1041	1195	1360
23	1.60	3.37	5.98	9.51	16.7	26.2	38.3	53.0	90.2	138	197	267	348	440	543	657	782	918	1064	1222	1390
24	1.63	3.44	6.11	9.72	17.0	26.8	39.1	54.1	92.1	141	201	273	356	450	555	671	799	937	1087	1248	1420
25	1.66	3.51	6.23	9.92	17.4	27.4	39.9	55.2	94.0	144	206	279	363	459	566	685	815	957	1110	1274	1450
26	1.70	3.58	6.36	10.1	17.7	27.9	40.7	56.3	95.9	147	210	284	370	468	577	699	831	976	1132	1299	1478
27	1.73	3.65	6.48	10.3	18.1	28.4	41.5	57.4	97.7	150	214	290	377	477	588	712	847	994	1153	1324	1507
28	1.76	3.72	6.60	10.5	18.4	29.0	42.3	58.4	99.5	153	218	295	384	486	599	725	863	1013	1174	1348	1534
29	1.79	3.78	6.71	10.7	18.7	29.5	43.0	59.5	101	155	221	300	391	494	610	738	878	1030	1195	1372	1561
30	1.82	3.85	6.83	10.9	19.1	30.0	43.7	60.5	103	158	225	305	398	503	620	750	893	1048	1216	1396	1588

Correction Factors For Other Pipe Lengths

L, in feet	6"	8"	10"	12"	15"	18"	21"	24"	30"	36"	42"	48"	54"	60"	66"	72"	78"	84"	90"	96"	102"
20	1.49	1.63	1.58	1.53	1.47	1.42	1.37	1.34	1.28	1.24	1.20	1.18	1.16	1.14	1.13	1.11	1.10	1.10	1.09	1.08	1.08
30	1.44	1.41	1.39	1.36	1.32	1.29	1.27	1.24	1.21	1.18	1.15	1.13	1.12	1.11	1.10	1.09	1.08	1.07	1.07	1.06	1.06
40	1.26	1.27	1.25	1.23	1.21	1.20	1.18	1.17	1.14	1.12	1.11	1.10	1.09	1.08	1.07	1.06	1.06	1.05	1.05	1.05	1.04
50	1.16	1.16	1.15	1.14	1.13	1.12	1.11	1.10	1.09	1.08	1.07	1.06	1.06	1.05	1.05	1.04	1.04	1.04	1.03	1.03	1.03
60	1.07	1.07	1.07	1.06	1.06	1.05	1.05	1.05	1.04	1.04	1.03	1.03	1.03	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.01
70	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
80	.94	.94	.95	.95	.95	.95	.96	.96	.96	.97	.97	.97	.98	.98	.98	.98	.98	.98	.99	.99	.99
90	.89	.89	.90	.90	.91	.91	.92	.92	.93	.94	.94	.95	.95	.96	.96	.96	.97	.97	.97	.97	.94
100	.85	.85	.86	.86	.87	.88	.89	.89	.90	.91	.92	.93	.93	.94	.94	.95	.95	.95	.96	.96	.94
120	.78	.79	.79	.80	.81	.82	.83	.83	.85	.86	.87	.89	.89	.90	.91	.89	.92	.93	.93	.94	.92
140	.72	.73	.74	.75	.76	.77	.78	.79	.81	.82	.84	.85	.86	.87	.88	.86	.89	.90	.91	.91	.90
160	.68	.69	.69	.70	.71	.73	.74	.75	.77	.79	.80	.82	.83	.84	.85	.92	.87	.88	.89	.89	

Figure 5.12
Pipe Flow Chart; “n” = 0.013 (USDA - NRCS)

PIPE FLOW CHART n = 0.013

FOR REINFORCED CONCRETE PIPE INLET $K_m = K_e + K_b = 1.00$ AND 70 FEET OF REINFORCED CONCRETE PIPE CONDUIT (full flow assumed)

Note correction factors for pipe lengths other than 70 feet

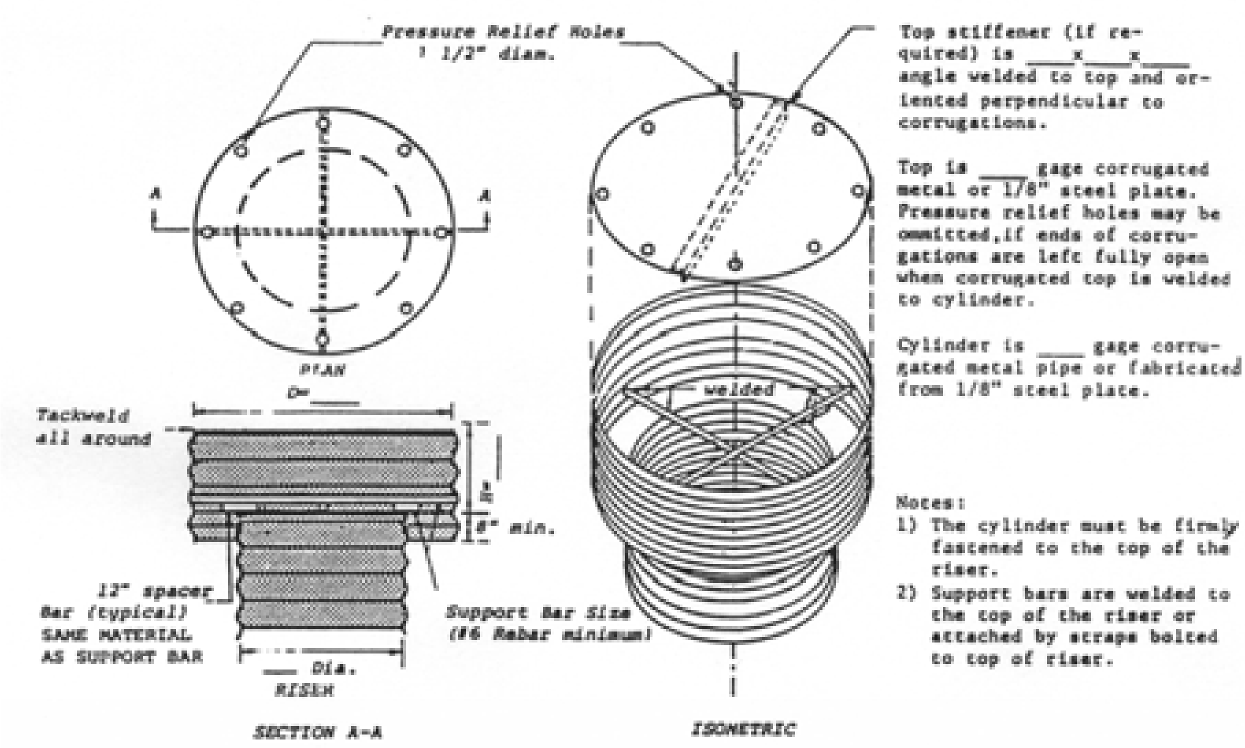
diameter of pipe in inches

H, in feet	12"	15"	18"	21"	24"	30"	36"	42"	48"	54"	60"	66"	72"	78"	84"	90"	96"	102"
1	3.22	5.44	8.29	11.8	15.9	26.0	38.6	53.8	71.4	91.5	114	139	167	197	229	264	302	342
2	4.55	7.69	11.7	16.7	22.5	36.8	54.6	76.0	101	129	161	197	236	278	324	374	427	483
3	5.57	9.42	14.4	20.4	27.5	45.0	66.9	93.1	124	159	198	241	289	341	397	458	523	592
4	6.43	10.9	16.6	23.5	31.8	52.0	77.3	108	143	183	228	278	334	394	459	529	604	683
5	7.19	12.2	18.5	26.3	35.5	58.1	86.4	120	160	205	255	311	373	440	513	591	675	764
6	7.88	13.3	20.3	28.8	38.9	63.7	94.6	132	175	224	280	341	409	482	562	647	739	837
7	8.51	14.4	21.9	31.1	42.0	68.8	102	142	189	242	302	368	441	521	607	699	798	904
8	9.10	15.4	23.5	33.3	44.9	73.5	109	152	202	259	323	394	472	557	685	748	854	966
9	9.65	16.3	24.9	35.3	47.7	78.0	116	161	214	275	342	418	500	590	688	793	905	1025
10	10.2	17.2	26.2	37.2	50.2	82.2	122	170	226	289	361	440	527	622	725	836	954	1080
11	10.7	18.0	27.5	39.0	52.7	86.2	128	178	237	304	379	462	553	653	761	877	1001	1133
12	11.1	18.9	28.7	40.8	55.0	90.1	134	186	247	317	395	482	578	682	794	916	1045	1184
13	11.6	19.6	29.9	42.4	57.3	93.7	139	194	257	330	411	502	601	710	827	953	1088	1232
14	12.0	20.4	31.0	44.1	59.4	97.3	145	201	267	342	427	521	624	736	858	989	1129	1278
15	12.5	21.1	32.1	45.6	61.5	101	150	208	277	354	442	539	646	762	888	1024	1169	1323
16	12.9	21.8	33.2	47.1	63.5	104	155	215	286	366	457	557	667	787	917	1057	1207	1367
17	13.3	22.4	34.2	48.5	65.5	107	159	222	294	377	471	574	688	812	946	1090	1244	1409
18	13.7	23.1	35.2	49.9	67.4	110	164	228	303	388	484	591	708	835	973	1121	1280	1450
19	14.0	23.7	36.1	51.3	69.2	113	168	234	311	399	497	607	727	858	1000	1152	1315	1489
20	14.4	24.3	37.1	52.6	71.0	116	173	240	319	409	510	623	746	880	1026	1182	1350	1528
21	14.7	24.9	38.0	53.9	72.8	119	177	246	327	419	523	638	764	902	1051	1211	1383	1566
22	15.1	25.5	38.9	55.2	74.5	122	181	252	335	429	535	653	782	923	1076	1240	1415	1603
23	15.4	26.1	39.8	56.5	76.2	125	186	258	342	439	547	668	800	944	1100	1260	1447	1639
24	15.8	26.7	40.6	57.7	77.8	127	189	263	350	448	559	682	817	964	1123	1295	1478	1674
25	16.1	27.2	41.5	58.9	79.4	130	193	269	357	458	571	696	834	984	1147	1322	1509	1708
26	16.4	27.7	42.3	60.0	81.0	133	197	274	364	467	582	710	850	1004	1169	1348	1539	1742
27	16.7	28.3	43.1	61.2	82.5	135	201	279	371	476	593	723	867	1023	1192	1373	1568	1775
28	17.0	28.8	43.9	62.3	84.1	138	204	285	378	484	604	737	883	1041	1214	1399	1597	1808
29	17.3	29.3	44.7	63.4	85.5	140	208	290	384	493	615	750	898	1060	1235	1423	1625	1840
30	17.6	29.8	45.4	64.5	87.0	142	212	294	391	501	625	763	913	1078	1256	1448	1653	1871

Correction Factors For Other Pipe Lengths

L, in feet	12"	15"	18"	21"	24"	30"	36"	42"	48"	54"	60"	66"	72"	78"	84"	90"	96"	102"
20	1.30	1.24	1.21	1.18	1.15	1.12	1.10	1.08	1.07	1.06	1.05	1.05	1.04	1.04	1.03	1.03	1.03	1.03
30	1.22	1.18	1.15	1.13	1.12	1,09	1.08	1.06	1.05	1.05	1.04	1.04	1.03	1.03	1.03	1.02	1.02	1.02
40	1.15	1.13	1.11	1.10	1.08	1.07	1.05	1.05	1.04	1.03	1.03	1.03	1.02	1.02	1.02	1.02	1.02	1.02
50	1.09	1.08	1.07	1.06	1.05	1.04	1.04	1.03	1.03	1.02	1.02	1.02	1.02	1.01	1.01	1.01	1.01	1.01
60	1.04	1.04	1.03	1.03	1.03	1.02	1.02	1.02	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01
70	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
80	.96	.97	.97	.97	.98	.98	.98	.99	.99	.99	.99	.99	.99	.99	.99	.99	.99	.99
90	.93	.94	.94	.95	.95	.96	.97	.97	.98	.98	.98	.98	.98	.99	.99	.99	.99	.99
100	.90	.91	.92	.93	.93	.95	.95	.96	.97	.97	.97	.98	.98	.98	.98	.98	.98	.99
120	.84	.86	.87	.89	.90	.91	.93	.94	.94	.95	.96	.96	.96	.97	.97	.97	.97	.98
140	.80	.82	.83	.85	.86	.88	.90	.91	.92	.93	.94	.94	.95	.95	.96	.96	.96	.97
160	.76	.78	.80	.82	.83	.86	.88	.89	.90	.91	.92	.93	.94	.94	.95	.95	.95	.96

Figure 5.13
Concentric Trash Rack and Anti-Vortex Device (USDA - NRCS)



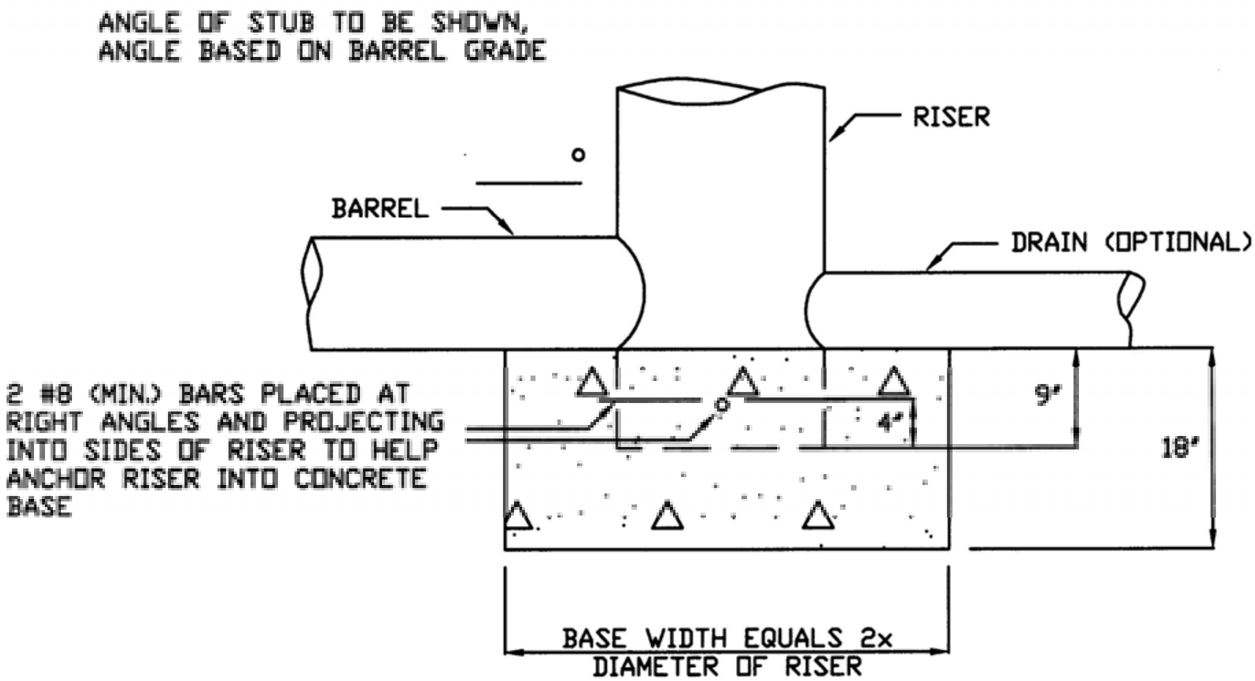
CONCENTRIC TRASH RACK AND ANTI-VORTEX DEVICE
(not to scale)

Figure 5.14
Concentric Trash Rack and Anti-Vortex Device Design Table
(USDA - NRCS)

Riser Diam.(in)	Cylinder Diam (in.)	Thick. Gage	H (in.)	Minimum Size Support Bar	Minimun Top Thickness	Stiffener
12	18	16	6	#6 Rebar	16 ga.	—
15	21	16	7	#6 Rebar	16 ga.	—
18	27	16	8	#6 Rebar	16 ga.	—
21	30	16	11	#6 Rebar	16 ga.	—
24	36	16	13	#6 Rebar	14 ga.	—
27	42	16	15	#6 Rebar	14 ga.	—
36	54	14	17	#8 Rebar	12 ga.	—
42	60	14	19	#8 Rebar	12 ga.	—
48	72	12	21	1 1/4" pipe or 1 1/4x1 1/4x1/4 angle	10 ga.	—
54	78	12	25	See 48" Riser	10 ga.	—
60	90	12	29	1 1/2" pipe or 1 1/2x1 1/2x1/2 angle	8 ga.	—
66	96	10	33	2" pipe or 2x2x3/16 angle	8 ga. w/stiffener	2x2x1/4 angle
72	102	10	36	———See 66" Riser———		2 1/2x2 1/2x1/4 angle
78	114	10	39	2 1/2" pipe or 2x2x1/4 angle	See 72" Riser	See 72" Riser
84	120	10	42	2 1/2" pipe or 2 1/2x2 1/2x1/4 angle	See 72" Riser	2 1/2x 2 1/2x 5/16 angle

Note: The criteria for sizing the cylinder is that the area between the inside of the cylinder and the outside of the riser is equal to or greater than the area inside the riser. Therefore, the above table is invalid for use with concrete pipe risers.

Figure 5.15
Riser Base Details



CONSTRUCTION SPECIFICATIONS

1. THE CONCRETE BASE SHALL BE POURED IN SUCH A MANNER TO INSURE THAT THE CONCRETE FILLS THE BOTTOM OF THE RISER TO THE INVERT OF THE OUTLET PIPE TO PREVENT THE RISER FROM BREAKING AWAY FROM THE BASE.
2. WITH ALUMINUM OR ALUMINIZED PIPE, THE EMBEDDED SECTION MUST BE PAINTED WITH CHROMATE OR EQUIVALENT.
3. RISER BASE MAY BE SIZED AS COMPUTED USING FLOATATION WITH A FACTOR OF SAFETY OF 1.2.

ADAPTED FROM DETAILS PROVIDED BY: USDA - NRCS, NEW YORK STATE DEPARTMENT OF TRANSPORTATION, NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION, NEW YORK STATE SOIL & WATER CONSERVATION COMMITTEE	RISER BASE DETAIL SEDIMENT BASIN

Figure 5.16
Anti-Seep Collar Design

This procedure provides the anti-seep collar dimensions for only temporary sediment basins to increase the seepage length by 15% for various pipe slopes, embankment slopes and riser heights.

The first step in designing anti-seep collars is to determine the length of pipe within the saturated zone of the embankment. This can be done graphically or by the following equation, assuming that the upstream slope of the embankment intersects the invert of the pipe at its upstream end. (See embankment-invert intersection on the drawing below:

$$L_s = y\,(z + 4)\left[1 + \frac{\text{pipe slope}}{0.25 - \text{pipe slope}}\right]$$

Where: L_s = length of pipe in the saturated zone (ft.)

y = distance in feet from upstream invert of pipe to highest normal water level expected to occur during the life of the structure, usually the top of the riser.

z = slope of upstream embankment as a ratio of z ft. horizontal to one ft. vertical.

pipe slope = slope of pipe in feet per foot.

This procedure is based on the approximation of the phreatic line as shown in the drawing below:

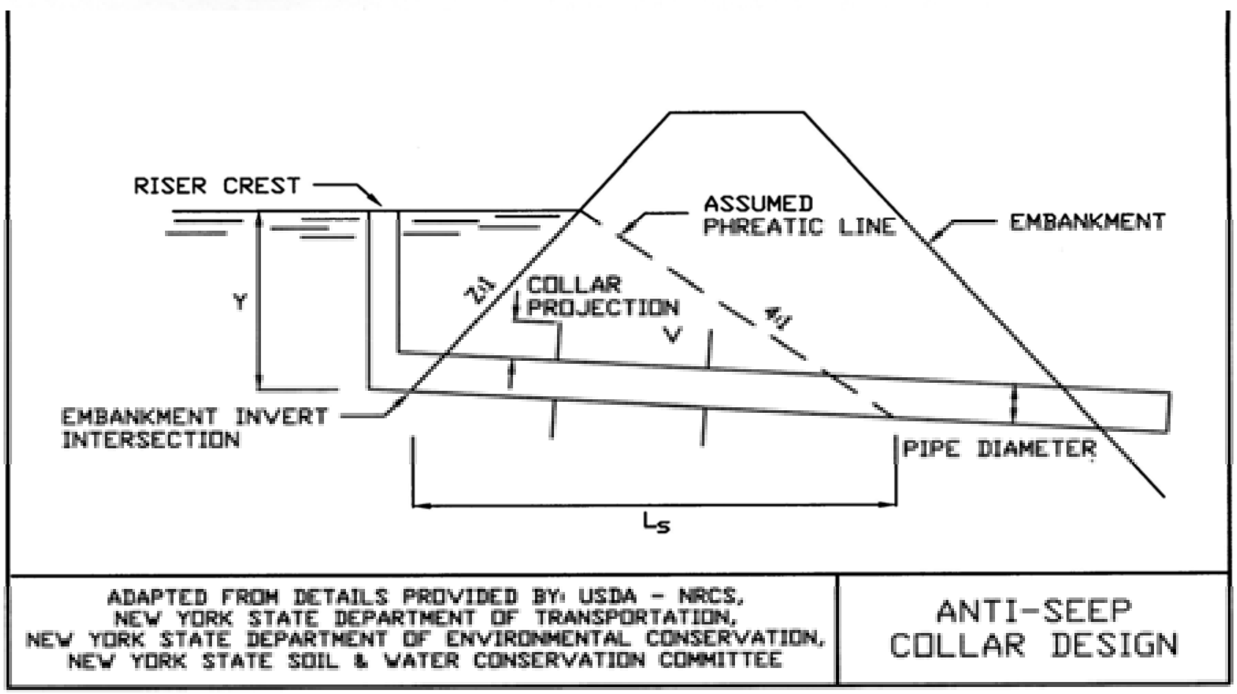


Figure 5.17
Anti-Seep Collar Design Charts (USDA - NRCS)

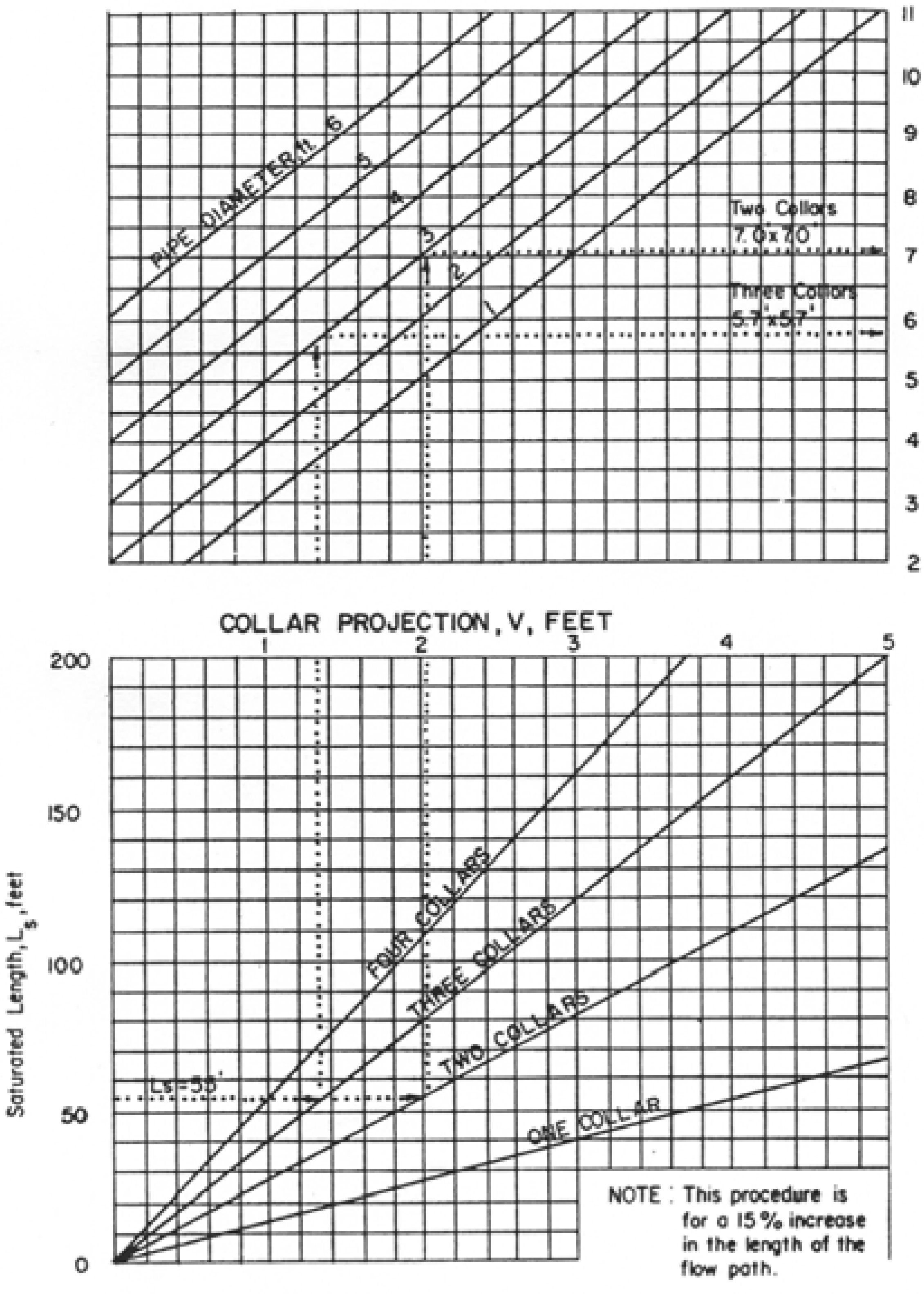


Figure 5.18
Anti-Seep Collar

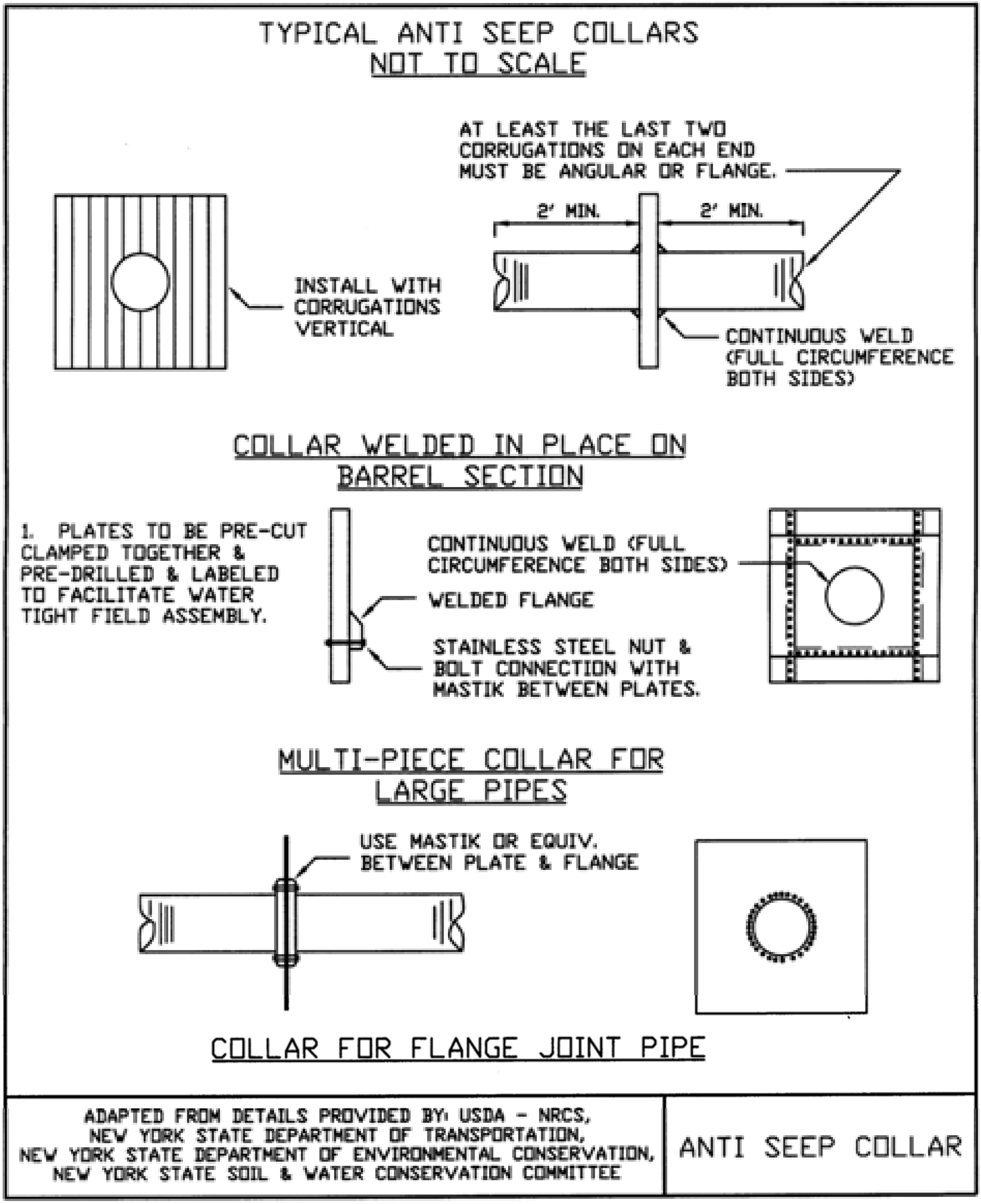
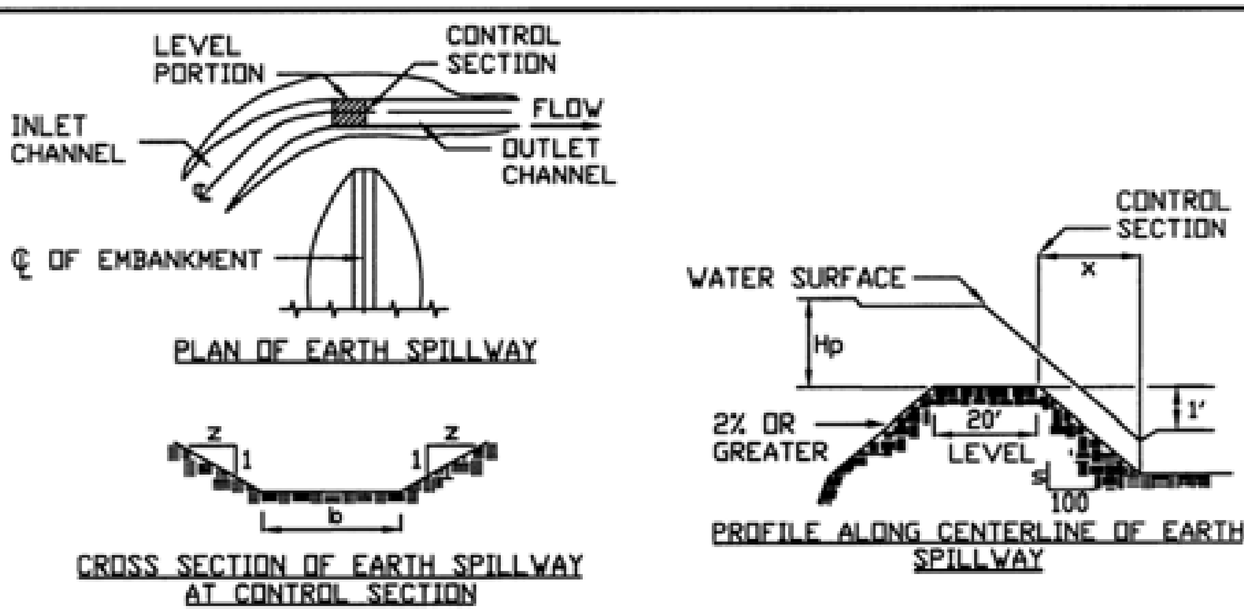


Figure 5.19
Design Data for Earth Spillways



LEGEND

n = MANNING'S COEFFICIENT OF ROUGHNESS.

Hp = DIFFERENCE IN ELEVATION BETWEEN CREST OF EARTH SPILLWAY AT THE CONTROL SECTION AND WATER SURFACE IN RESERVOIR, IN FEET.

b = BOTTOM WIDTH OF EARTH SPILLWAY AT THE CONTROL SECTION, IN FEET.

Q = TOTAL DISCHARGE, IN cfs.

V = VELOCITY, IN FEET PER SECOND, THAT WILL EXIST IN CHANNEL BELOW CONTROL SECTION, AT DESIGN Q, IF CONSTRUCTED TO SLOPE (S) THAT IS SHOWN.

S = FLATTEST SLOPE (S), IN %, ALLOWABLE FOR CHANNEL BELOW CONTROL SECTION.

X = MINIMUM LENGTH OF CHANNEL BELOW CONTROL SECTION, IN FEET.

z = SIDE SLOPE RATIO.

NOTES:

1) FOR A GIVEN Hp A DECREASE IN THE EXIT SLOPE FROM S AS GIVEN IN THE TABLE DECREASES SPILLWAY DISCHARGE BUT INCREASING THE EXIT SLOPE FROM S DOES NOT INCREASE DISCHARGE. IF AN EXIT SLOPE (Se) STEEPER THAN S IS USED, THEN VELOCITY (Ve) IN THE EXIT CHANNEL WILL INCREASE ACCORDING TO THE FOLLOWING RELATIONSHIP:

$$Ve = V\left(\frac{Se}{S}\right)^{0.3}$$

2) DATA TO RIGHT OF HEAVY VERTICAL LINES ON DRAWINGS SHOULD BE USED WITH CAUTION, AS THE RESULTING SECTIONS WILL BE EITHER POORLY PROPORTIONED OR HAVE VELOCITIES IN EXCESS OF 6 FT/SEC.

ADAPTED FROM DETAILS PROVIDED BY: USDA - NRCS, NEW YORK STATE DEPARTMENT OF TRANSPORTATION, NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION, NEW YORK STATE SOIL & WATER CONSERVATION COMMITTEE	DESIGN DATA FOR EARTH SPILLWAYS

Figure 5.20
Design Table for Vegetated Earth Spillways in Erosion Resistant Soils, K=0.1 - 0.35, Side Slopes = 3:1

Discharge Q CFS	Slope Range Minimum Percent	Slope Range Maximum Percent	Bottom Width Feet	Stage Feet
15	3.3	12.2	8	.83
	3.5	16.2	12	.69
20	3.1	8.9	8	.97
	3.2	13.0	12	.81
	3.3	17.3	16	.70
25	2.9	7.1	8	1.09
	3.2	9.9	12	.91
	3.3	13.2	16	.79
	3.3	17.2	20	.70
30	2.9	6.0	8	1.20
	3.0	8.2	12	1.01
	3.0	10.7	16	.88
	3.3	13.8	20	.78
35	2.8	5.1	8	1.30
	2.9	6.9	12	1.10
	3.1	9.0	16	.94
	3.1	11.3	20	.85
	3.2	14.1	24	.77
40	2.7	4.5	8	1.40
	2.9	6.0	12	1.18
	2.9	7.6	16	1.03
	3.1	9.7	20	.91
	3.1	11.9	24	.83
45	2.6	4.1	8	1.49
	2.8	5.3	12	1.25
	2.9	6.7	16	1.09
	3.0	8.4	20	.98
	3.0	10.4	24	.89
50	2.7	3.7	8	1.57
	2.8	4.7	12	1.33
	2.8	6.0	16	1.16
	2.9	7.3	20	1.03
	3.1	9.0	24	.94
60	2.6	3.1	8	1.73
	2.7	3.9	12	1.47
	2.7	4.8	16	1.28
	2.9	5.9	20	1.15
	2.9	7.3	24	1.05
	3.0	8.6	28	.97
70	2.5	2.8	8	1.88
	2.6	3.3	12	1.60
	2.6	4.1	16	1.40
	2.7	5.0	20	1.26
	2.8	6.1	24	1.15
	2.9	7.0	28	1.05
80	2.5	2.9	12	1.72
	2.6	3.6	16	1.51
	2.7	4.3	20	1.35
80	2.8	5.2	24	1.24
	2.8	5.9	28	1.14
	2.9	7.0	32	1.06
90	2.5	2.6	12	1.84
	2.5	3.1	16	1.61
	2.6	3.8	20	1.45
	2.7	4.5	24	1.32
	2.8	5.3	28	1.22
	2.8	6.1	32	1.14
100	2.5	2.8	16	1.71
	2.6	3.3	20	1.54
	2.6	4.0	24	1.41
	2.7	4.8	28	1.30
	2.7	5.3	32	1.21
	2.8	6.1	36	1.13
120	2.5	2.8	20	1.71
	2.6	3.2	24	1.56
	2.7	3.8	28	1.44
	2.7	4.2	32	1.34
	2.7	4.8	36	1.26
140	2.5	2.7	24	1.71
	2.5	3.2	28	1.58
	2.6	3.6	32	1.47
	2.6	4.0	36	1.38
	2.7	4.5	40	1.30
160	2.5	2.7	28	1.70
	2.5	3.1	32	1.58
	2.6	3.4	36	1.49
	2.6	3.8	40	1.40
	2.7	4.3	44	1.33
180	2.4	2.7	32	1.72
	2.4	3.0	36	1.60
	2.5	3.4	40	1.51
	2.6	3.7	44	1.43
200	2.5	2.7	36	1.70
	2.5	2.9	40	1.60
	2.5	3.3	44	1.52
	2.6	3.6	48	1.45
220	2.4	2.6	40	1.70
	2.5	2.9	44	1.61
	2.5	3.2	48	1.53
240	2.5	2.6	44	1.70
	2.5	2.9	48	1.62
	2.6	3.2	52	1.54
260	2.4	2.6	48	1.70
	2.5	2.9	52	1.62
280	2.4	2.6	52	1.70
300	2.5	2.6	56	1.69

Figure 5.21
Design Table for Vegetated Earth Spillways in Very Erodible Soils, K = 0.36 - 0.80, Side Slopes = 3:1
(USDA - NRCS)

Discharge Q CFS	Slope Range Minimum Percent	Slope Range Maximum Percent	Bottom Width Feet	Stage Feet
10	3.5	4.7	8	.68
15	3.4	4.4	12	.69
	3.4	5.9	16	.60
20	3.3	3.3	12	.80
	3.3	4.1	16	.70
	3.5	5.3	20	.62
25	3.3	3.3	16	.79
	3.3	4.0	20	.70
	3.5	4.9	24	.64
30	3.3	3.3	20	.78
	3.3	4.0	24	.71
	3.4	4.7	28	.65
	3.4	5.5	32	.61
35	3.2	3.2	24	.77
	3.3	3.9	28	.71
	3.5	4.6	32	.66
	3.5	5.2	36	.62
40	3.3	3.3	28	.76
	3.4	3.8	32	.71
	3.4	4.4	36	.67
	3.4	5.0	40	.64
45	3.3	3.3	32	.76
	3.4	3.8	36	.71
	3.4	4.3	40	.67
	3.4	4.8	44	.64
50	3.3	3.3	36	.75
	3.3	3.8	40	.71
	3.3	4.3	44	.68
60	3.2	3.2	44	.75
	3.2	3.7	48	.72
70	3.3	3.3	52	.75
80	3.1	3.1	56	.78

Procedure for Determining or Altering Sediment Basin Shape

As specified in the Standard and Specification, the pool area at the elevation of the crest of the principal spillway shall have a length to width ratio of at least 2.0 to 1. The purpose of this requirement is to minimize the "short circuiting" effect of the sediment laden inflow to the riser and thereby increase the effectiveness of the sediment basin. The purpose of this procedure is to prescribe the parameters, procedures, and methods of determining and modifying the shape of the basin.

The length of the flow path (L) is the distance from the point of inflow to the riser (outflow point). The point of inflow is the point that the stream enters the normal pool (pool level at the riser crest elevation). The pool area (A) is the area of the normal pool. The effective width (W_e) is found by the equation:

$$W_e = A/L \text{ and } L:W \text{ ratio} = L/W_e$$

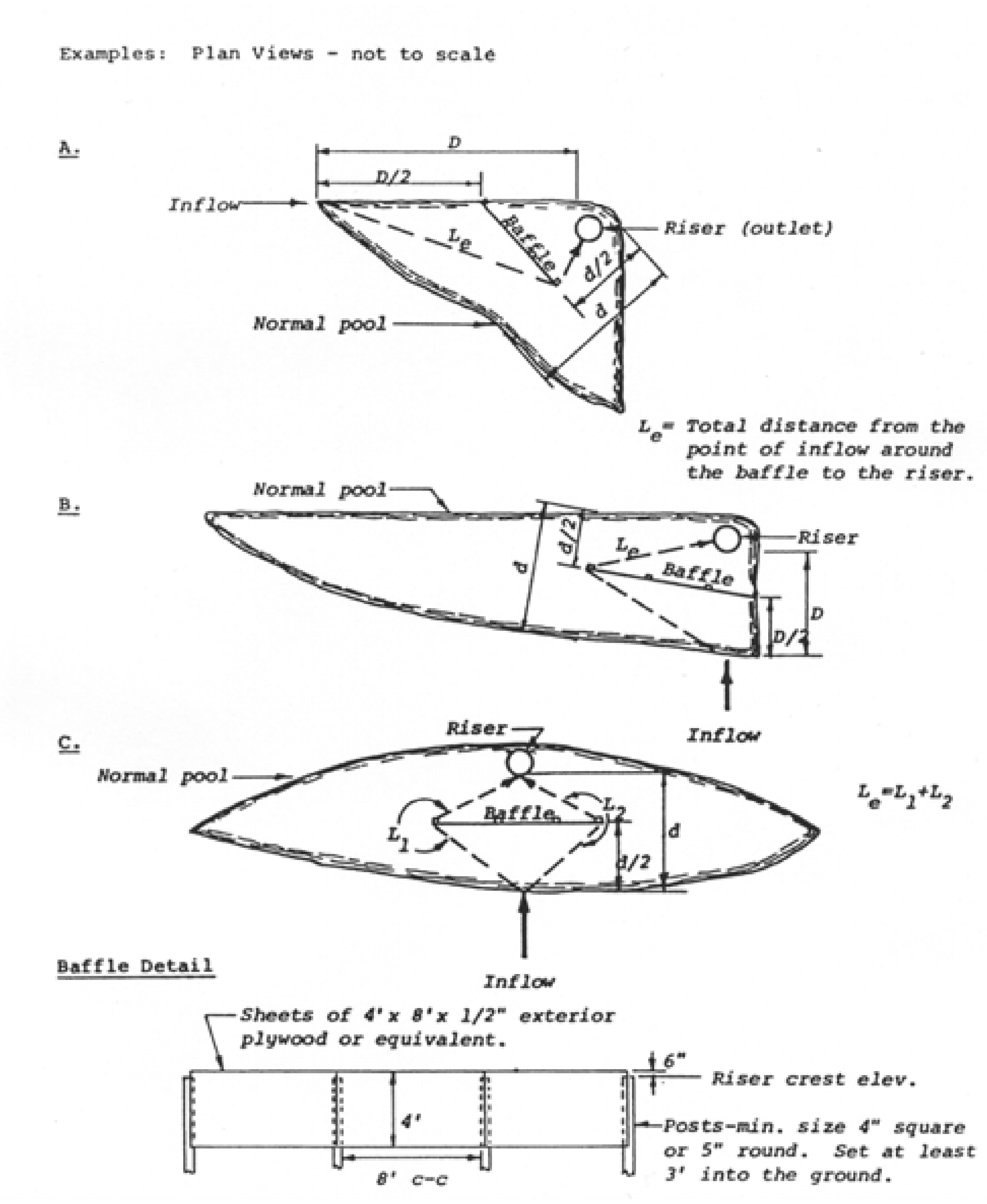
In the event there is more than one inflow point, any inflow point that conveys more than 30 percent of the total peak inflow rate shall meet the length to width ratio criteria.

The required basin shape may be obtained by proper site selection, by excavation, or by constructing a baffle in the basin. The purpose of the baffle is to increase the effective flow length from the inflow point to the riser. Baffles (see Figure 5.22 on following page) shall be placed midway between the inflow point around the end of the baffle to the outflow point. Then:

$$W_e = A/L_e \text{ and } L:W \text{ ratio} = L_e/W_e$$

Three examples are shown on the following page. Note that for the special case in example C the water is allowed to go around both ends of the baffle and the effective length, $L_e = L_1 + L_2$. Otherwise, the length to width ratio computations are the same as shown above. This special case procedure for computing L_e is allowable only when the two flow paths are equal, i.e., when $L_1 = L_2$. A baffle detail is also shown in Figure 5.22 on page 5.41.

Figure 5.22
Sediment Basin Baffle Details (USDA - NRCS)



STANDARD AND SPECIFICATIONS FOR SILT FENCE

Definition & Scope

A **temporary** barrier of geotextile fabric installed on the contours across a slope used to intercept sediment laden runoff from small drainage areas of disturbed soil by temporarily ponding the sediment laden runoff allowing settling to occur. The maximum period of use is limited by the ultraviolet stability of the fabric (approximately one year).

Conditions Where Practice Applies

A silt fence may be used subject to the following conditions:

1. Maximum allowable slope length and fence length will not exceed the limits shown in the Design Criteria for the specific type of silt fence used ; and

2. Maximum ponding depth of 1.5 feet behind the fence; and

3. Erosion would occur in the form of sheet erosion; and

4. There is no concentration of water flowing to the barrier; and

5. Soil conditions allow for proper keying of fabric, or other anchorage, to prevent blowouts.

Design Criteria

1. Design computations are not required for installations of 1 month or less. Longer installation periods should be designed for expected runoff.

2. All silt fences shall be placed as close to the disturbed area as possible, but at least 10 feet from the toe of a slope steeper than 3H:1V, to allow for maintenance and roll down. The area beyond the fence must be undisturbed or stabilized.

3. The type of silt fence specified for each location on the plan shall not exceed the maximum slope length and maximum fence length requirements shown in the following table:

		Slope Length/Fence Length (ft.)		
Slope	Steepness	Standard	Reinforced	Super
<2%	< 50:1	300/1500	N/A	N/A
2-10%	50:1 to 10:1	125/1000	250/2000	300/2500
10-20%	10:1 to 5:1	100/750	150/1000	200/1000
20-33%	5:1 to 3:1	60/500	80/750	100/1000
33-50%	3:1 to 2:1	40/250	70/350	100/500
>50%	> 2:1	20/125	30/175	50/250

Standard Silt Fence (SF) is fabric rolls stapled to wooden stakes driven 16 inches in the ground.
Reinforced Silt Fence (RSF) is fabric placed against welded wire fabric with anchored steel posts driven 16 inches in the ground.
Super Silt Fence (SSF) is fabric placed against chain link fence as support backing with posts driven 3 feet in the ground.

4. Silt fence shall be removed as soon as the disturbed area has achieved final stabilization.

The silt fence shall be installed in accordance with the appropriate details. Where ends of filter cloth come together, they shall be overlapped, folded and stapled to prevent sediment bypass. Butt joints are not acceptable. A detail of the silt fence shall be shown on the plan. See Figure 5.30 on page 5.56 for Reinforced Silt Fence as an example of details to be provided.

Criteria for Silt Fence Materials

1. Silt Fence Fabric: The fabric shall meet the following specifications unless otherwise approved by the appropriate erosion and sediment control plan approval authority. Such approval shall not constitute statewide acceptance.

Fabric Properties	Minimum Acceptable Value	Test Method
Grab Tensile Strength (lbs)	110	ASTM D 4632
Elongation at Failure (%)	20	ASTM D 4632
Mullen Burst Strength (PSI)	300	ASTM D 3786
Puncture Strength (lbs)	60	ASTM D 4833
Minimum Trapezoidal Tear Strength (lbs)	50	ASTM D 4533
Flow Through Rate (gal/min/sf)	25	ASTM D 4491
Equivalent Opening Size	40-80	US Std Sieve ASTM D 4751
Minimum UV Residual (%)	70	ASTM D 4355

2. Fence Posts (for fabricated units): The length shall be a minimum of 36 inches long. Wood posts will be of sound quality hardwood with a minimum cross sectional area of 3.5 square inches. Steel posts will be standard T and U section weighing not less than 1.00 pound per linear foot. Posts for super silt fence shall be standard chain link fence posts.

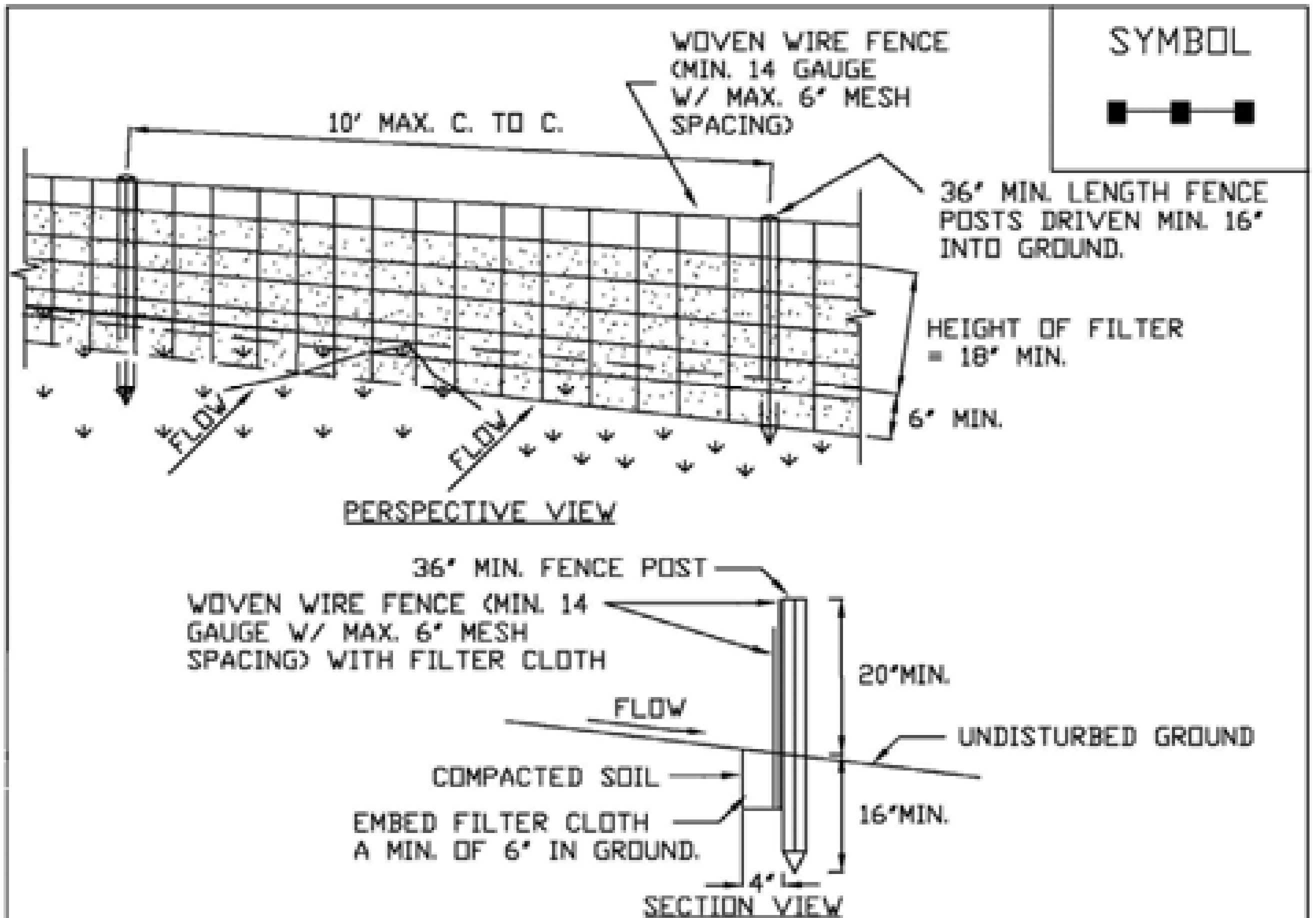
3. Wire Fence for reinforced silt fence: Wire fencing shall be a minimum 14 gage with a maximum 6 in. mesh opening, or as approved.

4. Prefabricated silt fence is acceptable as long as all material specifications are met.

Reinforced Silt Fence

Super Silt Fence

Figure 5.30
Reinforced Silt Fence



CONSTRUCTION SPECIFICATIONS

1. WOVEN WIRE FENCE TO BE FASTENED SECURELY TO FENCE POSTS WITH WIRE TIES OR STAPLES. POSTS SHALL BE STEEL EITHER "T" OR "U" TYPE OR HARDWOOD.
2. FILTER CLOTH TO BE FASTENED SECURELY TO WOVEN WIRE FENCE WITH TIES SPACED EVERY 24" AT TOP AND MID SECTION. FENCE SHALL BE WOVEN WIRE, 6" MAXIMUM MESH OPENING.
3. WHEN TWO SECTIONS OF FILTER CLOTH ADJOIN EACH OTHER THEY SHALL BE OVER-LAPPED BY SIX INCHES AND FOLDED. FILTER CLOTH SHALL BE EITHER FILTER X, MIRAFI 100X, STABILINKA T140N, OR APPROVED EQUIVALENT.
4. PREFABRICATED UNITS SHALL MEET THE MINIMUM REQUIREMENTS SHOWN.
5. MAINTENANCE SHALL BE PERFORMED AS NEEDED AND MATERIAL REMOVED WHEN "BULGES" DEVELOP IN THE SILT FENCE.

ADAPTED FROM DETAILS PROVIDED BY: USDA - NRCS, NEW YORK STATE DEPARTMENT OF TRANSPORTATION, NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION, NEW YORK STATE SOIL & WATER CONSERVATION COMMITTEE	REINFORCED SILT FENCE

STANDARD AND SPECIFICATIONS FOR STORM DRAIN INLET PROTECTION

Definition & Scope

A **temporary** barrier with low permeability, installed around inlets in the form of a fence, berm or excavation around an opening, detaining water and thereby reducing the sediment content of sediment laden water by settling thus preventing heavily sediment laden water from entering a storm drain system.

Conditions Where Practice Applies

This practice shall be used where the drainage area to an inlet is disturbed, it is not possible to temporarily divert the storm drain outfall into a trapping device, and watertight blocking of inlets is not advisable. **It is not to be used in place of sediment trapping devices.** This practice shall be used with an upstream buffer strip if placed at a storm drain inlet on a paved surface. It may be used in conjunction with storm drain diversion to help prevent siltation of pipes installed with low slope angle.

Types of Storm Drain Inlet Practices

There are five (5) specific types of storm drain inlet protection practices that vary according to their function, location, drainage area, and availability of materials:

I. Excavated Drop Inlet Protection
II. Fabric Drop Inlet Protection
III. Stone & Block Drop Inlet Protection
IV. Paved Surface Inlet Protection
V. Manufactured Insert Inlet Protection

Design Criteria

Drainage Area – The drainage area for storm drain inlets shall not exceed one acre. Erosion control/temporary stabilization measures must be implemented on the disturbed drainage area tributary to the inlet. The crest elevations of these practices shall provide storage and minimize bypass flow.

Type I – Excavated Drop Inlet Protection

This practice is generally used during initial overlot grading after the storm drain trunk line is installed.

Limit the drainage area to the inlet device to 1 acre. Excavated side slopes shall be no steeper than 2:1. The minimum depth shall be 1 foot and the maximum depth 2 feet as measured from the crest of the inlet structure. Shape the excavated basin to fit conditions with the longest dimension oriented toward the longest inflow area to provide maximum trap efficiency. The capacity of the excavated basin should be established to contain 900 cubic feet per acre of disturbed area. Weep holes, protected by fabric and stone, should be provided for draining the temporary pool.

Inspect and clean the excavated basin after every storm. Sediment should be removed when 50 percent of the storage volume is achieved This material should be incorporated into the site in a stabilized manner.

Type II – Fabric Drop Inlet Protection

This practice is generally used during final elevation grading phases after the storm drain system is completed.

Limit the drainage area to 1 acre per inlet device. Land area slope immediately surrounding this device should not exceed 1 percent. The maximum height of the fabric above the inlet crest shall not exceed 1.5 feet unless reinforced.

The top of the barrier should be maintained to allow overflow to drop into the drop inlet and not bypass the inlet to unprotected lower areas. Support stakes for fabric shall be a minimum of 3 feet long, spaced a maximum 3 feet apart. They should be driven close to the inlet so any overflow drops into the inlet and not on the unprotected soil. Improved performance and sediment storage volume can be obtained by excavating the area.

Inspect the fabric barrier after each rain event and make repairs as needed. Remove sediment from the pool area as necessary with care not to undercut or damage the filter fabric. Upon stabilization of the drainage area, remove all materials and unstable sediment and dispose of properly. Bring the adjacent area of the drop inlet to grade, smooth and compact and stabilize in the appropriate manner to the site.

Type III – Stone and Block Drop Inlet Protection

This practice is generally used during the initial and intermediate overlot grading of a construction site.

Limit the drainage area to 1 acre at the drop inlet. The stone barrier should have a minimum height of 1 foot and a maximum height of 2 feet. Do not use mortar. The height should be limited to prevent excess ponding and bypass flow.

Recess the first course of blocks at least 2 inches below the crest opening of the storm drain for lateral support. Subsequent courses can be supported laterally if needed by placing a 2x4 inch wood stud through the block openings perpendicular to the course. The bottom row should have a few blocks oriented so flow can drain through the block to dewater the basin area.

The stone should be placed just below the top of the blocks on slopes of 2:1 or flatter. Place hardware cloth of wire mesh with ½ inch openings over all block openings to hold stone in place.

As an optional design, the concrete blocks may be omitted and the entire structure constructed of stone, ringing the outlet ("doughnut"). The stone should be kept at a 3:1 slope toward the inlet to keep it from being washed into the inlet. A level area 1 foot wide and four inches below the crest will further prevent wash. Stone on the slope toward the inlet should be at least 3 inches in size for stability and 1 inch or smaller away from the inlet to control flow rate. The elevation of the top of the stone crest must be maintained 6 inches lower than the ground elevation down slope from the inlet to ensure that all storm flows pass over the stone into the storm drain and not past the structure. Temporary diking should be used as necessary to prevent bypass flow.

The barrier should be inspected after each rain event and repairs made where needed. Remove sediment as necessary to provide for accurate storage volume for subsequent rains. Upon stabilization of contributing drainage area, remove all materials and any unstable soil and dispose of properly.

Bring the disturbed area to proper grade, smooth, compact and stabilize in a manner appropriate to the site.

Type IV – Paved Surface Inlet Protection

This practice is generally used after pavement construction has been done while final grading and soil stabilization is occurring. These practices should be used with upstream buffer strips in linear construction applications, and with temporary surface stabilization for overlot areas, to reduce the sediment load at the practice. This practice includes sand bags, compost filter socks, geo-tubes filled with ballast, and manufactured surface barriers. Pea gravel can also be used in conjunction with these practices to improve performance. When the inlet is not at a low point, and is offset from the pavement or gutter line, protection should be selected and installed so that flows are not diverted around the inlet.

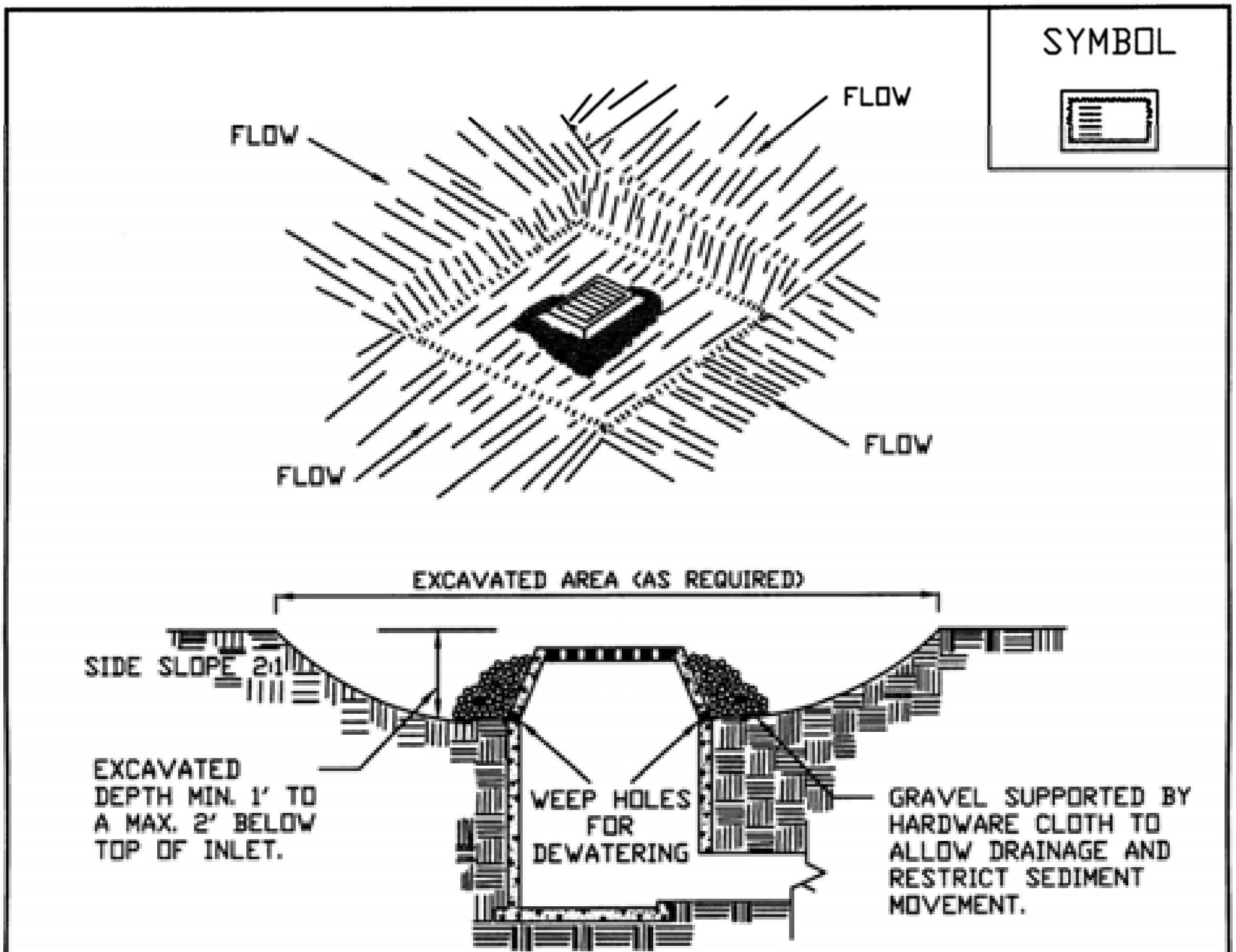
The drainage area should be limited to 1 acre at the drain inlet. All practices will be placed at the inlet perimeter or beyond to maximize the flow capacity of the inlet. Practices shall be weighted, braced, tied, or otherwise anchored to prevent movement or shifting of location on paved surfaces. Traffic safety shall be integrated with the use of this practice. All practices should be marked with traffic safety cones as appropriate. Structure height shall not cause flooding or by-pass flow that would cause additional erosion.

The structure should be inspected after every storm event. Any sediment should be removed and disposed of on the site. Any broken or damaged components should be replaced. Check all materials for proper anchorage and secure as necessary.

Type V - Manufactured Insert Inlet Protection

The drainage area shall be limited to 1 acre at the drain inlet. All inserts will be installed and anchored in accordance with the manufacturers recommendations and design details. The fabric portion of the structure will equal or exceed the performance standard for the silt fence fabric. The inserts will be installed to preserve a minimum of 50 percent of the open, unobstructed design flow area of the storm drain inlet opening to maintain capacity for storm events.

Figure 5.31
Excavated Drop Inlet Protection



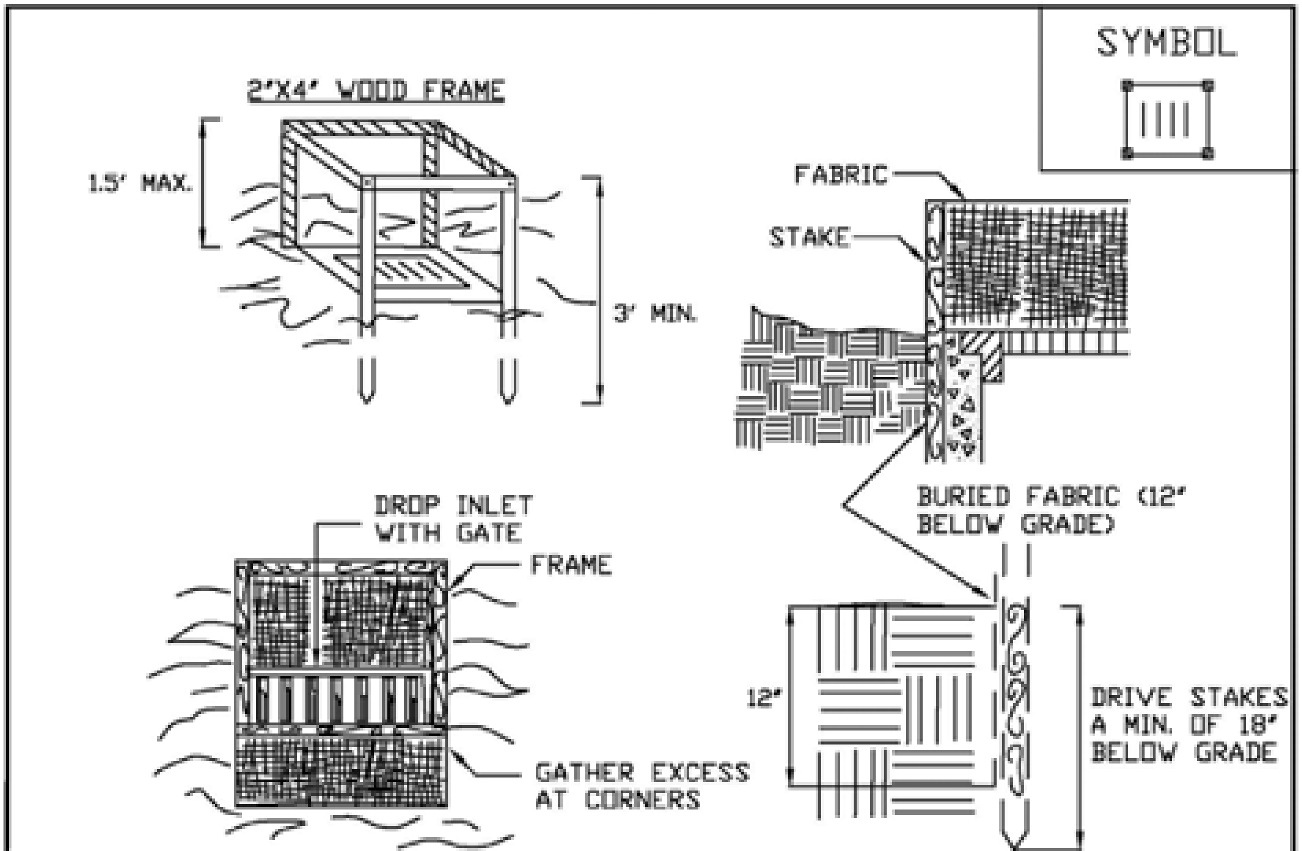
CONSTRUCTION SPECIFICATIONS

1. CLEAR THE AREA OF ALL DEBRIS THAT WILL HINDER EXCAVATION.
2. GRADE APPROACH TO THE INLET UNIFORMLY AROUND THE BASIN.
3. WEEP HOLES SHALL BE PROTECTED BY GRAVEL.
4. UPON STABILIZATION OF CONTRIBUTING DRAINAGE AREA, SEAL WEEP HOLES, FILL EXCAVATION WITH STABLE SOIL TO FINAL GRADE, COMPACT IT PROPERLY AND STABILIZE WITH PERMANENT SEEDING.

MAXIMUM DRAINAGE AREA 1 ACRE

ADAPTED FROM DETAILS PROVIDED BY: USDA - NRCS, NEW YORK STATE DEPARTMENT OF TRANSPORTATION, NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION, NEW YORK STATE SOIL & WATER CONSERVATION COMMITTEE	EXCAVATED DROP INLET PROTECTION

Figure 5.32
Fabric Drop Inlet Protection



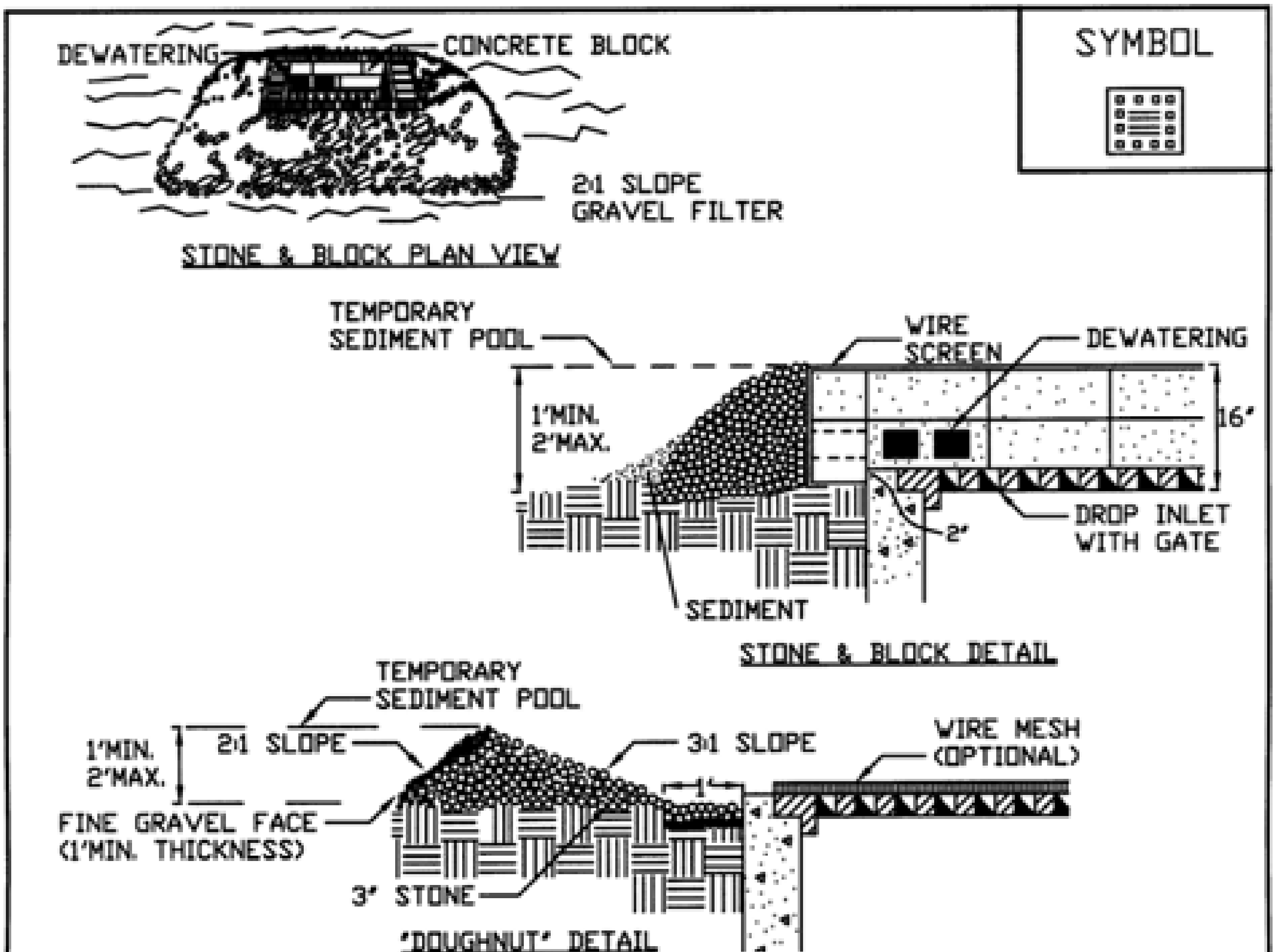
CONSTRUCTION SPECIFICATIONS

1. FABRIC SHALL HAVE AN EOS OF 40-85. BURLAP MAY BE USED FOR SHORT TERM APPLICATIONS.
2. CUT FABRIC FROM A CONTINUOUS ROLL TO ELIMINATE JOINTS. IF JOINTS ARE NEEDED THEY WILL BE OVERLAPPED TO THE NEXT STAKE.
3. STAKE MATERIALS WILL BE STANDARD 2" x 4" WOOD OR EQUIVALENT. METAL WITH A MINIMUM LENGTH OF 3 FEET.
4. SPACE STAKES EVENLY AROUND INLET 3 FEET APART AND DRIVE A MINIMUM 18 INCHES DEEP. SPANS GREATER THAN 3 FEET MAY BE BRIDGED WITH THE USE OF WIRE MESH BEHIND THE FILTER FABRIC FOR SUPPORT.
5. FABRIC SHALL BE EMBEDDED 1 FOOT MINIMUM BELOW GROUND AND BACKFILLED. IT SHALL BE SECURELY FASTENED TO THE STAKES AND FRAME.
6. A 2" x 4" WOOD FRAME SHALL BE COMPLETED AROUND THE CREST OF THE FABRIC FOR OVER FLOW STABILITY.

MAXIMUM DRAINAGE AREA 1 ACRE

ADAPTED FROM DETAILS PROVIDED BY: USDA - NRCS, NEW YORK STATE DEPARTMENT OF TRANSPORTATION, NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION, NEW YORK STATE SOIL & WATER CONSERVATION COMMITTEE	FABRIC DROP INLET PROTECTION

Figure 5.33
Stone & Block Drop Inlet Protection



CONSTRUCTION SPECIFICATIONS

1. LAY ONE BLOCK ON EACH SIDE OF THE STRUCTURE ON ITS SIDE FOR DEWATERING. FOUNDATION SHALL BE 2 INCHES MINIMUM BELOW REST OF INLET AND BLOCKS SHALL BE PLACED AGAINST INLET FOR SUPPORT.
2. HARDWARE CLOTH OR 1/2" WIRE MESH SHALL BE PLACED OVER BLOCK OPENINGS TO SUPPORT STONE.
3. USE CLEAN STONE OR GRAVEL 1/2-3/4 INCH IN DIAMETER PLACED 2 INCHES BELOW TOP OF THE BLOCK ON A 2:1 SLOPE OR FLATTER.
4. FOR STONE STRUCTURES ONLY, A 1 FOOT THICK LAYER OF THE FILTER STONE WILL BE PLACED AGAINST THE 3 INCH STONE AS SHOWN ON THE DRAWINGS.

MAXIMUM DRAINAGE AREA 1 ACRE

ADAPTED FROM DETAILS PROVIDED BY: USDA - NRCS, NEW YORK STATE DEPARTMENT OF TRANSPORTATION, NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION, NEW YORK STATE SOIL & WATER CONSERVATION COMMITTEE	STONE & BLOCK DROP INLET PROTECTION

Specifications for Bioretention

Material Specifications

The allowable materials to be used in bioretention area are detailed in Table G.2.

Planting Soil

The soil shall be a uniform mix, free of stones, stumps, roots or other similar objects larger than two inches. No other materials or substances shall be mixed or dumped within the bioretention area that may be harmful to plant growth, or prove a hindrance to the planting or maintenance operations. The planting soil shall be free of noxious weeds.

The planting soil shall be tested and shall meet the following criteria:

pH range	5.2 - 7.0
organic matter	1.5 - 4%
magnesium	35 lb./ac
phosphorus P_2O_5	75 lb./ac
potassium K_2O	85 lb./ac
soluble salts	not to exceed 500 ppm

All bioretention areas shall have a minimum of one test. Each test shall consist of both the standard soil test for pH, phosphorus, and potassium and additional tests of organic matter, and soluble salts. A textural analysis is required from the site stockpiled topsoil. If topsoil is imported, then a texture analysis shall be performed for each location where the top soil was excavated.

Since different labs calibrate their testing equipment differently, all testing results shall come from the same testing facility.

Should the pH fall out of the acceptable range, it may be modified (higher) with lime or (lower) with iron sulfate plus sulfur.

Compaction

It is very important to minimize compaction of both the base of the bioretention area and the required backfill. When possible, use excavation hoes to remove original soil. If bioretention areas are excavated using a loader, the contractor should use wide track or marsh track equipment, or light equipment with turf type tires. Use of equipment with narrow tracks or narrow tires, rubber tires with large lugs, or high pressure tires will cause excessive compaction resulting in reduced infiltration rates and storage volumes and is not acceptable. Compaction will significantly contribute to design failure.

Compaction can be alleviated at the base of the bioretention facility by using a primary tilling operation such as a chisel plow, ripper, or subsoiler. These tilling operations are to refracture the soil profile through the 12 inch compaction zone. Substitute methods must be approved by the engineer. Rototillers typically do not till deep enough to reduce the effects of compaction from heavy equipment.

Rototill 2 to 3 inches of sand into the base of the bioretention facility before back filling the required sand layer. Pump any ponded water before preparing (rototilling) base.

When back filling the topsoil over the sand layer, first place 3 to 4 inches of topsoil over the sand, then rototill the sand/topsoil to create a gradation zone. Backfill the remainder of the topsoil to final grade.

When back filling the bioretention facility, place soil in lifts 12” or greater. Do not use heavy equipment within the bioretention basin. Heavy equipment can be used around the perimeter of the basin to supply soils and sand. Grade bioretention materials by hand or with light equipment such as a compact loader or a dozer/loader with marsh tracks.

Plant Installation

Mulch around individual plants only. Shredded hardwood mulch is the only accepted mulch. Pine mulch and wood chips will float and move to the perimeter of the bioretention area during a storm event and are not acceptable. Shredded mulch must be well aged (6 to 12 months) for acceptance.

The plant root ball should be planted so 1/8th of the ball is above final grade surface.

Root stock of the plant material shall be kept moist during transport and on-site storage. The diameter of the planting pit shall be at least six inches larger than the diameter of the planting ball. Set and maintain the plant straight during the entire planting process. Thoroughly water ground bed cover after installation.

Trees shall be braced using 2" X 2" stakes only as necessary and for the first growing season only. Stakes are to be equally spaced on the outside of the tree ball.

Grasses and legume seed shall be tilled into the soil to a depth of at least one inch. Grass and legume plugs shall be planted following the non-grass ground cover planting specifications.

The topsoil specifications provide enough organic material to adequately supply nutrients from natural cycling. The primary function of the bioretention structure is to improve water quality. Adding fertilizers defeats, or at a minimum, impedes this goal. Only add fertilizer if wood chips or mulch is used to amend the soil. Rototill urea fertilizer at a rate of 2 pounds per 1000 square feet.

Underdrains

Under drains to be placed on a 3’-0” wide section of filter cloth. Pipe is placed next, followed by the gravel bedding. The ends of under drain pipes not terminating in an observation well shall be capped.

The main collector pipe for underdrain systems shall be constructed at a minimum slope of 0.5%. Observation wells and/or clean-out pipes must be provided (one minimum per every 1000 square feet of surface area).

Miscellaneous

The bioretention facility may not be constructed until all contributing drainage area has been stabilized.

Table C.2 Materials Specifications for Bioretention

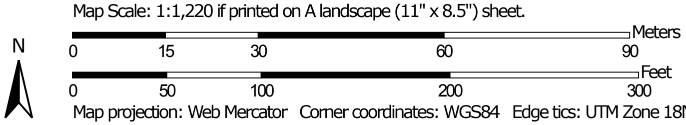
Parameter	Specification	Size	Notes
Plantings	see your local NRCS Standards and Specifications guidance.	n/a	plantings are site-specific
Planting Soil [4= deep]	sand 35 - 60% silt 30 - 55% clay 10 - 25%	n/a	USDA soil types loamy sand, sandy loam or loam
Mulch	shredded hardwood		aged 6 months, minimum
pea gravel diaphragm and curtain drain	pea gravel: ASTM D 448 ornamental stone: washed cobbles	pea gravel: No. 6 stone: 2" to 5"	
Geotextile	Class "C" apparent opening size (ASTM-D-4751) grab tensile strength (ASTM-D-4632) burst strength (ASTM-D-4833)	n/a	for use as necessary beneath underdrains only
underdrain gravel	AASHTO M-43. No. 67.	0.25" to 0.75"	
underdrain piping	ASTM D 1785 or AASHTO M-278	6" rigid schedule 40 PVC	3/8" perf. @ 6" on center, 4 holes per row; minimum of 3" of gravel over pipes; not necessary underneath pipes
poured in place concrete (if required)	See local DOT Standards and Specs.; f=c = 3500 psi. @ 28 days, normal weight, air-entrained; re-inforcing to meet ASTM 615-60	n/a	on-site testing of poured-in-place concrete required: 28 day strength and slump test; all concrete design (cast-in-place or pre-cast) *not using previously approved State or local standards* requires design drawings sealed and approved by a licensed professional structural engineer.
sand [1= deep]	AASHTO M-6 or ASTM C-33	0.02" to 0.04"	Sand substitutions such as Diabase and Graystone #10 are not acceptable. No calcium carbonated or dolomitic sand substitutions are acceptable. No "rock dust" can be used for sand.

APPENDIX C

NRCS Soil Map

Soil Map—Ulster County, New York
(Ashokan Station Trailhead)

Map Scale: 1:1,220 if printed on A landscape (11" x 8.5") sheet.



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

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

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

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

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

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

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

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

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

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

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

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

Soil Survey Area: Ulster County, New York
Survey Area Data: Version 15, Oct 8, 2017

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

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

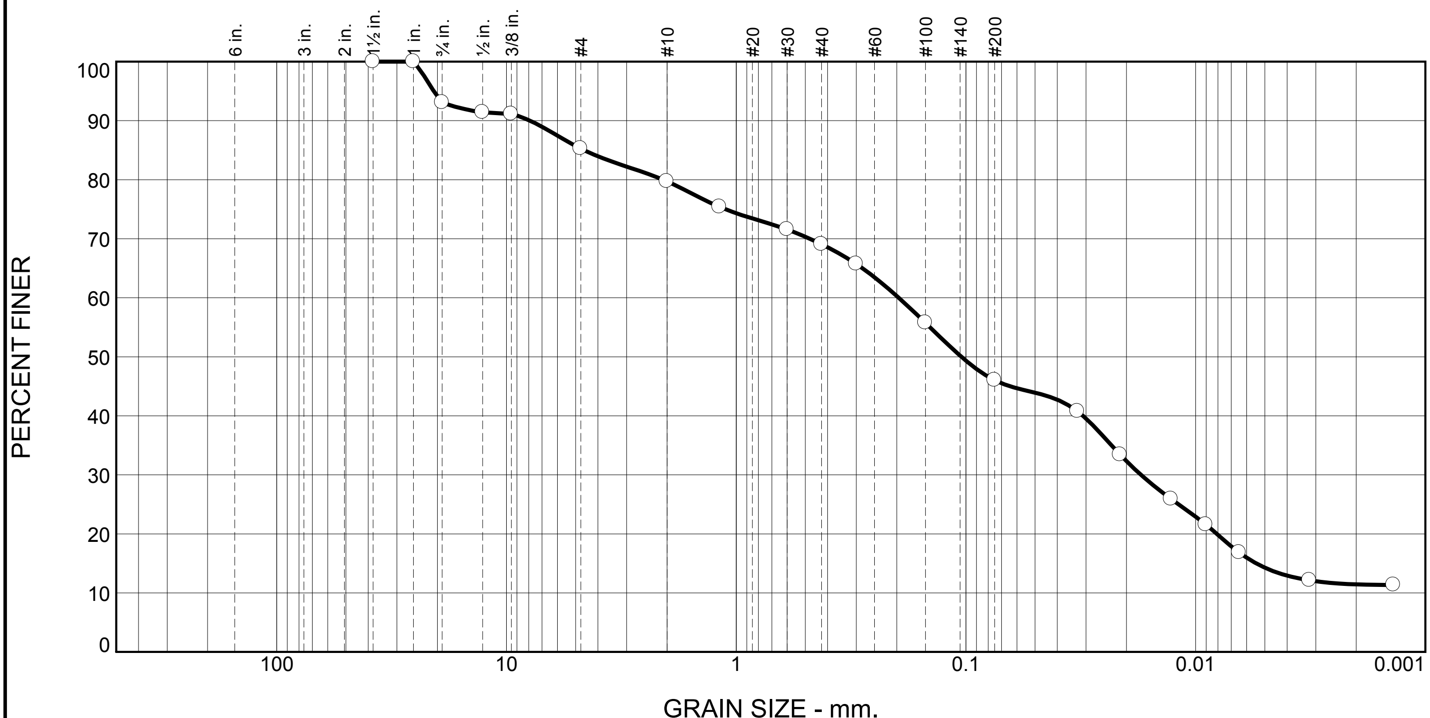
The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
CgA	Castile gravelly silt loam, 0 to 3 percent slopes	0.7	21.7%
VAB	Valois very bouldery soils, gently sloping	2.6	78.3%
Totals for Area of Interest		**3.3**	**100.0%**

HVEA ENGINEERS

Particle Size Distribution Report



% Stones	% +3"	% Gravel			% Sand					% Silt		% Clay
		Coarse	Medium	Fine	V. Crs.	Crs.	Med.	Fine	V. Fine	Crs.	Fine	
0	0	7	8	5	6	4	7	14	5	12	21	11

Test Results (ASTM C 136 & ASTM C 117)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1-1/2"	100		
1"	100		
3/4"	93		
1/2"	91		
3/8"	91		
#4	85		
#10	80		
#16	75		
#30	72		
#40	69		
#50	66		
#100	56		
#200	46		
0.0326 mm.	41		
0.0213 mm.	33		
0.0128 mm.	26		
0.0090 mm.	22		
0.0065 mm.	17		
0.0032 mm.	12		
0.0014 mm.	11		

* (no specification provided)

Material Description

On Site Material; Location #1

Atterberg Limits (ASTM D 4318)

PL= **LL=** **PI=**

Classification

USCS (D 2487)= **AASHTO (M 145)=**

Coefficients

D_{90}= 7.9049 D_{85}= 4.6008 D_{60}= 0.1962
D_{50}= 0.1047 D_{30}= 0.0173 D_{15}= 0.0054
D_{10}= C_u= C_c=

Remarks

Material sampled 2/7/18 by HVEA Staff from Location #1. Moisture content of in place sample is 11.8%.

Date Received: 2/7/18 **Date Tested:** 2/12/18
Tested By: Chris Sotanski
Checked By: Jessica Mariani, P.E.
Title: Laboratory Manager

Source of Sample: On Site **Depth:** ---
Sample Number: 18-2092-S-1
Date Sampled: 2/7/18

HVEA Engineers

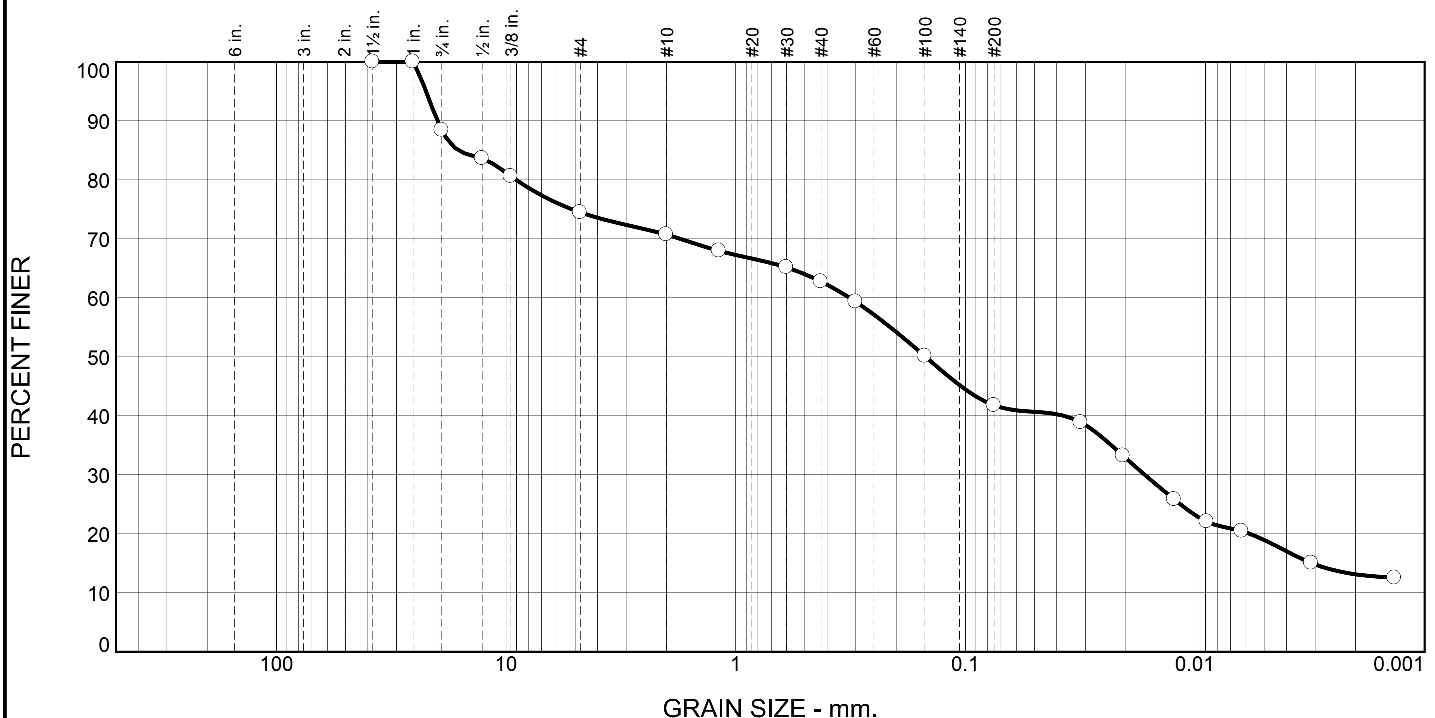
Beacon, NY

Client: HVEA Engineers
Project: NYCDEP Ashokan Trailhead (17-311)
Project No: 18-2092 **Figure**

702 Chestnut Ridge Road, Chestnut Ridge, NY 10977 Ph: (845) 414-9300 fax: (845) 414-9304 www.hveapc.com

HVEA ENGINEERS

Particle Size Distribution Report



% Stones	% +3"	% Gravel			% Sand				% Silt		% Clay
		Coarse	Medium	Fine	V. Crs.	Crs.	Med.	Fine	V. Fine	Crs.	Fine	
0	0	12	14	3	4	3	7	13	3	8	20	13

Test Results (ASTM C 136 & ASTM C 117)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1-1/2"	100		
1"	100		
3/4"	88		
1/2"	84		
3/8"	81		
#4	74		
#10	71		
#16	68		
#30	65		
#40	63		
#50	59		
#100	50		
#200	42		
0.0314 mm.	39		
0.0206 mm.	33		
0.0123 mm.	26		
0.0089 mm.	22		
0.0063 mm.	20		
0.0031 mm.	15		
0.0014 mm.	13		

* (no specification provided)

Material Description

On Site Material; Location #2

Atterberg Limits (ASTM D 4318)

PL= **LL=** **PI=**

Classification

USCS (D 2487)= **AASHTO (M 145)=**

Coefficients

D_{90}= 19.8962 D_{85}= 16.1392 D_{60}= 0.3193
D_{50}= 0.1489 D_{30}= 0.0165 D_{15}= 0.0031
D_{10}= C_u= C_c=

Remarks

Material sampled 2/7/18 by HVEA Staff from Location #2. Moisture content of in place sample is 11.6%.

Date Received: 2/7/18 **Date Tested:** 2/12/18
Tested By: Chris Sotanski
Checked By: Jessica Mariani, P.E.
Title: Laboratory Manager

Source of Sample: On Site **Depth:** ---
Sample Number: 18-2092-S-2
Date Sampled: 2/7/18

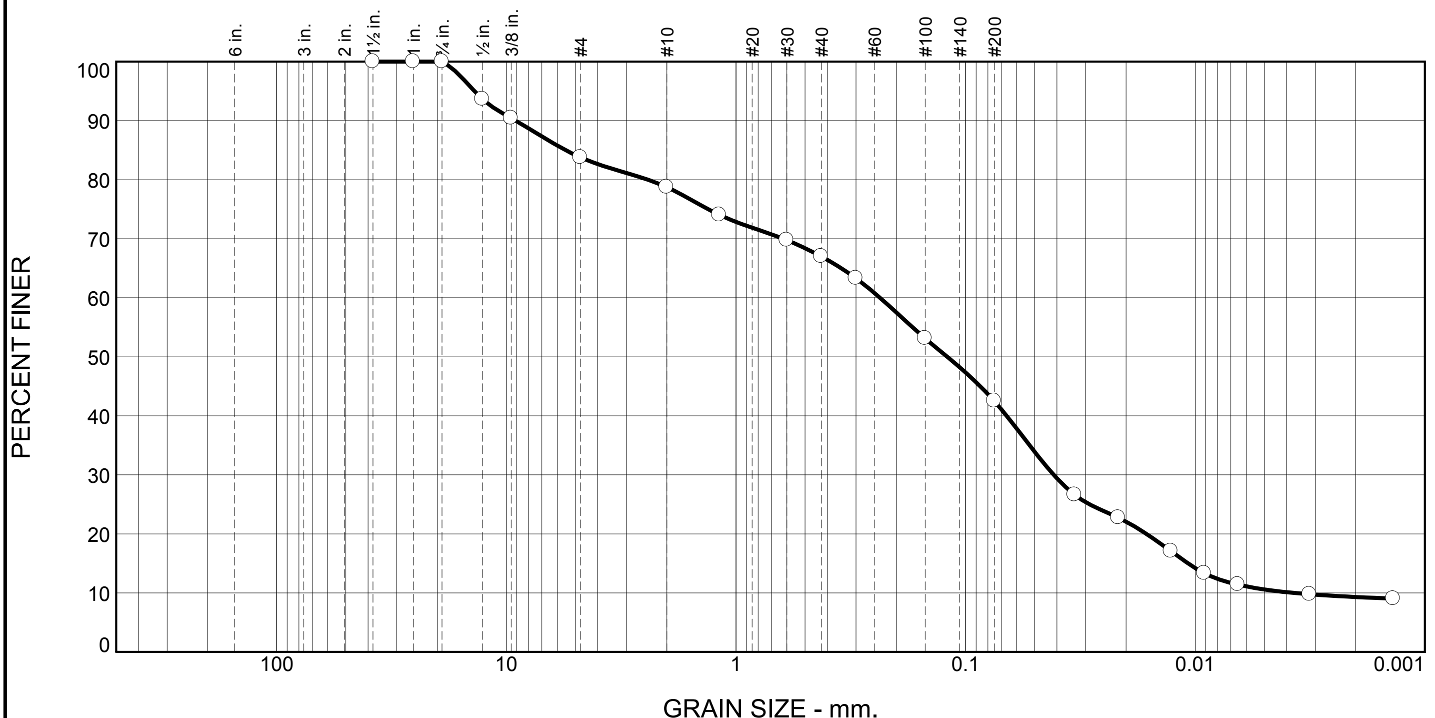
HVEA Engineers

Beacon, NY

Client: HVEA Engineers
Project: NYCDEP Ashokan Trailhead (17-311)
Project No: 18-2092 **Figure**

HVEA ENGINEERS

Particle Size Distribution Report



% Stones	% +3"	% Gravel			% Sand					% Silt		% Clay
		Coarse	Medium	Fine	V. Crs.	Crs.	Med.	Fine	V. Fine	Crs.	Fine	
0	0	0	16	5	6	5	7	14	13	12	13	9

Test Results (ASTM C 136 & ASTM C 117)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1-1/2"	100		
1"	100		
3/4"	100		
1/2"	94		
3/8"	90		
#4	84		
#10	79		
#16	74		
#30	70		
#40	67		
#50	63		
#100	53		
#200	42		
0.0335 mm.	27		
0.0216 mm.	23		
0.0128 mm.	17		
0.0091 mm.	13		
0.0065 mm.	11		
0.0032 mm.	9.8		
0.0014 mm.	9.0		

* (no specification provided)

Material Description

On Site Material; Location #3

Atterberg Limits (ASTM D 4318)

PL= **LL=** **PI=**

Classification

USCS (D 2487)= **AASHTO (M 145)=**

Coefficients

D_{90}= 9.1081 D_{85}= 5.5049 D_{60}= 0.2360
D_{50}= 0.1203 D_{30}= 0.0413 D_{15}= 0.0107
D_{10}= 0.0037 C_u= 63.42 C_c= 1.94

Remarks

Material sampled 2/7/18 by HVEA Staff from Location #3. Moisture content of in place sample is 10.7%.

Date Received: 2/7/18 **Date Tested:** 2/12/18
Tested By: Chris Sotanski
Checked By: Jessica Mariani, P.E.
Title: Laboratory Manager

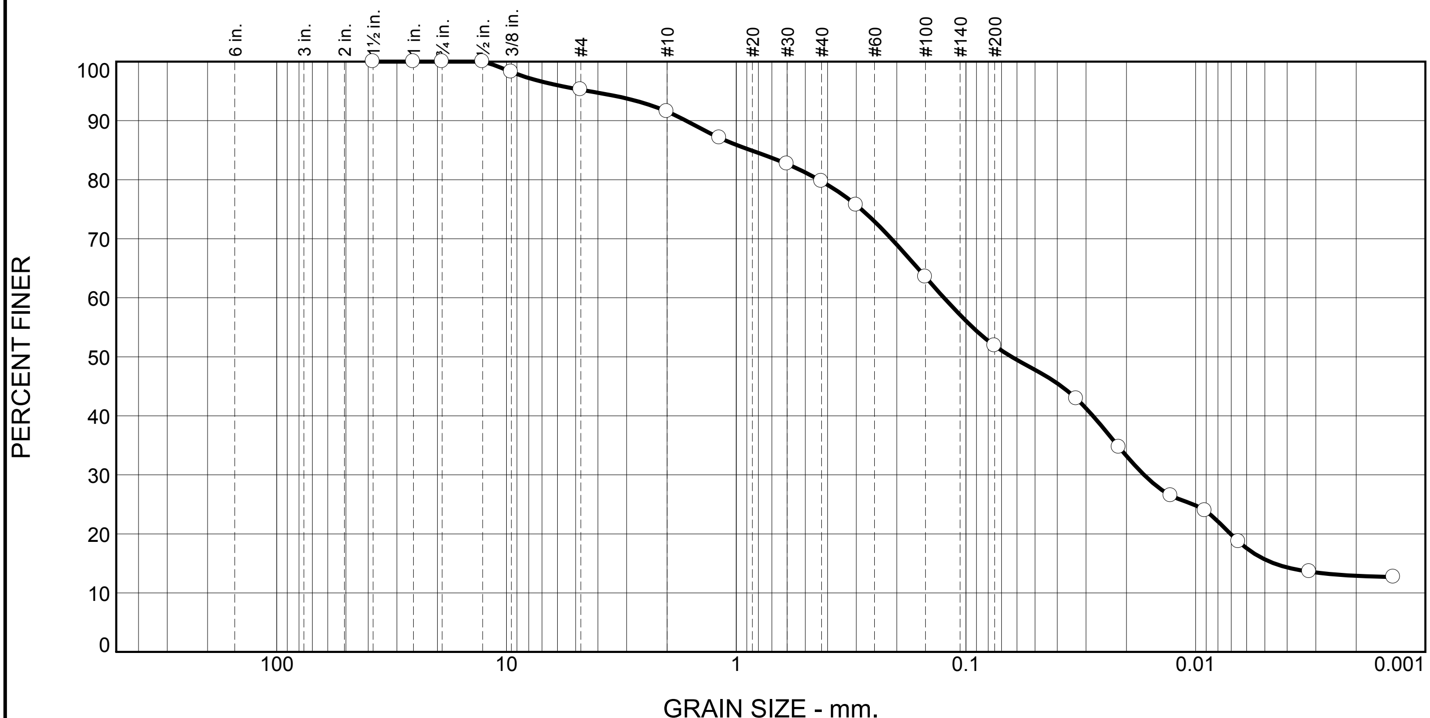
Source of Sample: On Site **Depth:** ---
Sample Number: 18-2092-S-3
Date Sampled: 2/7/18

HVEA Engineers

Beacon, NY

Client: HVEA Engineers
Project: NYCDEP Ashokan Trailhead (17-311)
Project No: 18-2092 **Figure**

Particle Size Distribution Report



% Stones	% +3"	% Gravel			% Sand					% Silt		% Clay
		Coarse	Medium	Fine	V. Crs.	Crs.	Med.	Fine	V. Fine	Crs.	Fine	
0	0	0	5	3	6	5	8	17	8	15	20	13

Test Results (ASTM C 136 & ASTM C 117)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1-1/2"	100		
1"	100		
3/4"	100		
1/2"	100		
3/8"	98		
#4	95		
#10	92		
#16	87		
#30	83		
#40	80		
#50	76		
#100	64		
#200	52		
0.0330 mm.	43		
0.0215 mm.	35		
0.0128 mm.	26		
0.0091 mm.	24		
0.0065 mm.	19		
0.0032 mm.	14		
0.0014 mm.	13		

* (no specification provided)

Material Description

On Site Material; Location #4

Atterberg Limits (ASTM D 4318)

PL= **LL=** **PI=**

Classification

USCS (D 2487)= **AASHTO (M 145)=**

Coefficients

D_{90}= 1.6546 D_{85}= 0.8658 D_{60}= 0.1246
D_{50}= 0.0633 D_{30}= 0.0168 D_{15}= 0.0046
D_{10}= C_u= C_c=

Remarks

Material sampled 2/7/18 by HVEA Staff from Location #4. Moisture content of in place sample is 15.9%.

Date Received: 2/7/18 **Date Tested:** 2/12/18
Tested By: Chris Sotanski
Checked By: Jessica Mariani, P.E.
Title: Laboratory Manager

Source of Sample: On Site **Depth:** ---
Sample Number: 18-2092-S-4
Date Sampled: 2/7/18

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Beacon, NY

Client: HVEA Engineers
Project: NYCDEP Ashokan Trailhead (17-311)
Project No: 18-2092 **Figure**

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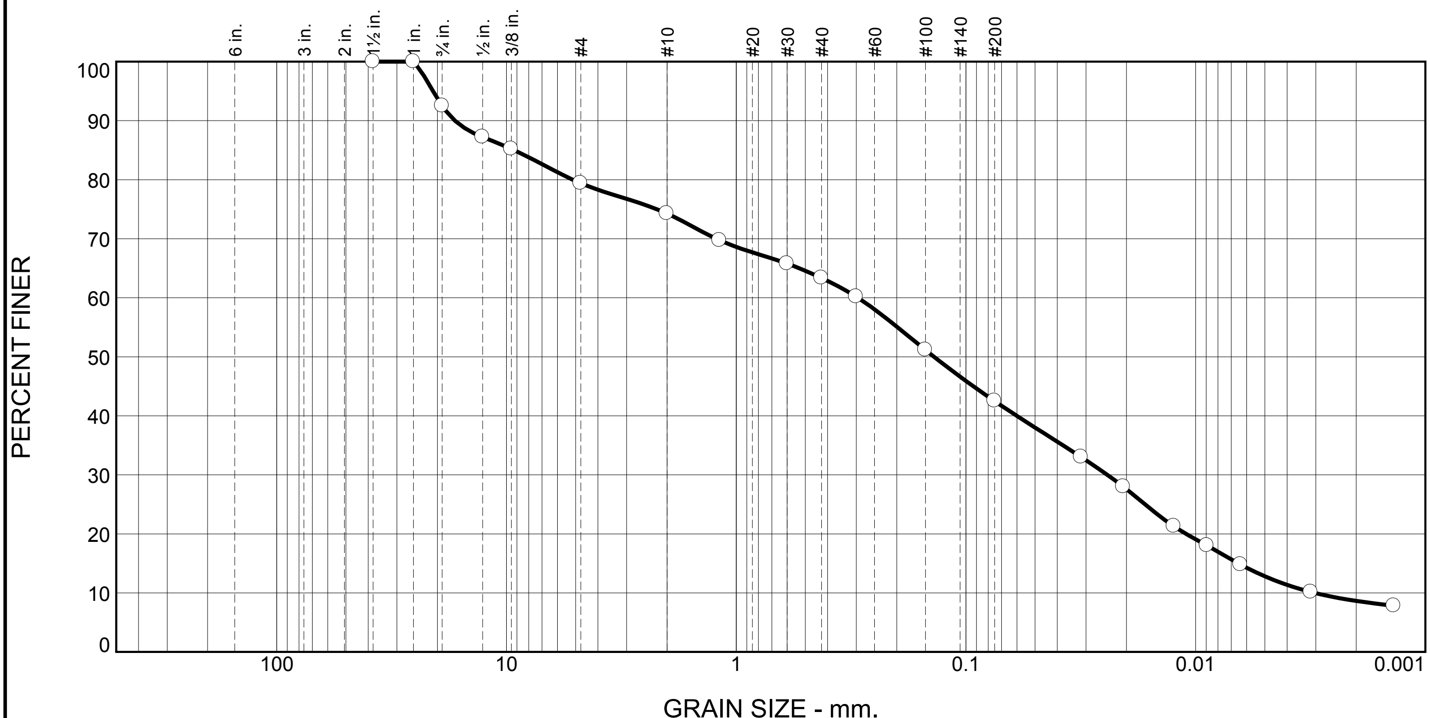
Particle Size Distribution Report



% Stones	% +3"	% Gravel			% Sand					% Silt		% Clay
		Coarse	Medium	Fine	V. Crs.	Crs.	Med.	Fine	V. Fine	Crs.	Fine	
0	0	7	14	5	5	4	7	12	8	10	19	9

Test Results (ASTM C 136 & ASTM C 117)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1-1/2"	100		
1"	100		
3/4"	93		
1/2"	87		
3/8"	85		
#4	79		
#10	74		
#16	70		
#30	66		
#40	63		
#50	60		
#100	51		
#200	42		
0.0315 mm.	33		
0.0206 mm.	28		
0.0124 mm.	21		
0.0089 mm.	18		
0.0064 mm.	15		
0.0031 mm.	10		
0.0014 mm.	7.8		

* (no specification provided)

Material Description

On Site Material; Location #5

Atterberg Limits (ASTM D 4318)

PL= LL= PI=

Classification

USCS (D 2487)= AASHTO (M 145)=

Coefficients

D_{90}= 16.7662 D_{85}= 9.2661 D_{60}= 0.2958
D_{50}= 0.1377 D_{30}= 0.0242 D_{15}= 0.0065
D_{10}= 0.0030 C_u= 97.38 C_c= 0.65

Remarks

Material sampled 2/7/18 by HVEA Staff from Location #5. Moisture content of in place sample is 12.6%.

Date Received: 2/13/18 **Date Tested:** 2/13/18
Tested By: Chris Sotanski
Checked By: Jessica Mariani, P.E.
Title: Laboratory Manager

Source of Sample: On Site **Depth:** ---
Sample Number: 18-2092-S-5
Date Sampled: 2/7/18

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Client: HVEA Engineers
Project: NYCDEP Ashokan Trailhead (17-311)
Project No: 18-2092 **Figure**

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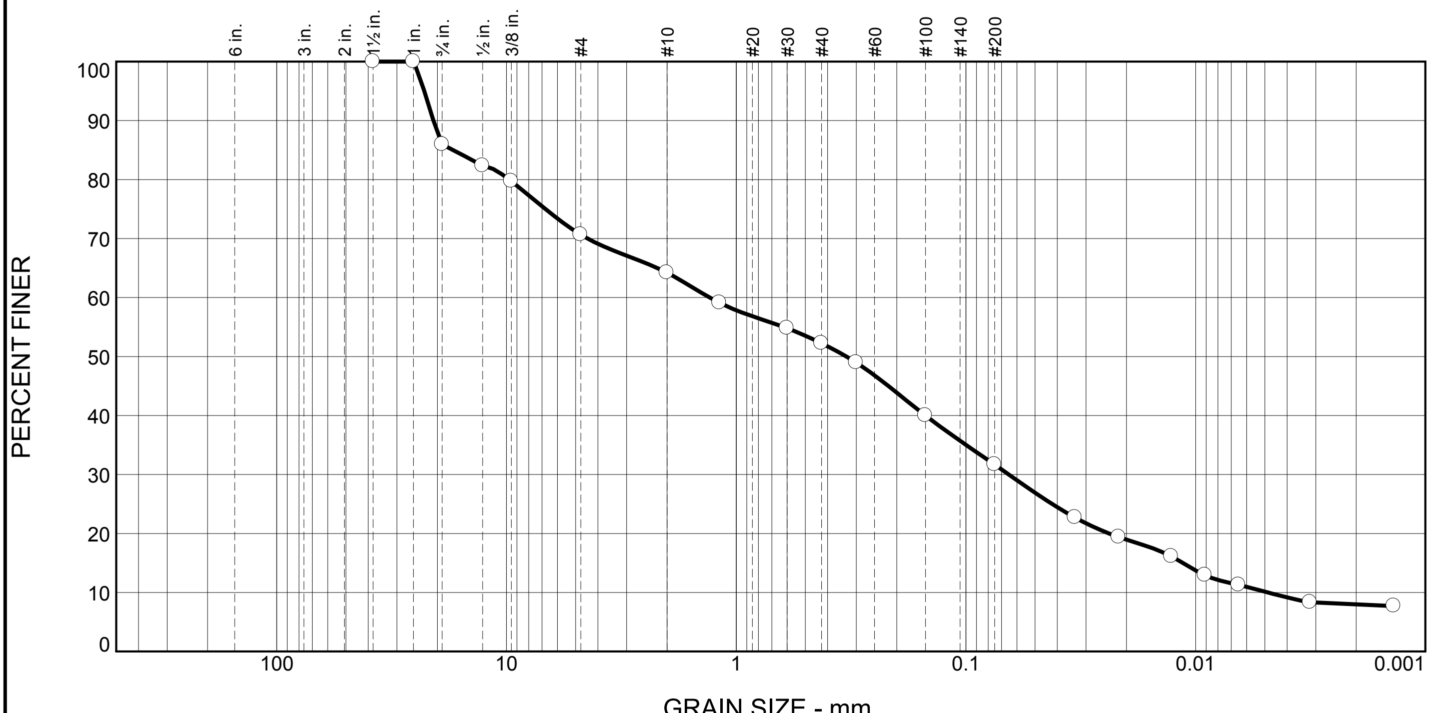
Particle Size Distribution Report



% Stones	% +3"	% Gravel			% Sand					% Silt		% Clay
		Coarse	Medium	Fine	V. Crs.	Crs.	Med.	Fine	V. Fine	Crs.	Fine	
0	0	14	15	7	6	4	7	12	8	8	11	8

Test Results (ASTM C 136 & ASTM C 117)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1-1/2"	100		
1"	100		
3/4"	86		
1/2"	82		
3/8"	80		
#4	71		
#10	64		
#16	59		
#30	55		
#40	52		
#50	49		
#100	40		
#200	32		
0.0335 mm.	23		
0.0216 mm.	19		
0.0127 mm.	16		
0.0091 mm.	13		
0.0065 mm.	11		
0.0032 mm.	8.3		
0.0014 mm.	7.7		

* (no specification provided)

Material Description

On Site Material; Location #6

Atterberg Limits (ASTM D 4318)

PL= **LL=** **PI=**

Classification

USCS (D 2487)= **AASHTO (M 145)=**

Coefficients

D_{90}= 20.7944 D_{85}= 17.0791 D_{60}= 1.3030
D_{50}= 0.3314 D_{30}= 0.0651 D_{15}= 0.0114
D_{10}= 0.0048 C_u= 269.14 C_c= 0.67

Remarks

Material sampled 2/7/18 by HVEA Staff from Location #6. Moisture content of in place sample is 12.4%.

Date Received: 2/7/18 **Date Tested:** 2/13/18
Tested By: Chris Sotanski
Checked By: Jessica Mariani, P.E.
Title: Laboratory Manager

Source of Sample: On Site **Depth:** ---
Sample Number: 18-2092-S-6
Date Sampled: 2/7/18

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Client: HVEA Engineers
Project: NYCDEP Ashokan Trailhead (17-311)
Project No: 18-2092 **Figure**

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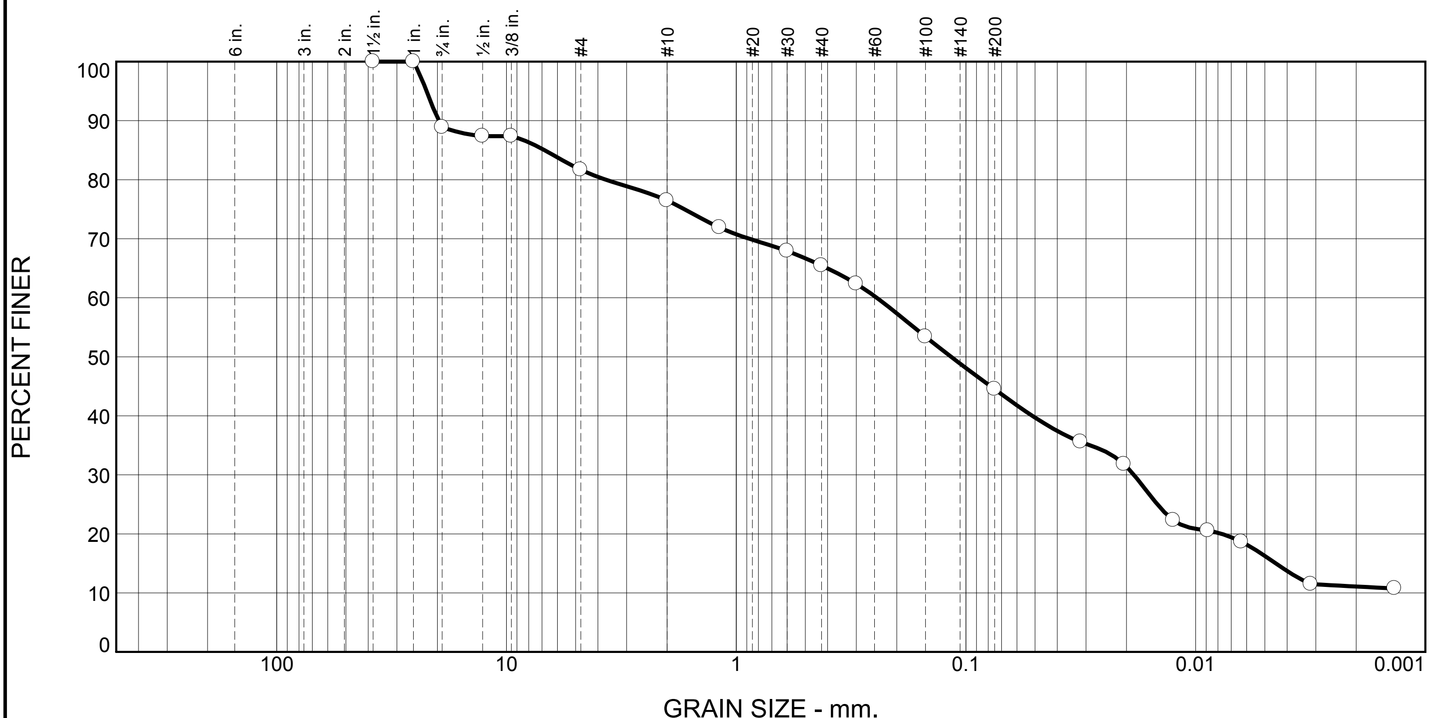
Particle Size Distribution Report



% Stones	% +3"	% Gravel			% Sand					% Silt		% Clay
		Coarse	Medium	Fine	V. Crs.	Crs.	Med.	Fine	V. Fine	Crs.	Fine	
0	0	11	7	6	5	4	7	12	8	9	20	11

Test Results (ASTM C 136 & ASTM C 117)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1-1/2"	100		
1"	100		
3/4"	89		
1/2"	87		
3/8"	87		
#4	82		
#10	76		
#16	72		
#30	68		
#40	65		
#50	62		
#100	53		
#200	45		
0.0317 mm.	36		
0.0205 mm.	32		
0.0125 mm.	22		
0.0088 mm.	21		
0.0063 mm.	19		
0.0031 mm.	11		
0.0014 mm.	11		

* (no specification provided)

Material Description

On Site Material; Location #7

Atterberg Limits (ASTM D 4318)

PL= LL= PI=

Classification

USCS (D 2487)= AASHTO (M 145)=

Coefficients

D_{90}= 19.7285 D_{85}= 6.8327 D_{60}= 0.2446
D_{50}= 0.1160 D_{30}= 0.0186 D_{15}= 0.0045
D_{10}= C_u= C_c=

Remarks

Material sampled 2/7/18 by HVEA Staff from Location #7. Moisture content of in place sample is 11.5%.

Date Received: 2/7/18 **Date Tested:** 2/13/18
Tested By: Chris Sotanski
Checked By: Jessica Mariani, P.E.
Title: Laboratory Manager

Source of Sample: On Site **Depth:** ---
Sample Number: 18-2092-S-7
Date Sampled: 2/7/18

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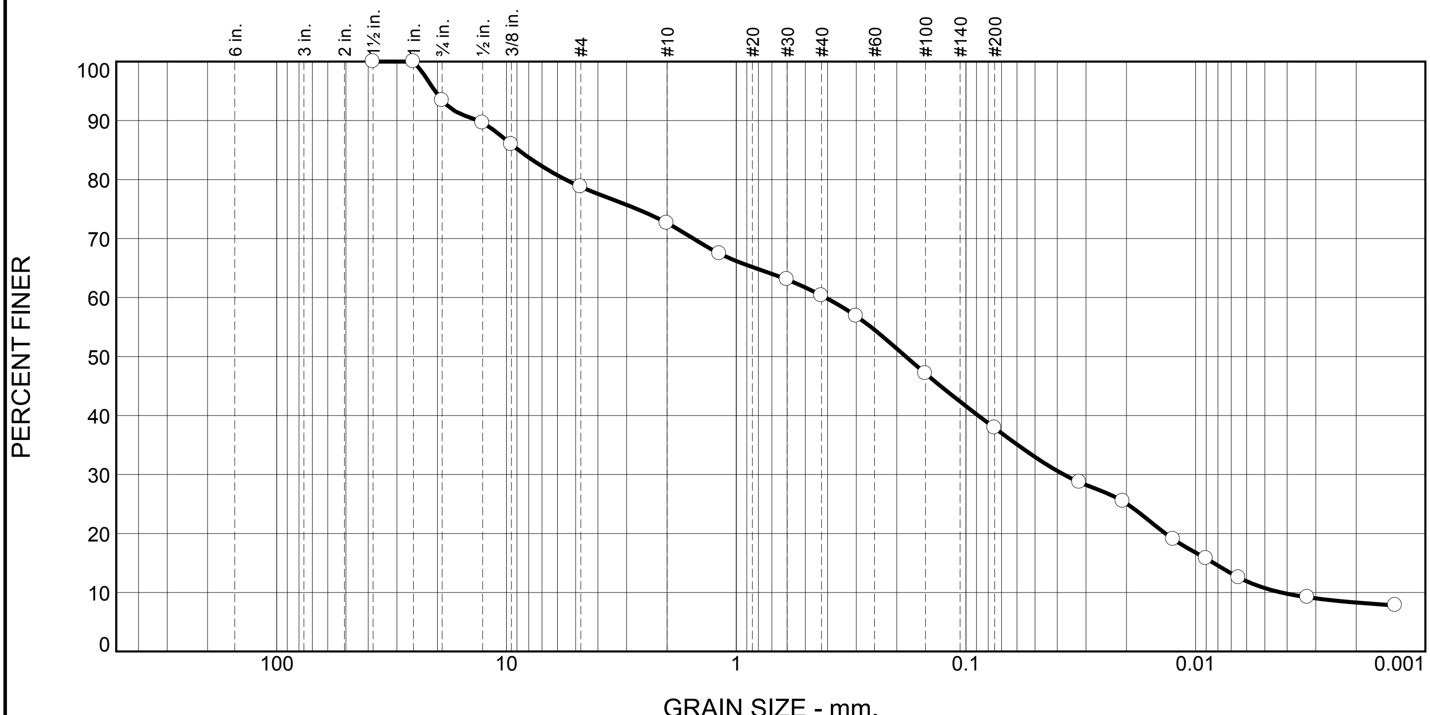
Client: HVEA Engineers
Project: NYCDEP Ashokan Trailhead (17-311)
Project No: 18-2092 **Figure**

Particle Size Distribution Report



% Stones	% +3"	% Gravel			% Sand					% Silt		% Clay
		Coarse	Medium	Fine	V. Crs.	Crs.	Med.	Fine	V. Fine	Crs.	Fine	
0	0	7	14	6	7	4	7	13	9	8	17	8

Test Results (ASTM C 136 & ASTM C 117)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1-1/2"	100		
1"	100		
3/4"	93		
1/2"	90		
3/8"	86		
#4	79		
#10	73		
#16	67		
#30	63		
#40	60		
#50	57		
#100	47		
#200	38		
0.0321 mm.	29		
0.0207 mm.	25		
0.0125 mm.	19		
0.0090 mm.	16		
0.0065 mm.	13		
0.0033 mm.	9.2		
0.0014 mm.	7.8		

* (no specification provided)

Material Description

On Site Material; Location #8

Atterberg Limits (ASTM D 4318)

PL= **LL=** **PI=**

Classification

USCS (D 2487)= **AASHTO (M 145)=**

Coefficients

D_{90}= 13.3207 D_{85}= 8.8561 D_{60}= 0.4094
D_{50}= 0.1825 D_{30}= 0.0375 D_{15}= 0.0083
D_{10}= 0.0042 C_u= 96.39 C_c= 0.81

Remarks

Material sampled 2/7/18 by HVEA Staff from Location #8. Moisture content of in place sample is 10.0%.

Date Received: 2/7/18 **Date Tested:** 2/13/18
Tested By: Chris Sotanski
Checked By: Jessica Mariani, P.E.
Title: Laboratory Manager

Source of Sample: On Site **Depth:** ---
Sample Number: 18-2092-S-8
Date Sampled: 2/7/18

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Client: HVEA Engineers
Project: NYCDEP Ashokan Trailhead (17-311)
Project No: 18-2092 **Figure**

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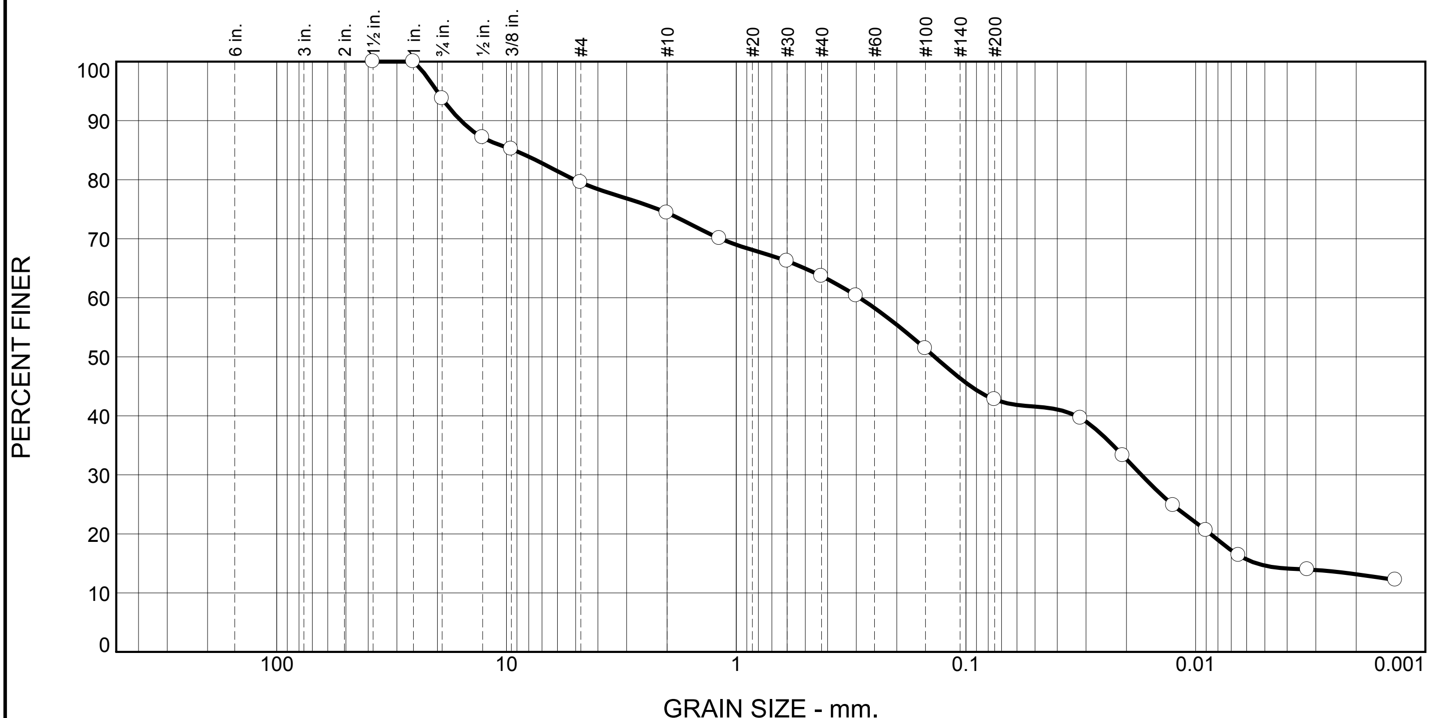
Particle Size Distribution Report



% Stones	% +3"	% Gravel			% Sand					% Silt		% Clay
		Coarse	Medium	Fine	V. Crs.	Crs.	Med.	Fine	V. Fine	Crs.	Fine	
0	0	6	14	6	5	4	7	12	4	9	20	13

Test Results (ASTM C 136 & ASTM C 117)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1-1/2"	100		
1"	100		
3/4"	94		
1/2"	87		
3/8"	85		
#4	80		
#10	74		
#16	70		
#30	66		
#40	64		
#50	60		
#100	51		
#200	43		
0.0317 mm.	40		
0.0207 mm.	33		
0.0125 mm.	25		
0.0090 mm.	21		
0.0065 mm.	16		
0.0033 mm.	14		
0.0013 mm.	12		

* (no specification provided)

Material Description

On Site Material; Location #10

Atterberg Limits (ASTM D 4318)

PL= **LL=** **PI=**

Classification

USCS (D 2487)= **AASHTO (M 145)=**

Coefficients

D_{90}= 15.8003 D_{85}= 9.2745 D_{60}= 0.2907
D_{50}= 0.1368 D_{30}= 0.0172 D_{15}= 0.0054
D_{10}= C_u= C_c=

Remarks

Material sampled 2/7/18 by HVEA Staff from Location #10.
Moisture content of in place sample is 14.3%.

Date Received: 2/7/18 **Date Tested:** 2/13/18
Tested By: Chris Sotanski
Checked By: Jessica Mariani, P.E.
Title: Laboratory Manager

Source of Sample: On Site **Depth:** ---
Sample Number: 18-2092-S-10
Date Sampled: 2/7/18

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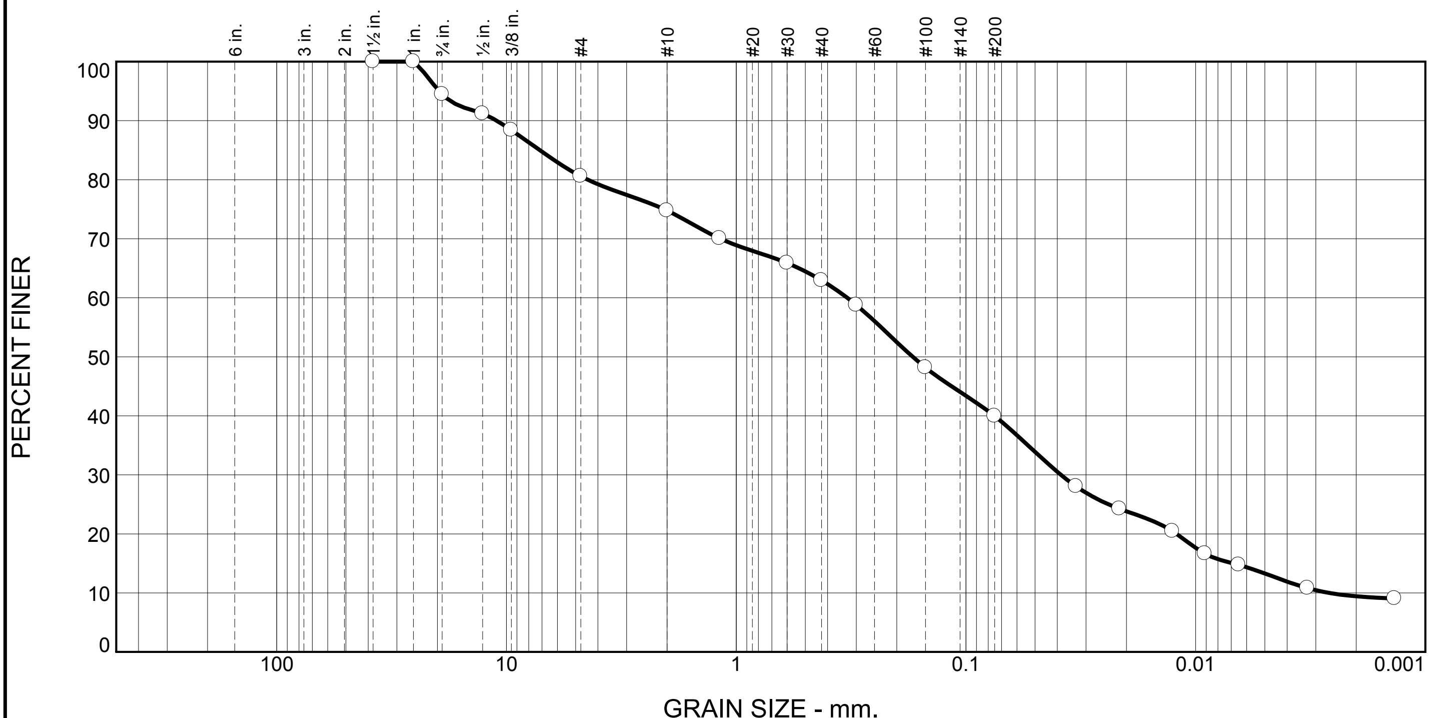
Client: HVEA Engineers
Project: NYCDEP Ashokan Trailhead (17-311)
Project No: 18-2092 **Figure**

Particle Size Distribution Report



% Stones	% +3"	% Gravel			% Sand					% Silt		% Clay
		Coarse	Medium	Fine	V. Crs.	Crs.	Med.	Fine	V. Fine	Crs.	Fine	
0	0	6	13	6	6	5	8	13	9	10	15	9

Test Results (ASTM C 136 & ASTM C 117)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1-1/2"	100		
1"	100		
3/4"	94		
1/2"	91		
3/8"	88		
#4	81		
#10	75		
#16	70		
#30	66		
#40	63		
#50	59		
#100	48		
#200	40		
0.0331 mm.	28		
0.0214 mm.	24		
0.0126 mm.	20		
0.0091 mm.	17		
0.0065 mm.	15		
0.0033 mm.	11		
0.0014 mm.	9.1		

* (no specification provided)

Material Description

On Site Material; Location #11

Atterberg Limits (ASTM D 4318)

PL= LL= PI=

Classification

USCS (D 2487)= AASHTO (M 145)=

Coefficients

D_{90}= 11.0388 D_{85}= 7.1633 D_{60}= 0.3288
D_{50}= 0.1704 D_{30}= 0.0386 D_{15}= 0.0069
D_{10}= 0.0026 C_u= 125.44 C_c= 1.73

Remarks

Material sampled 2/7/18 by HVEA Staff from Location #11.
Moisture content of in place sample is 11.7%.

Date Received: 2/7/18 **Date Tested:** 2/13/18
Tested By: Chris Sotanski
Checked By: Jessica Mariani, P.E.
Title: Laboratory Manager

Source of Sample: On Site **Depth:** ---
Sample Number: 18-2092-S-11
Date Sampled: 2/7/18

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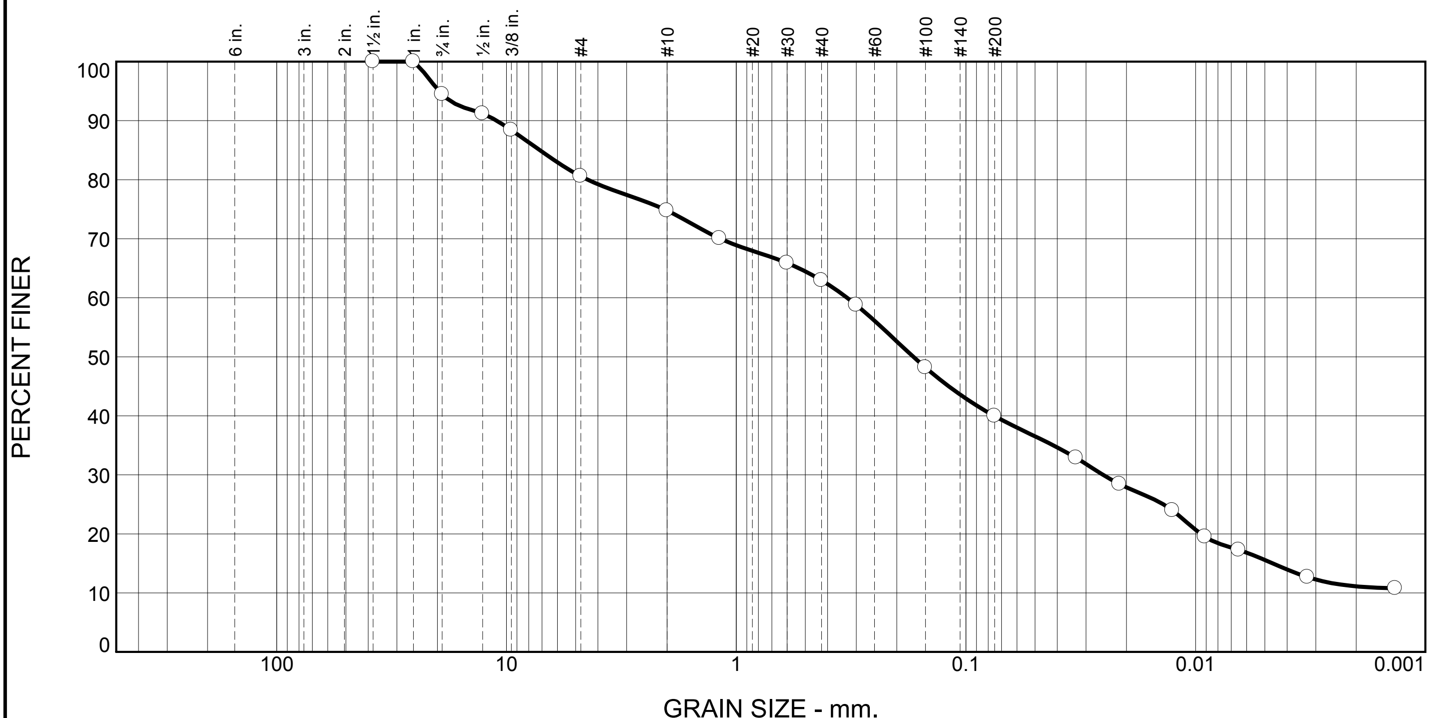
Client: HVEA Engineers
Project: NYCDEP Ashokan Trailhead (17-311)
Project No: 18-2092 **Figure**

Particle Size Distribution Report



% Stones	% +3"	% Gravel			% Sand					% Silt		% Clay
		Coarse	Medium	Fine	V. Crs.	Crs.	Med.	Fine	V. Fine	Crs.	Fine	
0	0	6	13	6	6	5	8	13	6	9	17	11

Test Results (ASTM C 136 & ASTM C 117)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1-1/2"	100		
1"	100		
3/4"	94		
1/2"	91		
3/8"	88		
#4	81		
#10	75		
#16	70		
#30	66		
#40	63		
#50	59		
#100	48		
#200	40		
0.0331 mm.	33		
0.0214 mm.	28		
0.0126 mm.	24		
0.0091 mm.	20		
0.0065 mm.	17		
0.0033 mm.	13		
0.0014 mm.	11		

* (no specification provided)

Material Description

On Site Material; Location #12

Atterberg Limits (ASTM D 4318)

PL= **LL=** **PI=**

Classification

USCS (D 2487)= **AASHTO (M 145)=**

Coefficients

D_{90}= 11.0388 D_{85}= 7.1633 D_{60}= 0.3291
D_{50}= 0.1694 D_{30}= 0.0253 D_{15}= 0.0046
D_{10}= C_u= C_c=

Remarks

Material sampled 2/7/18 by HVEA Staff from Location #12.
Moisture content of in place sample is 14.6%.

Date Received: 2/7/18 **Date Tested:** 2/13/18
Tested By: Chris Sotanski
Checked By: Jessica Mariani, P.E.
Title: Laboratory Manager

Source of Sample: On Site **Depth:** ---
Sample Number: 18-2092-S-12
Date Sampled: 2/7/18

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Client: HVEA Engineers
Project: NYCDEP Ashokan Trailhead (17-311)
Project No: 18-2092 **Figure**

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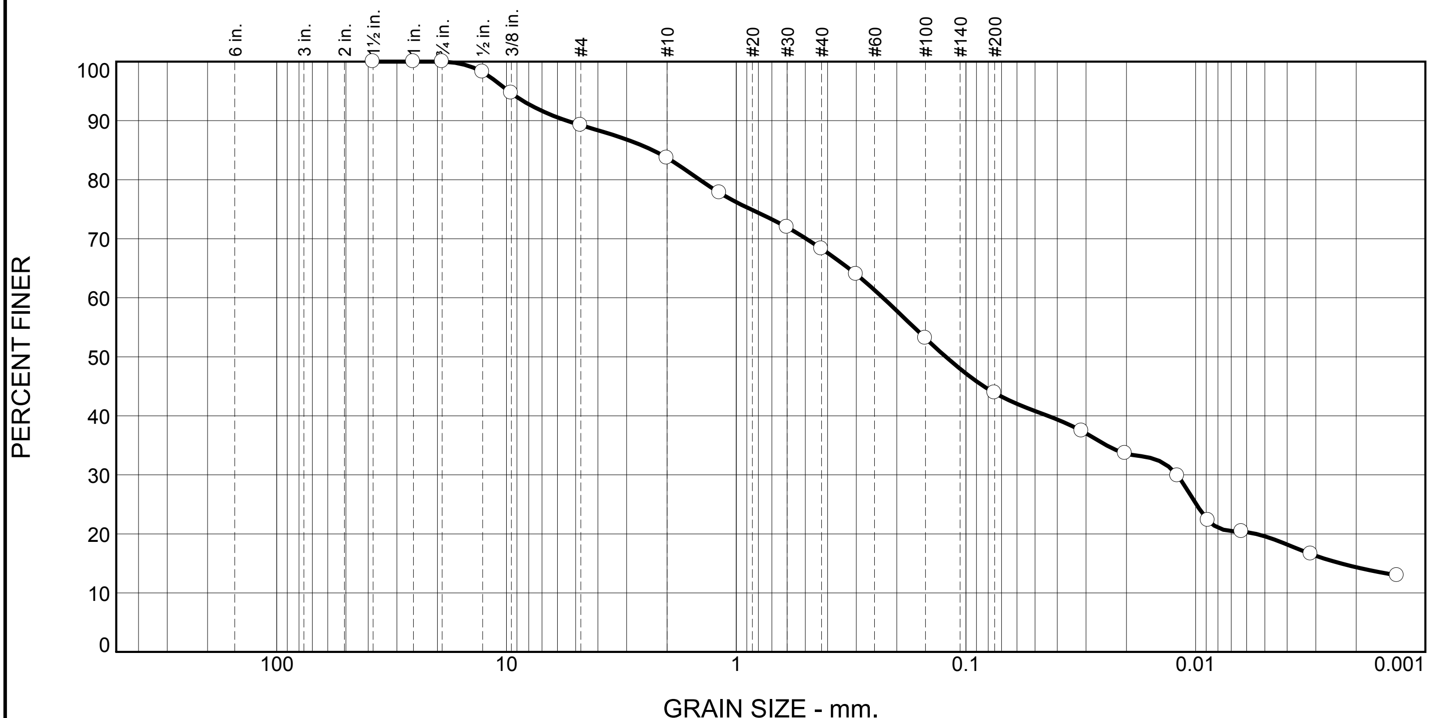
Particle Size Distribution Report



% Stones	% +3"	% Gravel Coarse	% Gravel Medium	% Gravel Fine	% Sand V. Crs.	% Sand Crs.	% Sand Med.	% Sand Fine	% Sand V. Fine	% Silt Crs.	% Silt Fine	% Clay
0	0	0	11	5	8	6	9	14	6	7	20	14

Test Results (ASTM C 136 & ASTM C 117)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1-1/2"	100		
1"	100		
3/4"	100		
1/2"	98		
3/8"	95		
#4	89		
#10	84		
#16	78		
#30	72		
#40	68		
#50	64		
#100	53		
#200	44		
0.0313 mm.	37		
0.0203 mm.	34		
0.0120 mm.	30		
0.0088 mm.	22		
0.0063 mm.	20		
0.0031 mm.	17		
0.0013 mm.	13		

* (no specification provided)

Material Description

On Site Material; Location #13

Atterberg Limits (ASTM D 4318)

PL= **LL=** **PI=**

Classification

USCS (D 2487)= **AASHTO (M 145)=**

Coefficients

D_{90}= 5.4697 D_{85}= 2.3135 D_{60}= 0.2297
D_{50}= 0.1224 D_{30}= 0.0121 D_{15}= 0.0023
D_{10}= C_u= C_c=

Remarks

Material sampled 2/7/18 by HVEA Staff from Location #13.
Moisture content of in place sample is 14.7%.

Date Received: 2/7/18 **Date Tested:** 2/13/18
Tested By: Chris Sotanski
Checked By: Jessica Mariani, P.E.
Title: Laboratory Manager

Source of Sample: On Site **Depth:** ---
Sample Number: 18-2092-S-13
Date Sampled: 2/7/18

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Client: HVEA Engineers
Project: NYCDEP Ashokan Trailhead (17-311)
Project No: 18-2092 **Figure**

APPENDIX D

Construction Inspection Checklist and Maintenance and Management Inspection Checklist

Stormwater/Wetland Pond Construction Inspection Checklist

Project:
Location:
Site Status:

Date:

Time:

Inspector:

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

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

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

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

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

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

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

Comments:

Actions to be Taken:

Bioretention Construction Inspection Checklist

Project:
Location:
Site Status:

Date:

Time:

Inspector:

CONSTRUCTION SEQUENCE	SATISFACTORY/ UNSATISFACTORY	COMMENTS
1. Pre-Construction		
Pre-construction meeting		
Runoff diverted		
Facility area cleared		
If designed as exfilter, soil testing for permeability		
Facility location staked out		
2. Excavation		
Size and location		
Lateral slopes completely level		
If designed as exfilter, ensure that excavation does not compact susoils.		
Longitudinal slopes within design range		

Construction Sequence	Satisfactory / Unsatisfactory	Comments
3. Structural Components		
Stone diaphragm installed correctly		
Outlets installed correctly		
Underdrain		
Pretreatment devices installed		
Soil bed composition and texture		
4. Vegetation		
Complies with planting specs		
Topsoil adequate in composition and placement		
Adequate erosion control measures in place		
5. Final Inspection		
Dimensions		
Proper stone diaphragm		
Proper outlet		
Soil/ filter bed permeability testing		
Effective stand of vegetation and stabilization		
Construction generated sediments removed		
Contributing watershed stabilized before flow is diverted to the practice		

Comments:

Actions to be Taken:

Open Channel System Construction Inspection Checklist

Project:
Location:
Site Status:

Date:

Time:

Inspector:

Construction Sequence	Satisfactory / Unsatisfactory	Comments
1. Pre-Construction		
Pre-construction meeting		
Runoff diverted		
Facility location staked out		
2. Excavation		
Size and location		
Side slope stable		
Soil permeability		
Groundwater / bedrock		
Lateral slopes completely level		
Longitudinal slopes within design range		
Excavation does not compact subsoils		
3. Check dams		
Dimensions		
Spacing		
Materials		

CONSTRUCTION SEQUENCE	SATISFACTORY / UNSATISFACTORY	COMMENTS
4. Structural Components		
Underdrain installed correctly		
Inflow installed correctly		
Pretreatment devices installed		
5. Vegetation		
Complies with planting specifications		
Topsoil adequate in composition and placement		
Adequate erosion control measures in place		
6. Final inspection		
Dimensions		
Check dams		
Proper outlet		
Effective stand of vegetation and stabilization		
Contributing watershed stabilized before flow is routed to the factility		

Comments:

Actions to be Taken:

Stormwater Pond/Wetland Operation, Maintenance and Management Inspection Checklist

Project
Location: ______________________
Site Status: ______________________

Date: ______________________
Time: ______________________

Inspector: ______________________

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

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

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

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

Comments:

Actions to be Taken:

Bioretention Operation, Maintenance and Management Inspection Checklist

Project:
Location:
Site Status:

Date:

Time:

Inspector:

MAINTENANCE ITEM	SATISFACTORY / UNSATISFACTORY	COMMENTS
1. Debris Cleanout (Monthly)		
Bioretention and contributing areas clean of debris		
No dumping of yard wastes into practice		
Litter (branches, etc.) have been removed		
2. Vegetation (Monthly)		
Plant height not less than design water depth		
Fertilized per specifications		
Plant composition according to approved plans		
No placement of inappropriate plants		
Grass height not greater than 6 inches		
No evidence of erosion		
3. Check Dams/Energy Dissipaters/Sumps (Annual, After Major Storms)		
No evidence of sediment buildup		

Maintenance Item	**Satisfactory / Unsatisfactory**	**Comments**
Sumps should not be more than 50% full of sediment		
No evidence of erosion at downstream toe of drop structure		
4. Dewatering (Monthly)		
Dewaters between storms		
No evidence of standing water		
5. Sediment Deposition (Annual)		
Swale clean of sediments		
Sediments should not be > 20% of swale design depth		
6. Outlet/Overflow Spillway (Annual, After Major Storms)		
Good condition, no need for repair		
No evidence of erosion		
No evidence of any blockages		
7. Integrity of Filter Bed (Annual)		
Filter bed has not been blocked or filled inappropriately		

Comments:

Actions to be Taken:

Open Channel Operation, Maintenance, and Management Inspection Checklist

Project:
Location:
Site Status:

Date:

Time:

Inspector:

MAINTENANCE ITEM	SATISFACTORY/ UNSATISFACTORY	COMMENTS
1. Debris Cleanout (Monthly)		
Contributing areas clean of debris		
2. Check Dams or Energy Dissipators (Annual, After Major Storms)		
No evidence of flow going around structures		
No evidence of erosion at downstream toe		
Soil permeability		
Groundwater / bedrock		
3. Vegetation (Monthly)		
Mowing done when needed		
Minimum mowing depth not exceeded		
No evidence of erosion		
Fertilized per specification		
4. Dewatering (Monthly)		
Dewaters between storms		

MAINTENANCE ITEM	SATISFACTORY/ UNSATISFACTORY	COMMENTS
5. Sediment deposition (Annual)		
Clean of sediment		
6. Outlet/Overflow Spillway (Annual)		
Good condition, no need for repairs		
No evidence of erosion		

Comments:

Actions to be Taken:

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APPENDIX E

NYSDEC SPDES General Permit No. GP-0-15-002
Spill Reporting and Initial Notification Requirements
(NYSDEC)
Deep Ripping and De-Compaction Manual
(NYSDEC)

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

Modification Date:

July 14, 2015 – Correction of typographical error in definition of "New Development", Appendix A

November 23, 2016 – Updated to require the use of the New York State Standards and Specifications for Erosion and Sediment Control, dated November 2016. The use of this standard will be required as of February 1, 2017.

John J. Ferguson
Chief Permit Administrator

Authorized Signature 11-14-16
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 November 2016, 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 discharges*;

(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 *Discharges*.** 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 *discharge*s 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 *discharge*s from *construction activities*.

3. Notwithstanding paragraphs E.1 and E.2 above, the following non-stormwater *discharges* may be authorized by this permit: *discharge*s 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 *discharge*s 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 *discharge*s 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 **not** authorized by this permit:

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

2. *Discharge*s 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 *discharge*s 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 *discharge*s 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. *Discharge*s 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 not 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 not subject to the requirements of a *regulated, traditional land use control MS4*:

(i) Five (5) business days from the date the Department receives a complete 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 not 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 November 2016.

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*

1. When property ownership changes or when there is a change in operational control over the construction plans and specifications, the original *owner or operator* must notify the new *owner or operator*, <u>in writing,</u> 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 November 2016. 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 November 2016, 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 November 2016;

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 November 2016. 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.

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* <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.

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.

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; <u>and</u> all areas of disturbance have achieved *final stabilization*; <u>and</u> all temporary, structural erosion and sediment control measures have been removed; <u>and</u> 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; <u>and</u> all areas disturbed as of the project shutdown date have achieved *final stabilization*; <u>and</u> all temporary, structural erosion and sediment control measures have been removed; <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;

   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.

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 not 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

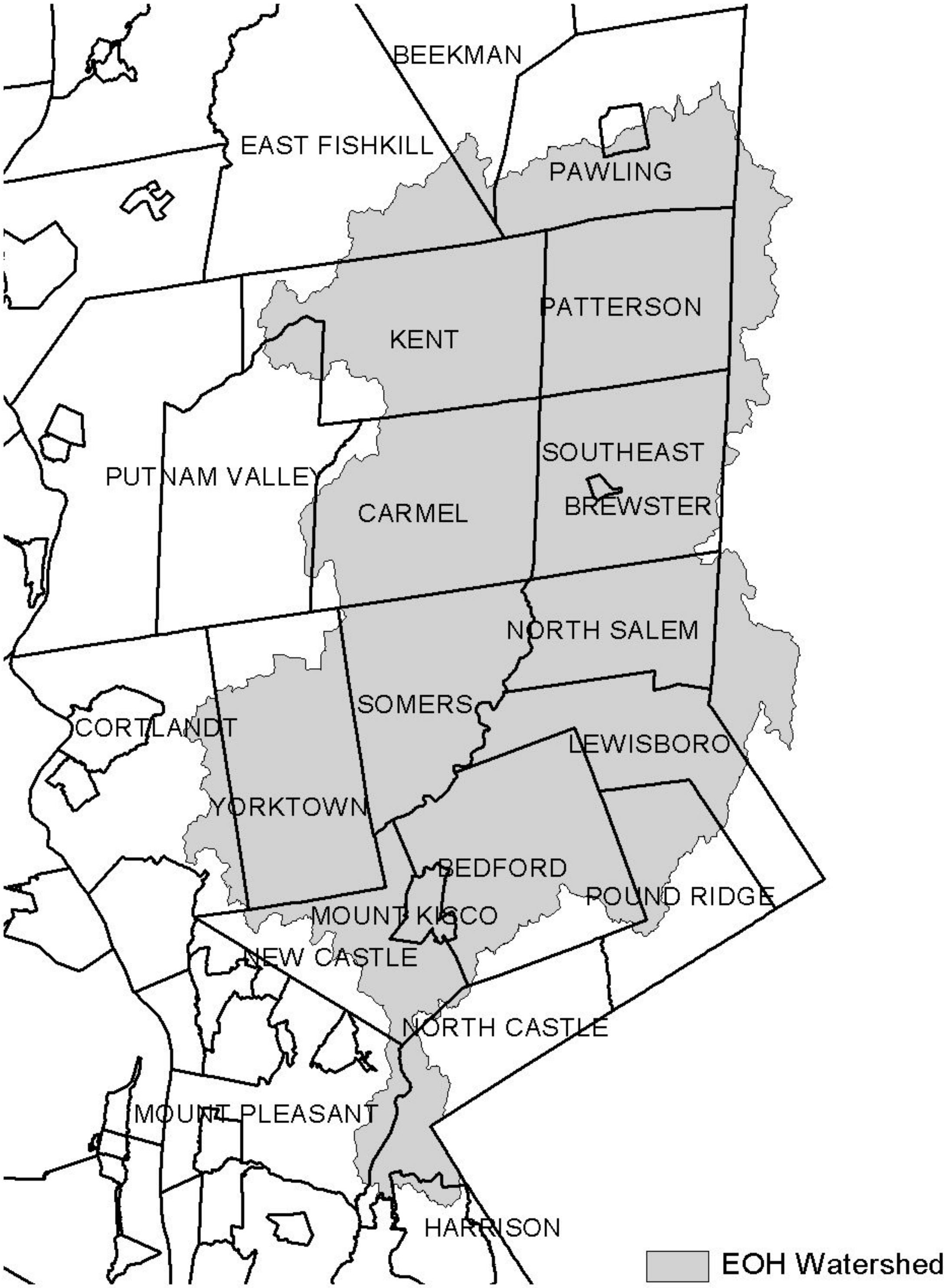


Figure 2 - Onondaga Lake Watershed

Figure 3 - Greenwood Lake Watershed

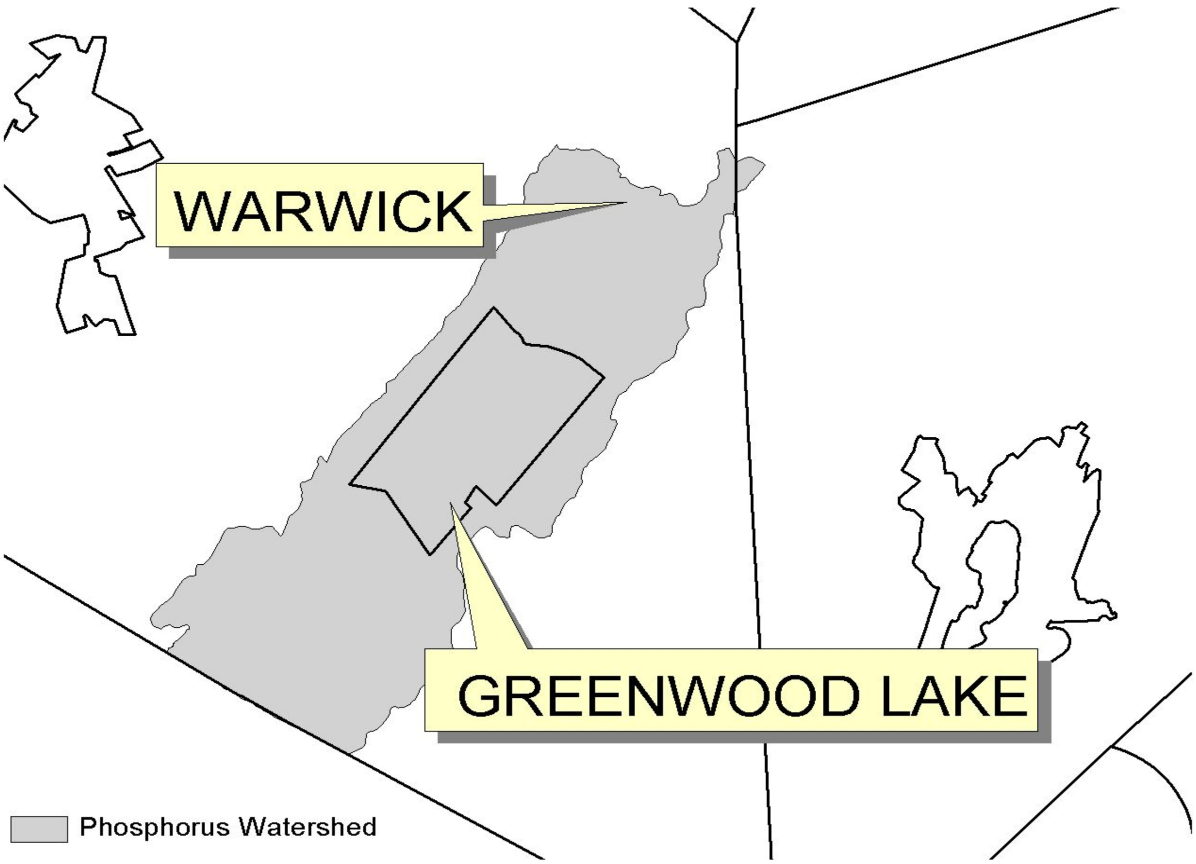


Figure 4 - Oscawana Lake Watershed

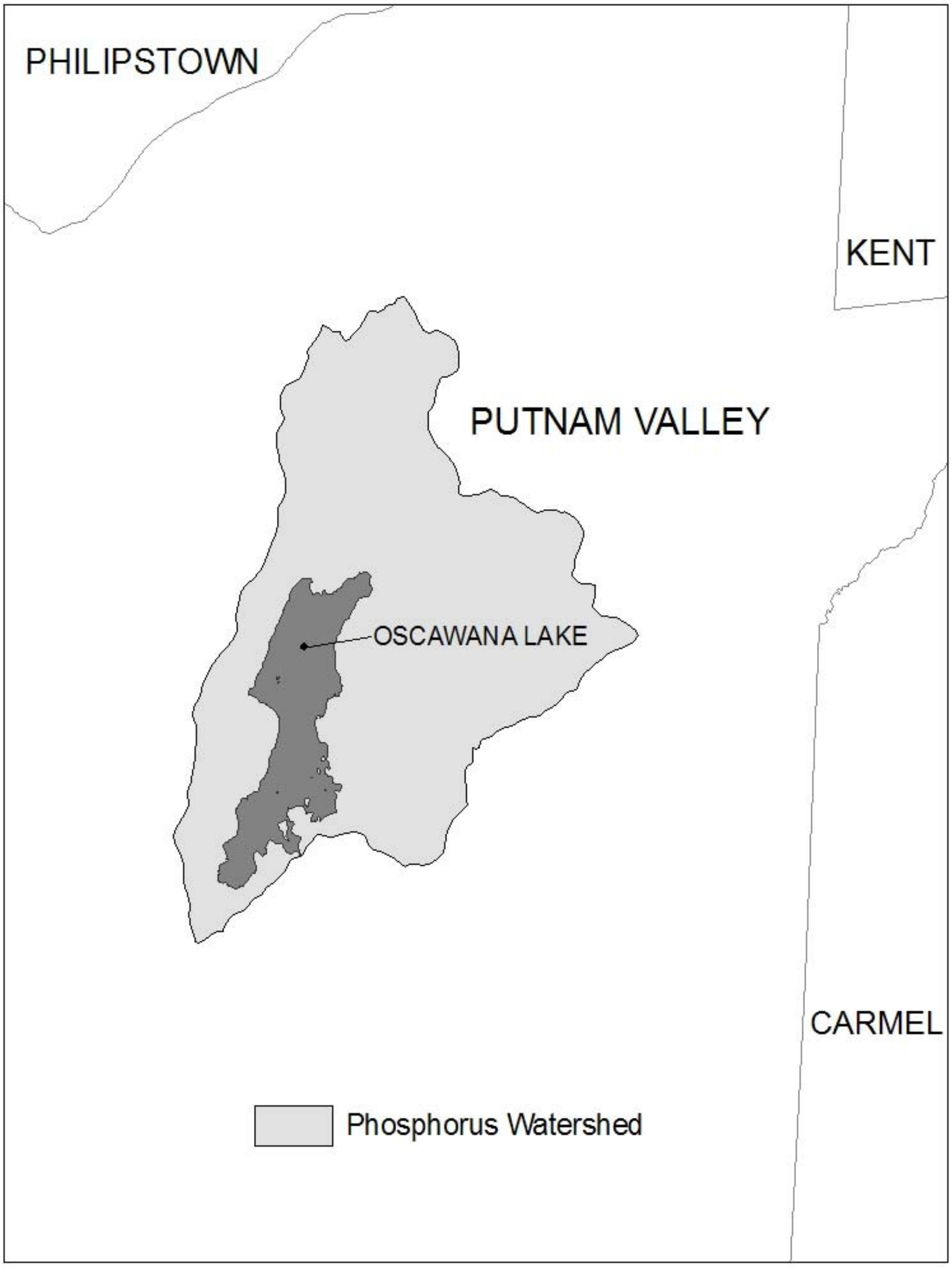
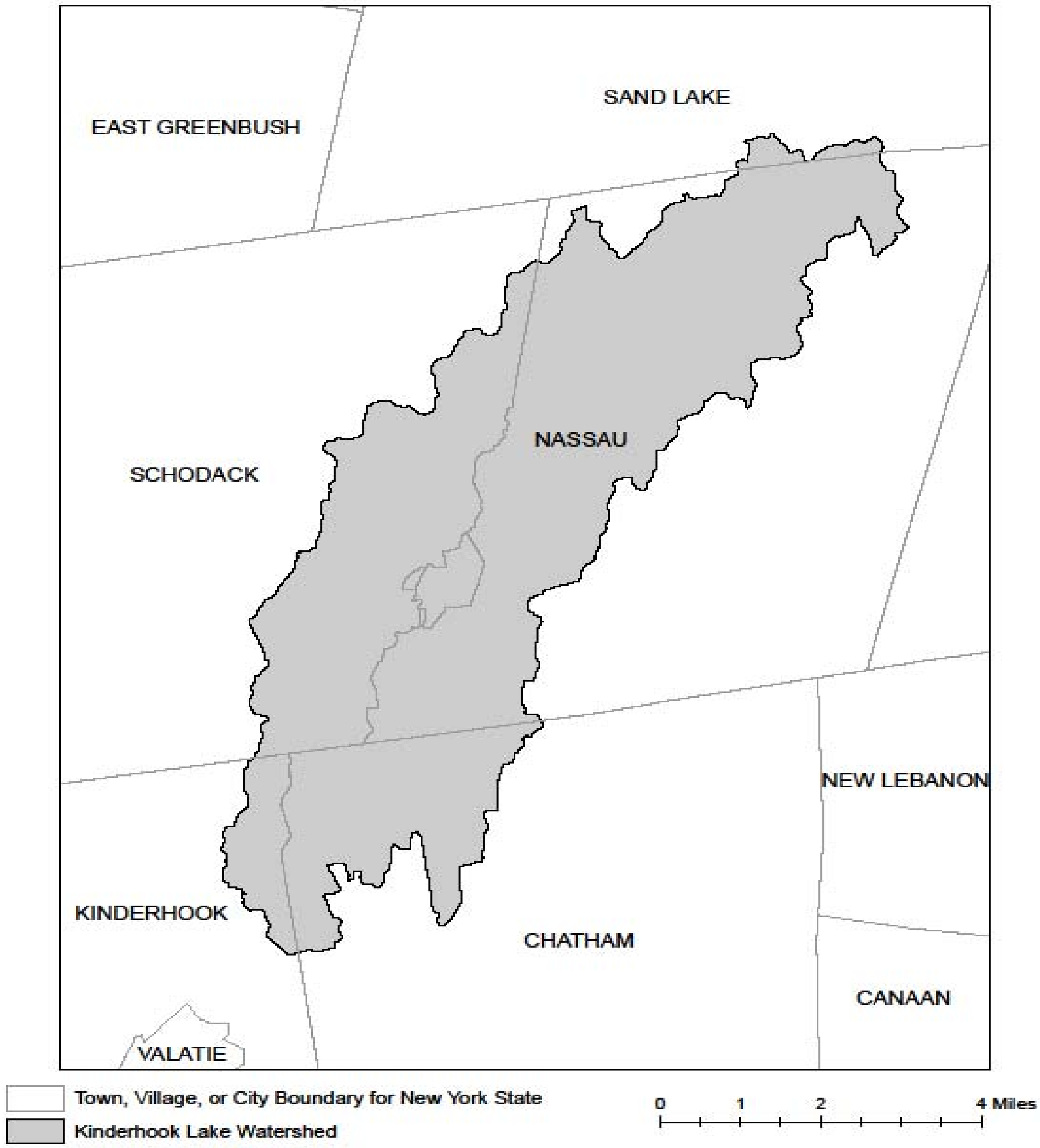


Figure 5: Kinderhook Lake Watershed



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
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	COUNTY	WATERBODY
Onondaga	Onondaga Creek, Middle and tribs	Suffolk	Great South Bay, West
Onondaga	Onondaga Creek, Upp, and minor tribs	Suffolk	Mill and Seven Ponds
Onondaga	Harbor Brook, Lower, and tribs	Suffolk	Moriches Bay, East
Onondaga	Ninemile Creek, Lower, and tribs	Suffolk	Moriches Bay, West
Onondaga	Minor tribs to Onondaga Lake	Suffolk	Quantuck Bay
Onondaga	Onondaga Creek, Lower, and tribs	Suffolk	Shinnecock Bay (and Inlet)
Ontario	Honeoye Lake	Sullivan	Bodine, Montgomery Lakes
Ontario	Hemlock Lake Outlet and minor tribs	Sullivan	Davies Lake
Ontario	Great Brook and minor tribs	Sullivan	Pleasure Lake
Orange	Monhagen Brook and tribs	Sullivan	Swan Lake
Orange	Orange Lake	Tompkins	Cayuga Lake, Southern End
Orleans	Lake Ontario Shoreline, Western	Tompkins	Owasco Inlet, Upper, and tribs
Oswego	Pleasant Lake	Ulster	Ashokan Reservoir
Oswego	Lake Neatahwanta	Ulster	Esopus Creek, Upper, and minor tribs
Putnam	Oscawana Lake		
Putnam	Palmer Lake	Ulster	Esopus Creek, Lower, Main Stem
Putnam	Lake Carmel	Ulster	Esopus Creek, Middle, and minor tribs
Queens	Jamaica Bay, Eastern, and tribs (Queens)		
Queens	Bergen Basin	Warren	Lake George
Queens	Shellbank Basin	Warren	Tribs to L.George, Village of L George
Rensselaer	Nassau Lake		
Rensselaer	Snyders Lake	Warren	Huddle/Finkle Brooks and tribs
Richmond	Grasmere, Arbutus and Wolfes Lakes	Warren	Indian Brook and tribs
Rockland	Congers Lake, Swartout Lake	Warren	Hague Brook and tribs
Rockland	Rockland Lake	Washington	Tribs to L.George, East Shr Lk George
Saratoga	Ballston Lake		
Saratoga	Round Lake	Washington	Cossayuna Lake
Saratoga	Dwaas Kill and tribs	Washington	Wood Cr/Champlain Canal, minor tribs
Saratoga	Tribs to Lake Lonely		
Saratoga	Lake Lonely	Wayne	Port Bay
Schenectady	Collins Lake	Wayne	Marbletown Creek and tribs
Schenectady	Duane Lake	Westchester	Lake Katonah
Schenectady	Mariaville Lake	Westchester	Lake Mohegan
Schoharie	Engleville Pond	Westchester	Lake Shenorock
Schoharie	Summit Lake	Westchester	Reservoir No.1 (Lake Isle)
Schuyler	Cayuta Lake	Westchester	Saw Mill River, Middle, and tribs
St. Lawrence	Fish Creek and minor tribs	Westchester	Silver Lake
St. Lawrence	Black Lake Outlet/Black Lake	Westchester	Teatown Lake
Steuben	Lake Salubria	Westchester	Truesdale Lake
Steuben	Smith Pond	Westchester	Wallace Pond
Suffolk	Millers Pond	Westchester	Peach Lake
Suffolk	Mattituck (Marratooka) Pond	Westchester	Mamaroneck River, Lower
Suffolk	Tidal tribs to West Moriches Bay	Westchester	Mamaroneck River, Upp, and tribs
Suffolk	Canaan Lake	Westchester	Sheldrake River and tribs
Suffolk	Lake Ronkonkoma	Westchester	Blind Brook, Lower
Suffolk	Beaverdam Creek and tribs	Westchester	Blind Brook, Upper, and tribs
Suffolk	Big/Little Fresh Ponds	Westchester	Lake Lincolndale
Suffolk	Fresh Pond	Westchester	Lake Meahaugh
Suffolk	Great South Bay, East	Wyoming	Java Lake
Suffolk	Great South Bay, Middle	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.

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

TECHNICAL

FIELD GUIDANCE

SPILL REPORTING AND INITIAL NOTIFICATION REQUIREMENTS

NOTES

Spill Reporting and Initial Notification Requirements

GUIDANCE SUMMARY AT-A-GLANCE

- Reporting spills is a crucial first step in the response process.
- You should understand the spill reporting requirements to be able to inform the spillers of their responsibilities.
- Several different state, local, and federal laws and regulations require spillers to report petroleum and hazardous materials spills.
- The state and federal reporting requirements are summarized in Exhibit 1.1-1.
- Petroleum spills must be reported to DEC unless they meet all of the following criteria:
    - The spill is known to be less than 5 gallons; and
    - The spill is contained and under the control of the spiller; and
    - The spill has not and will not reach the State’s water or any land; and
    - The spill is cleaned up within 2 hours of discovery.

  All reportable petroleum spills and most hazardous materials spills must be reported to DEC hotline (1-800-457-7362) within New York State; and (1-518 457-7362) from outside New York State. For spills not deemed reportable, it is strongly recommended that the facts concerning the incident be documented by the spiller and a record maintained for one year.
- Inform the spiller to report the spill to other federal or local authorities, if required.
- Report yourself those spills for which you are unable to locate the responsible spiller.
- Make note of other agencies' emergency response telephone numbers in case you require their on-scene assistance, or if the response is their responsibility and not BSPR's.

NOTES

1.1.1 Notification Requirements for Oil Spills and Hazardous Material Spills

Spillers are required under state law and under certain local and federal laws to report spills. These various requirements, summarized in Exhibit 1.1-1, often overlap; that is, a particular spill might be required to be reported under several laws or regulations and to several authorities. Under state law, all petroleum and most hazardous material spills must be reported to DEC Hotline (1-800-457-7362), within New York State, and to 1-518-457-7362 from outside New York State. Prompt reporting by spillers allows for a quick response, which may reduce the likelihood of any adverse impact to human health and the environment. Yo will often have to inform spillers of there responsibilities.

Although the spiller is responsible for reporting spills, other persons with knowledge of a spill, leak, or discharge is required to report the incident (see Appendices A and B). You will often have to inform spillers of their responsibilities. You may also have to report spills yourself in situations where the spiller is not known or cannot be located. However, it is the legal responsibility of the spiller to report spills to both state and other authorities.

BSPR personnel also are responsible for notifying other response agencies when the expertise or assistance of other agencies is needed. For example, the local fire department should be notified of spills that pose a potential explosion and/or fire hazard. If such a hazard is detected and the fire department has not been notified, call for their assistance immediately. Fire departments are trained and equipped to respond to these situations; you should not proceed with your response until the fire/safety hazard is eliminated. For more information on interagency coordination in emergency situations see Part 1, Section 3, Emergency Response.

Another important responsibility is notifying health department officials when a drinking water supply is found to be contaminated as a result of a spill. It will be the health department's responsibility to advise you on the health risk associated with any contamination.

Exhibits 1.1-1 and 1.1-2 list the state and federal requirements to report petroleum and hazardous substance spills, respectively. The charts describe the type of material covered, the applicable act or regulation, the agency that must be notified, what must be reported, and the person responsible for reporting. New York state also has a emergency notification network for spill situations (e.g., major chemical releases) that escalate beyond the capabilities of local and regional response agencies/authorities to provide adequate response. The New York State Emergency Management Office (SEMO) coordinates emergency response activities among local, state, and federal government organizations in these cases.

Exhibit 1.1-1

State and Federal Reporting Requirements for Petroleum Spills, Leaks, and Discharges

Materials Covered	Act or Regulation	Agency to Notify	What Must Be Reported and When	Who Must Report
Petroleum from any source	Navigation Law Article 12; 17 NYCRR 32.3 and 32.4	DEC Hotline 1-800-457-7362	The notification of a discharge must be immediate, but in no case later than two hours after discharge. 1. Name of person making report and his relationship to any person which might be responsible for causing the discharge. 2. Time and date of discharge. 3. Probable source of discharge. 4. The location of the discharge, both geographic and with respect to bodies of water. 5. Type of petroleum discharges. 6. Possible health or fire hazards resulting from the discharge. 7. Amount of petroleum discharged. 8. All actions that are being taken to clean up and remove the discharge. 9. The personnel presently on the scene. 10. Other government agencies that have been or will be notified.	Any person causing discharge of petroleum. Owner or person in actual or constructive control must notify DEC unless that person has adequate assurance that such notice has already been given.
All aboveground petroleum and underground storage facilities with a combined storage capacity of over 1100 gallons.	ECL §17-1007; 6 NYCRR §613.8	DEC Hotline 1-800-457-7362	1. Report spill incident within two hours of discovery. 2. Also when results of any inventory, record, test, or inspection shows a facility is leaking, that fact must be reported within two hours of discovery.	Any person with knowledge of a spill, leak, or discharge.
Petroleum contaminated with PCB.	Chemical Bulk Storage Act 6 NYCRR Parts 595, 596, 597	DEC Hotline 1-800-457-7362	Releases of a reportable quantity of PCB oil.	Owner or person in actual or constructive possession or control of the substance, or a person in contractual relationship, who inspects, tests, or repairs for owner.

Exhibit 1.1-1

State and Federal Reporting Requirements for Petroleum Spills, Leaks, and Discharges (continued)

Materials Covered	Act or Regulation	Agency to Notify	What Must Be Reported and When	Who Must Report
Any liquid (petroleum included) that if released would be likely to pollute lands or waters of the state.	ECL §17-1743	DEC Hotline 1-800-457-7362	Immediate notification that a spill, release, or discharge of any amount has occurred. Owner or person in actual or constructive possession or control of more than 1,100 gallons of the liquid.	
Petroleum Discharge in violation of §311(b)(3) of the Clean Water Act	40 CFR §110.10 (Clean Water Act)	1. National Response Center (NRC) 1-800-424-8802. 2. If not possible to notify NRC, notify Coast Guard or predesignated on-scene coordinator. 3. If not possible to notify either 1 or 2, reports may be made immediately to nearest Coast Guard units, provided NRC notified as soon as possible.	Immediate notification as soon as there is knowledge of an oil discharge that violates water quality standards or causes sheen on navigable waters. Procedures for notice are set forth in 33 CFR Part 153, Subpart B, and in the National Oil and Hazardous Substances Pollution Contingency Plan, 40 CFR Part 300, Subpart E.	Person in charge of vessel or on-shore or off-shore facility.
Petroleum, petroleum by-products or other dangerous liquid commodities that may create a hazardous or toxic condition spilled into navigable waters.	33 CFR 126.29 (Ports and Waters Safety Act)	Captain of the Port or District Commander	As soon as discharge occurs, owner or master of vessel must immediately report that a discharge has occurred.	Owner or master of vessel or owner or operator of the facility at which the discharge occurred.

Exhibit 1.1-1

State and Federal Reporting Requirements for Petroleum Spills, Leaks, and Discharges (continued)

Materials Covered	Act or Regulation	Agency to Notify	What Must Be Reported and When	Who Must Report
Petroleum or hazardous substance from a vessel, on-shore or off-shore facility in violation of §311(b)(3) of the Clean Water Act.	33 CFR 153.203 (Clean Water Act)	1. NRC U.S. Coast Guard, 2100 Second Street, SW, Washington, DC 20593; 1-800-424-8802. 2. Where direct reporting not practicable, reports may be made to the Coast Guard (District Offices), the 3rd and 9th district of the EPA regional office at 26 Federal Plaza, NY, NY 10278; 1-201-548-8730. 3. Where none of the above is possible, may contact nearest Coast Guard unit, provided NRC notified as soon as possible.	Any discharger shall immediately notify the NRC of such discharge.	Person in charge of vessel or facility.

Exhibit 1.1-2

State and Federal Reporting Requirements for Hazardous Substance Spills, Leaks, and Discharges

Materials Covered	Act or Regulation	Agency to Notify	What Must Be Reported and When	Who Must Report
Any hazardous substance pursuant to Article 37. Does not include petroleum.	Chemical Bulk Storage Act 6 NYCRR Parts 595, 596, 597; ECL 40-0113(d)	DEC Hotline 1-800-457-7362	Releases of a reportable quantity of a hazardous substance.	Owner or person in actual or constructive possession or control of the substance, or a person in contractual relationship, who inspects, tests, or repairs for owner.
Hazardous materials or substances as defined in 49 CFR §171.8 that are transported. (See federal reporting requirements.)	Transportation Law 14(f); 17 NYCRR 507.4(b)	Local fire department or police department or local municipality	Immediate notification must be given of incident in which any of the following occurs as a direct result of a spill of hazardous materials: 1. Person is killed. 2. Person receives injuries requiring hospitalization. 3. Estimated damage to carrier or other property exceeds $50,000. 4. Fire, breakage, spillage, or suspected contamination due to radioactive materials. 5. Fire, breakage, spillage, or suspected contamination involving etiologic agents. 6. Situation is such that, in the judgment of the carrier, a continuing danger to life or property exists at the scene of the incident.	All persons and carriers engaged in the transportation of hazardous materials.

Exhibit 1.1-2
State and Federal Reporting Requirements for Hazardous Substance Spills, Leaks, and Discharges
(continued)

Materials Covered	Act or Regulation	Agency to Notify	What Must Be Reported and When	Who Must Report
Hazardous materials (wastes included) that are transported, whose carrier is involved in an accident.	Department of Transportation Regulations 49 CFR 171.15; 17 NYCRR Part 924; 17 NYCRR Part 507	1. U.S. Department of Transportation 1-800-424-8802 2. DEC Hotline 1-800-457-7362 3. Rail Carrier On-Duty 518-457-1046 Off-Duty 518-457-6164 4. Notify local police or fire department.	Notice should be given by telephone at the earliest practicable moment and should include: 1. Name of reporter. 2. Name and address of carrier represented by reporter. 3. Phone number where reporter can be contacted. 4. Date, time, and location of incident. 5. The extent of injuries, if any. 6. Classification, name and quantity of hazardous materials involved, if available. 7. Type of incident and nature of hazardous material involved and whether a continuing danger to life exists at scene. 8. Each carrier making this report must also make the report required by §171.16.	Each carrier that transports hazardous materials involves in an accident that causes any of the following as a direct result: 1. A person is killed 2. A person receives injuries requiring hospitalization 3. Estimated damage to carrier or other property exceeds $50,000 4. Fire, breakage, spillage, suspected or otherwise involving radioactive material. 5. Fire, breakage, spillage, suspected contamination involving etiologic agents. 6. Situation is such that carrier thinks it should be reported in accordance with paragraph b.

Exhibit 1.1-2
State and Federal Reporting Requirements for Hazardous Substance Spills, Leaks, and Discharges
(continued)

Materials Covered	Act or Regulation	Agency to Notify	What Must Be Reported and When	Who Must Report
Reportable quantity of a hazardous substance into navigable waters or adjoining shorelines. Substances are listed in 40 CFR 302.4.	Department of Transportation Regulations 49 CFR §171.16 as authorized by the Hazardous Materials Transportation Act	U.S. Coast Guard National Response Center (NRC), 1-800-424-8802 or 1-202-267-2675	As soon as person in charge becomes aware of a spill incident, he must notify NRC and provide the following information: 1. The information required by 49 CFR §171.15 (see above). 2. Name of shipper of hazardous substance. 3. Quantity of hazardous substance discharged, if known. 4. If person in charge is incapacitated, carrier shall make the notification. 5. Estimate of quantity of hazardous substance removed from the scene and the manner of disposition of any unremoved hazardous substance shall be entered in Part (H) of the report required by 49 CFR 171.16 (see above).	Person in charge of aircraft, vessel, transport vehicle, or facility. Must inform NRC directly, or indirectly through carrier.
Reportable quantity of a hazardous substance from vessel, on-shore or off-shore facility. Substances and requirements specified in 40 CFR §117.3.	40 CFR §117.21 as authorized under the FWPCA	NRC 1-800-424-8802. If not practicable report may be made to the Coast Guard (3rd or 9th Districts) District Offices or to EPA, designated On-Scene Coordinator, Region II, 26 Federal Plaza, NY, NY 10278; 1-201-548-8730	Immediate notification is required.	Person in charge of vessel, or on-shore or off-shore facility

Exhibit 1.1-2
State and Federal Reporting Requirements for Hazardous Substance Spills, Leaks, and Discharges (continued)

Materials Covered	Act or Regulation	Agency to Notify	What Must Be Reported and When	Who Must Report
Facilities where a hazardous chemical is produced, used, or stored, and there is a reportable quantity of any extremely hazardous substance as set out in Appendix A to 40 CFR 355 or a CERCLA hazardous substance as specified in 40 CFR 302.4. (This section does not apply to a release that does not go beyond the facility, that emanates from a facility that is federally permitted, is continuous as defined under §103(f) of CERCLA or to any release exempt from CERCLA §103(a) reporting under §101(22) of CERCLA.)	40 CFR 355.40 (SARA) Releases of CERCLA Hazardous Substances are subject to release reporting requirements of CERCLA §103, codified at 40 CFR Part 302, in addition to being subject to the requirements of this Part.	Community emergency coordinator for the local emergency planning committee of any area likely to be affected and the State Emergency Response Commission of any state likely to be affected by the release. If there is no local emergency planning commission notification shall be made to relevant local emergency response personnel.	Immediately notify agencies at left and provide the following information when available: 1. Chemical name or identity of any substance involved in the release. 2. Indication of whether the substance is an extremely hazardous substance. 3. An estimate of the quantity released. 4. Time and duration of release. 5. Medium or media into which the release occurred. 6. Known health risks associated with emergency and where appropriate advice regarding medical attention for those exposed. 7. Proper precautions/actions that should be taken, including evacuation. 8. Names and telephone numbers of person to be contacted for further information. As soon as practicable after release, followup notification by providing the following information: 1. Actions taken to respond to and contain the release. 2. Health risks. 3. Advice on medical attention for exposed individuals.	Owner or operator of facility

Exhibit 1.1-2
State and Federal Reporting Requirements for Hazardous Substance Spills, Leaks, and Discharges
(continued)

Materials Covered	Act or Regulation	Agency to Notify	What Must Be Reported and When	Who Must Report
Hazardous liquids transported in pipelines, a release of which results in any circumstances as set out in 195.50(a) through (f). Also any incident that results in circumstances listed in 195.52(g).	49 CFR 195.50, 195.52 and 195.54 (Hazardous Liquid Pipeline Safety Act).	NRC, 1-800-424-8802	Notice must be given at the earliest practicable moment and the following information provided: 1. Name and address of the operator. 2. Name and telephone number of the reporter. 3. Location of the failure. 4. The time of the failure. 5. The fatalities and personal injuries, if any. 6. All other significant facts known by the operator that are relevant to the cause of the failure or extent of the damages.	Operator of system.
Hazardous wastes in transport	40 CFR §263.30(a) (RCRA)	1. Local authorities 2. If required by 49 CFR 171.15, notify the NRC at 1-800-424-8802 or 1-202-426-2675 3. Report in writing to Director of Hazardous Materials Regulations, Materials Transportation Bureau, Department of Transportation, Washington, DC 20590	Notification must be immediate. For discharge of hazardous waste by air, rail, highway, or water, the transporter must: 1. Give notice as in 49 CFR 161.15 (if applicable). 2. Report in writing as in 49 CFR 171.16. Wastes transporter (bulk shipment) must give same notice as required by 33 CFR 153.20.	Transporter by air, rail, highway, or water.

Exhibit 1.1-2
State and Federal Reporting Requirements for Hazardous Substance Spills, Leaks, and Discharges
(continued)

Materials Covered	Act or Regulation	Agency to Notify	What Must Be Reported and When	Who Must Report
Vinyl Chloride from any manual vent valve, or polyvinyl chloride plants	Clean Air Act 40 CFR 61.64	Administrator of EPA	Within 10 days of any discharge from any manual vent valve, report must be made, in writing, and the following information provided: 1. Source, nature and cause of the discharge 2. Date and time of the discharge 3. Approximate total vinyl chloride loss during discharge 4. Method used for determining loss 5. Action taken to prevent the discharge 6. Measures adopted to prevent future discharges.	Owner or operator of plant.
Radioactive Materials	6 NYCRR §380.7	Commissioner of DEC	1. Notify immediately by telephone when concentration, averaged over a 24-hour period, exceeds or threatens to exceed 5000 times the limits set forth in Schedule 2 of 380.9 (in uncontrolled areas). 2. Notify within 24 hours by telephone when concentration, averaged over 24- hour period, exceeds or threatens to exceed 500 times the limits set forth in Schedule 2 above (in uncontrolled areas). 3. Report within 30 days the concentration and quantity of radioactive material involved, the cause of the discharge, and corrective steps taken or planned to ensure no recurrence of the discharge.	Operator of the radiation installation.

Exhibit 1.1-2
State and Federal Reporting Requirements for Hazardous Substance Spills, Leaks, and Discharges
(continued)

Materials Covered	Act or Regulation	Agency to Notify	What Must Be Reported and When	Who Must Report
Low Level radioactive wastes in transport. Any suspected or actual uncontrolled releases.	6 NYCRR 381.16 ECL §27-0305 Waste Transporter Permits	DEC and Department of Health	Immediate notification.	Transporter

TECHNICAL

FIELD GUIDANCE

SPILL REPORTING AND INITIAL NOTIFICATION ENFORCEMENT OF SPILLER RESPONSIBILITY

NOTES

Spill Reporting and Initial Notification -
Enforcement of Spiller Responsibility

GUIDANCE SUMMARY-AT-A-GLANCE

Use the "Notification Procedures Checklist" (Exhibit 1.1-3) to document conversations with the responsible party or potentially responsible party (PRP/RP) concerning his or her clean-up responsibilities.

The steps to follow when you inform the PRP/RP of his or her legal responsibility are:

-- Give your name and identify yourself as a DEC employee;

-- Inform them that they have been identified as the party responsible for the spill;

-- Inform PRP/Rps of their liability for all clean-up and removal costs. (If necessary, cite Section 181 of the Navigation Law);

-- Ask PRP/Rps "point blank" if they will accept responsibility for the cleanup; and

-- If the PRP/RP does not accept responsibility, or does not admit to being the PRP/RP, inform him or her that DEC will conduct the cleanup and send the bill to whoever is the PRP/RP. Also inform them that a DEC-conducted cleanup could be more costly than a PRP/RP-conducted cleanup, and that the PRP/RP could face interest charges and penalties for refusing to clean up the spill.

If the PRP/RP accepts responsibility for the cleanup:

(1) Send the PRP/RP a "Spiller Responsibility Letter" (Exhibit 1.1-5) and an "Acceptance of Financial Responsibility Form" (Exhibit 1.1-6) and

(2) Send the PRP/RP an "Option Letter," which should outline the options available to the PRP/RP to clean up the spill. See Exhibit 1.1-4 for a summary of how and when to use these forms and what they may include.

NOTES

1.1.2 Spill Reporting and Initial Notification - Enforcement of Spiller Responsibility

This section provides guidance on those steps you take to inform responsible parties or potentially responsible parties (PRP/Rps) or spillers of their responsibility under state law for cleaning up spills. This guidance applies to all contacts (by phone, by mail, or in person) you have with Rps throughout the response process concerning their fulfillment of this legal responsibility. The possible consequences of an RP's refusal or inability to conduct the spill response are also discussed.

1. State Law and Policy

Under Article 12 of the Navigation Law and Article 71 of the Environmental Conservation law (ECL), those parties responsible for a petroleum release are liable for all costs associated with cleaning up the spill as well as third party damages (see Introduction-A for more information). Section 181 of the Navigation Law states:

> *Any person who has discharged petroleum shall be strictly liable, without regard to fault, for all cleanup and removal costs and all direct damages, no matter by whom sustained as defined in this section.*

There are two ways by which PRP/RPs can pay for the costs associated with cleanups. First, the PRP/RP can reimburse the state for site investigation, clean-up, and remediation costs incurred by the State Oil Spill Fund or federal Leaking Underground Storage Tank (LUST) Trust Fund. Second, the PRP/RP can assume full responsibility for the cleanup from the beginning and bear all costs throughout the clean-up process. It is DEC's policy to make every effort to have PRP/RPs pay for cleanups from the outset.[1]

To achieve PRP/RP-directed and PRP/RP-financed cleanups, your responsibilities are to: (1) identify the PRP/RP(s), (2) inform them of their legal responsibilities for the spill, and (3) ensure that they carry out these responsibilities. All investigations of spills and PRP/RPs should be pursued vigorously and without prejudice. Use to your advantage the argument that having the PRP/RP assume responsibility for clean-up costs benefits both DEC and the spiller. It saves DEC the expense of cost-recovery procedures. It also allows the PRP/RP to be more involved in clean-up decisions (e.g., choosing their clean-up contractors) and, more significantly, it usually results in lower clean-up costs. Because the PRP/RP is responsible for all indirect costs incurred if DEC conducts the cleanup, the spiller will pay for the DEC contractor's clean-up work, as well as the supervision costs incurred by DEC, any third-party claims associated with the spill, and any punitive fines levied.

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[1] Spillers are not only responsible for assuming the costs of a cleanup, but also can be subject to a $25,000 per day fine for not paying the clean-up costs (among other violations). The Navigation Law provides for these penalties in Section 192, which states:

> Any person who knowingly gives or causes to be given any false information as a part of, or in response to, any claim made pursuant to this article for cleanup and removal costs, direct or indirect damages resulting from a discharge, or who otherwise violates any of the provisions of this article or any rule promulgated thereunder or who fails to comply with any duty created by this article shall be liable to a penalty of not more than twenty-five thousand dollars for each offense in court of competent jurisdiction. If the violation is of a continuing nature each day during which it continues shall constitute an additional, separate, and distinct offense. (emphasis added)

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2. Notification Process

Part 1, Section 4, of this manual discusses the process of identifying the PRP/RP as part of the spill investigation for a particular site. Once you identify the PRP/RP, follow the guidance provided below for informing the PRP/RP of his or her responsibilities for spill cleanup. If you are uncertain about who the PRP/RP is, apply the procedures outlined below with all suspected RPs until the responsible party or parties are identified.

a. Informing RPs of Their Responsibility at the Spill Scene

It is important to inform PRP/RPs of their legal responsibility to clean up a spill as soon as possible. When you arrive at a spill site, you should immediately inform the representative of any PRP/RP of their liability under the Navigation Law and the Environmental Conservation Law. In doing so, follow the steps covered in the "Notification Procedures Checklist" (Exhibit 1.1-3).

Document completion of the notification steps, and identify your contact(s).

> Although you should be firm and direct in informing the PRP/RP of their responsibility, you should make every attempt to avoid an adversarial relationship with the RP. The full cooperation of the PRP/RP will result in a more efficient and effective cleanup.

b. Informing Spillers of Their Responsibility in Writing

You should send three different letters to the PRP/RP to inform them of their responsibility (see Exhibit 1.1-4, "Notification Forms Summary"). If a site response was initiated and you are able to confirm the spill visually, the "Spiller Responsibility Letter" (Exhibit 1.1-5) along with an "Acceptance of Financial Responsibility Form" (Exhibit 1.1-6) should be sent as soon as possible. In addition, an "Option Letter" that informs the PRP/RP of their possible options for addressing a spill should be sent. These letters should be kept as part of the Corrective Action Plan (CAP) (see Part 1, Section 5, "Corrective Action Plans.")

Exhibit 1.1-3
Notification Procedures Checklist

Completed	Step		Date	Contact(s)
____________	1.	Give your name and identify yourself as a DEC employee.		
____________	2.	Inform the PRP/RP that he/she has been identified as the party responsible for the spill.		
____________	3.	Inform PRP/RPs of their responsibility to pay for all clean-up costs. (As necessary, cite Section 181 of the Navigation Law or Article 71 of the ECL.)		
____________	4.	Ask PRP/RPs "point blank" if they will accept responsibility for the cleanup.		
	Response: ____________________________ ____________________________ ____________________________ ____________________________ ________________________			
____________	5.	If the PRP/RP does not accept responsibility, or does not admit to being the spiller, inform him/her that DEC will conduct the cleanup and send the bill to whoever is the spiller.		
____________	6.	If the PRP/RP does not accept responsibility also inform him or her that a DEC-conducted cleanup could be more costly than a spiller-conducted cleanup, and that the spiller could face interest charges and a fine for refusing to pay for the billed clean-up costs.		

Exhibit 1-A-4

Notification Forms Summary
(Send Forms by Certified Mail)

Notification Form	When and How to Use	Information to be Included
Spiller Responsibility Letter	Send by certified mail to PRP/RP for confirmed spill.	# Spill location; # Spiller's responsibility under the Navigation Law; # Penalties that can be levied if the spiller does not cooperate; and # Deadline for spiller to begin containment and removal of the spill.
Acceptance of Spiller Responsibility Form	Send by certified mail to PRP/RP for confirmed spill.	# Request for spiller's signature acknowledging his or her acceptance of responsibility for the spill cleanup.
Option Letter	Send by certified mail to PRP/RP for confirmed or suspected release (e.g., failed tightness test).	# Spill number; # Date spill was discovered or reported; # Exact location of the spill; # Authority of Article 12 of the Navigation Act; and # Penalties for noncompliance.

Exhibit 1.1-5

Spiller Responsibility Letter

[Date]

[Addressee]
[Address]

Dear [   ]:

This is to inform you that as a result of investigation by our Department, we consider you responsible for Petroleum Spill Number __________, dated _______, at ____________________________. Under Article 12 of the Navigation Law, Section 192, any person who discharges petroleum without a permit and fails to promptly clean up such prohibited discharge may be subject to a penalty of up to $25,000 a day.

Containment and removal of this spill must be initiated within _____ hours.

Your failure to initiate timely spill cleanup and removal, in addition to the penalty stated above, will result in your being billed for all actual costs incurred by New York State as set forth in Section 181 of the Navigation Law. These costs include cleanup and removal, all direct and indirect damages, including damages incurred by third parties.

Sincerely,

Regional Spill Engineer
Region

Exhibit 1.1-6
Acceptance of Spiller Responsibility Letter

[Date]

SPILL #_________

ACCEPTANCE OF FINANCIAL RESPONSIBILITY

___________________________, hereby assumes responsibility for containment and
(Name of Company and Person)

cleanup of _______________ discharged from_______________________
(Substance) (Source)

on _______, and recognizes that the determination of the adequacy and propriety of
(Date)

the containment and cleanup operation continues to rest with the New York State

Department of Environmental Conservation On-Scene Coordinator.

____
(Authorized Signature and Title)

____
(Name and Title Printed)

____
(Address of Company)

____
(Date and Time)

____
(Witness)

NOTES

The "Spiller Responsibility Letter" informs spillers of their responsibility under the Navigation Law and explains the penalties that can be levied if the spiller does not cooperate. It should be sent to the spiller or suspected spiller as soon as a petroleum spill has been confirmed. The letter notifies the spiller that he or she is required to initiate containment and removal of the spill within a period of time you specify.

There are at least three factors you should consider when specifying a deadline in this letter:

- # The size and nature of the spill;

- # The proximity of the spill to, or its possible effects on, water supplies (surface or ground water), nearby homes and other structures, and/or sensitive environmental areas; and The possible environmental, safety, and/or human health effects of delaying containment and removal.

The "Acceptance of Spiller Responsibility Form" requires the spiller's signature acknowledging his or her responsibility for containment and cleanup of the spill. This form and the "Spiller Responsibility Letter" should be sent by certified mail.

The "Option Letter" outlines the possible options available to the PRP/RP for cleanup of the spill. The contents of this letter can vary somewhat depending on how the release was discovered (e.g., through a complaint or a failed tightness test), the extent and type of spill, and the policies and procedures of your regional office. There is, however, some information that should appear in every "Option Letter." All "Option Letters" should contain the following: spill number, date the spill was discovered, and exact location of the spill. In addition, the letter should cite the response authority provided DEC by Article 12 of the Navigation Act and describe the penalties for noncompliance.

Each "Option Letter" should outline clearly the options open to the PRP/RP to address the spill and the information you wish submitted, and may also specify certain deadlines for taking action. However, it is up to you to determine the particular options, information requirements, and dates you include in the letter. Depending on the circumstances, you may list in your letter one or several options from which the PRP/RP can choose. For example, when an UST fails an initial tank test the following options could be included:

- # Conduct separate integrity tests on the piping and the tanks in order to verify the release source within the tank system.

- # Remove the "non-tight" tank and either remove and dispose of all contaminated soils, or install monitoring wells.

NOTES

- # Install monitoring wells and abandon the "non-tight" tank in-place.

- # Remove the tank within 30 days, according to the requirements for tank removal (outline these requirements in the letter).

The "Option Letter" should always be sent by certified mail. In addition, you should have the PRP/RP inform you as soon as possible about the option(s) he or she has chosen.

Several examples of possible "Option Letters" are included as Exhibits 1.1-7 through 1.1-12. These are provided as examples only; you should use "Option Letters" developed by your own office, or develop your own.

Exhibit 1.1-7 is a sample option letter to an PRP/RP for removal of contaminated soil from an UST release. Note that this option letter includes: (a) specific requirements for removal of the contaminated soil; (b) dates for when the removal must be completed, and (c) requirements for the PRP/RP to forward to DEC copies of the landfill disposal receipt and ample test results. The additional sample option letters apply to the following situations: when an UST has failed an initial tightness test (Exhibit 1.1-8), when an UST fails an isolation tank test (Exhibit 1.1-9), when an UST fails a Petro-tite Systems Test (Exhibit 1.1-10), and ground-water contamination cleanup (Exhibit 1.1-11).

3. Dealing with Uncooperative Spillers

There are generally two ways in which an PRP/RP may fail to fulfill his or her legal responsibilities for spill cleanup: (1) a PRP/RP may refuse from the beginning to accept responsibility, or (2) an PRP/RP may fail to conduct a cleanup in the manner, or in as timely a fashion, as agreed upon with the DEC. If a PRP/RP refuses to cooperate from the outset, try again to change the RP's mind. Send additional notices of spiller responsibility (Exhibit 1.1-12) and/or initiate phone conversations with PRP/RPs to inform them again of the consequences of not cooperating (i.e., higher clean-up costs and possible penalties). If a party claims not to be the PRP/RP, you should inform them of your reasons for believing they are the PRP/RP under the Navigation Law.

If a PRP/RP agrees to conduct and pay for the cleanup and then does not proceed in the manner agreed upon or as quickly as agreed upon, you should inform the PRP/RP immediately that you are dissatisfied with the progress of the cleanup and that DEC is considering taking it over. There are no hard-and-fast rules for deciding when you should take over a cleanup. If possible, you should always work toward having the PRP/RP continue the cleanup in the agreed-upon manner. Attempt to determine why the cleanup is not proceeding as planned and consider means of helping the PRP/RP-directed cleanup get back on track.

Exhibit 1.1-7

Sample Option Letter:
Soil Cleanup Spill

[Date]

[Addressee]
[Address]

Dear [ ]:

This letter is to confirm your - (site meeting) (telephone conversation) with _____________ of this Department on ___________________________,
(Name) (day) (date) (year)
in regards to the above-mentioned spill site. This site involves ___________________________
(explanation)

The following items were discussed and agreed upon:

1. All contaminated material must be removed and stored on site until it can be properly disposed of at a properly permitted landfill.

2. All contaminated material must be sampled for ____ ____________________________________. The results must be
(analyses)
negative for the material to be considered non-hazardous oily debris. You must contact your selected sanitary landfill to verify the sample analyses that they require for disposal.

3. A hauler with a Part 364 permit must be used to haul the contaminated soil to your selected landfill.

4. Please notify this Department after the work is completed but prior to any backfilling of the spill area so that an inspection of the excavation may be made.

5. Please forward to us a copy of the landfill disposal receipt and the sample results.

A schedule for this work is required by ______________________________.
(day) (date) (year)
Cleanup must be performed by no later than ______________________________.
(day) (date) (year)

If you have any questions, please feel free to contact ___________________________________
(Name)
at 847-4590. Your cooperation will be appreciated.

Very truly yours,

Senior Sanitary Engineer

Exhibit 1.1-8

Sample Option Letter:
Initial Tank Failure

[Date]

[Addressee]
[Address]

Dear [ ]:

This Department received notification on ______________________that (a)
(day) (date) (year)
_______________________tank(s) failed its (their) tank test performed by
(gallons) (product stored)
_____________. On _________, Mr._____________of this Department
(contractor) (date) (name)
discussed with __________ that one of the following options must be done concerning this tank.
(person)

OPTION 1:

1. The tank is to be immediately isolated from the piping and is to be retested. If the tank tests tight, it may remain in service.
2. The lines are to be repaired, if necessary, and retested by a state-approved method. Exposed piping may be air tested.
3. A copy of any test results are to be sent to this office.

OPTION 2: If the tank fails the retest, or if you decide not to retest, the following must now be done:

1. All product must be immediately removed from the tank.
2. The tank itself must be removed within thirty days. A Petroleum Bulk Storage form must be submitted to this Department prior to tank removal.
3. The interior surface of the tank must be cleaned, and all sludge and residue generated by this process must be properly disposed. The tank must be cut open to allow for this work and to ensure proper ventilation of the tank interior.
4. All safety precautions regarding the opening, cleaning and entering of the tank must be followed. The interior atmosphere of the tank may be explosive and proper procedures must be followed.
5. Once the tank has been cleaned out, it may be disposed as scrap.

Mr.________must be notified when you have a firm date for retesting or removal. Please note, we must be present when this tank is removed to determine if any groundwater or soil contamination exists. If groundwater or soil contamination is found, further remedial work will be required.

If you have any questions, please contact_________ at 847-4590. Your cooperation will be appreciated.

Sincerely,

[ ]

Exhibit 1.1-9

Sample Option Letter:
Retest Failure, Tank Removal

[Date]

[Addressee]
[Address]

Dear [ ]:

On____________________, a ______gallon ________________, underground store storage tank at the
(day) (date) (year) (#) (material)
above-mentioned address failed a system tank test. On____________________, this tank failed an isolation tank test.
(day) (date) (year)
Since the tank failed the retest, the following must now be done:

1. All product must be immediately removed from the tank.

2. The tank itself must be removed within thirty days. A Petroleum Bulk Storage form (enclosed) must be submitted to this Department prior to tank removal.

3. The interior surface of the tank must be cleaned, and all sludge and residue generated by this process must be properly disposed. The tank must be cut open to allow for this work and to ensure proper ventilation of the tank interior.

4. All safety precautions regarding the opening, cleaning and entering of the tank must be followed. The interior atmosphere of the tank may be explosive and proper procedures must be followed.

5. Once the tank has been cleaned out, it may be disposed as scrap.

____________________of this Department must be notified when you have a firm
(Name)
date for removal. We must be present when this tank is removed to determine if any groundwater or soil contamination exists. If groundwater or soil contamination is found, further remedial work will be required.

For your use, enclosed is a list of contractors that are known by this Department to do this type of work. This list is by no means complete. Any contractor may be used by you for this work.

If you have any questions, please feel free to call ________________________at 847-4590.
(Name)
Your cooperation will be appreciated.

Sincerely,

[ ]

Exhibit 1.1-10

Sample Option Letter:
Failed Tank Test

[Date]

CERTIFIED - RETURN RECEIPT REQUESTED

[Addressee]
[Address]

RE: Spill No.

Gentlemen:

This office has been informed by (Name) that (tank) failed a Petrotite systems test. In accordance with Article 12 of the New York State Navigation Law, I must determine if there has been any harm to the lands or the groundwater of the State. In order for me to make this determination, you have three options:

1. Prove that it was not a leaking tank by removing all the piping from the tank and separately Petrotite test the tank. If the tank passes the Petrotite test, it is a piping leak. The tank may then be abandoned or the piping can be repaired, attached to the tank, and the system Petrotite tested.

2. Excavate and remove the tank in the presence of a representative from this office so that an inspection of the tank and the soil can be made. If the tank is sound, and there is no evidence of product loss, nothing further need be done. If there is a problem, proceed as in 3 below.

3. Abandon the tank in-place and install several four (4) inch diameter PVC site wells extending five (5) feet into the groundwater with a screen length of ten (10) feet, with slot size of .020 inches. The exact location and number of wells will be determined by a representative from this office. These wells will be checked for a period of twelve months by New York State, and if there is no evidence of product for that period, the spill will be removed from our listing. If free or dissolved product appears, cleanup must begin immediately.

If cleanup does not begin by (Date) by the responsible party, the State will begin the cleanup and bill the responsible party.

Sincerely,

[ ]

Exhibit 1.1-11

Sample Option Letter:
Ground-water Cleanup

[Date]

[Addressee]
[Address]

Dear [ ]:

This letter is to confirm your (site meeting) (telephone conversation) with (Name) of this Department on (day) (date) (year). Groundwater at this spill site is contaminated with (free floating oil) (dissolved oil components). The following items were discussed and agreed upon:

1. (#) additional four-inch monitoring wells will be installed at the agreed upon locations. A sketch of a typical monitoring well is enclosed for your use.

2. One recovery well will be installed to recover oil product. Groundwater must be pumped to depress the groundwater table. The groundwater must be pumped to an oil-water separator tank. Accumulated oil may be recovered from the well by bailing or by a second pump. A second type of recovery well pumps both oil and water to a separator tank. Oil from the tank is then recovered. You should check with your contractor to determine the best method for the recovery well. Groundwater must be pumped to depress the groundwater table.

3. The discharge water must be sampled for (Contaminates). Dependent upon the sampling results, it may be discharged with a SPDES permit to (Name). The water must at all times be sheenless. An air stripper or a carbon filter may be necessary for the discharge water.

4. All collected oil must be properly disposed. Copies of receipts indicating the disposal site must be forwarded to this office.

It was also agreed that these actions be completed by (Date). Should you have any questions, please do not hesitate to contact (Name) at 847-4590. Your cooperation will be appreciated.

Sincerely,

[ ]

Exhibit 1.1-12

Sample Option Letter:
Soil Disposal, Soil Still On Site

[Date]

[Addressee]
[Address]

Dear [ ]:

A recent inspection by___(Name)_______of this office indicated that the contaminated soil at your facility still remains on site. We are requesting this oil be removed by__(day)__(date)__(year)_to an acceptable landfill. Please send a copy of the disposal receipt to this office.

If you cannot remove the soil by that date, please contact this office immediately. If you do not contact this office and the soil still remains on site past_ (Date)_, DEC will have the soil removed from your site. You will then be billed for the costs of removal and disposal as well any relevant penalties.

If you have any questions, please feel free to contact__(Name)________at 847-4590. Your cooperation will be appreciated.

Very truly yours,

Senior Sanitary Engineer

NOTES

If all efforts to encourage a PRP/RP to continue the cleanup fail, send a certified letter (Exhibit 1.1-13) notifying them that their actions have been unsatisfactory and that DEC will assume responsibility for the cleanup. This letter again informs the PRP/RP of his or her liability for all costs incurred by DEC during its cleanup.

Exhibit 1.1-13

Unsatisfactory Cleanup Notice Letter

[Date]

CERTIFIED MAIL SPILL #

[Addressee]
[Address]

Dear Sir:

My letter of (Date) notified you of New York State's interest in a pollution incident for which you are presently considered responsible.

You are hereby given notice that your actions to remove the pollutant and mitigate its effects have been evaluated as unsatisfactory. Effective (Date), the New York State Department of Environmental Conservation will conduct all cleanup activities under the authority of Article 12 of the Navigation Law. Removal will be effected in accordance with the regulations of the Department of Environmental Conservation. You will be billed for all actual costs incurred by New York State as set forth in Section 181 of the Navigation Law, as well as interest and penalties.

Should you require further information concerning this matter, contact: (Name) .

Sincerely,

[ ]

Received and Acknowledged

______________________ ____________ ____________
Time Date

TECHNICAL

FIELD GUIDANCE

SPILL REPORTING AND INITIAL NOTIFICATIONS - ACCESS AND RIGHT-OF-ENTRY

NOTES

Spill Reporting and Initial Notifications - Access and Right-of-Entry

GUIDANCE SUMMARY AT-A-GLANCE

Section 178 of the Navigation Law gives you the authority to enter private property to investigate or clean up a suspected spill.

In general, you should inform the property owner of your right to enter onto private property and obtain consent from the owner. This consent can be either written or verbal.

Detailed information and procedures for access and right-of-entry is considered confidential for spill responders. This information is contained in Appendix L, and is marked confidential.

NOTES

1.1.3 Access and Right-of-Entry

This section addresses the right of NYSDEC personnel to enter private property on which a spill has occurred or is suspected, for the purpose of investigating, containing, and/or cleaning up the spill. Detailed information and procedures of access and right-of-entry are considered confidential. Therefore, this information can be found in Appendix L, including your legal rights to enter property and the procedures to follow to ensure that no charges of trespassing are brought against the Department.

1. State Law and Policy

   You have the authority, under the Navigation Law, to enter property to investigate or clean up a real or suspected spill. Specifically, Section 178 of the Navigation Law states:

   > *The department is hereby authorized to enter and inspect any property or premises for the purpose of inspecting facilities and investigating either actual or suspected sources of discharges or violation of this article or any rule or regulations promulgated pursuant to this article. The department is further authorized to enter on property or premises in order to assist in the cleanup or removal of the discharge. Any information relating to secret processes or methods of manufacture shall be kept confidential.*

   In any emergency or non-emergency, you must possess information supporting a reasonable belief to suspect that a spill has occurred or is occurring, or that the spill is impacting the premises for which access is sought. A reasonable belief may be based on a report of a spill or visual observation. For example, if a gasoline station operator reports an unexpected loss of product from his underground storage tanks that are located near private household wells, you might want to investigate those wells and check the water.

   Although you have the authority to enter the premises, *it is always advisable to obtain the consent of the property owner or his or her agent before entering the property.* This consent can be either written or verbal. Obtaining this consent may help avoid civil or criminal charges for trespass being logged. In cases where the owner/agent is not available or not ascertainable, entry should be made.

New York State
DEPARTMENT OF ENVIRONMENTAL CONSERVATION

Division of Water

Deep-Ripping and Decompaction

April 2008

New York State
Department of Environmental Conservation

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NYS Dept. of Agriculture & Markets)

Alternative Stormwater Management
Deep-Ripping and Decompaction

Description

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

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

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

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

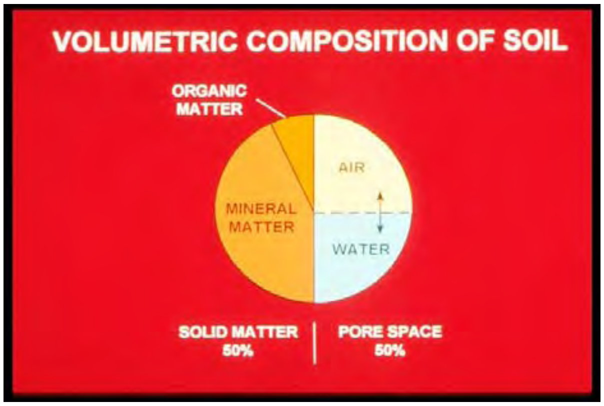

Fig. 2. About 50% of the volume of undisturbed loam surface soil is pore space, when soil is in good condition for plant growth. Brady, 2002.

Recommended Application of Practice

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

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

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

Benefits

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

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

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

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

Feasibility / Limitations

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

Soil

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

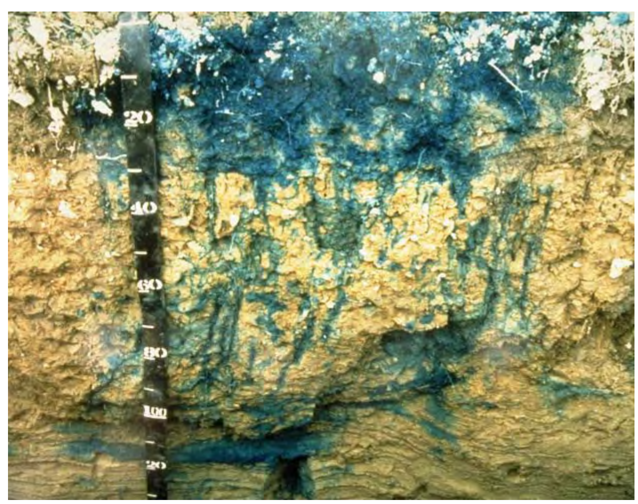

Fig. 4. Profile (in centimeters) displaying the infiltration test result of the natural undisturbed horizons of a soil in Hydrologic Soil Group C.

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

Publications:

- American Society of Agricultural Engineers. 1971. *Compaction of Agricultural Soils.* ASAE.

- Brady, N.C., and R.R. Weil. 2002. *The Nature and Properties of Soils. 13th ed.* Pearson Education, Inc.

- Baver, L.D. 1948. *Soil Physics.* John Wiley & Sons.

- Carpachi, N. 1987 (1995 fifth printing). *Excavation and Grading Handbook, Revised. 2nd ed.* Craftsman Book Company
- Ellis, B. (Editor). 1997. Safe & Easy Lawn Care: The Complete Guide to Organic Low Maintenance Lawn. Houghton Mifflin.

- Harpstead, M.I., T.J. Sauer, and W.F. Bennett. 2001. *Soil Science Simplified. 4th ed.* Iowa State University Press.

- Magdoff, F., and H. van Es. 2000. *Building Soils for Better Crops. 2nd ed.* Sustainable Agricultural Networks

- McCarthy, D.F. 1993. *Essentials of Soil Mechanics and Foundations, Basic Geotechnics 4th ed.* Regents/Prentice Hall.

- Plaster, E.J. 1992. *Soil Science & Management. 3rd ed.* Delmar Publishers.

- Union Gas Limited, Ontario, Canada. 1984. *Rehabilitation of Agricultural Lands, Dawn-Kerwood Loop Pipeline; Technical Report*. Ecological Services for Planning, Ltd.; Robinson, Merritt & Devries, Ltd. and Smith, Hoffman Associates, Ltd.

- US Department of Agriculture in cooperation with Cornell University Agricultural Experiment Station. Various years. *Soil Survey of (various names) County, New York.* USDA.

Internet Access:

- Examples of implements:

V-Rippers. Access by internet search of *John Deere Ag -New Equipment for 915* (larger-frame model) *V-Rippe*; and, *for 913* (smaller-frame model) *V-Ripper*. Deep, angled-leg subsoiler. Access by internet search of: 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

Miscellaneous Forms
-SWPPP Preparer Certification
-MS4 SWPPP Acceptance Form
-Construction Site Inspection and Maintenance Log Book
-Notice of Intent
-CONR 5 (Contractor/Subcontractor SPDES Certification)
MURK 6, 6-1, 6-2 (SPDES Stormwater Inspection Report)
-CONR 8 (SWPPP Revision)
-HC 209 (Notice to Disturb Greater than 5 Acres of Soil)
-HC 210 (Notice to Reduce Frequency of SPDES Site Inspections)
-Notice of Termination

NEW YORK STATE OF OPPORTUNITY | Department of Environmental Conservation

SWPPP Preparer Certification Form

SPDES General Permit for Stormwater Discharges From Construction Activity (GP-0-15-002)

Project Site Information

Project/Site Name

Ashokan Station Trailhead

Owner/Operator Information

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

NYCDEP

Certification Statement – SWPPP Preparer

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	MI	Last Name
Brendan		Fitzgerald

Signature

Date

NEW YORK STATE OF OPPORTUNITY | Department of Environmental Conservation

Owner/Operator Certification Form

SPDES General Permit For Stormwater Discharges From Construction Activity (GP-0-15-002)

Project/Site Name: ______________________________

eNOI Submission Number: ______________________________

eNOI Submitted by: ☐ Owner/Operator ☐ SWPPP Preparer ☐ Other

Certification Statement - Owner/Operator

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.

Owner/Operator First Name M.I. Last Name

____
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:
2. Contact Person:
3. Street Address:
4. City/State/Zip:
II. Project Site Information
5. Project/Site Name:
6. Street Address:
7. City/State/Zip:
III. Stormwater Pollution Prevention Plan (SWPPP) Review and Acceptance Information
8. SWPPP Reviewed by:
9. Title/Position:
10. Date Final SWPPP Reviewed and Accepted:
IV. Regulated MS4 Information
11. Name of MS4:
12. MS4 SPDES Permit Identification Number: NYR20A
13. Contact Person:
14. Street Address:
15. City/State/Zip:
16. Telephone Number:

MS4 SWPPP Acceptance Form - continued

V. Certification Statement - MS4 Official (principal executive officer or ranking elected official) or Duly Authorized Representative
I hereby certify that the final Stormwater Pollution Prevention Plan (SWPPP) for the construction project identified in question 5 has been reviewed and meets the substantive requirements in the SPDES General Permit For Stormwater Discharges from Municipal Separate Storm Sewer Systems (MS4s). Note: The MS4, through the acceptance of the SWPPP, assumes no responsibility for the accuracy and adequacy of the design included in the SWPPP. In addition, review and acceptance of the SWPPP by the MS4 does not relieve the owner/operator or their SWPPP preparer of responsibility or liability for errors or omissions in the plan.
Printed Name:
Title/Position:
Signature:
Date:
VI. Additional Information

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

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 <u>Construction Activity</u> 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)
NYC Dept of Environmental Protection

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

Owner/Operator Contact Person First Name
Charlie

Owner/Operator Mailing Address
71 Smith Avenue

City
Kingston

State
NY

Zip
12401 -

Phone (Owner/Operator)
845 - 340 - 7218

Fax (Owner/Operator)
 - -

Email (Owner/Operator)
claing@dep.nyc.gov

FED TAX ID
 - (not required for individuals)

6401089828

Project Site Information

Project/Site Name
Ashokan Rail Trail Trailhead

Street Address (NOT P.O. BOX)
3040 Route 28

Side of Street
○ North ● South ○ East ○ West

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

State	Zip	County	DEC Region
NY	12416 -	Ulster	3

Name of Nearest Cross Street
Mountain Road

Distance to Nearest Cross Street (Feet)
200

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)
566454	4647300

2. What is the nature of this construction project?

● **New Construction**

○ **Redevelopment with increase in impervious area**

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

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

Pre-Development Existing Land Use

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

Post-Development Future Land Use

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

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

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

Total Site Area	Total Area To Be Disturbed	Existing Impervious Area To Be Disturbed	Future Impervious Area Within Disturbed Area
1.5	1.4	0.0	0.6

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
%	80 %	%	20 %

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

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

Start Date 06/01/2019 – **End Date** 11/30/2019

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

Name

Stream outletting to Ashokan Reservoir

9a. Type of waterbody identified in Question 9?

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

9b. How was the wetland identified?

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

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

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

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

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

____._

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

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

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

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

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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
HVEA Engineers

Contact Name (Last, Space, First)
Gorton, Jack

Mailing Address
560 Route 52 Suite 201

City
Beacon

State NY Zip 12508 -

Phone 845-838-3600 Fax - -

Email
jgorton@hveapc.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 Jack **MI**

Last Name Gorton

Signature

Date 03/07/2019

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

0.078 **acre-feet**

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

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

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

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

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

RR Techniques (Volume Reduction)	Total Contributing Impervious Area (acres)
● Vegetated Swale (RR-5)	0.600
○ 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)	0.600
○ 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)	0.600
○ Extended Detention Wetland (W-2)	.
○ Pond/Wetland System (W-3)	.
○ Pocket Wetland (W-4)	.
● Wet Swale (O-2)	0.600

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

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

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

Name

Manufacturer

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

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

Total RRv provided

0.034 **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

0.030 **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

0.085 **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). 0.119

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**
0.027 **acre-feet**	0.028 **acre-feet**

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

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

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

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

Total Overbank Flood Control Criteria (Qp)

Pre-Development	**Post-development**
3.48 **CFS**	1.98 **CFS**

Total Extreme Flood Control Criteria (Qf)

Pre-Development	**Post-development**
8.49 **CFS**	7.33 **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

NYC Dept of Environmental Protection

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

3547089826

Owner/Operator Certification

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

Print First Name **MI**

Print Last Name

Owner/Operator Signature

Date / /

CONR 5
(2/15)

Contractor / Subcontractor SPDES Permit Certification

Contract No.: ____________________ PIN: ____________________

Description: ____________________

Town, Village, City: ____________________

County: ____________________

Check Applicable Box: ☐ Prime Contractor ☐ Subcontractor

Name of Contractor/ Subcontractor: ____________________

Address: ____________________

City: ____________________ State: ________ ZIP: ________

Phone: ____________________ Fax: ____________________

Core Pay Item Groups for which the Contractor/Subcontractor will be responsible (e.g. 203, 207, 209, etc.): _____ _____ _____ _____ _____ _____ _____ _____

Mandatory Certification: The SPDES General Permit for Stormwater Discharges from Construction Activities requires the Prime Contractor and subcontractors to certify they understand the Stormwater Pollution Prevention Plan (SWPPP), the General Permit conditions, and their responsibilities for compliance. The certification must be signed prior to performing any contract work. The certification shall be signed by an Owner, Principal, President, Secretary or Treasurer of the firm in accordance with the signature requirements of 102-05 *Proposal Submission* of the Standard Specifications.

"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."

Signature: ____________________ Date: ____________________

Name: ____________________ Title: ____________________

Required Training: Effective April 30, 2010, the SPDES General Permit also requires the Prime Contractor and all subcontractors ***performing earthwork or soil-disturbing activities*** to identify at least one trained individual ***from each company*** who will be responsible for implementing the SWPPP and who shall be on-site on a daily basis when the company is performing soil disturbance activities. These activities include clearing, grubbing, grading, filling, excavation, stockpiling, demolition, landscaping, and installation and maintenance of Erosion & Sediment Control practices. Training must consist of 4 hours of NYSDEC-endorsed Erosion & Sediment Control Training every 3 years. (Training is not required if the individual is a licensed Professional Engineer, registered licensed Landscape Architect, or CPESC.) Provide the information below for trained individuals who will be on-site and responsible for SWPPP implementation on this Contract (attach a separate sheet if needed for additional Trained Individuals):

Trained Individual Name/Title : ____________________

Name of Training Course: ____________________

Trainee Number: ____________________ Date of Training: ____________

Trained Individual Name/Title : ____________________

Name of Training Course: ____________________

Trainee Number: ____________________ Date of Training: ____________

CONR 8
(03/14)

SPDES STORMWATER POLLUTION PREVENTION PLAN (SWPPP) REVISION

JOB STAMP

Date: ______________________

Day of Week: S M T W T F S

Sheet No. ____ of ____

This form is to be used when revisions to the current Stormwater Pollution Prevention Plan (SWPPP) are required by SPDES General Permit for Stormwater Discharges from Construction Activity. The completed form must be filed in the Engineer's Field Office.

Reason for the Revision(s): Revision(s) were requested by NYSDEC: ☐ Yes ☐ No

____

____

____

____

____

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____

Describe the Revision(s) to the SWPPP:

____

____

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____

Engineer-in-Charge Signature: ______________________

EICs Name & Title: ______________________

Date Completed: ______________

Copy to Contractor: ______________

APPENDIX F
CONSTRUCTION SITE INSPECTION AND MAINTENANCE LOG BOOK

STATE POLLUTANT DISCHARGE ELIMINATION SYSTEM FOR CONSTRUCTION ACTIVITIES

SAMPLE CONSTRUCTION SITE LOG BOOK

Table of Contents

I. PRE-CONSTRUCTION MEETING DOCUMENTS

Project Name ______________________________

Permit No. ______________________ **Date of Authorization** __________

Name of Operator ______________________________

Prime Contractor ______________________________

a. Preamble to Site Assessment and Inspections

The Following Information To Be Read By All Person's Involved in The Construction of Stormwater Related Activities:

The Operator agrees to have a qualified inspector[1] conduct an assessment of the site prior to the commencement of construction[2] and certify in this inspection report that the appropriate erosion and sediment controls described in the SWPPP have been adequately installed or implemented to ensure overall preparedness of the site for the commencement of construction.

Prior to the commencement of construction, the Operator shall certify in this site logbook that the SWPPP has been prepared in accordance with the State's standards and meets all Federal, State and local erosion and sediment control requirements. A preconstruction meeting should be held to review all of the SWPPP requirements with construction personnel.

When construction starts, site inspections shall be conducted by the qualified inspector at least every 7 calendar days. The Operator shall maintain a record of all inspection reports in this site logbook. The site logbook shall be maintained on site and be made available to the permitting authorities upon request.

Prior to filing the Notice of Termination or the end of permit term, the Operator shall have a qualified inspector perform a final site inspection. The qualified inspector shall certify that the site has undergone final stabilization[3] using either vegetative or structural stabilization methods and that all temporary erosion and sediment controls (such as silt fencing) not needed for long-term erosion control have been removed. In addition, the Operator must identify and certify that all permanent structures described in the SWPPP have been constructed and provide the owner(s) with an operation and maintenance plan that ensures the structure(s) continuously functions as designed.

1 Refer to "Qualified Inspector" inspection requirements in the current SPDES General Permit for Stormwater Discharges from Construction Activity for complete list of inspection requirements.
2 "Commencement of construction" means the initial removal of vegetation and disturbance of soils associated with clearing, grading or excavating activities or other construction activities.
3 "Final stabilization" means that all soil-disturbing activities at the site have been completed and a uniform, perennial vegetative cover with a density of eighty (80) percent has been established or equivalent stabilization measures (such as the use of mulches or geotextiles) have been employed on all unpaved areas and areas not covered by permanent structures.

b. Pre-construction Site Assessment Checklist
(NOTE: Provide comments below as necessary)

1. Notice of Intent, SWPPP, and Contractors Certification:

Yes No NA

[ ] [ ] [ ] Has a Notice of Intent been filed with the NYS Department of Conservation?
[ ] [ ] [ ] Is the SWPPP on-site? Where?______________________________
[ ] [ ] [ ] Is the Plan current? What is the latest revision date?_____________
[ ] [ ] [ ] Is a copy of the NOI (with brief description) onsite? Where?_______________
[ ] [ ] [ ] Have all contractors involved with stormwater related activities signed a contractor's certification?

2. Resource Protection

Yes No NA

[ ] [ ] [ ] Are construction limits clearly flagged or fenced?
[ ] [ ] [ ] Important trees and associated rooting zones, on-site septic system absorption fields, existing vegetated areas suitable for filter strips, especially in perimeter areas, have been flagged for protection.
[ ] [ ] [ ] Creek crossings installed prior to land-disturbing activity, including clearing and blasting.

3. Surface Water Protection

Yes No NA

[ ] [ ] [ ] Clean stormwater runoff has been diverted from areas to be disturbed.
[ ] [ ] [ ] Bodies of water located either on site or in the vicinity of the site have been identified and protected.
[ ] [ ] [ ] Appropriate practices to protect on-site or downstream surface water are installed.
[ ] [ ] [ ] Are clearing and grading operations divided into areas <5 acres?

4. Stabilized Construction Access

Yes No NA

[ ] [ ] [ ] A temporary construction entrance to capture mud and debris from construction vehicles before they enter the public highway has been installed.
[ ] [ ] [ ] Other access areas (entrances, construction routes, equipment parking areas) are stabilized immediately as work takes place with gravel or other cover.
[ ] [ ] [ ] Sediment tracked onto public streets is removed or cleaned on a regular basis.

5. Sediment Controls

Yes No NA

[ ] [ ] [ ] Silt fence material and installation comply with the standard drawing and specifications.
[ ] [ ] [ ] Silt fences are installed at appropriate spacing intervals
[ ] [ ] [ ] Sediment/detention basin was installed as first land disturbing activity.
[ ] [ ] [ ] Sediment traps and barriers are installed.

6. Pollution Prevention for Waste and Hazardous Materials

Yes No NA

[ ] [ ] [ ] The Operator or designated representative has been assigned to implement the spill prevention avoidance and response plan.
[ ] [ ] [ ] The plan is contained in the SWPPP on page ______
[ ] [ ] [ ] Appropriate materials to control spills are onsite. Where? _______________

II. CONSTRUCTION DURATION INSPECTIONS

a. Directions:

Inspection Forms will be filled out during the entire construction phase of the project.

Required Elements:

1) On a site map, indicate the extent of all disturbed site areas and drainage pathways. Indicate site areas that are expected to undergo initial disturbance or significant site work within the next 14-day period;

2) Indicate on a site map all areas of the site that have undergone temporary or permanent stabilization;

3) Indicate all disturbed site areas that have not undergone active site work during the previous 14-day period;

4) Inspect all sediment control practices and record the approximate degree of sediment accumulation as a percentage of sediment storage volume (for example, 10 percent, 20 percent, 50 percent);

5) Inspect all erosion and sediment control practices and record all maintenance requirements such as verifying the integrity of barrier or diversion systems (earthen berms or silt fencing) and containment systems (sediment basins and sediment traps). Identify any evidence of rill or gully erosion occurring on slopes and any loss of stabilizing vegetation or seeding/mulching. Document any excessive deposition of sediment or ponding water along barrier or diversion systems. Record the depth of sediment within containment structures, any erosion near outlet and overflow structures, and verify the ability of rock filters around perforated riser pipes to pass water; and

6) Immediately report to the Operator any deficiencies that are identified with the implementation of the SWPPP.

SITE PLAN/SKETCH

______________________________ ______________________________
Inspector (print name) **Date of Inspection**

______________________________ ______________________________
Qualified Inspector (print name) **Qualified Inspector Signature**

The above signed acknowledges that, to the best of his/her knowledge, all information provided on the forms is accurate and complete.

Maintaining Water Quality

Yes No NA
[ ] [ ] [ ] Is there an increase in turbidity causing a substantial visible contrast to natural conditions at the outfalls?
[ ] [ ] [ ] Is there residue from oil and floating substances, visible oil film, or globules or grease at the outfalls?
[ ] [ ] [ ] All disturbance is within the limits of the approved plans.
[ ] [ ] [ ] Have receiving lake/bay, stream, and/or wetland been impacted by silt from project?

Housekeeping

1. General Site Conditions

Yes No NA
[ ] [ ] [ ] Is construction site litter, debris and spoils appropriately managed?
[ ] [ ] [ ] Are facilities and equipment necessary for implementation of erosion and sediment control in working order and/or properly maintained?
[ ] [ ] [ ] Is construction impacting the adjacent property?
[ ] [ ] [ ] Is dust adequately controlled?

2. Temporary Stream Crossing

Yes No NA
[ ] [ ] [ ] Maximum diameter pipes necessary to span creek without dredging are installed.
[ ] [ ] [ ] Installed non-woven geotextile fabric beneath approaches.
[ ] [ ] [ ] Is fill composed of aggregate (no earth or soil)?
[ ] [ ] [ ] Rock on approaches is clean enough to remove mud from vehicles & prevent sediment from entering stream during high flow.

3. Stabilized Construction Access

Yes No NA
[ ] [ ] [ ] Stone is clean enough to effectively remove mud from vehicles.
[ ] [ ] [ ] Installed per standards and specifications?
[ ] [ ] [ ] Does all traffic use the stabilized entrance to enter and leave site?
[ ] [ ] [ ] Is adequate drainage provided to prevent ponding at entrance?

Runoff Control Practices

1. Excavation Dewatering

Yes No NA
[ ] [ ] [ ] Upstream and downstream berms (sandbags, inflatable dams, etc.) are installed per plan.
[ ] [ ] [ ] Clean water from upstream pool is being pumped to the downstream pool.
[ ] [ ] [ ] Sediment laden water from work area is being discharged to a silt-trapping device.
[ ] [ ] [ ] Constructed upstream berm with one-foot minimum freeboard.

Runoff Control Practices (continued)

2. Flow Spreader

Yes No NA

[ ] [ ] [ ] Installed per plan.
[ ] [ ] [ ] Constructed on undisturbed soil, not on fill, receiving only clear, non-sediment laden flow.
[ ] [ ] [ ] Flow sheets out of level spreader without erosion on downstream edge.

3. Interceptor Dikes and Swales

Yes No NA

[ ] [ ] [ ] Installed per plan with minimum side slopes 2H:1V or flatter.
[ ] [ ] [ ] Stabilized by geotextile fabric, seed, or mulch with no erosion occurring.
[ ] [ ] [ ] Sediment-laden runoff directed to sediment trapping structure

4. Stone Check Dam

Yes No NA

[ ] [ ] [ ] Is channel stable? (flow is not eroding soil underneath or around the structure).
[ ] [ ] [ ] Check is in good condition (rocks in place and no permanent pools behind the structure).
[ ] [ ] [ ] Has accumulated sediment been removed?

5. Rock Outlet Protection

Yes No NA

[ ] [ ] [ ] Installed per plan.
[ ] [ ] [ ] Installed concurrently with pipe installation.

Soil Stabilization

1. Topsoil and Spoil Stockpiles

Yes No NA

[ ] [ ] [ ] Stockpiles are stabilized with vegetation and/or mulch.
[ ] [ ] [ ] Sediment control is installed at the toe of the slope.

2. Revegetation

Yes No NA

[ ] [ ] [ ] Temporary seedings and mulch have been applied to idle areas.
[ ] [ ] [ ] 4 inches minimum of topsoil has been applied under permanent seedings

Sediment Control Practices

1. Silt Fence and Linear Barriers

Yes No NA

[ ] [ ] [ ] Installed on Contour, 10 feet from toe of slope (not across conveyance channels).
[ ] [ ] [ ] Joints constructed by wrapping the two ends together for continuous support.
[ ] [ ] [ ] Fabric buried 6 inches minimum.
[ ] [ ] [ ] Posts are stable, fabric is tight and without rips or frayed areas.

Sediment accumulation is ___% of design capacity.

Sediment Control Practices (continued)

2. Storm Drain Inlet Protection (Use for Stone & Block; Filter Fabric; Curb; or, Excavated; Filter Sock or Manufactured practices)

Yes No NA
[ ] [ ] [ ] Installed concrete blocks lengthwise so open ends face outward, not upward.
[ ] [ ] [ ] Placed wire screen between No. 3 crushed stone and concrete blocks.
[ ] [ ] [ ] Drainage area is 1acre or less.
[ ] [ ] [ ] Excavated area is 900 cubic feet.
[ ] [ ] [ ] Excavated side slopes should be 2:1.
[ ] [ ] [ ] 2" x 4" frame is constructed and structurally sound.
[ ] [ ] [ ] Posts 3-foot maximum spacing between posts.
[ ] [ ] [ ] Fabric is embedded 1 to 1.5 feet below ground and secured to frame/posts with staples at max 8-inch spacing.
[ ] [ ] [ ] Posts are stable, fabric is tight and without rips or frayed areas.
[ ] [ ] [ ] Manufactured insert fabric is free of tears and punctures.
[ ] [ ] [ ] Filter Sock is not torn or flattened and fill material is contained within the mesh sock.
Sediment accumulation ___% of design capacity.

3. Temporary Sediment Trap

Yes No NA
[ ] [ ] [ ] Outlet structure is constructed per the approved plan or drawing.
[ ] [ ] [ ] Geotextile fabric has been placed beneath rock fill.
[ ] [ ] [ ] Sediment trap slopes and disturbed areas are stabilized.
Sediment accumulation is ___% of design capacity.

4. Temporary Sediment Basin

Yes No NA
[ ] [ ] [ ] Basin and outlet structure constructed per the approved plan.
[ ] [ ] [ ] Basin side slopes are stabilized with seed/mulch.
[ ] [ ] [ ] Drainage structure flushed and basin surface restored upon removal of sediment basin facility.
[ ] [ ] [ ] Sediment basin dewatering pool is dewatering at appropriate rate.
Sediment accumulation is ___% of design capacity.

<u>Note:</u> Not all erosion and sediment control practices are included in this listing. Add additional pages to this list as required by site specific design. All practices shall be maintained in accordance with their respective standards.

Construction inspection checklists for post-development stormwater management practices can be found in Appendix F of the New York Stormwater Management Design Manual.

b. Modifications to the SWPPP (To be completed as described below)

The Operator shall amend the SWPPP whenever:

1. There is a significant change in design, construction, operation, or maintenance which may have a significant effect on the potential for the discharge of pollutants to the waters of the United States and which has not otherwise been addressed in the SWPPP; or
2. The SWPPP proves to be ineffective in:
   a. Eliminating or significantly minimizing pollutants from sources identified in the SWPPP and as required by this permit; or
   b. Achieving the general objectives of controlling pollutants in stormwater discharges from permitted construction activity; and
3. Additionally, the SWPPP shall be amended to identify any new contractor or subcontractor that will implement any measure of the SWPPP.

Modification & Reason:

HC 209
(03/14)

(●) English

( ) Metric

NOTICE TO DISTURB GREATER THAN 5 ACRES OF SOIL

SPDES General Permit for Stormwater Discharges from Construction Activity

Part II.C.3 of the SPDES General Permit for Stormwater Discharges from Construction Activity, requires written authorization from the New York State Department of Environmental Conservation (NYSDEC) prior to disturbing more than 5 AC of soil. Executive management at the New York State Department of Transportation (NYSDOT) and NYSDEC have mutually agreed that prior authorization is not required for NYSDOT contracts, provided adequate control measures are implemented and site inspections are conducted in accordance with the SPDES General Permit. The NYSDOT hereby notifies NYSDEC that more than 5 AC of soil will be disturbed at this site.

A Qualified Inspector will conduct at least 2 site inspections every 7 calendar days whenever more than 5 AC of soil has been disturbed. Inspections during this period will be separated by a minimum of 2 full calendar days.

This notification will be filed with the Stormwater Pollution Prevention Plan (SWPPP).

Contract No.: ____________ PIN: ____________

Description: ____________

Town, Village, City: ____________

County: ____________

Approximate date soil disturbance will exceed 5 AC : ____________

Total soil disturbance: ____________

Signature ____________

Name: ____________

Title: ____________

Phone: ____________

E-Mail: ____________

Date Submitted to NYSDEC: ____________

Make Form Read-Only (Cannot be undone)

HC 210
(03/14)

NOTICE TO REDUCE FREQUENCY OF SPDES SITE INSPECTIONS

SPDES General Permit for Stormwater Discharges from Construction Activity

In accordance with Part IV.C.2.c of the SPDES General Permit for Stormwater Discharges from Construction Activity, the New York State Department of Transportation hereby notifies the New York State Department of Environmental Conservation that work on this Contract will be temporarily suspended and temporary stabilization measures have been applied to all disturbed areas.

A Qualified Inspector will conduct a site inspection at least once every 30 calendar days during this period. The standard site inspection frequency will resume when construction activities re-commence.

Contract No.: ____________ PIN: ____________

Description: ____________

Town, Village, City: ____________

County: ____________

Reason for temporary suspension of work:

☐ Winter Shutdown
☐ Other ____________

Approximate date work will be suspended: ____________

Approximate date work will resume: ____________

Signature ____________

Name: ____________

Title: ____________

Phone: ____________

E-Mail: ____________

Date Submitted to NYSDEC: ____________

Make Form Read-Only (Cannot be undone)

MURK 6 (11/14) ◯ Metric ◉ English

SPDES STORMWATER INSPECTION REPORT

JOB STAMP

Date: ____________________

Day of Week: S M T W T F S

Sheet No. ____ of ____

	AM		PM	
Weather				
Temperature		° F		° F
Soil Condition				

This form is to be used on contracts covered by the SPDES General Permit for Stormwater Discharges from Construction Activity. The completed form must be filed in the Engineer's Field Office and distributed to contractors.

Reason for this Inspection:

☐ 7-calendar day inspection ☐ 30-day inspection (temporary shut-down)

☐ Second inspection in 7-calendar-day period due to soil disturbance exceeding 5 Acres

Codes for Erosion and Sediment control measures and Stormwater Management Practices to be inspected: (1) mulch, (2) seed and mulch, (3) check dams, (4) straw bales, (5) silt fence, (6) sediment trap, (7) turbidity curtains, (8) pipe slope drains, (9) drainage structure inlet protection, (10) rolled erosion control products, (11) soil stabilizers, (12) construction access/exits, (13) pipe inlet/outlet protection, (14) water diversion structures, (15) sedimentation basins, (16) coffer dams, (17) staging area, (18) stockpile stabilization, (19) Other ____________________

List ONLY those practices that require repair, maintenance, reinstallation or replacement. Attach COLOR copies of photographs to this report **with accurate date stamp** that shows the condition of practices **identified** as needing corrective action within 7 calendar days of the inspection. Attach COLOR copies of photographs to this report with **accurate date stamp** showing the condition of the practice(s) after completion of the corrective actions that document the completion of the **corrective** actions within a reasonable timeframe after the inspection.

ID	Location of Practice (Use stations or descriptions)	Practice: Code #	Practice: Temp or Perm? (T or P)	Remarks (Describe Specific Maintenance Required)(Including sediment removal, replacement, replacement or installation of practice)
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				

ID	Location of Practice (Use stations or descriptions)	Practice		Remarks (Describe Specific Maintenance Required)(Including sediment removal, replacement, replacement or installation of practice)
		Code #	Temp or Perm? (T or P)	
11				
12				
13				
14				
15				

Attach a location map showing all disturbed areas and areas stabilized since the last inspection.

Identify all locations where stormwater is discharged from the site to a Water of the U.S. (e.g. streams, lakes, wetlands, etc.) within or adjacent to the limits of construction, and all locations where stormwater exits the construction site. Describe the condition of the stormwater and the condition of the receiving waterbodies. Add Form MURK 6-2 for continuation as necessary.

	Location of Outlet (STA / OFFSET)	Type of Outlet (e.g. pipe, ditch, overland flow,etc.)	Does this discharge to a Water of the US?	Describe Runoff (if any) (e.g. clear, turbid, oily)	Describe Receiving Water (if any) (e.g. clear, turbid, oily, unknown)
1					
2					
3					

Number of Acres currently disturbed: ____________

If more than 5 Acres of soil disturbed at any one time, was NYSDEC advised? (Form HC209 may apply) ________

Describe existing deficiencies in the SWPPP. Specify for each location using row ID number from front

____
____
____
____
____
____
____
____
____

Were significant deficiencies identified that require the SWPPP to be revised: ☐ Yes ☐ No

If Yes, complete a CONR-8 SWPPP Revision Form and file in the Engineer's Field Office

NOTE: Within 1 business day of completion of this inspection, the Contractor(s) must be notified of any corrective actions required. The Contractor(s) or identified Sub-Contractor(s) shall begin corrective actions within 1 business day of notification, and shall complete corrective actions within 1 business day of notification or within a reasonable timeframe for complex corrective actions.

Qualified Inspector Name/Title
Company Name (If Consultant) ______________________________

Qualified Inspector Signature: ______________________ Prepared: ____________ (Date) Copy to Contractor: ____________ (Date)

Reviewed By: ______________________

☐ Engineer-in-Charge
☐ Resident Engineer
☐ Area Supervisor

Date Reviewed: ____________ (Date)

☐ MURK 6-1 SPDES Stormwater Inspection Report - Continuation attached

☐ MURK 6-2 SPDES Stormwater Outlets to Waters of the U.S. - Continuation attached

MURK 6-1
(04/14)

SPDES STORMWATER INSPECTION REPORT - CONTINUATION

JOB STAMP

Date: ____________________ Sheet No. ____ of ____

Codes for Erosion and Sediment control measures and Stormwater Management Practices to be inspected: (1) mulch, (2) seed and mulch, (3) check dams, (4) straw bales, (5) silt fence, (6) sediment trap, (7) turbidity curtains, (8) pipe slope drains, (9) drainage structure inlet protection, (10) rolled erosion control products, (11) soil stabilizers, (12) construction access/exits, (13) pipe inlet/outlet protection, (14) water diversion structures, (15) sedimentation basins, (16) coffer dams, (17) staging area, (18) stockpile stabilization, (19) Other ____________________________________

List ONLY those practices that require repair, maintenance, reinstallation or replacement.

ID	Location of Practice (Use stations or descriptions)	Practice		Remarks (Describe Specific Maintenance Required)(Including sediment removal, replacement, replacement or installation of practice)
		Code #	Temp or Perm? (T or P)	
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				
26				
27				
28				
29				
30				
31				
32				

MURK 6-1 REVERSE
(04/14)

ID	Location of Practice (Use stations or descriptions)	Practice		Remarks (Describe Specific Maintenance Required)(Including sediment removal, replacement, replacement or installation of practice)
		Code #	Temp or Perm? (T or P)	
33				
34				
35				
36				
37				
38				
39				
40				
41				
42				
43				
44				
45				
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53				
54				
55				
56				
57				

Qualified Inspector Initials:: ____________

MURK 6-2
(11/14)

Date: ____________________ Sheet No. ___ of ___

SPDES STORMWATER OUTLETS TO WATERS OF THE U.S. - CONTINUATION

Identify all locations where stormwater is discharged from the site to a Water of the U.S. (e.g. streams, lakes, wetlands, etc.) within or adjacent to the limits of construction, and all locations where stormwater exits the construction site. Describe the condition of the stormwater and the condition of the receiving waterbodies.

	Location of Outlet (STA / OFFSET)	**Type of Outlet** (e.g. pipe, ditch, overland flow,etc.)	**Does this discharge to a Water of the US?**	**Describe Runoff** (if any) (e.g. clear, turbid, oily)	**Describe Receiving Water** (if any) (e.g. clear, turbid, oily, unknown)
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					

Description of required maintenance and any existing deficiencies in the SWPPP. Specify each location using row ID number, if applicable

Were significant deficiencies identified that require the SWPPP to be revised: ☐ Yes ☐ No

If Yes, complete a CONR-8 SWPPP Revision Form and file in the Engineer's Field Office

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

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

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

I. Owner or Operator Information

1. Owner/Operator Name:

2. Street Address:

3. City/State/Zip:

4. Contact Person: | 4a.Telephone:

4b. Contact Person E-Mail:

II. Project Site Information

5. Project/Site Name:

6. Street Address:

7. City/Zip:

8. County:

III. Reason for Termination

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

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

9c. □ Other (Explain on Page 2)

IV. Final Site Information:

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

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

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

____

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

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

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

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

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

□ For post-construction stormwater management practices that are privately owned, 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)

APPENDIX G

Correspondence

APPENDIX H

Water Quality Volume, Runoff Reduction Volume Calculations and Coliform Analysis

Calculate Initial Water Quality Volume in Accordance with NYS Stormwater Management Design Manual (January 2015)

	Area Sqaure Feet	Acres
Existing		
Impervious within disturbed area=	0	0.000
Pervious within disturbed area=	68438	1.571
	68438	1.571
Proposed		
impervious within disturbed area=	25975	0.596
pervious within disturbed area=	42463	0.975
	68438	1.571
New development (additional pavement areas)	25975	0.596
Impervious within disturbed areas =	25975	0.596
Redevelopment (replaced impervious within disturbed area)	0	0.000
Total Distubed Area	68438	1.571

Compute Runoff Coefficient, Rv

Rv=0.05+0.009*(IC), where IC % Impervious cover within the disturbed.
A minimum of 0.2 for Rv should be used.

$$IC = \frac{\text{New Development Impervious Area + Redevelopment}}{\text{Entire Project Disturbed Area}} \times 100$$

IC = 37.95 %

Rv=0.05+0.009*(IC)
Rv= 0.39

$$N = \frac{\text{New Development Impervious Area}}{\text{Total Impervious (New + Replaced)}}$$

N= 1.00

$$R = \frac{\text{Redevelopment Impervious Area}}{\text{Total Impervious (New + Replaced)}}$$

R = 0.00

$$WQv(initial) = \frac{(N + 0.25R) \times (P) \times (Rv) \times (A)}{12}$$

(Use the 90% rainfall to comply with NYSDEC requirements=1.5" rainfall)
P= 1.5 from Table 4.1 of the NYSSMDM

WQv(initial)= 0.0769 acre*ft
3349.93 cubic feet

Determine the minimum Rv required:
RRv (acre feet of storage) = ((P) X Rv X Ai)/12

Ai =	(S) X (Aic)	
Ai =	impervious cover targeted for runoff reduction (in acres)	
Aic =	Total area of new impervious cover (in acres)	
Aic =	0.596	
Ai =	0.179	
Rv =	0.05 + 0.009 (IC) where IC is 100% impervious this is just for impervious so Rv = 0.95	
S =	Hydrologic Soil Group Reduction Factor (80% B, 20% A)	
Weighted S=	0.43	
RRv =	0.0304	acre-ft
	1326.35	cubic feet

This is the minimum required reduction. Justification must be provided that evaluates each of the GI planning and volume reduction techniques and identify the specific site limitations according to which application of this criterion is technically feasible and documented in the SWPPP.

Channel Protection Storage Volume was calculated only for areas draining to the wetland.
Areas of redevelopment were not accounted for in this calculation as redeveloped areas consist of areas with no increase in impervious or change to runoff characteristics.

Compute Channel Protection Storage Volume
Determine value of the unit peak discharge (qu)
For Area draining to Shallow Wetland:

CN =	98	
Ia =	2.083333	
P =	2.68	inches
Ia / P =	0.777363	
Tc =	0.1	hr, use minimum for Exhibit 4-III

Using above data and Exhibit 4-III from TR-55, Say qu = 200 csm/min.

Knowing qu and T = 12 hours (project location ultimately outlets to a stream with a standard of A (T), find qo/qi using Figure B.1 Detention Time vs. Discharge Ratios
Peak outflow discharge/peak inflow discharge (qo/qi) = 0.15

Vs/Vr =	0.682 - (1.43 X (qo/qi)) + (1.64 X (qo/qi)^2) - (0.804 X (qo/qi)^3)	
Vs/Vr	0.501687	
Runoff depth =	1.18	inches
Area draining to pond =	24089	SQFT
Vs =	((Vs/Vr) X Runoff depth (inches) X Area (Acres))/12	
Vs = Cpv =	0.027281	acre * ft
	1188.371	cubic feet to be released over 12 hours
Define average release rate =	0.027509	cfs

Compute ED orifice size, and compute release rate for Cpv - ED control

Required Cpv Storage = 0.027281 acre * ft

From HydroCAD file, 559 cubic feet is stored below elevation 657.50.
Size Cpv orifice:
Size to release average of 0.027281 cfs, based on average head of

Average head= (658.00-656.5)/2
Average head= 0.75

Use orifice equation to compute cross sectional area and diameter

Q = CA(2gh)^0.5

C=	0.6	
g=	32.2	
A=	Q/(C x (2 x g x h)^ 0.5	
A=	0.006597	SQFT

Determine diameter of orifice:

A=	0.006597	
r=	0.045824	ft
r=	0.549893	inches
diameter=	1.099786	inches

A 3" extended detention orifice will be used to contain/release the Cpv. In accordance with Section 2.3.2.5.1 of Appendix B of Chapter 8 in the Highway Design Manual, a 3" orifice is acceptable even though it will not result in retention of the entire Cpv for the required time period.

The Simple Method was used to calculate pollutant loadings. Minimum pollutant discharge and maximum pollution discharge were based on pollutant removal efficiencies from Table 4-4.

	SUB-AREA 1 OUTLET DESIGN POINT			
	Existing Pollutant Dishcarge (kg for TSS, billion colonies for F Coli)	PROPOSED (kg)		% Change From Existing Pollutant Discharge
		Pollutant Discharge Before SWMP	Min. Pollutant Discharge	
TSS	448.55	680.59	102.09	-77.24
F Coli	2.24E+04	2.60E+04	17092.79	-23.69

	SUB-AREA 2 OUTLET DESIGN POINT			
	Existing Pollutant Dishcarge (kg for TSS, billion colonies for F Coli)	PROPOSED (kg)		% Change From Existing Pollutant Discharge
		Pollutant Discharge Before SWMP	Min. Pollutant Discharge	
TSS	48.64	478.92	47.89	-1.54
F Coli	1.92E+03	1.93E+04	1920	0.00

	SUB-AREA 3 OUTLET DESIGN POINT			
	Existing Pollutant Dishcarge (kg for TSS, billion colonies for F Coli)	PROPOSED (kg)		% Change From Existing Pollutant Discharge
		Pollutant Discharge Before SWMP	Min. Pollutant Discharge	
TSS	7.1	400.02	40	463.38
F Coli	6.42E+02	0	0	-100.00

The Simple Method was used to calculate pollutant loadings. Minimum pollutant discharge and maximum pollution discharge were based on pollutant removal efficiencies from Table 4-4.
The following table is a cummulative pollutant loading for the Sub-Watersheds 1, 2 and 3 through the project corridor. Pollutant loading calculations were done for each Sub-Watershed Area and also at each outlet design point. Calculations at each outlet design point can be found on the following pages in Appendix I.

APPENDIX I

HydroCAD Calculations – Pre. Vs. Post Hydrologic Site Hydrology and Storm Data for the Project Location

Figure 4.1 from the New York State Stormwater Management Design Manual, January 2015

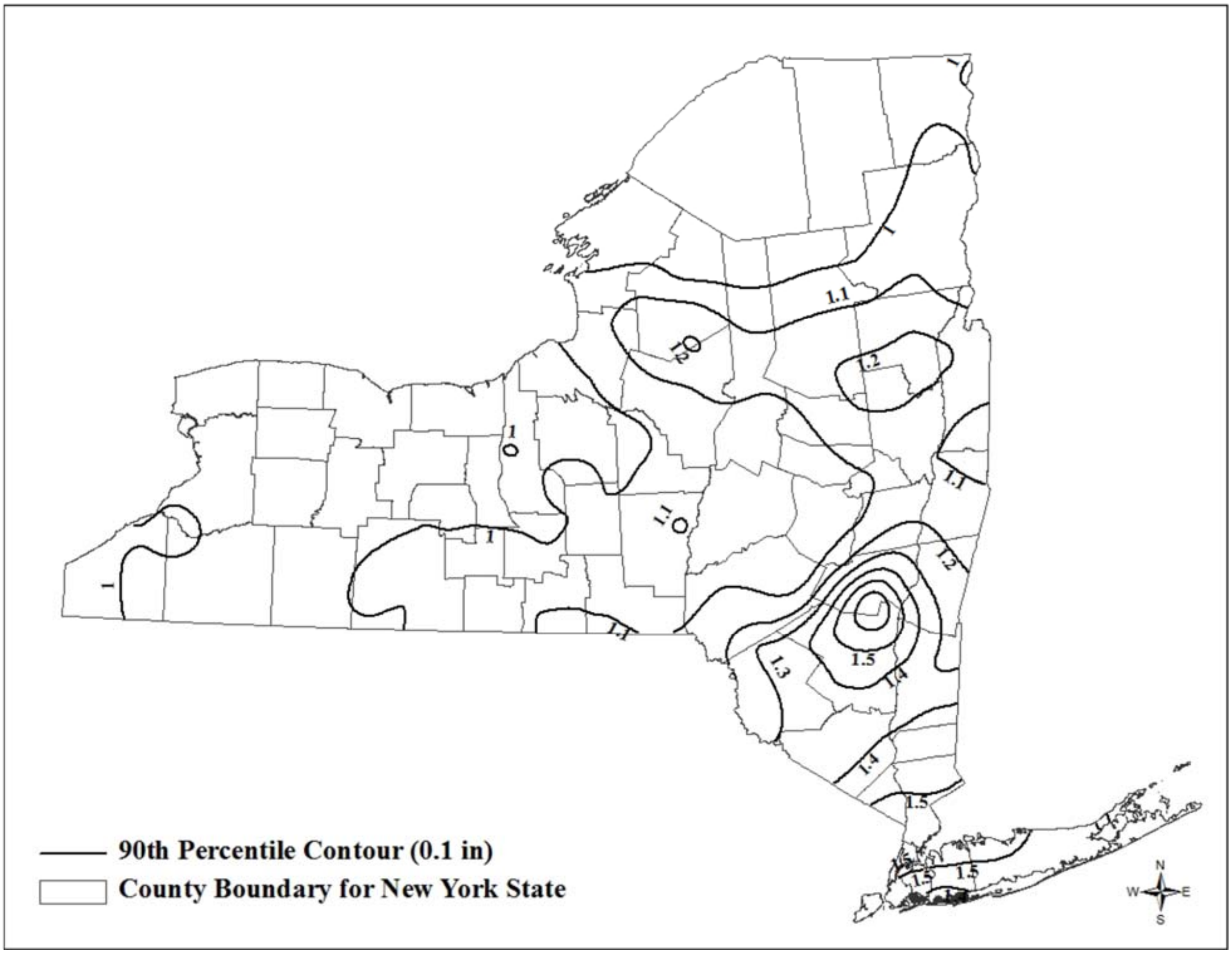


Figure 4.2 from the New York State Stormwater Management Design Manual, January 2015

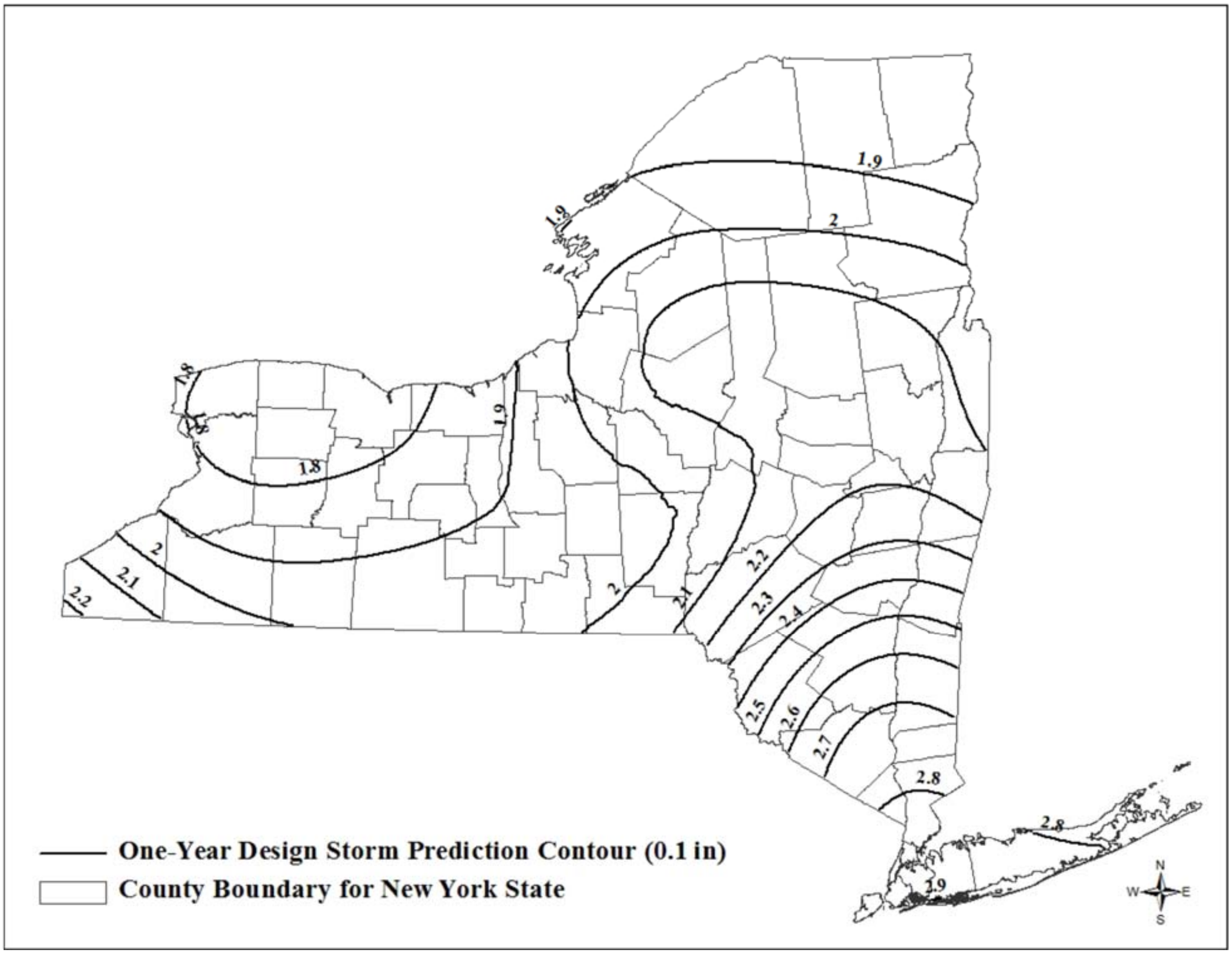


Figure 4.3 from the New York State Stormwater Management Design Manual, January 2015

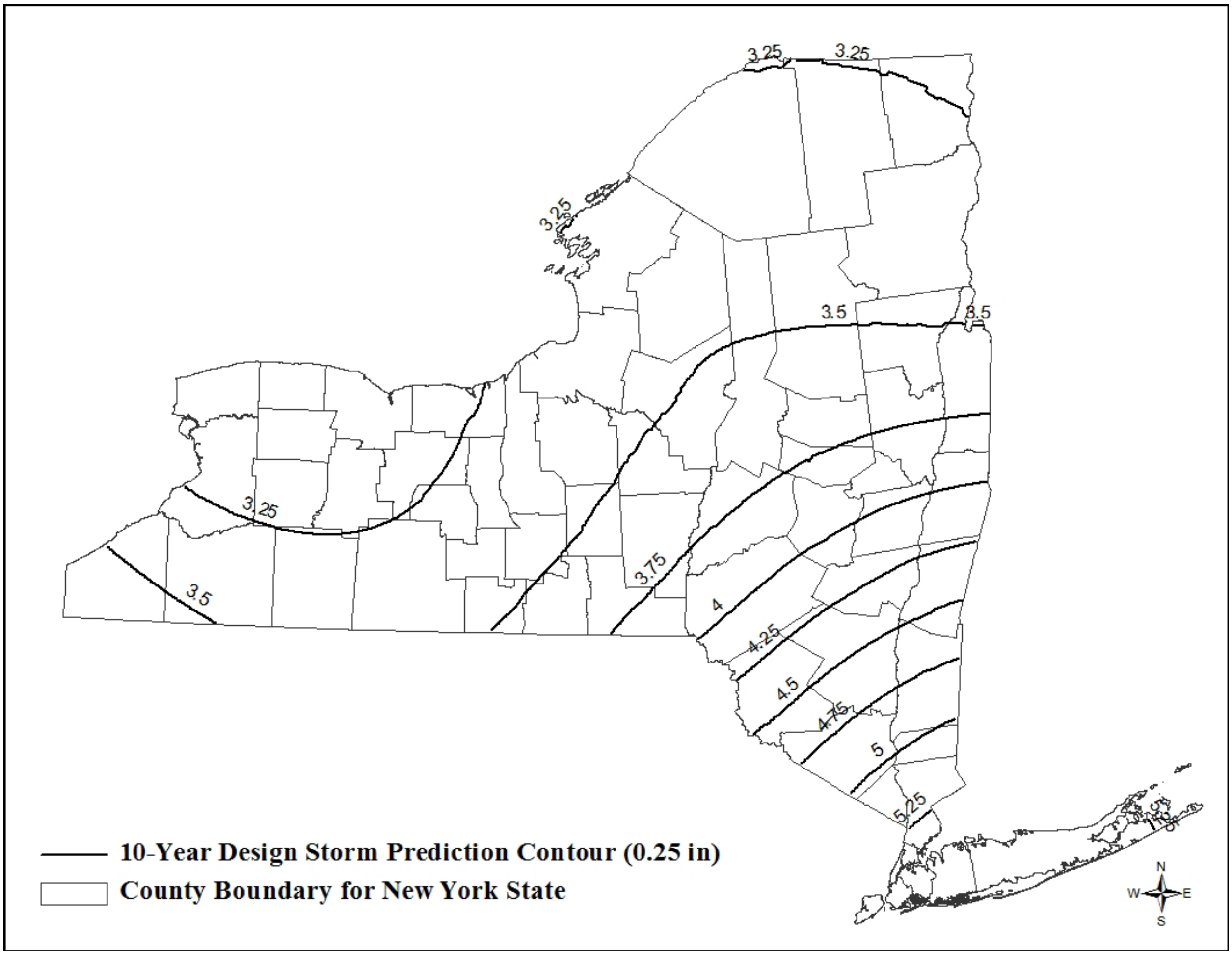
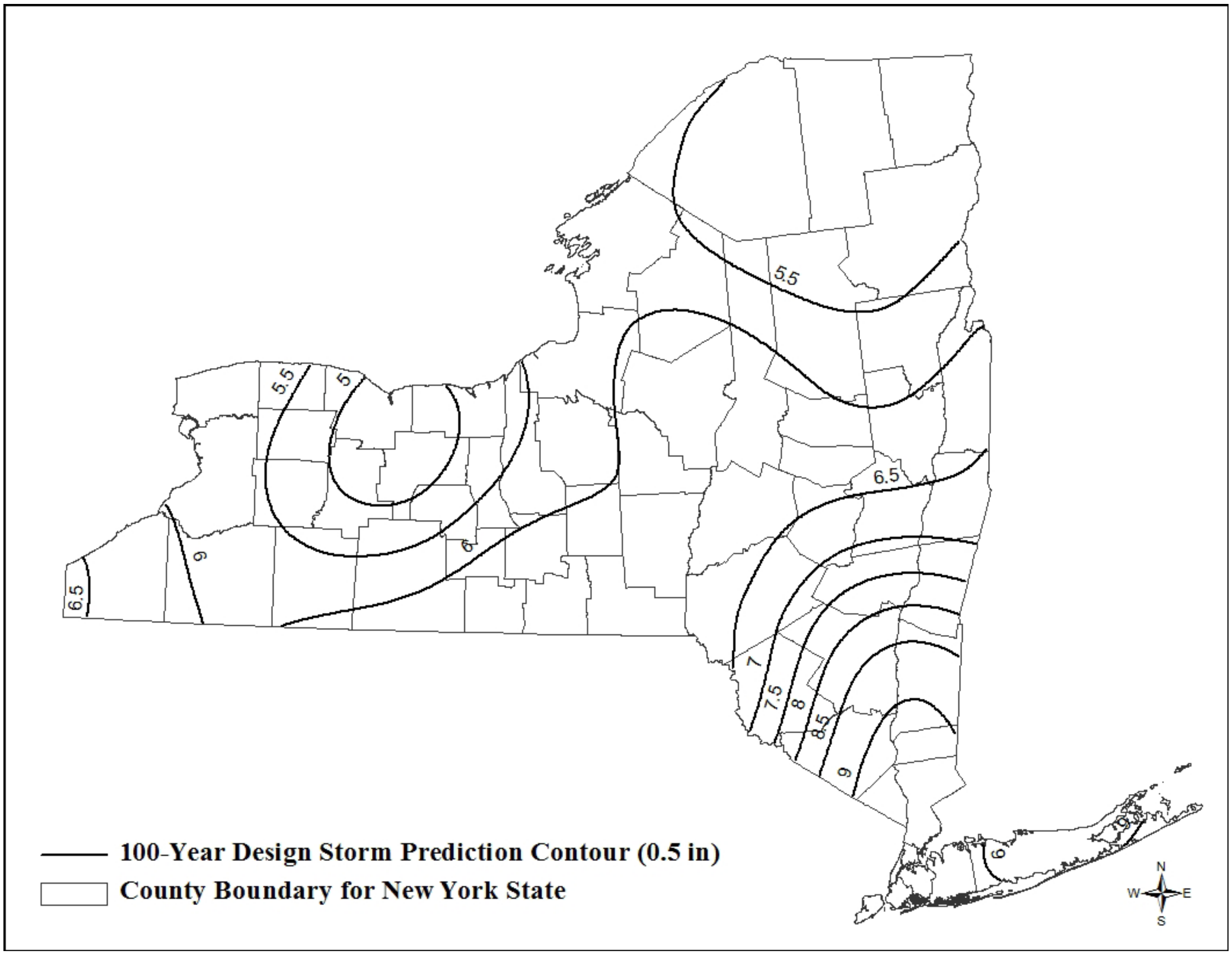
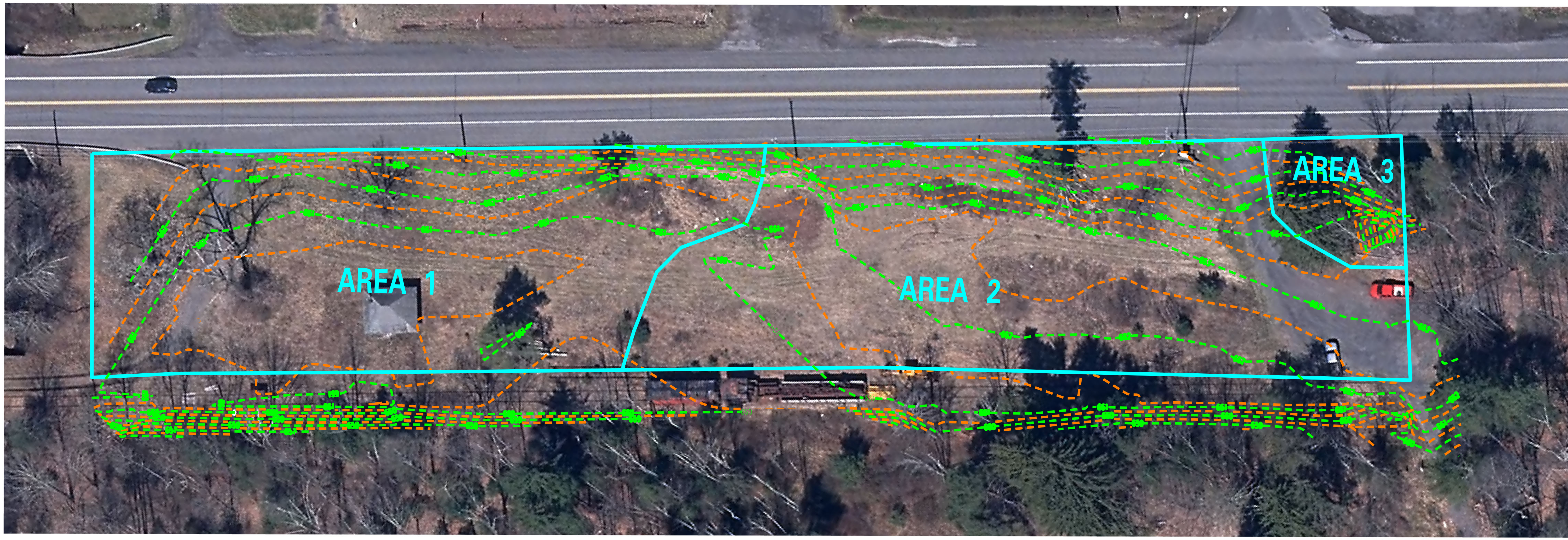


Figure 4.4 from the New York State Stormwater Management Design Manual, January 2015





SUB AREA	CN	DESCRIPTION	AREA (SQ FT)	SUB AREA	CN	DESCRIPTION	AREA (SQ FT)
AREA 1	69	50-75% GRASS COVER, FAIR, HSG B	16,105	AREA 3	56	BRUSH, FAIR, HSG B	3,360
AREA 1	84	50-75% GRASS COVER, FAIR, HSG D	12,016	AREA 3	96	GRAVEL SURFACE, HSG B	268
AREA 1	96	GRAVEL SURFACE, HSG D	1,445				
AREA 2	69	50-75% GRASS COVER, HSG B	30,688				
AREA 2	96	GRAVEL SURFACE, HSG B	4,556				

AFFIX SEAL:
ON:

ALTERED BY: ________________
ON: ________________

AS-BUILT REVISIONS
DESCRIPTION OF ALTERATIONS:

COUNTY: ULSTER
NYSDOT REGION: 8

PIN

BRIDGES

CULVERTS

ALL DIMENSIONS IN ft UNLESS OTHERWISE NOTED

EXISTING DRAINAGE AREAS

CONTRACT NUMBER

DRAWING NO.

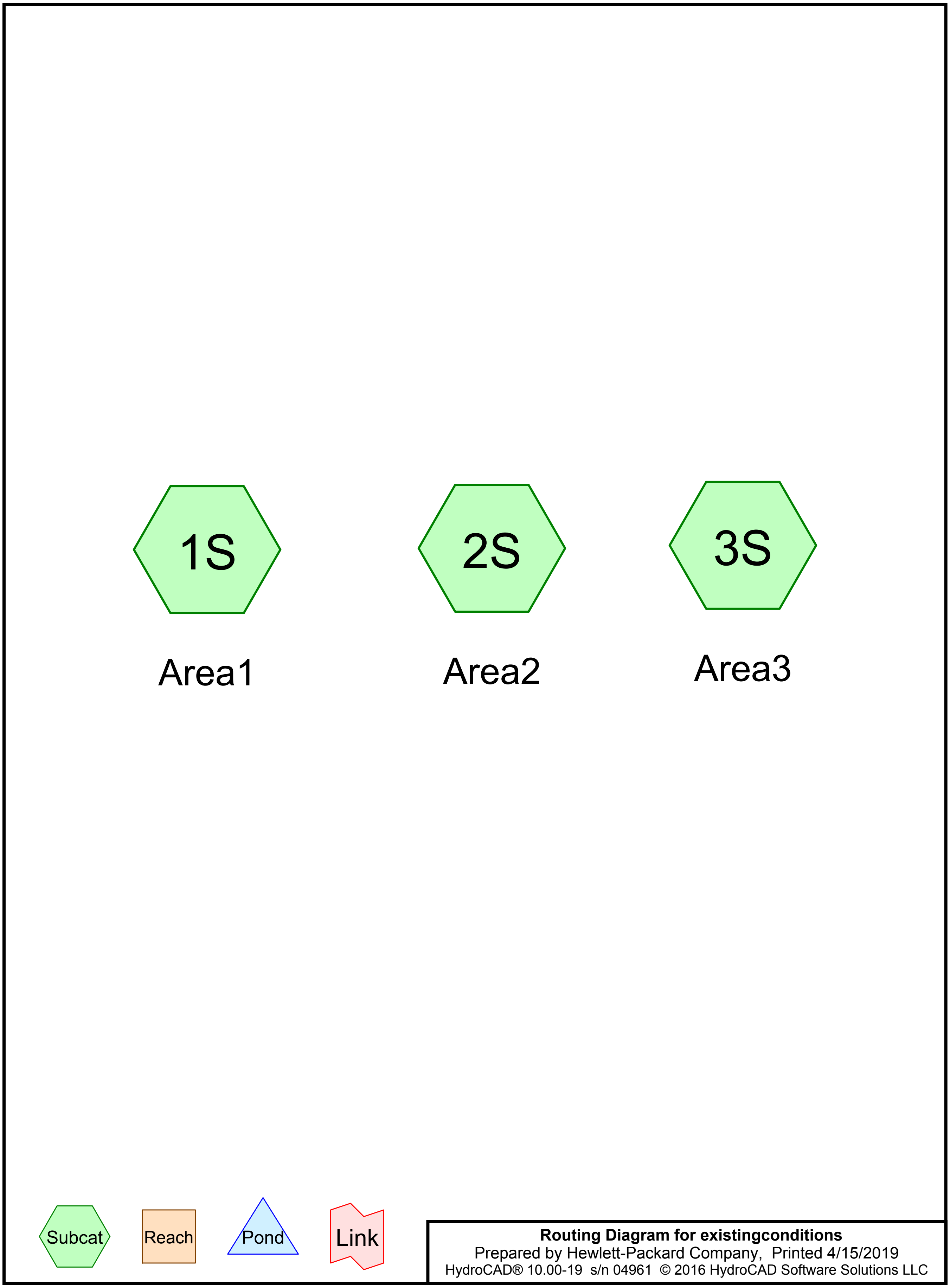
SHEET NO.

HVEA ENGINEERS
BEACON, NEW YORK 12508
(845) 838-3600
www.hveapc.com

NYC Environmental Protection

PROJECT MANAGER J. GORTON
CHECK L. BACH
DRAFTING K. FISCHER
CHECK L. BACH
DESIGN C. DREYER
JOB MANAGER J. GORTON
DESIGN SUPERVISOR J. GORTON

FILE NAME = DGN$SPEC•
DATE/TIME = DGN$SYTIME
USER = DGN$USERNAME



Routing Diagram for existingconditions
Prepared by Hewlett-Packard Company, Printed 4/15/2019

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
1.097	69	50-75% Grass cover, Fair, HSG B (1S, 2S)
0.276	84	50-75% Grass cover, Fair, HSG D (1S)
0.077	56	Brush, Fair, HSG B (3S)
0.111	96	Gravel surface, HSG B (2S, 3S)
0.033	96	Gravel surface, HSG D (1S)
1.594	**73**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
1.285	HSG B	1S, 2S, 3S
0.000	HSG C	
0.309	HSG D	1S
0.000	Other	
1.594		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	1.097	0.000	0.276	0.000	1.373	50-75% Grass cover, Fair	1S, 2S
0.000	0.077	0.000	0.000	0.000	0.077	Brush, Fair	3S
0.000	0.111	0.000	0.033	0.000	0.144	Gravel surface	1S, 2S, 3S
0.000	**1.285**	**0.000**	**0.309**	**0.000**	**1.594**	**TOTAL AREA**	

Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: Area1 Runoff Area=30,566 sf 0.00% Impervious Runoff Depth=0.81"
Flow Length=78' Slope=0.0268 '/' Tc=7.1 min CN=76 Runoff=0.59 cfs 0.047 af

Subcatchment 2S: Area2 Runoff Area=35,244 sf 0.00% Impervious Runoff Depth=0.62"
Flow Length=171' Slope=0.0409 '/' Tc=11.2 min CN=72 Runoff=0.42 cfs 0.042 af

Subcatchment 3S: Area3 Runoff Area=3,628 sf 0.00% Impervious Runoff Depth=0.20"
Flow Length=78' Slope=0.0833 '/' Tc=4.5 min CN=59 Runoff=0.01 cfs 0.001 af

Total Runoff Area = 1.594 ac Runoff Volume = 0.091 af Average Runoff Depth = 0.68"
100.00% Pervious = 1.594 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment 1S: Area1

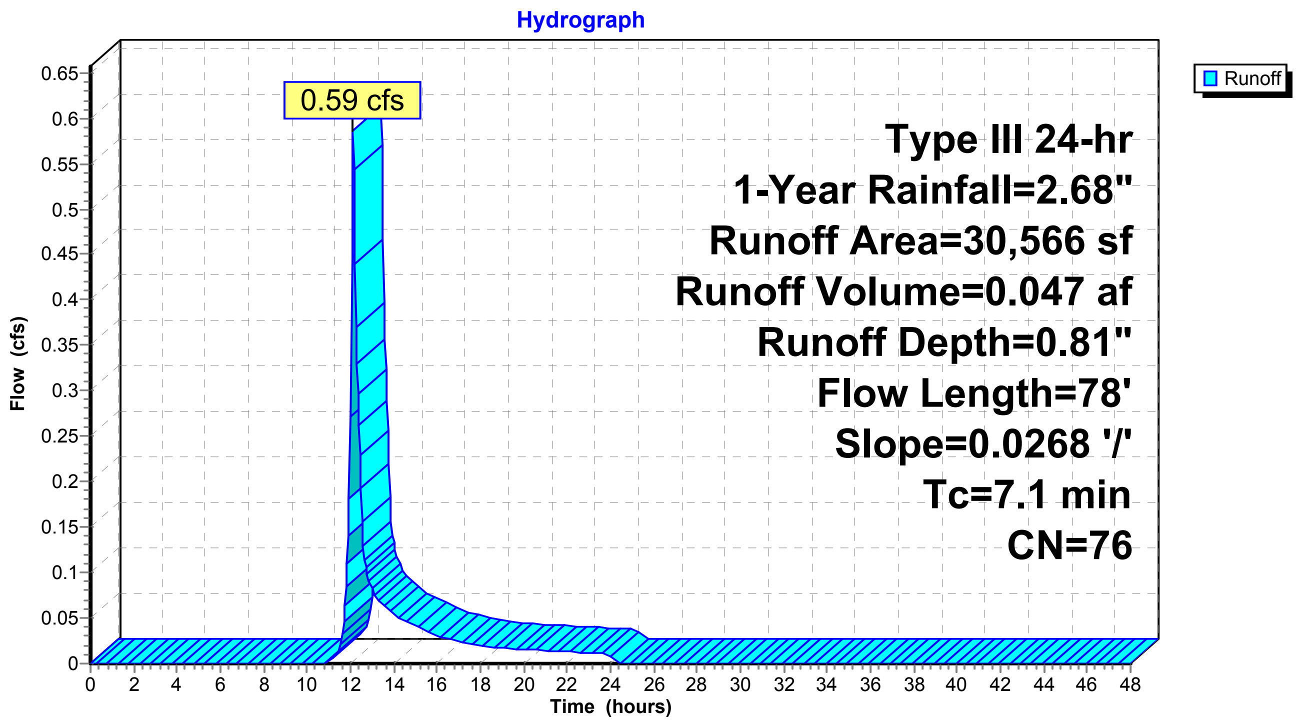
Runoff = 0.59 cfs @ 12.11 hrs, Volume= 0.047 af, Depth= 0.81"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 1-Year Rainfall=2.68"

Area (sf)	CN	Description
17,105	69	50-75% Grass cover, Fair, HSG B
12,016	84	50-75% Grass cover, Fair, HSG D
1,445	96	Gravel surface, HSG D
30,566	76	Weighted Average
30,566		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	78	0.0268	0.18		**Sheet Flow, segmentAB** Grass: Short n= 0.150 P2= 3.24"

Subcatchment 1S: Area1



Summary for Subcatchment 2S: Area2

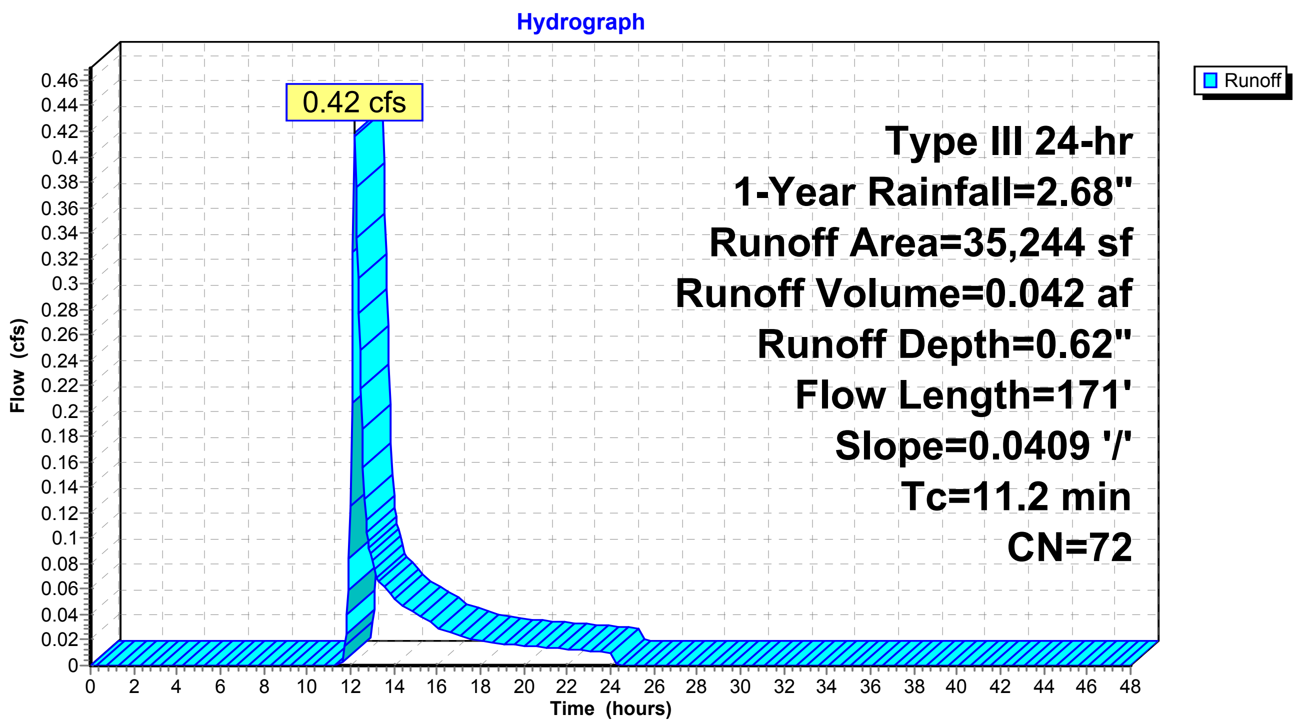
Runoff = 0.42 cfs @ 12.18 hrs, Volume= 0.042 af, Depth= 0.62"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 1-Year Rainfall=2.68"

Area (sf)	CN	Description
30,688	69	50-75% Grass cover, Fair, HSG B
4,556	96	Gravel surface, HSG B
35,244	72	Weighted Average
35,244		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.2	171	0.0409	0.25		**Sheet Flow, segmentAB** Grass: Short n= 0.150 P2= 3.24"

Subcatchment 2S: Area2



Summary for Subcatchment 3S: Area3

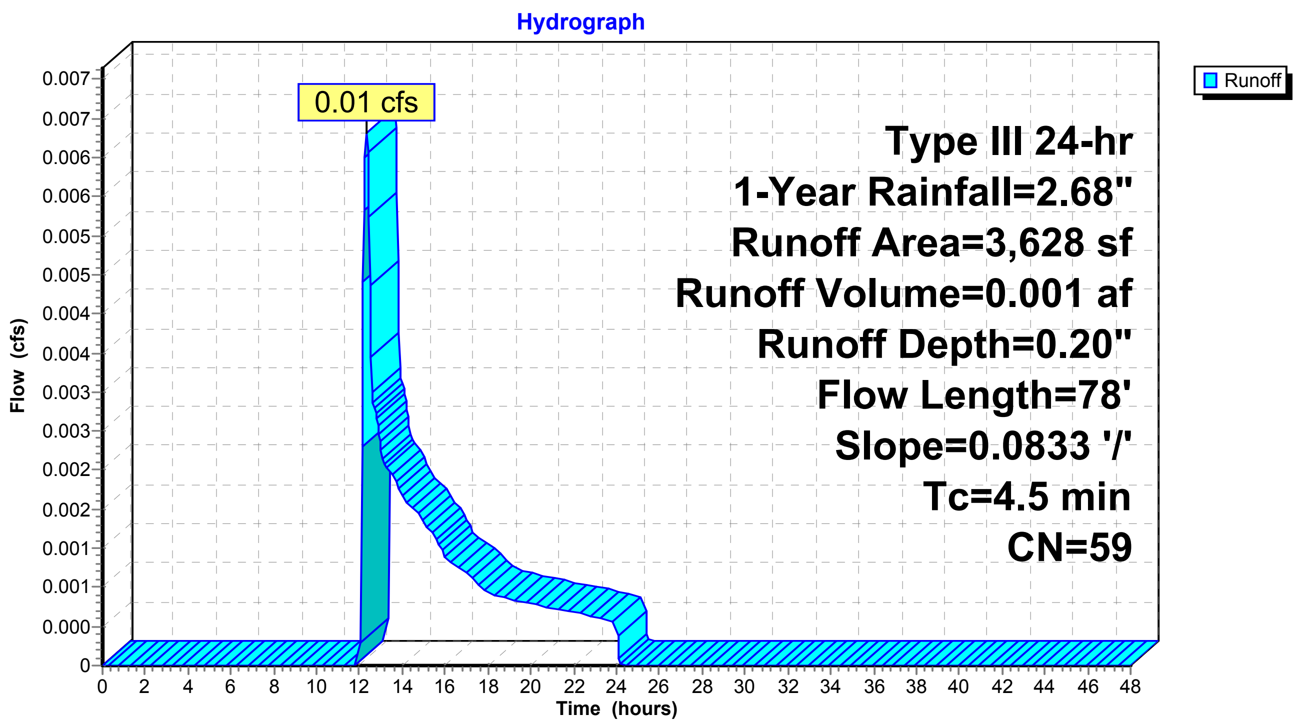
Runoff = 0.01 cfs @ 12.32 hrs, Volume= 0.001 af, Depth= 0.20"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 1-Year Rainfall=2.68"

Area (sf)	CN	Description
3,360	56	Brush, Fair, HSG B
268	96	Gravel surface, HSG B
3,628	59	Weighted Average
3,628		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.5	78	0.0833	0.29		**Sheet Flow, segmentAB** Grass: Short n= 0.150 P2= 3.24"

Subcatchment 3S: Area3



Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: Area1 Runoff Area=30,566 sf 0.00% Impervious Runoff Depth=2.34"
Flow Length=78' Slope=0.0268 '/' Tc=7.1 min CN=76 Runoff=1.82 cfs 0.137 af

Subcatchment 2S: Area2 Runoff Area=35,244 sf 0.00% Impervious Runoff Depth=2.01"
Flow Length=171' Slope=0.0409 '/' Tc=11.2 min CN=72 Runoff=1.57 cfs 0.136 af

Subcatchment 3S: Area3 Runoff Area=3,628 sf 0.00% Impervious Runoff Depth=1.10"
Flow Length=78' Slope=0.0833 '/' Tc=4.5 min CN=59 Runoff=0.09 cfs 0.008 af

Total Runoff Area = 1.594 ac Runoff Volume = 0.280 af Average Runoff Depth = 2.11"
100.00% Pervious = 1.594 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment 1S: Area1

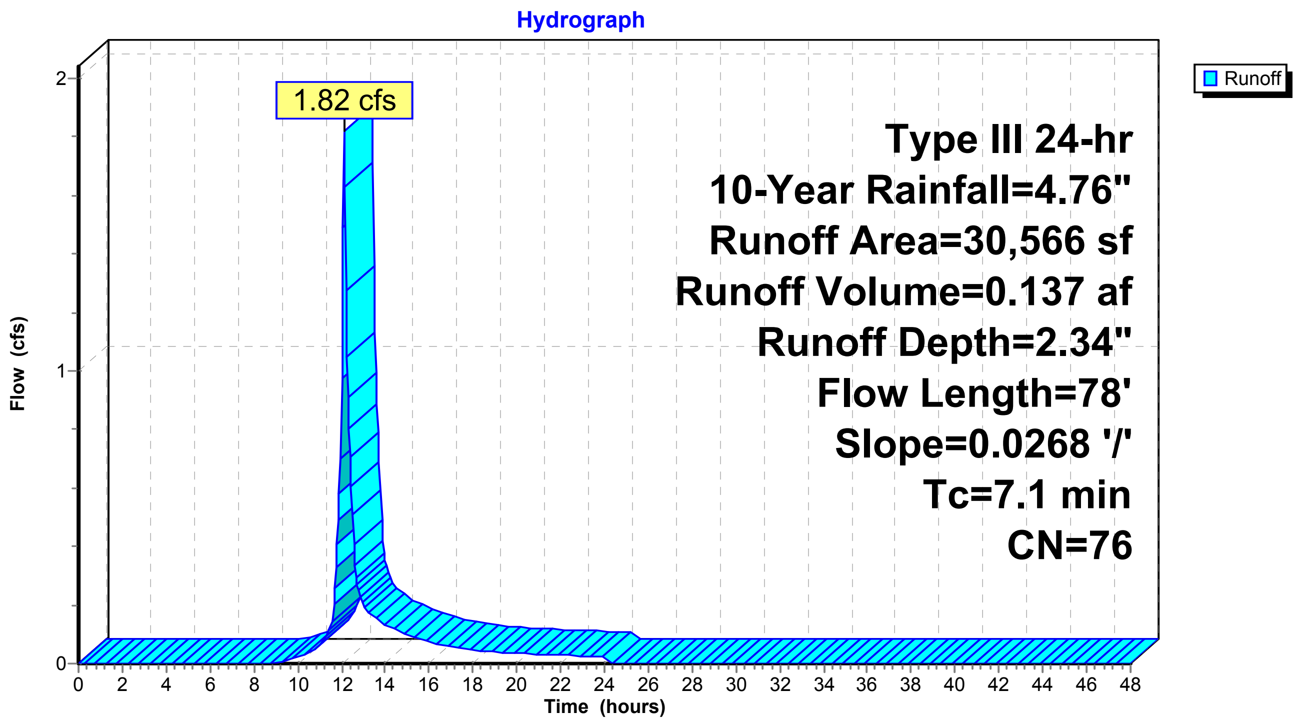
Runoff = 1.82 cfs @ 12.11 hrs, Volume= 0.137 af, Depth= 2.34"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.76"

Area (sf)	CN	Description
17,105	69	50-75% Grass cover, Fair, HSG B
12,016	84	50-75% Grass cover, Fair, HSG D
1,445	96	Gravel surface, HSG D
30,566	76	Weighted Average
30,566		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	78	0.0268	0.18		**Sheet Flow, segmentAB** Grass: Short n= 0.150 P2= 3.24"

Subcatchment 1S: Area1



Summary for Subcatchment 2S: Area2

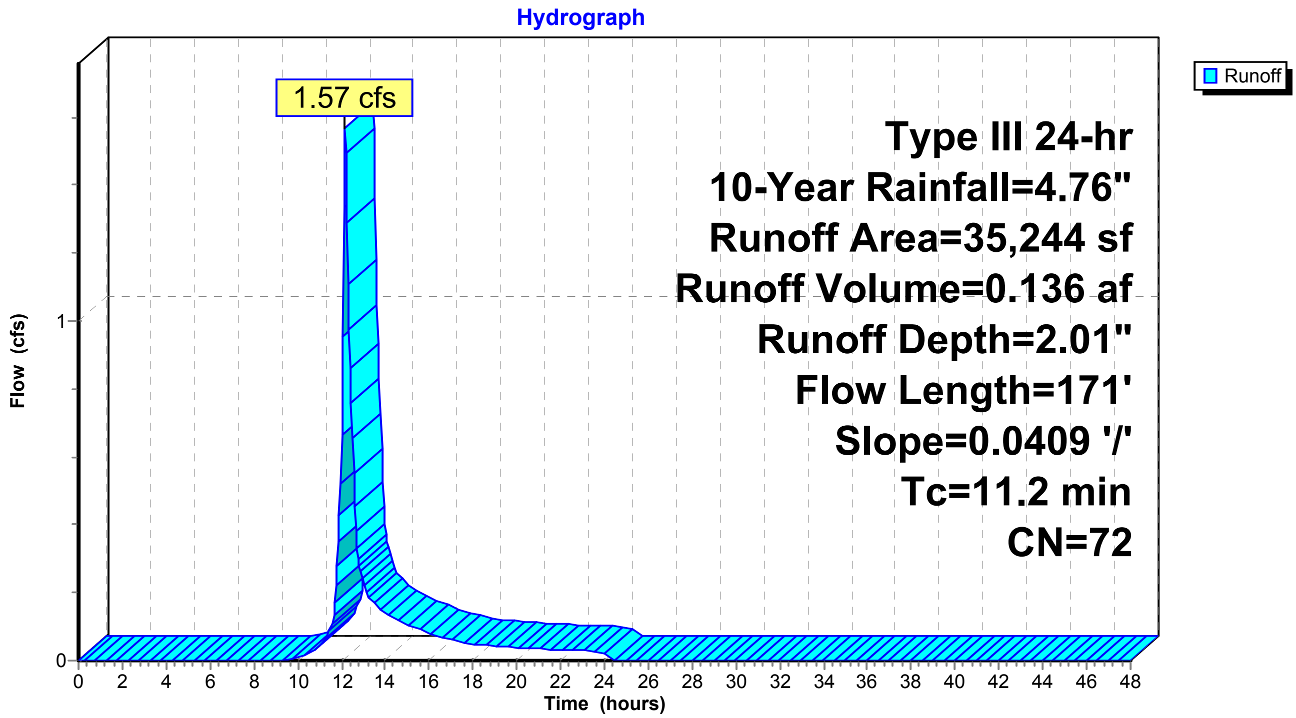
Runoff = 1.57 cfs @ 12.16 hrs, Volume= 0.136 af, Depth= 2.01"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.76"

Area (sf)	CN	Description
30,688	69	50-75% Grass cover, Fair, HSG B
4,556	96	Gravel surface, HSG B
35,244	72	Weighted Average
35,244		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.2	171	0.0409	0.25		**Sheet Flow, segmentAB** Grass: Short n= 0.150 P2= 3.24"

Subcatchment 2S: Area2



Summary for Subcatchment 3S: Area3

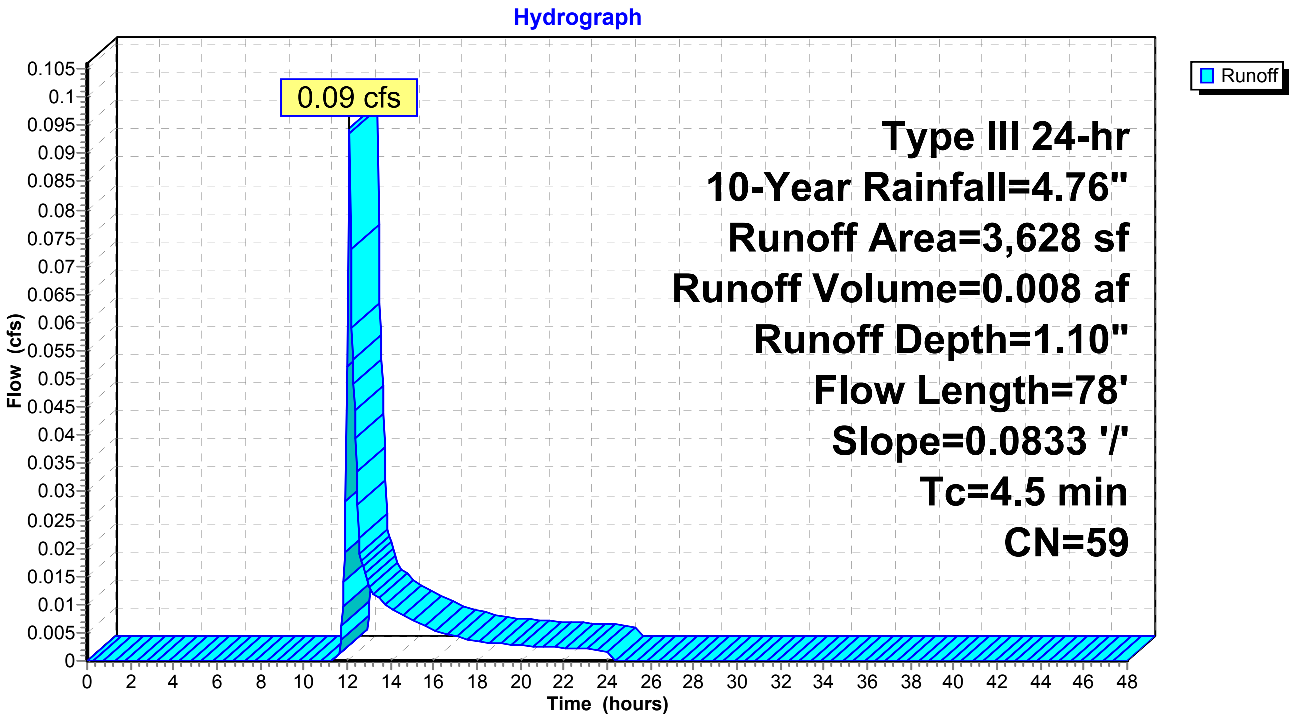
Runoff = 0.09 cfs @ 12.09 hrs, Volume= 0.008 af, Depth= 1.10"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.76"

Area (sf)	CN	Description
3,360	56	Brush, Fair, HSG B
268	96	Gravel surface, HSG B
3,628	59	Weighted Average
3,628		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.5	78	0.0833	0.29		**Sheet Flow, segmentAB** Grass: Short n= 0.150 P2= 3.24"

Subcatchment 3S: Area3



Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: Area1 Runoff Area=30,566 sf 0.00% Impervious Runoff Depth=5.43"
Flow Length=78' Slope=0.0268 '/' Tc=7.1 min CN=76 Runoff=4.22 cfs 0.318 af

Subcatchment 2S: Area2 Runoff Area=35,244 sf 0.00% Impervious Runoff Depth=4.96"
Flow Length=171' Slope=0.0409 '/' Tc=11.2 min CN=72 Runoff=3.93 cfs 0.334 af

Subcatchment 3S: Area3 Runoff Area=3,628 sf 0.00% Impervious Runoff Depth=3.45"
Flow Length=78' Slope=0.0833 '/' Tc=4.5 min CN=59 Runoff=0.34 cfs 0.024 af

Total Runoff Area = 1.594 ac Runoff Volume = 0.676 af Average Runoff Depth = 5.09"
100.00% Pervious = 1.594 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment 1S: Area1

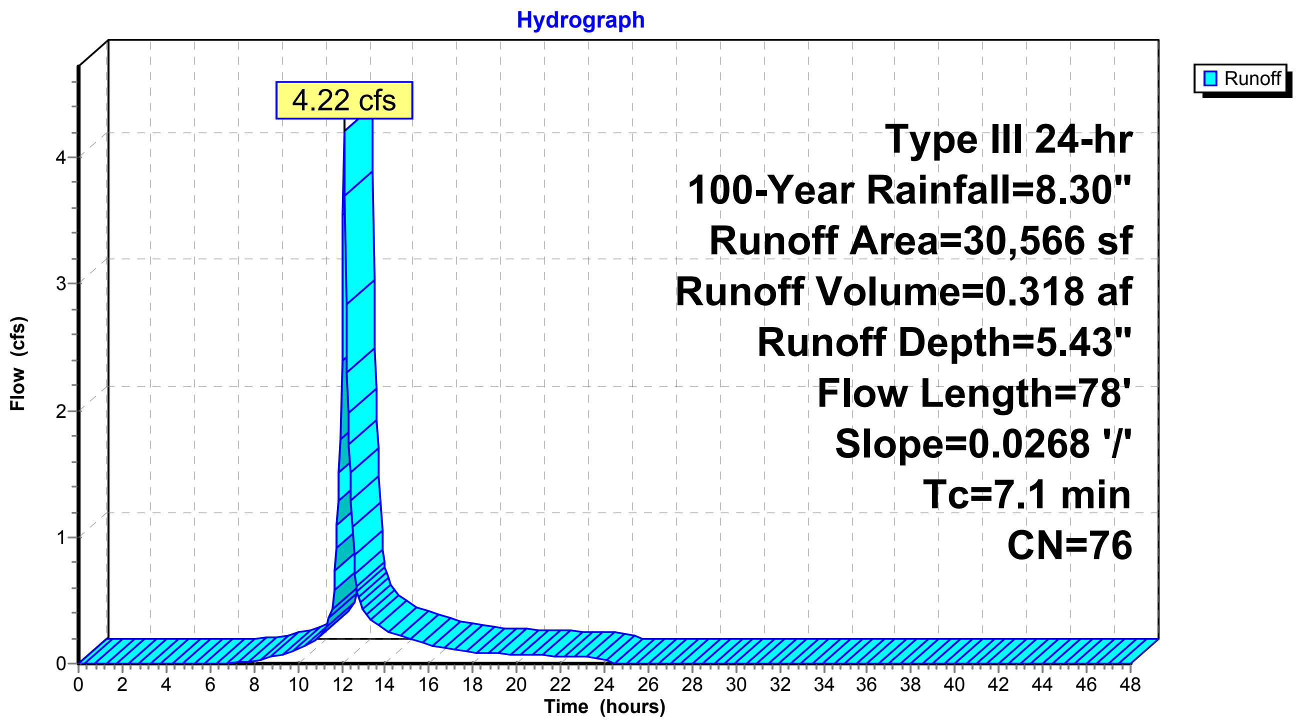
Runoff = 4.22 cfs @ 12.10 hrs, Volume= 0.318 af, Depth= 5.43"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.30"

Area (sf)	CN	Description
17,105	69	50-75% Grass cover, Fair, HSG B
12,016	84	50-75% Grass cover, Fair, HSG D
1,445	96	Gravel surface, HSG D
30,566	76	Weighted Average
30,566		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	78	0.0268	0.18		**Sheet Flow, segmentAB** Grass: Short n= 0.150 P2= 3.24"

Subcatchment 1S: Area1



Summary for Subcatchment 2S: Area2

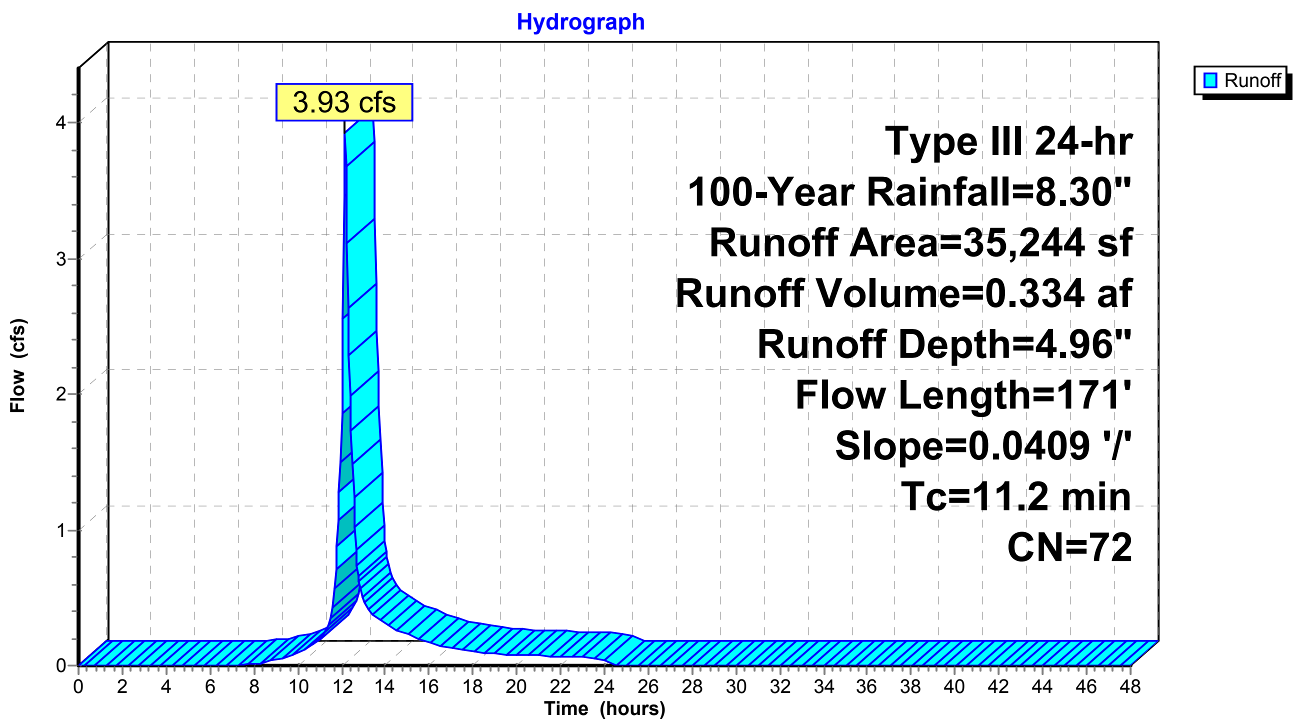
Runoff = 3.93 cfs @ 12.16 hrs, Volume= 0.334 af, Depth= 4.96"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.30"

Area (sf)	CN	Description
30,688	69	50-75% Grass cover, Fair, HSG B
4,556	96	Gravel surface, HSG B
35,244	72	Weighted Average
35,244		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.2	171	0.0409	0.25		**Sheet Flow, segmentAB** Grass: Short n= 0.150 P2= 3.24"

Subcatchment 2S: Area2



Summary for Subcatchment 3S: Area3

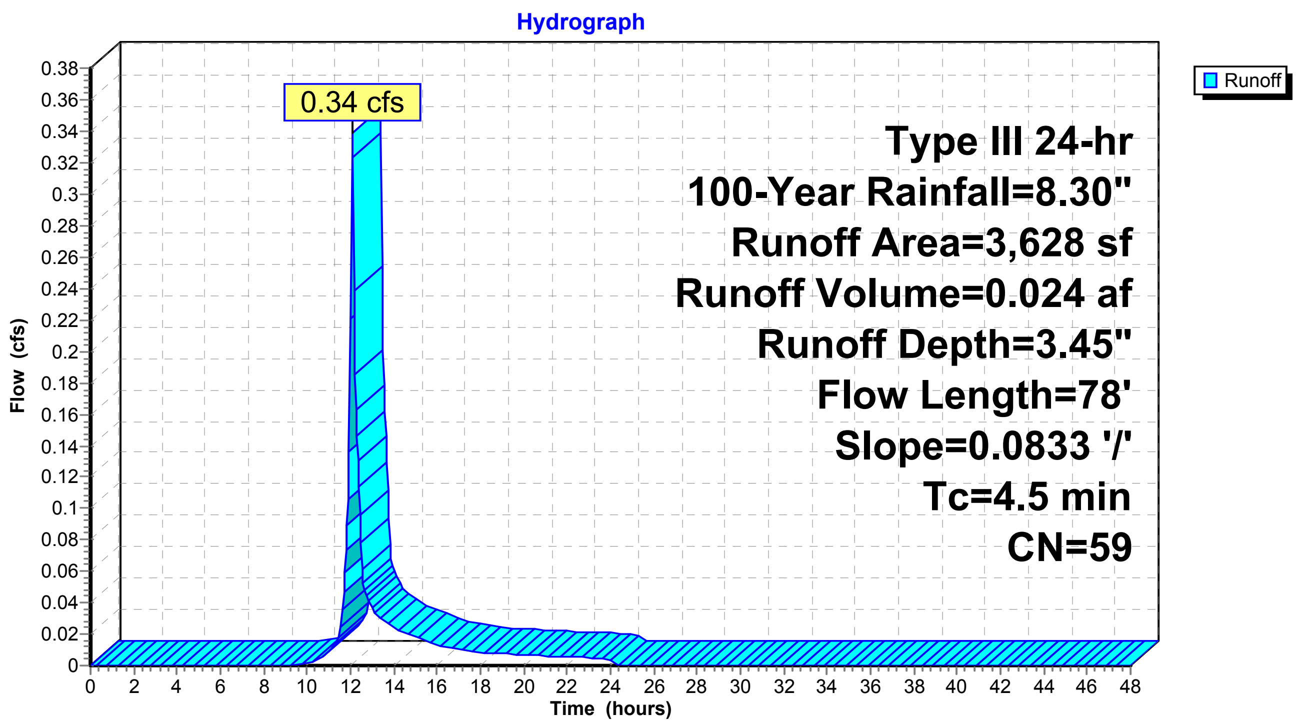
Runoff = 0.34 cfs @ 12.07 hrs, Volume= 0.024 af, Depth= 3.45"

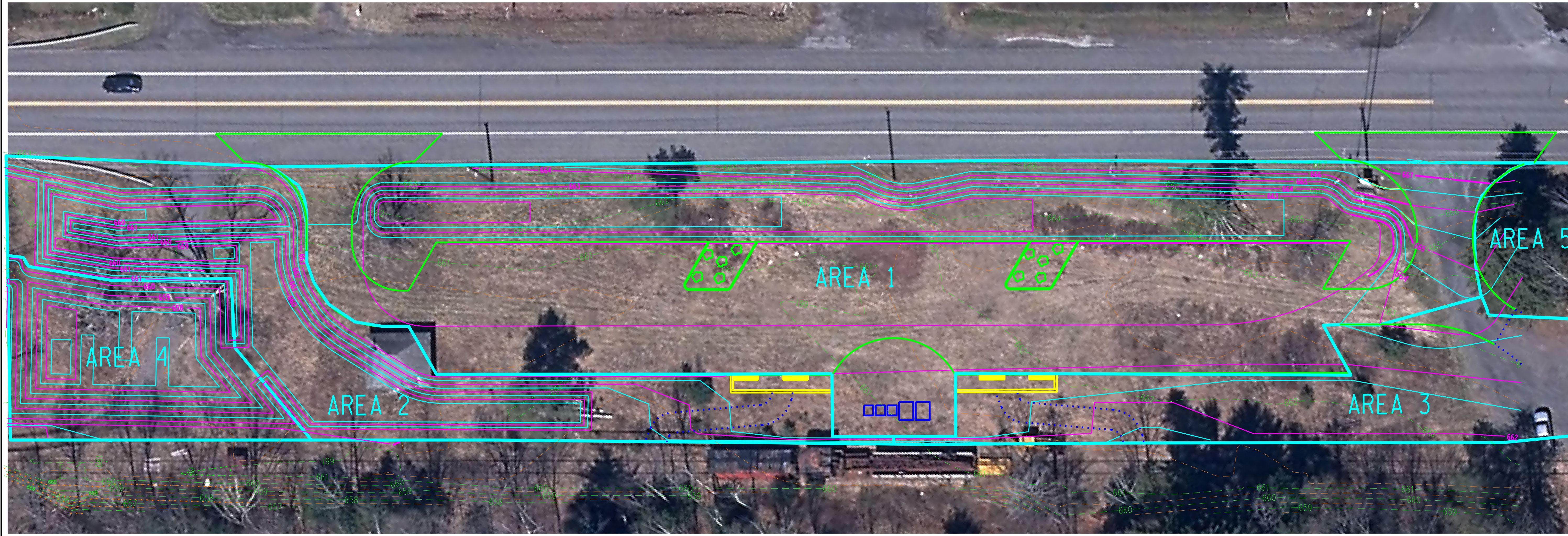
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.30"

Area (sf)	CN	Description
3,360	56	Brush, Fair, HSG B
268	96	Gravel surface, HSG B
3,628	59	Weighted Average
3,628		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.5	78	0.0833	0.29		**Sheet Flow, segmentAB** Grass: Short n= 0.150 P2= 3.24"

Subcatchment 3S: Area3





SUB AREA	CN	DESCRIPTION	AREA (SQ FT)	SUB AREA	CN	DESCRIPTION	AREA (SQ FT)
AREA 1	98	PAVED PARKING, HSG B	23,109	AREA 3	98	PAVED PARKING, HSG B	358
AREA 1	69	50-75% GRASS COVER, FAIR, HSG B	14,880	AREA 3	69	50-75% GRASS COVER, FAIR, HSG B	5,357
AREA 1	98	PAVED PARKING, HSG D	980	AREA 3	96	GRAVEL SURFACE, HSG B	1,320
AREA 2	96	GRAVEL SURFACE, HSG B	473	AREA 3	98	CONCRETE WALKWAY, HSG B	288
AREA 2	98	CONCRETE WALKWAY, HSG B	288	AREA 4	69	50-75% GRASS COVER, FAIR, HSG B	2,337
AREA 2	69	50-75% GRASS COVER, FAIR, HSG B	12,518	AREA 5	69	50-75% GRASS COVER, FAIR, HSG B	6,530

PROJECT MANAGER J. GORTON
CHECK L. BACH
DRAFTING K. FISCHER
CHECK L. BACH
DESIGN C. DREYER
JOB MANAGER J. GORTON
DESIGN SUPERVISOR J. GORTON

FILE NAME = DGN$SPEC$
DATE/TIME = DGN$SYTIME
USER = DGN$USERNAME

AFFIX SEAL:
ON:

ALTERED BY:
ON:

AS-BUILT REVISIONS
DESCRIPTION OF ALTERATIONS:

COUNTY: ULSTER
NYSDOT REGION: 8

PIN

BRIDGES

CULVERTS

ALL DIMENSIONS IN ft UNLESS OTHERWISE NOTED

PROPOSED DRAINAGE AREAS

CONTRACT NUMBER

DRAWING NO.

SHEET NO.

HVEA ENGINEERS
BEACON, NEW YORK 12508
(845) 838-3600
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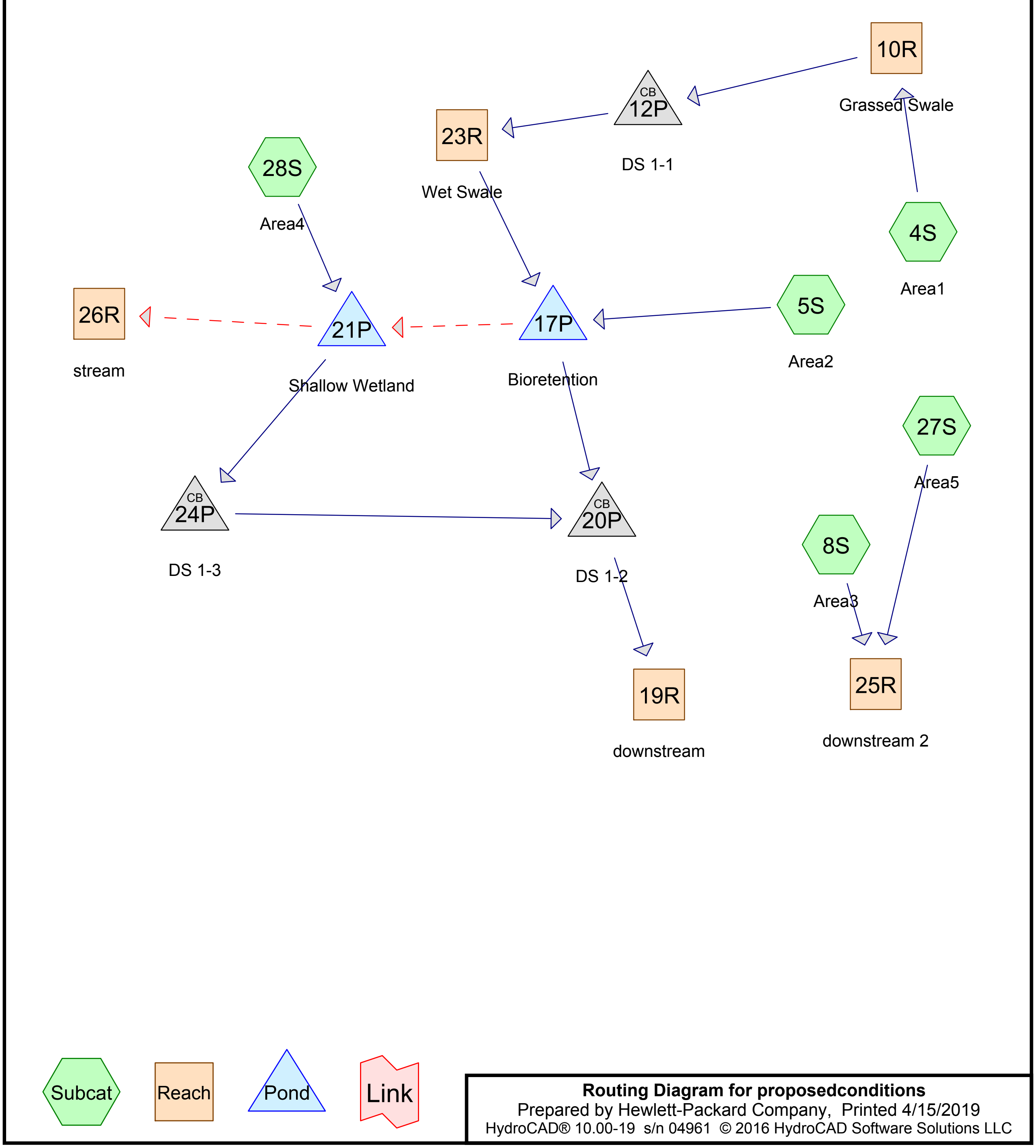
NYC Environmental Protection



Routing Diagram for proposedconditions
Prepared by Hewlett-Packard Company, Printed 4/15/2019
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Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.956	69	50-75% Grass cover, Fair, HSG B (4S, 5S, 8S, 27S, 28S)
0.041	96	Gravel surface, HSG B (5S, 8S)
0.552	98	Paved parking, HSG B (4S, 5S, 8S)
0.022	98	Paved parking, HSG D (4S)
1.571	**80**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
1.549	HSG B	4S, 5S, 8S, 27S, 28S
0.000	HSG C	
0.022	HSG D	4S
0.000	Other	
1.571		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.956	0.000	0.000	0.000	0.956	50-75% Grass cover, Fair	4S, 5S, 8S, 27S, 28S
0.000	0.041	0.000	0.000	0.000	0.041	Gravel surface	5S, 8S
0.000	0.552	0.000	0.022	0.000	0.574	Paved parking	4S, 5S, 8S
0.000	**1.549**	**0.000**	**0.022**	**0.000**	**1.571**	**TOTAL AREA**	

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Diam/Width (inches)	Height (inches)	Inside-Fill (inches)
1	12P	660.95	660.85	46.0	0.0022	0.011	15.0	0.0	0.0
2	17P	657.60	657.25	57.0	0.0061	0.011	12.0	0.0	0.0
3	20P	651.60	650.50	43.0	0.0256	0.011	15.0	0.0	0.0
4	21P	653.50	653.00	28.0	0.0179	0.011	15.0	0.0	0.0
5	24P	652.00	651.50	101.0	0.0050	0.011	15.0	0.0	0.0

Time span=0.00-24.00 hrs, dt=0.02 hrs, 1201 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 4S: Area1 Runoff Area=38,969 sf 61.82% Impervious Runoff Depth>1.46"
Flow Length=424' Tc=3.7 min CN=87 Runoff=1.66 cfs 0.109 af

Subcatchment 5S: Area2 Runoff Area=13,279 sf 2.17% Impervious Runoff Depth>0.58"
Flow Length=90' Tc=5.2 min CN=71 Runoff=0.18 cfs 0.015 af

Subcatchment 8S: Area3 Runoff Area=7,323 sf 8.82% Impervious Runoff Depth>0.80"
Flow Length=109' Slope=0.0229 '/' Tc=9.9 min CN=76 Runoff=0.13 cfs 0.011 af

Subcatchment 27S: Area5 Runoff Area=6,530 sf 0.00% Impervious Runoff Depth>0.50"
Tc=6.0 min CN=69 Runoff=0.07 cfs 0.006 af

Subcatchment 28S: Area4 Runoff Area=2,337 sf 0.00% Impervious Runoff Depth>0.50"
Tc=6.0 min CN=69 Runoff=0.02 cfs 0.002 af

Reach 10R: Grassed Swale Avg. Flow Depth=0.13' Max Vel=1.26 fps Inflow=1.66 cfs 0.109 af
n=0.022 L=360.0' S=0.0056 '/' Capacity=13.74 cfs Outflow=1.42 cfs 0.108 af

Reach 19R: downstream Inflow=0.25 cfs 0.038 af
Outflow=0.25 cfs 0.038 af

Reach 23R: Wet Swale Avg. Flow Depth=0.30' Max Vel=0.92 fps Inflow=1.42 cfs 0.108 af
n=0.025 L=170.0' S=0.0015 '/' Capacity=46.76 cfs Outflow=1.32 cfs 0.108 af

Reach 25R: downstream 2 Inflow=0.19 cfs 0.018 af
Outflow=0.19 cfs 0.018 af

Reach 26R: stream Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Pond 12P: DS 1-1 Peak Elev=661.69' Inflow=1.42 cfs 0.108 af
15.0" Round Culvert n=0.011 L=46.0' S=0.0022 '/' Outflow=1.42 cfs 0.108 af

Pond 17P: Bioretention Peak Elev=659.79' Storage=2,262 cf Inflow=1.43 cfs 0.123 af
Primary=0.25 cfs 0.018 af Secondary=0.35 cfs 0.055 af Outflow=0.60 cfs 0.073 af

Pond 20P: DS 1-2 Peak Elev=651.84' Inflow=0.25 cfs 0.038 af
15.0" Round Culvert n=0.011 L=43.0' S=0.0256 '/' Outflow=0.25 cfs 0.038 af

Pond 21P: Shallow Wetland Peak Elev=658.05' Storage=1,666 cf Inflow=0.36 cfs 0.057 af
Primary=0.04 cfs 0.020 af Secondary=0.00 cfs 0.000 af Outflow=0.04 cfs 0.020 af

Pond 24P: DS 1-3 Peak Elev=652.11' Inflow=0.04 cfs 0.020 af
15.0" Round Culvert n=0.011 L=101.0' S=0.0050 '/' Outflow=0.04 cfs 0.020 af

Total Runoff Area = 1.571 ac Runoff Volume = 0.144 af Average Runoff Depth = 1.10"
63.44% Pervious = 0.997 ac 36.56% Impervious = 0.574 ac

Summary for Subcatchment 4S: Area1

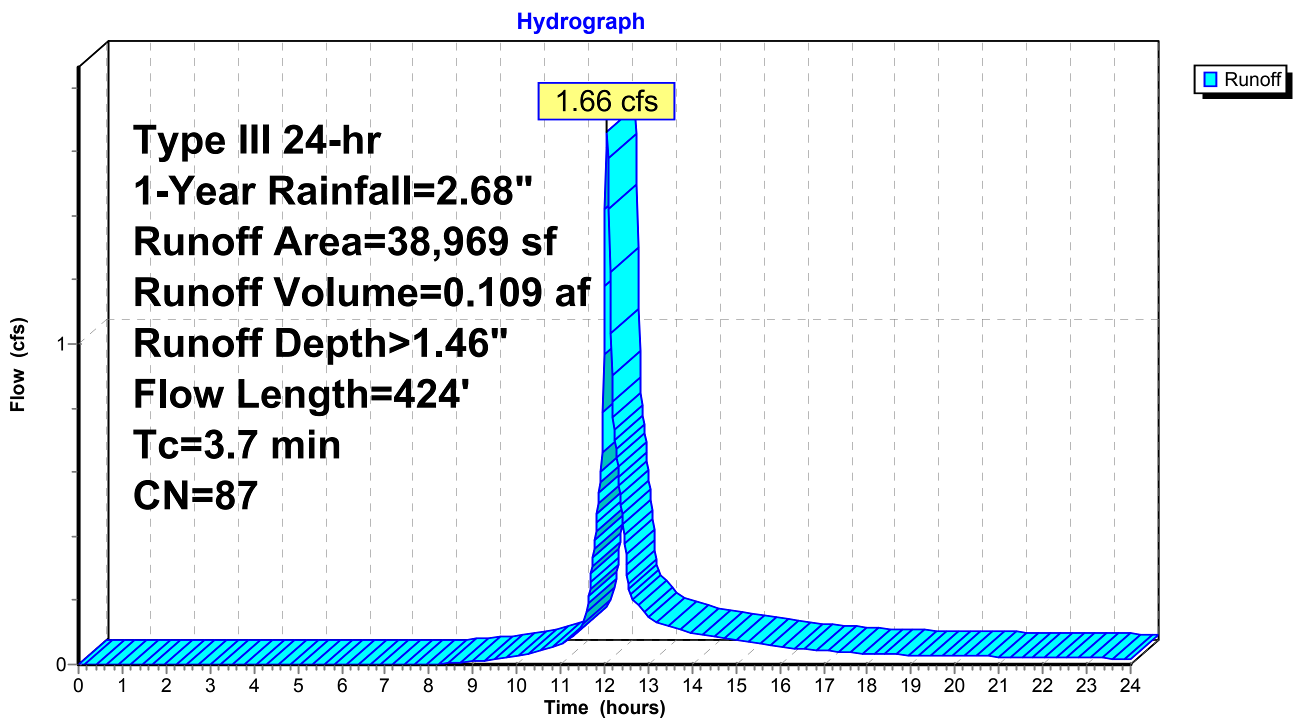
Runoff = 1.66 cfs @ 12.06 hrs, Volume= 0.109 af, Depth> 1.46"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 1-Year Rainfall=2.68"

Area (sf)	CN	Description
23,109	98	Paved parking, HSG B
14,880	69	50-75% Grass cover, Fair, HSG B
980	98	Paved parking, HSG D
38,969	87	Weighted Average
14,880		38.18% Pervious Area
24,089		61.82% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	34	0.0735	1.88		**Sheet Flow, segmentAB** Smooth surfaces n= 0.011 P2= 3.24"
0.5	10	0.3160	0.33		**Sheet Flow, segmentBC** Grass: Short n= 0.150 P2= 3.24"
2.9	380	0.0050	2.16	1.80	**Parabolic Channel, segmentCD** W=2.50' D=0.50' Area=0.8 sf Perim=2.7' n= 0.022 Earth, clean & straight
3.7	424	Total			

Subcatchment 4S: Area1



Summary for Subcatchment 5S: Area2

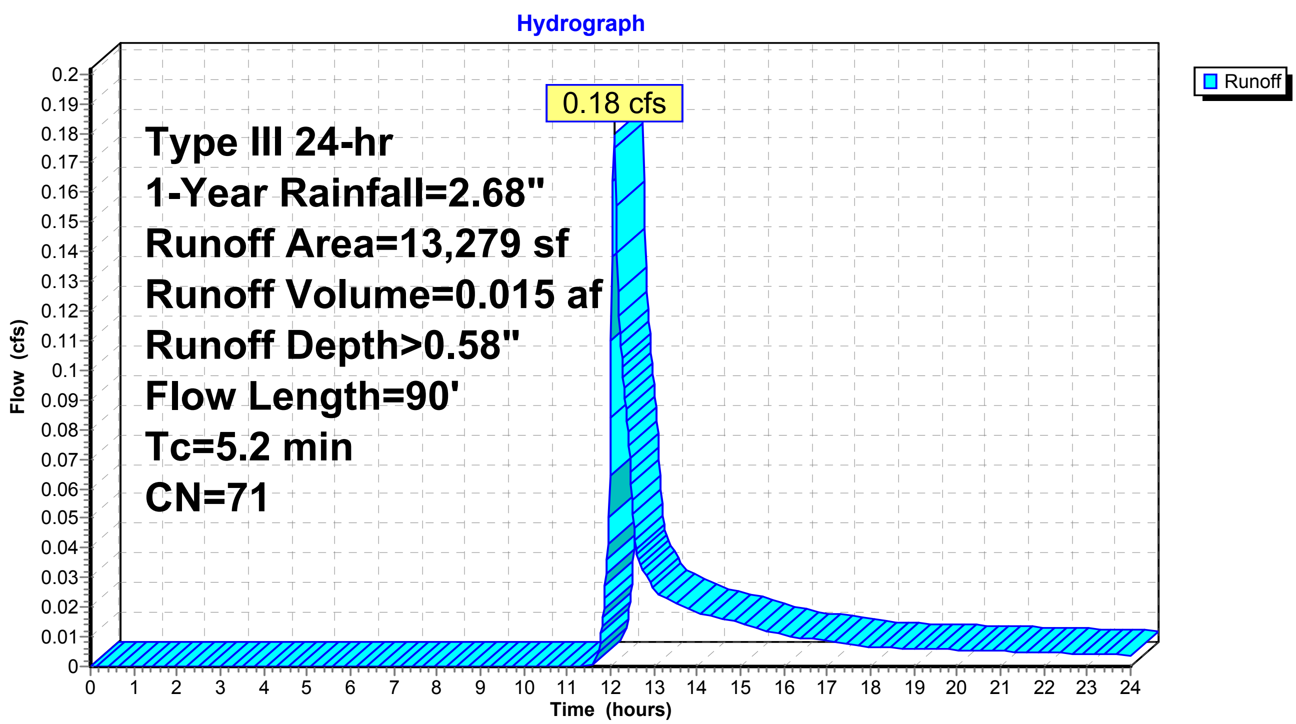
Runoff = 0.18 cfs @ 12.09 hrs, Volume= 0.015 af, Depth> 0.58"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 1-Year Rainfall=2.68"

Area (sf)	CN	Description
12,518	69	50-75% Grass cover, Fair, HSG B
473	96	Gravel surface, HSG B
288	98	Paved parking, HSG B
13,279	71	Weighted Average
12,991		97.83% Pervious Area
288		2.17% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.0	43	0.0058	0.71		**Sheet Flow, segmentAB** Smooth surfaces n= 0.011 P2= 3.24"
3.7	16	0.0058	0.07		**Sheet Flow, segmentBC** Grass: Short n= 0.150 P2= 3.24"
0.5	31	0.0160	1.00		**Sheet Flow, segmentCD** Smooth surfaces n= 0.011 P2= 3.24"
5.2	90	Total			

Subcatchment 5S: Area2



Summary for Subcatchment 8S: Area3

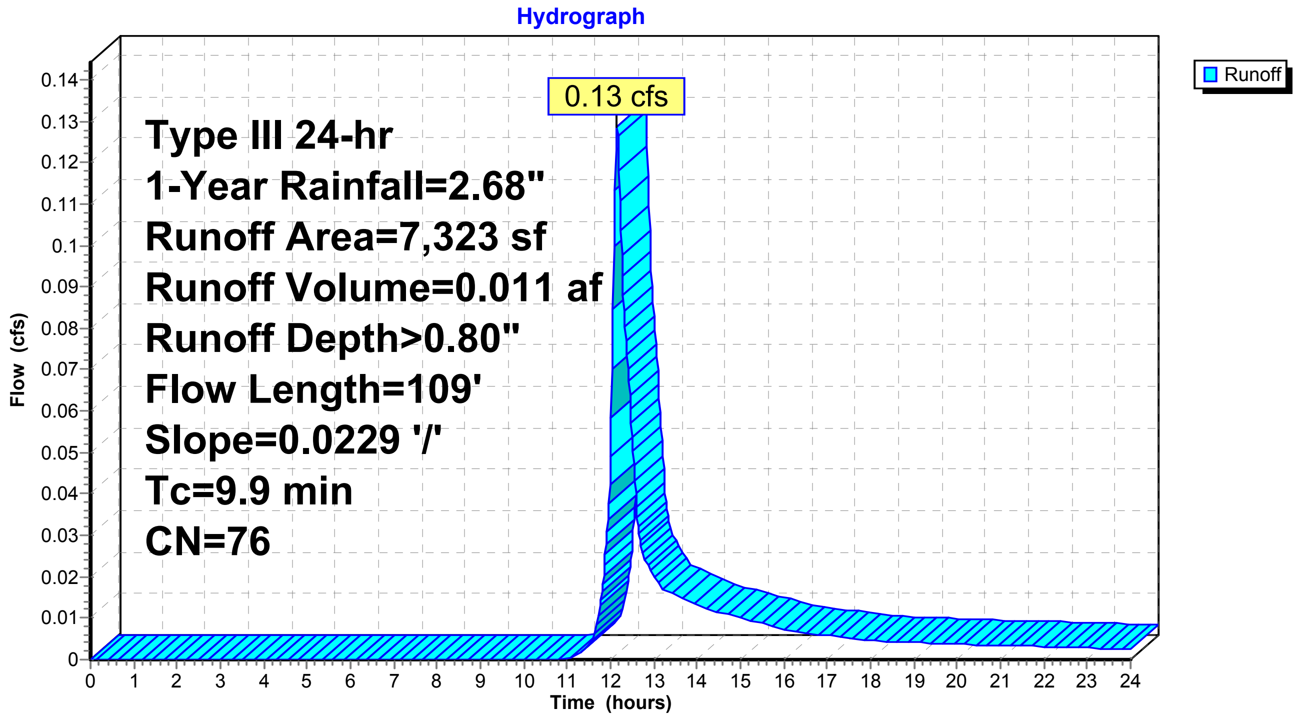
Runoff = 0.13 cfs @ 12.15 hrs, Volume= 0.011 af, Depth> 0.80"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 1-Year Rainfall=2.68"

Area (sf)	CN	Description
358	98	Paved parking, HSG B
5,357	69	50-75% Grass cover, Fair, HSG B
1,320	96	Gravel surface, HSG B
288	98	Paved parking, HSG B
7,323	76	Weighted Average
6,677		91.18% Pervious Area
646		8.82% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.9	109	0.0229	0.18		**Sheet Flow, semgentAB** Grass: Short n= 0.150 P2= 3.24"

Subcatchment 8S: Area3



Summary for Subcatchment 27S: Area5

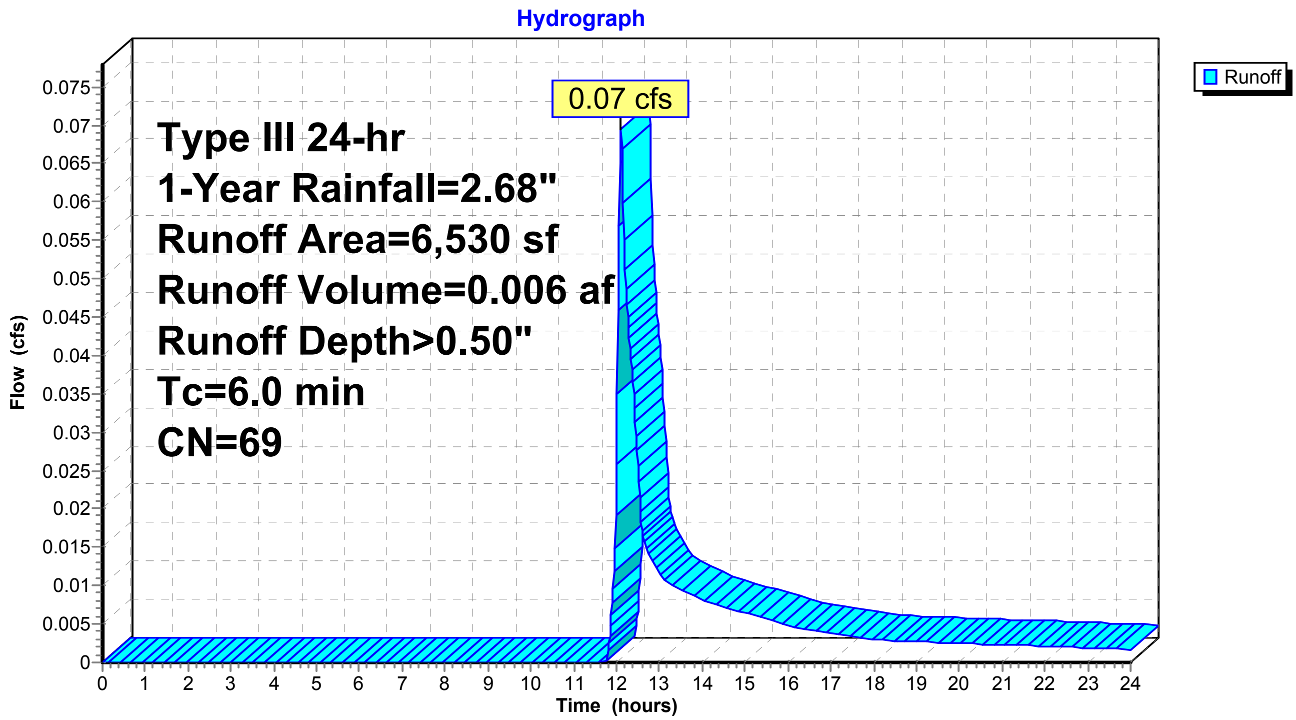
Runoff = 0.07 cfs @ 12.11 hrs, Volume= 0.006 af, Depth> 0.50"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 1-Year Rainfall=2.68"

Area (sf)	CN	Description
6,530	69	50-75% Grass cover, Fair, HSG B
6,530		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment 27S: Area5



Summary for Subcatchment 28S: Area4

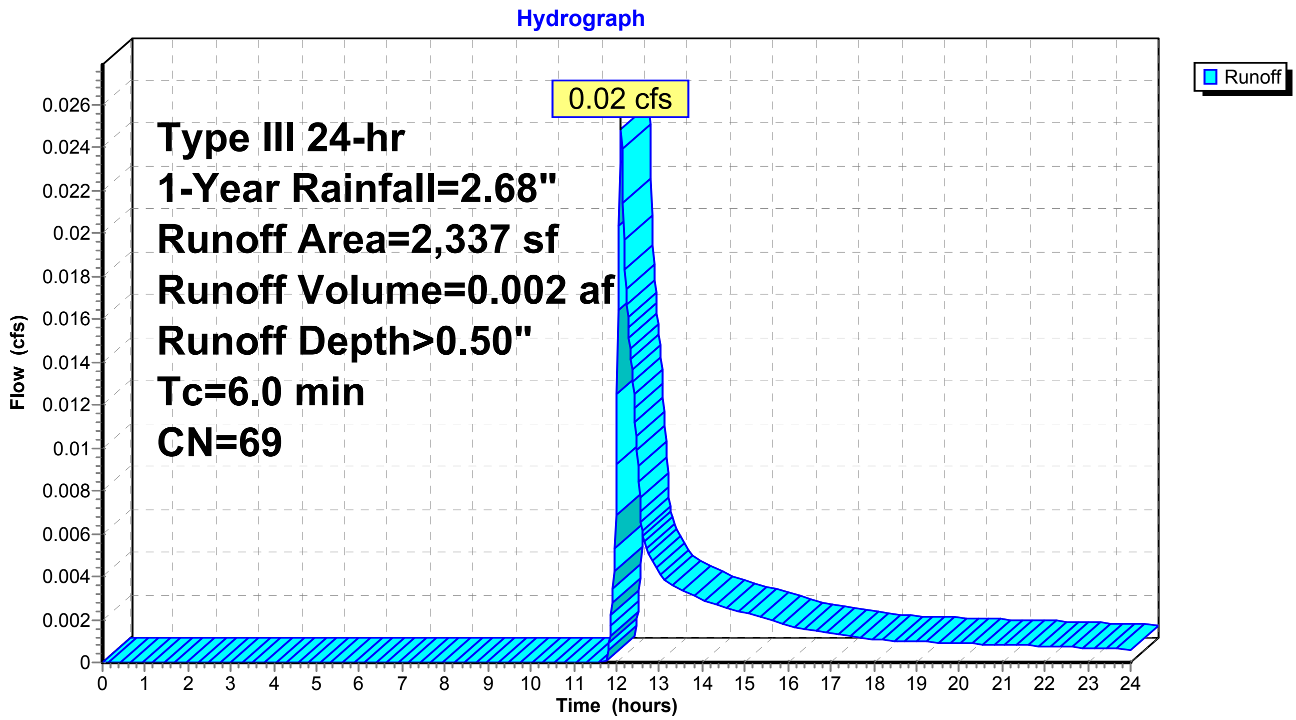
Runoff = 0.02 cfs @ 12.11 hrs, Volume= 0.002 af, Depth> 0.50"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 1-Year Rainfall=2.68"

Area (sf)	CN	Description
2,337	69	50-75% Grass cover, Fair, HSG B
2,337		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment 28S: Area4



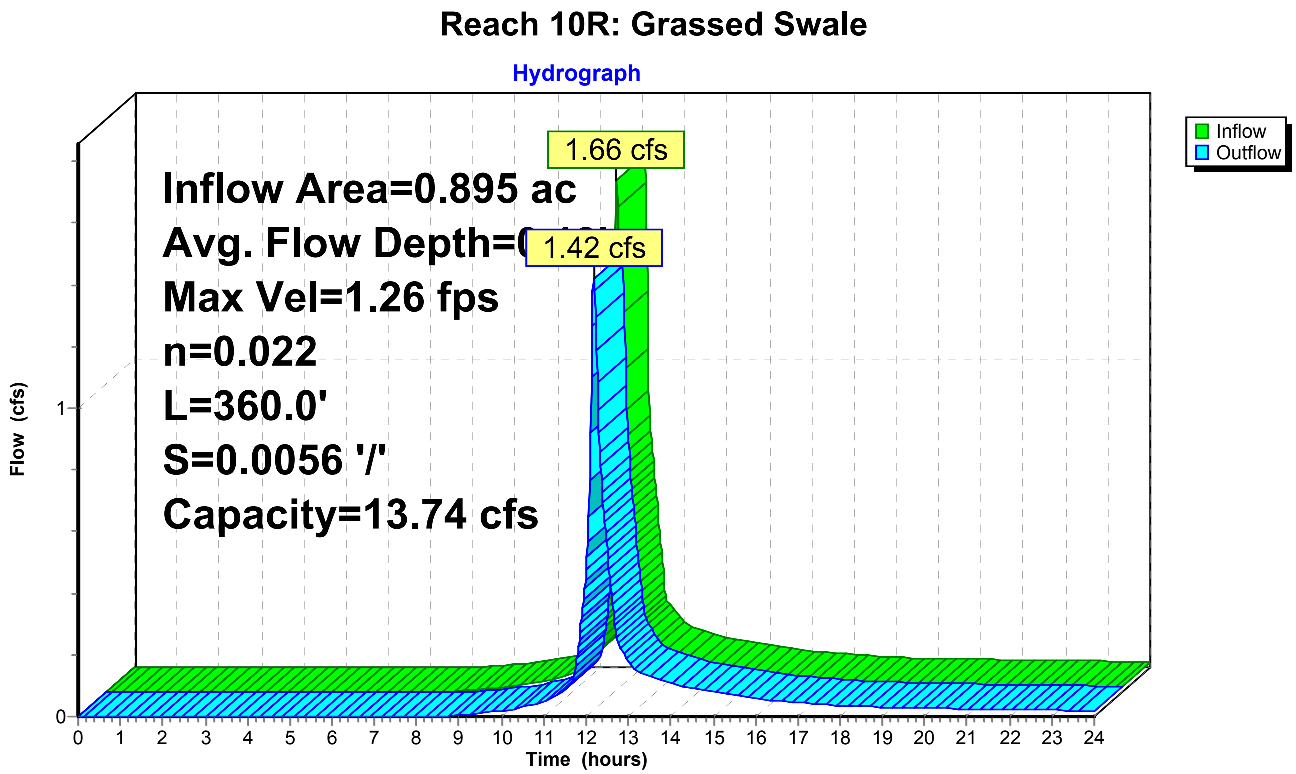
Summary for Reach 10R: Grassed Swale

Inflow Area = 0.895 ac, 61.82% Impervious, Inflow Depth > 1.46" for 1-Year event
Inflow = 1.66 cfs @ 12.06 hrs, Volume= 0.109 af
Outflow = 1.42 cfs @ 12.18 hrs, Volume= 0.108 af, Atten= 14%, Lag= 7.3 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Max. Velocity= 1.26 fps, Min. Travel Time= 4.8 min
Avg. Velocity = 0.35 fps, Avg. Travel Time= 17.3 min

Peak Storage= 406 cf @ 12.10 hrs
Average Depth at Peak Storage= 0.13'
Bank-Full Depth= 0.50' Flow Area= 4.9 sf, Capacity= 13.74 cfs

8.00' x 0.50' deep channel, n= 0.022 Earth, clean & straight
Side Slope Z-value= 3.0 4.0 '/' Top Width= 11.50'
Length= 360.0' Slope= 0.0056 '/'
Inlet Invert= 663.00', Outlet Invert= 661.00'

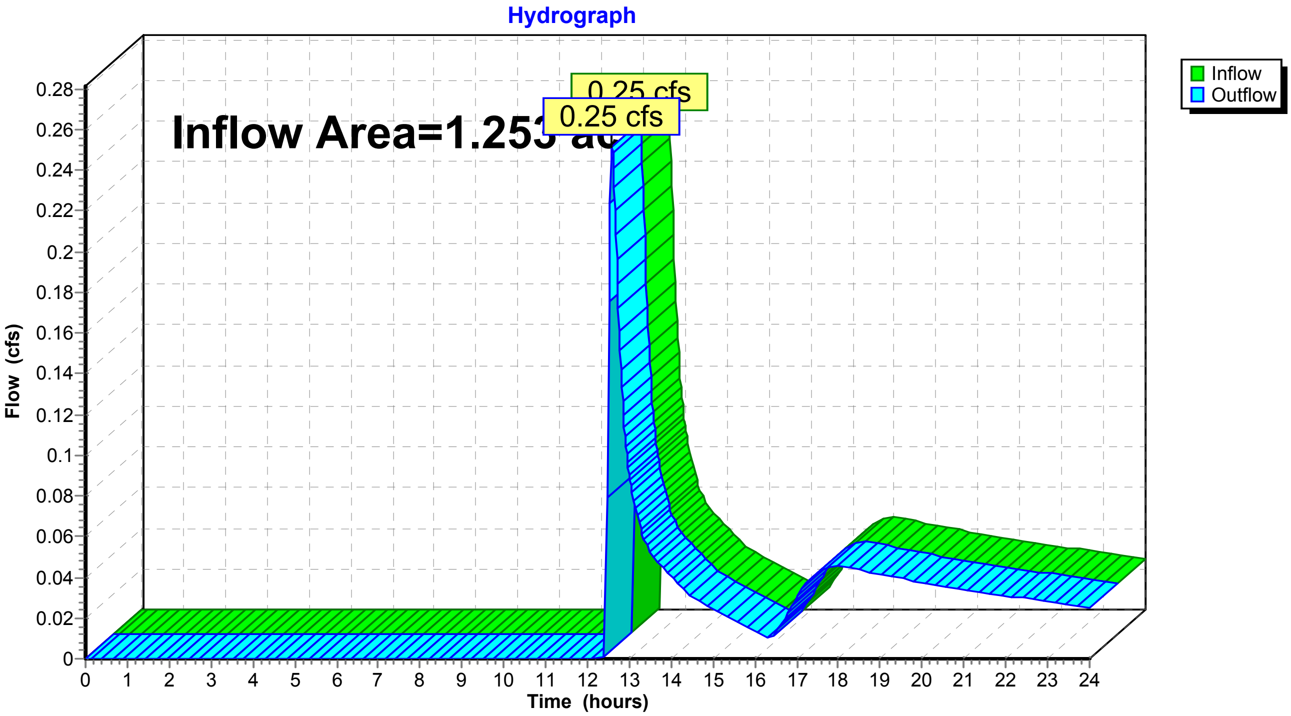


Summary for Reach 19R: downstream

Inflow Area = 1.253 ac, 44.66% Impervious, Inflow Depth > 0.36" for 1-Year event
Inflow = 0.25 cfs @ 12.58 hrs, Volume= 0.038 af
Outflow = 0.25 cfs @ 12.58 hrs, Volume= 0.038 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs

Reach 19R: downstream



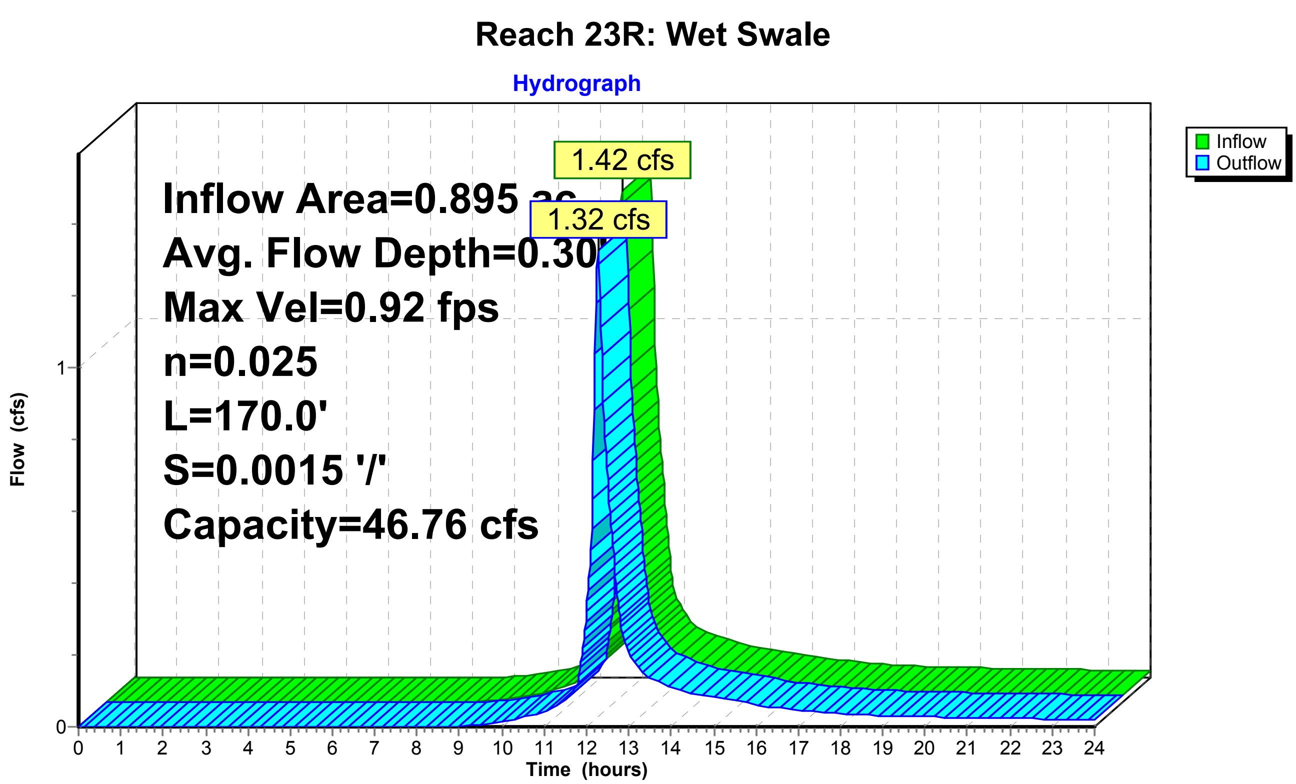
Summary for Reach 23R: Wet Swale

Inflow Area = 0.895 ac, 61.82% Impervious, Inflow Depth > 1.45" for 1-Year event
Inflow = 1.42 cfs @ 12.18 hrs, Volume= 0.108 af
Outflow = 1.32 cfs @ 12.27 hrs, Volume= 0.108 af, Atten= 7%, Lag= 5.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Max. Velocity= 0.92 fps, Min. Travel Time= 3.1 min
Avg. Velocity = 0.29 fps, Avg. Travel Time= 9.9 min

Peak Storage= 246 cf @ 12.21 hrs
Average Depth at Peak Storage= 0.30'
Bank-Full Depth= 2.00' Flow Area= 18.0 sf, Capacity= 46.76 cfs

4.00' x 2.00' deep channel, n= 0.025 Earth, clean & winding
Side Slope Z-value= 3.0 2.0 '/' Top Width= 14.00'
Length= 170.0' Slope= 0.0015 '/'
Inlet Invert= 660.25', Outlet Invert= 660.00'

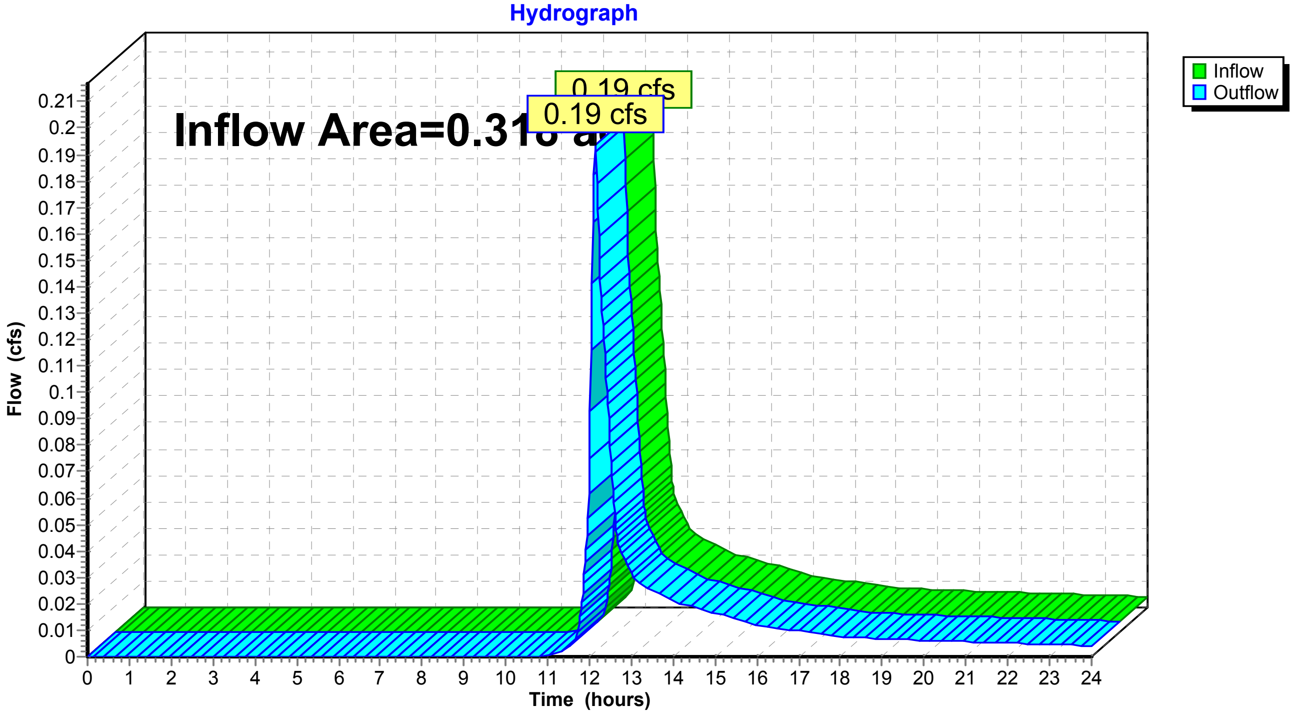


Summary for Reach 25R: downstream 2

Inflow Area =	0.318 ac,	4.66% Impervious,	Inflow Depth > 0.66"	for 1-Year event	
Inflow =	0.19 cfs @	12.13 hrs,	Volume=	0.018 af	
Outflow =	0.19 cfs @	12.13 hrs,	Volume=	0.018 af,	Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs

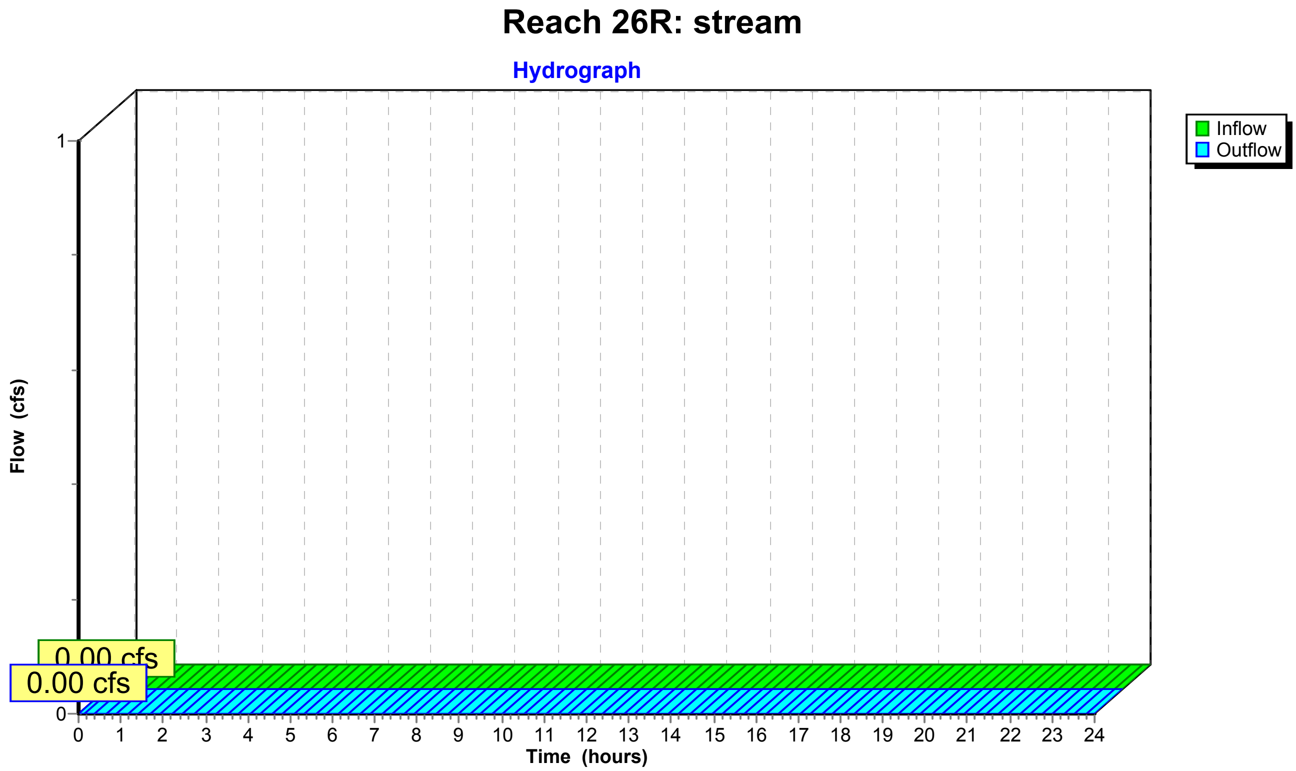
Reach 25R: downstream 2



Summary for Reach 26R: stream

Inflow	=	0.00 cfs @	0.00 hrs, Volume=	0.000 af
Outflow	=	0.00 cfs @	0.00 hrs, Volume=	0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs



Summary for Pond 12P: DS 1-1

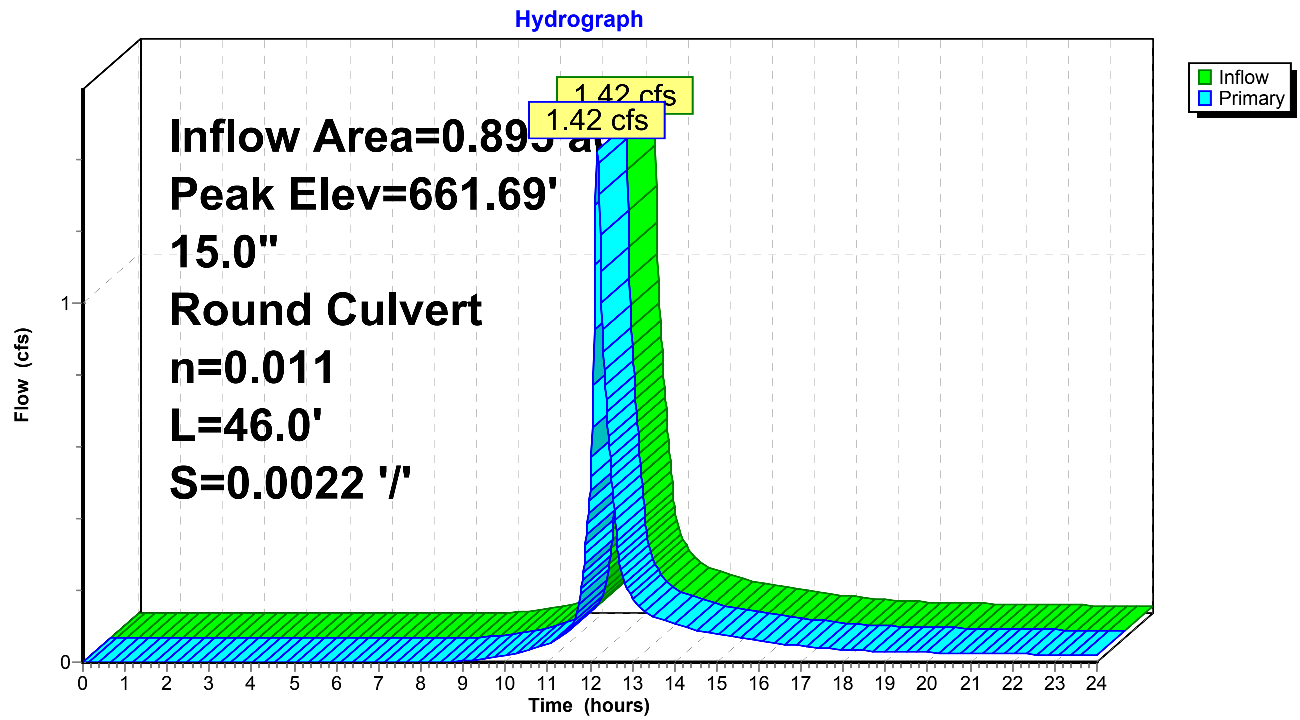
Inflow Area = 0.895 ac, 61.82% Impervious, Inflow Depth > 1.45" for 1-Year event
Inflow = 1.42 cfs @ 12.18 hrs, Volume= 0.108 af
Outflow = 1.42 cfs @ 12.18 hrs, Volume= 0.108 af, Atten= 0%, Lag= 0.0 min
Primary = 1.42 cfs @ 12.18 hrs, Volume= 0.108 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Peak Elev= 661.69' @ 12.18 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	660.95'	**15.0" Round Culvert** L= 46.0' CMP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 660.95' / 660.85' S= 0.0022 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 1.23 sf

Primary OutFlow Max=1.42 cfs @ 12.18 hrs HW=661.69' (Free Discharge)
└─**1=Culvert** (Barrel Controls 1.42 cfs @ 2.69 fps)

Pond 12P: DS 1-1



Summary for Pond 17P: Bioretention

Inflow Area = 1.199 ac, 46.66% Impervious, Inflow Depth > 1.23" for 1-Year event
Inflow = 1.43 cfs @ 12.27 hrs, Volume= 0.123 af
Outflow = 0.60 cfs @ 12.58 hrs, Volume= 0.073 af, Atten= 58%, Lag= 19.1 min
Primary = 0.25 cfs @ 12.58 hrs, Volume= 0.018 af
Secondary = 0.35 cfs @ 12.58 hrs, Volume= 0.055 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Peak Elev= 659.79' @ 12.58 hrs Surf.Area= 2,669 sf Storage= 2,262 cf

Plug-Flow detention time= 200.1 min calculated for 0.073 af (59% of inflow)
Center-of-Mass det. time= 89.1 min (937.6 - 848.4)

Volume	Invert	Avail.Storage	Storage Description
#1	655.84'	5,212 cf	**Custom Stage Data (Irregular)** Listed below (Recalc) 13,065 cf Overall - 7,853 cf Embedded = 5,212 cf
#2	656.51'	317 cf	**Custom Stage Data (Irregular)** Listed below (Recalc) Inside #1 6,333 cf Overall x 5.0% Voids
#3	655.84'	608 cf	**Custom Stage Data (Irregular)** Listed below (Recalc) Inside #1 1,520 cf Overall x 40.0% Voids
		6,137 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
655.84	2,303	357.0	0	0	2,303
659.26	2,303	357.0	7,876	7,876	3,524
660.00	2,822	370.0	1,893	9,769	4,323
660.50	3,282	395.0	1,525	11,294	5,857
661.00	3,811	410.0	1,772	13,065	6,838

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
656.51	2,303	357.0	0	0	2,303
659.26	2,303	357.0	6,333	6,333	3,285

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
655.84	2,303	357.0	0	0	2,303
656.50	2,303	357.0	1,520	1,520	2,539

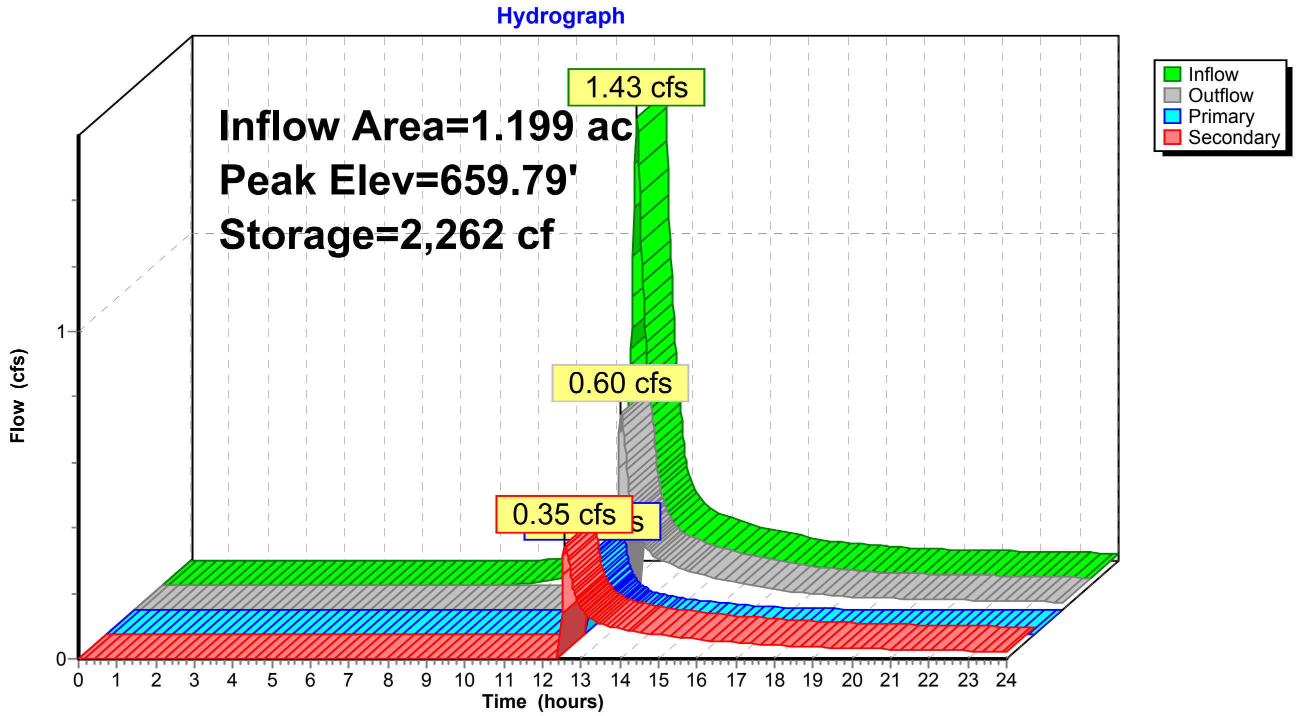
Device	Routing	Invert	Outlet Devices
#1	Primary	657.60'	**12.0" Round Culvert** L= 57.0' CMP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 657.60' / 657.25' S= 0.0061 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 0.79 sf
#2	Secondary	659.75'	**15.0' long x 12.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.57 2.62 2.70 2.67 2.66 2.67 2.66 2.64
#3	Device 1	659.26'	**0.250 in/hr Exfiltration over Surface area above 659.26'** Excluded Surface area = 2,303 sf

#4	Device 1	659.76'	**2.5" x 3.8" Horiz. Orifice/Grate X 11.00** C= 0.600 in 33.5" x 38.0" Grate (8% open area) Limited to weir flow at low heads

Primary OutFlow Max=0.19 cfs @ 12.58 hrs HW=659.79' (Free Discharge)
└─**1=Culvert** (Passes 0.19 cfs of 4.34 cfs potential flow)
  ├─**3=Exfiltration** (Exfiltration Controls 0.00 cfs)
  └─**4=Orifice/Grate** (Weir Controls 0.19 cfs @ 0.56 fps)

Secondary OutFlow Max=0.30 cfs @ 12.58 hrs HW=659.79' (Free Discharge)
└─**2=Broad-Crested Rectangular Weir** (Weir Controls 0.30 cfs @ 0.51 fps)

Pond 17P: Bioretention



Summary for Pond 20P: DS 1-2

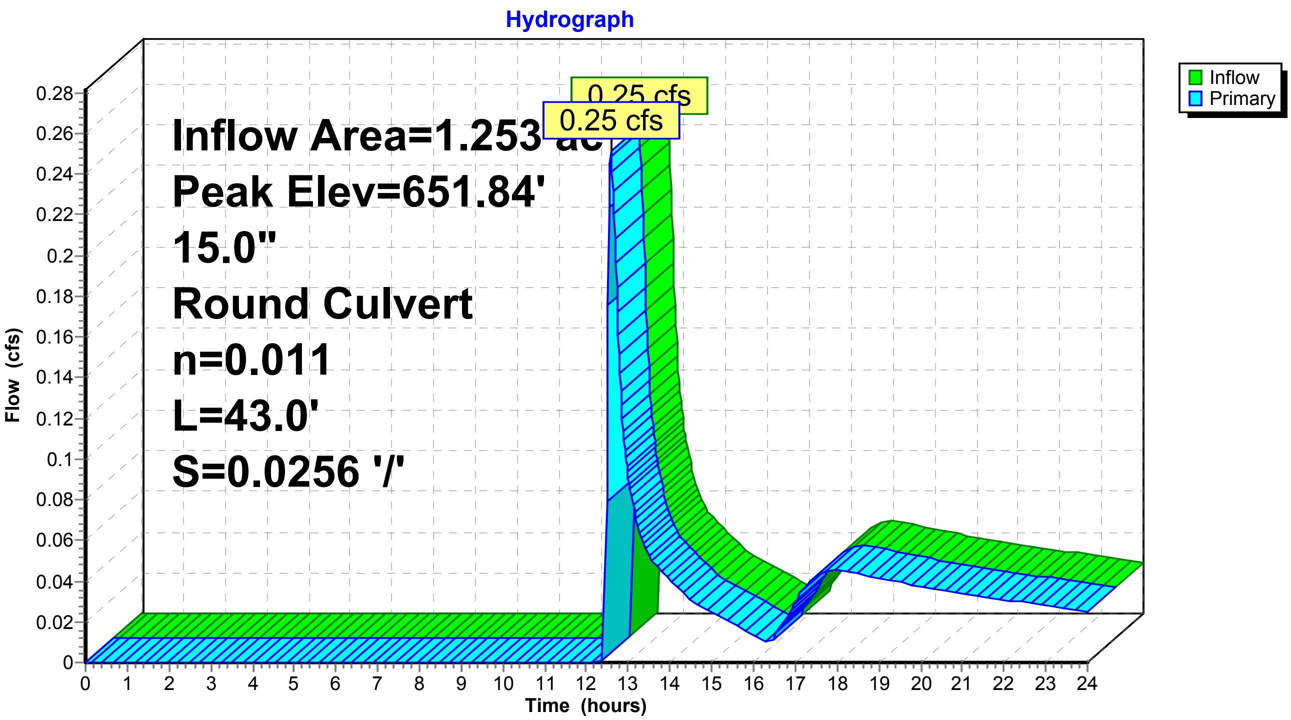
Inflow Area =	1.253 ac,	44.66% Impervious,	Inflow Depth >	0.36"	for 1-Year event
Inflow =	0.25 cfs @	12.58 hrs,	Volume=	0.038 af	
Outflow =	0.25 cfs @	12.58 hrs,	Volume=	0.038 af,	Atten= 0%, Lag= 0.0 min
Primary =	0.25 cfs @	12.58 hrs,	Volume=	0.038 af	

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Peak Elev= 651.84' @ 12.58 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	651.60'	**15.0" Round Culvert** L= 43.0' CMP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 651.60' / 650.50' S= 0.0256 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 1.23 sf

Primary OutFlow Max=0.25 cfs @ 12.58 hrs HW=651.84' (Free Discharge)
└─**1=Culvert** (Inlet Controls 0.25 cfs @ 1.48 fps)

Pond 20P: DS 1-2



Summary for Pond 21P: Shallow Wetland

Inflow Area = 0.054 ac, 0.00% Impervious, Inflow Depth > 12.76" for 1-Year event
Inflow = 0.36 cfs @ 12.58 hrs, Volume= 0.057 af
Outflow = 0.04 cfs @ 18.10 hrs, Volume= 0.020 af, Atten= 88%, Lag= 330.9 min
Primary = 0.04 cfs @ 18.10 hrs, Volume= 0.020 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Peak Elev= 658.05' @ 18.10 hrs Surf.Area= 2,377 sf Storage= 1,666 cf

Plug-Flow detention time= 426.0 min calculated for 0.020 af (35% of inflow)
Center-of-Mass det. time= 241.3 min (1,205.8 - 964.5)

Volume	Invert	Avail.Storage	Storage Description
#1	656.50'	6,117 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

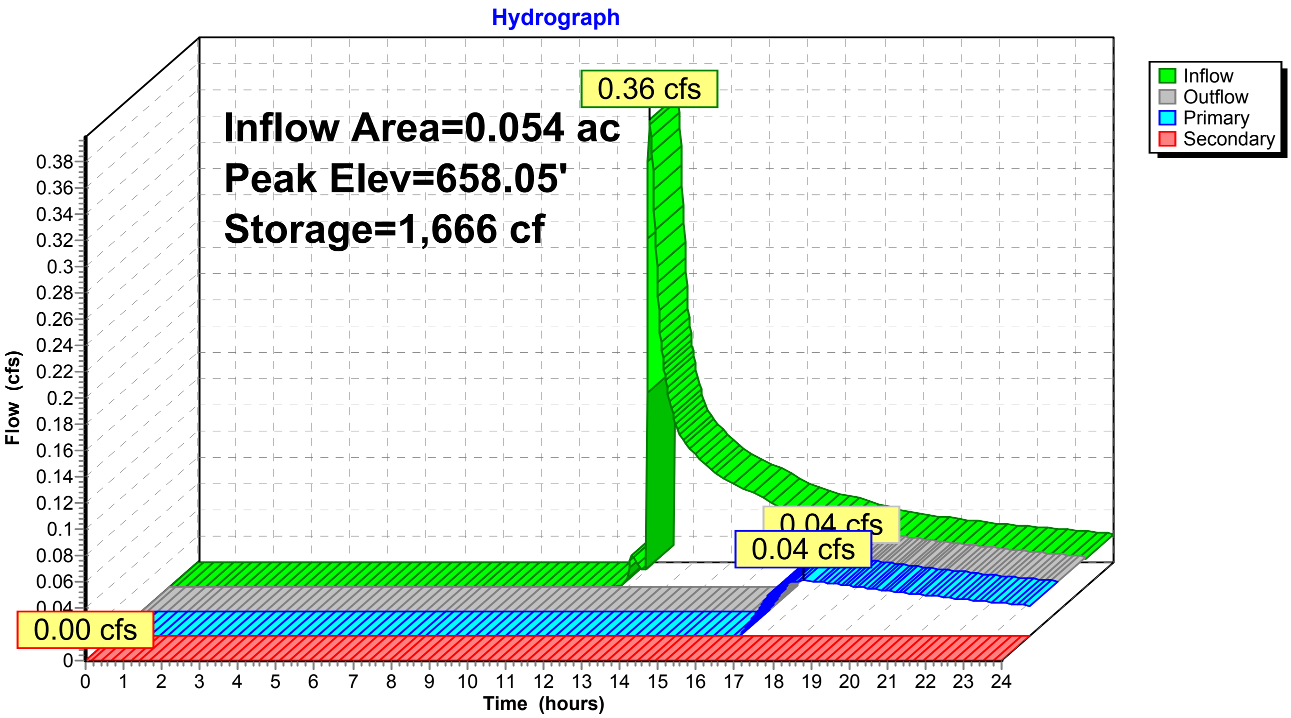
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
656.50	106	43.0	0	0	106
657.00	342	80.0	106	106	469
657.50	1,626	315.0	452	559	7,857
658.00	2,331	218.0	984	1,543	11,973
658.50	2,787	237.0	1,278	2,820	12,671
659.00	3,281	256.0	1,515	4,336	13,426
659.50	3,853	277.0	1,782	6,117	14,327

Device	Routing	Invert	Outlet Devices
#1	Primary	653.50'	**15.0" Round Culvert** L= 28.0' RCP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 653.50' / 653.00' S= 0.0179 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 1.23 sf
#2	Device 1	658.00'	**2.5" x 3.8" Horiz. Orifice/Grate** C= 0.600 in 33.5" x 38.0" Grate (1% open area) Limited to weir flow at low heads
#3	Secondary	659.25'	**13.0' long x 8.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64 2.64 2.65 2.65 2.66 2.66 2.68 2.70 2.74

Primary OutFlow Max=0.04 cfs @ 18.10 hrs HW=658.05' (Free Discharge)
└─**1=Culvert** (Passes 0.04 cfs of 10.33 cfs potential flow)
  └─**2=Orifice/Grate** (Weir Controls 0.04 cfs @ 0.75 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=656.50' (Free Discharge)
└─**3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 21P: Shallow Wetland



Summary for Pond 24P: DS 1-3

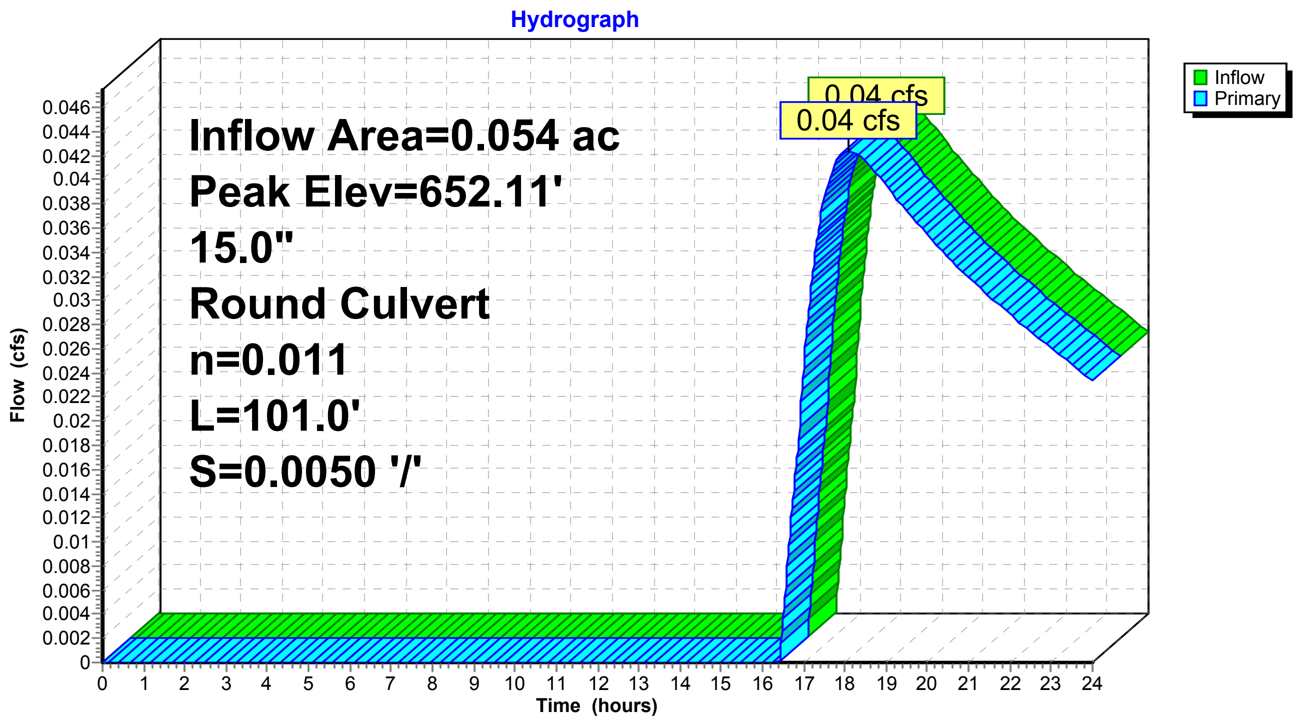
Inflow Area = 0.054 ac, 0.00% Impervious, Inflow Depth > 4.42" for 1-Year event
Inflow = 0.04 cfs @ 18.10 hrs, Volume= 0.020 af
Outflow = 0.04 cfs @ 18.10 hrs, Volume= 0.020 af, Atten= 0%, Lag= 0.0 min
Primary = 0.04 cfs @ 18.10 hrs, Volume= 0.020 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Peak Elev= 652.11' @ 18.10 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	652.00'	**15.0" Round Culvert** L= 101.0' RCP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 652.00' / 651.50' S= 0.0050 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 1.23 sf

Primary OutFlow Max=0.04 cfs @ 18.10 hrs HW=652.11' (Free Discharge)
1=Culvert (Barrel Controls 0.04 cfs @ 1.29 fps)

Pond 24P: DS 1-3



Time span=0.00-24.00 hrs, dt=0.02 hrs, 1201 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 4S: Area1 Runoff Area=38,969 sf 61.82% Impervious Runoff Depth>3.34"
Flow Length=424' Tc=3.7 min CN=87 Runoff=3.73 cfs 0.249 af

Subcatchment 5S: Area2 Runoff Area=13,279 sf 2.17% Impervious Runoff Depth>1.93"
Flow Length=90' Tc=5.2 min CN=71 Runoff=0.70 cfs 0.049 af

Subcatchment 8S: Area3 Runoff Area=7,323 sf 8.82% Impervious Runoff Depth>2.33"
Flow Length=109' Slope=0.0229 '/' Tc=9.9 min CN=76 Runoff=0.40 cfs 0.033 af

Subcatchment 27S: Area5 Runoff Area=6,530 sf 0.00% Impervious Runoff Depth>1.78"
Tc=6.0 min CN=69 Runoff=0.30 cfs 0.022 af

Subcatchment 28S: Area4 Runoff Area=2,337 sf 0.00% Impervious Runoff Depth>1.78"
Tc=6.0 min CN=69 Runoff=0.11 cfs 0.008 af

Reach 10R: Grassed Swale Avg. Flow Depth=0.22' Max Vel=1.73 fps Inflow=3.73 cfs 0.249 af
n=0.022 L=360.0' S=0.0056 '/' Capacity=13.74 cfs Outflow=3.36 cfs 0.248 af

Reach 19R: downstream Inflow=1.30 cfs 0.216 af
Outflow=1.30 cfs 0.216 af

Reach 23R: Wet Swale Avg. Flow Depth=0.50' Max Vel=1.22 fps Inflow=3.36 cfs 0.248 af
n=0.025 L=170.0' S=0.0015 '/' Capacity=46.76 cfs Outflow=3.20 cfs 0.247 af

Reach 25R: downstream 2 Inflow=0.68 cfs 0.055 af
Outflow=0.68 cfs 0.055 af

Reach 26R: stream Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Pond 12P: DS 1-1 Peak Elev=662.20' Inflow=3.36 cfs 0.248 af
15.0" Round Culvert n=0.011 L=46.0' S=0.0022 '/' Outflow=3.36 cfs 0.248 af

Pond 17P: Bioretention Peak Elev=659.90' Storage=2,552 cf Inflow=3.59 cfs 0.296 af
Primary=1.29 cfs 0.089 af Secondary=2.18 cfs 0.157 af Outflow=3.46 cfs 0.246 af

Pond 20P: DS 1-2 Peak Elev=652.19' Inflow=1.30 cfs 0.216 af
15.0" Round Culvert n=0.011 L=43.0' S=0.0256 '/' Outflow=1.30 cfs 0.216 af

Pond 21P: Shallow Wetland Peak Elev=658.59' Storage=3,061 cf Inflow=2.24 cfs 0.165 af
Primary=0.24 cfs 0.127 af Secondary=0.00 cfs 0.000 af Outflow=0.24 cfs 0.127 af

Pond 24P: DS 1-3 Peak Elev=652.25' Inflow=0.24 cfs 0.127 af
15.0" Round Culvert n=0.011 L=101.0' S=0.0050 '/' Outflow=0.24 cfs 0.127 af

Total Runoff Area = 1.571 ac Runoff Volume = 0.361 af Average Runoff Depth = 2.76"
63.44% Pervious = 0.997 ac 36.56% Impervious = 0.574 ac

Summary for Subcatchment 4S: Area1

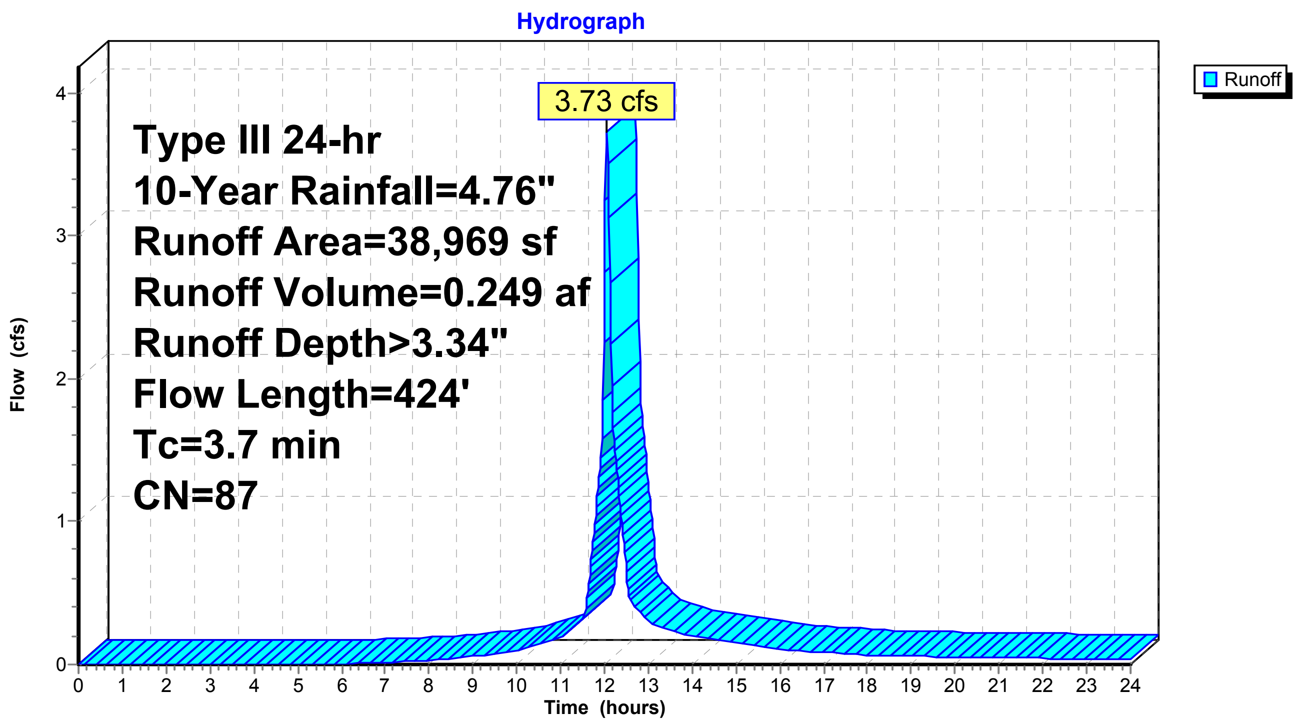
Runoff = 3.73 cfs @ 12.06 hrs, Volume= 0.249 af, Depth> 3.34"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 10-Year Rainfall=4.76"

Area (sf)	CN	Description
23,109	98	Paved parking, HSG B
14,880	69	50-75% Grass cover, Fair, HSG B
980	98	Paved parking, HSG D
38,969	87	Weighted Average
14,880		38.18% Pervious Area
24,089		61.82% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	34	0.0735	1.88		**Sheet Flow, segmentAB** Smooth surfaces n= 0.011 P2= 3.24"
0.5	10	0.3160	0.33		**Sheet Flow, segmentBC** Grass: Short n= 0.150 P2= 3.24"
2.9	380	0.0050	2.16	1.80	**Parabolic Channel, segmentCD** W=2.50' D=0.50' Area=0.8 sf Perim=2.7' n= 0.022 Earth, clean & straight
3.7	424	Total			

Subcatchment 4S: Area1



Summary for Subcatchment 5S: Area2

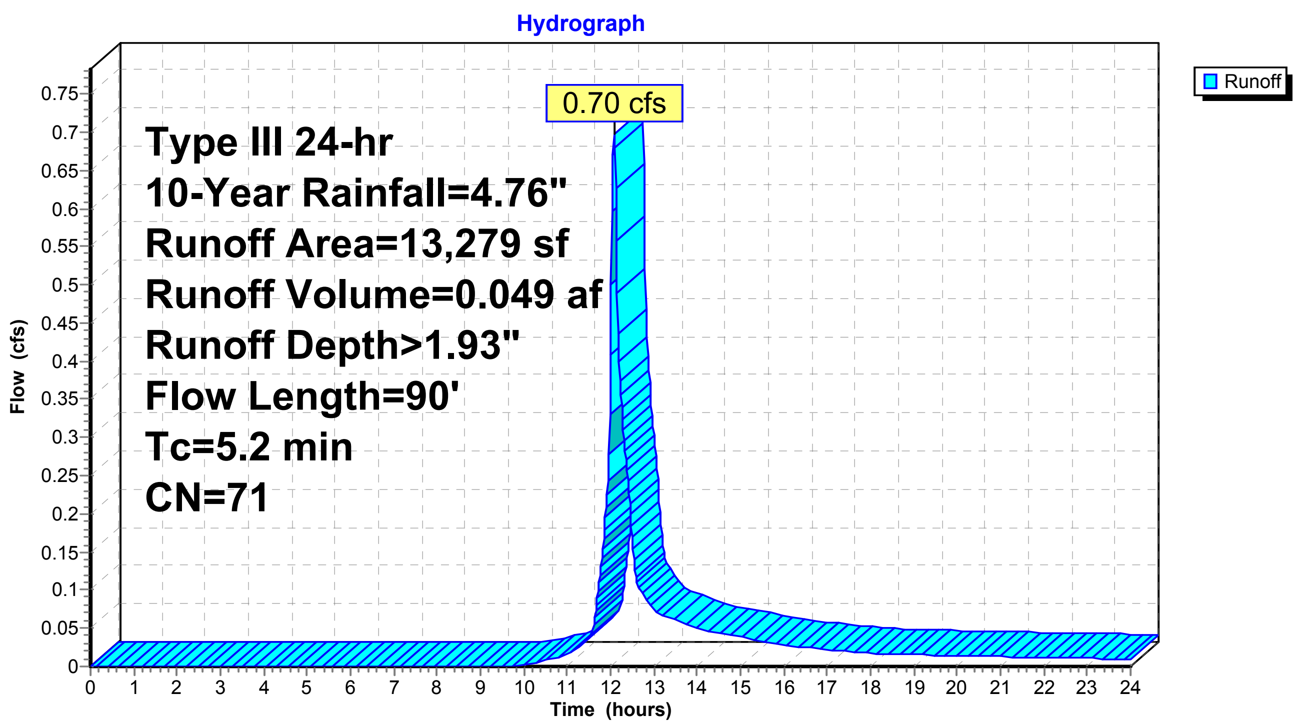
Runoff = 0.70 cfs @ 12.08 hrs, Volume= 0.049 af, Depth> 1.93"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 10-Year Rainfall=4.76"

Area (sf)	CN	Description
12,518	69	50-75% Grass cover, Fair, HSG B
473	96	Gravel surface, HSG B
288	98	Paved parking, HSG B
13,279	71	Weighted Average
12,991		97.83% Pervious Area
288		2.17% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.0	43	0.0058	0.71		**Sheet Flow, segmentAB** Smooth surfaces n= 0.011 P2= 3.24"
3.7	16	0.0058	0.07		**Sheet Flow, segmentBC** Grass: Short n= 0.150 P2= 3.24"
0.5	31	0.0160	1.00		**Sheet Flow, segmentCD** Smooth surfaces n= 0.011 P2= 3.24"
5.2	90	Total			

Subcatchment 5S: Area2



Summary for Subcatchment 8S: Area3

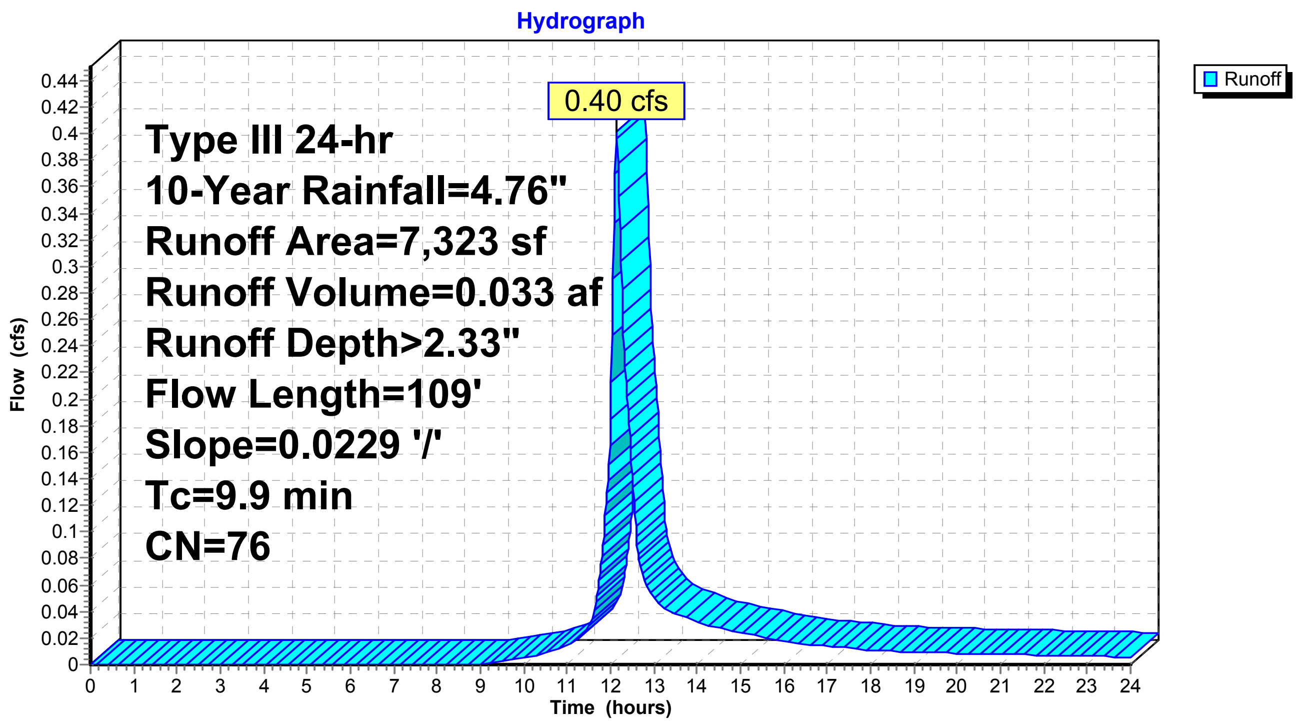
Runoff = 0.40 cfs @ 12.14 hrs, Volume= 0.033 af, Depth> 2.33"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 10-Year Rainfall=4.76"

Area (sf)	CN	Description
358	98	Paved parking, HSG B
5,357	69	50-75% Grass cover, Fair, HSG B
1,320	96	Gravel surface, HSG B
288	98	Paved parking, HSG B
7,323	76	Weighted Average
6,677		91.18% Pervious Area
646		8.82% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.9	109	0.0229	0.18		**Sheet Flow, semgentAB** Grass: Short n= 0.150 P2= 3.24"

Subcatchment 8S: Area3



Summary for Subcatchment 27S: Area5

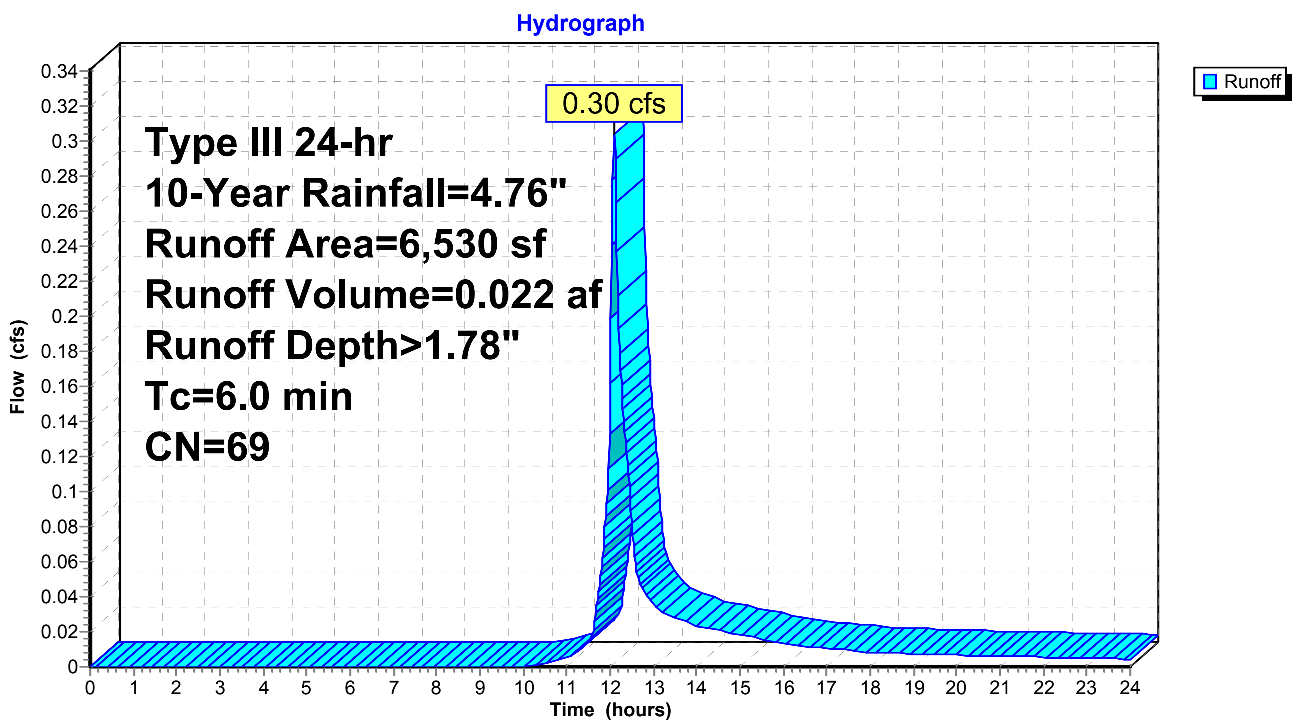
Runoff = 0.30 cfs @ 12.09 hrs, Volume= 0.022 af, Depth> 1.78"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 10-Year Rainfall=4.76"

Area (sf)	CN	Description
6,530	69	50-75% Grass cover, Fair, HSG B
6,530		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment 27S: Area5



Summary for Subcatchment 28S: Area4

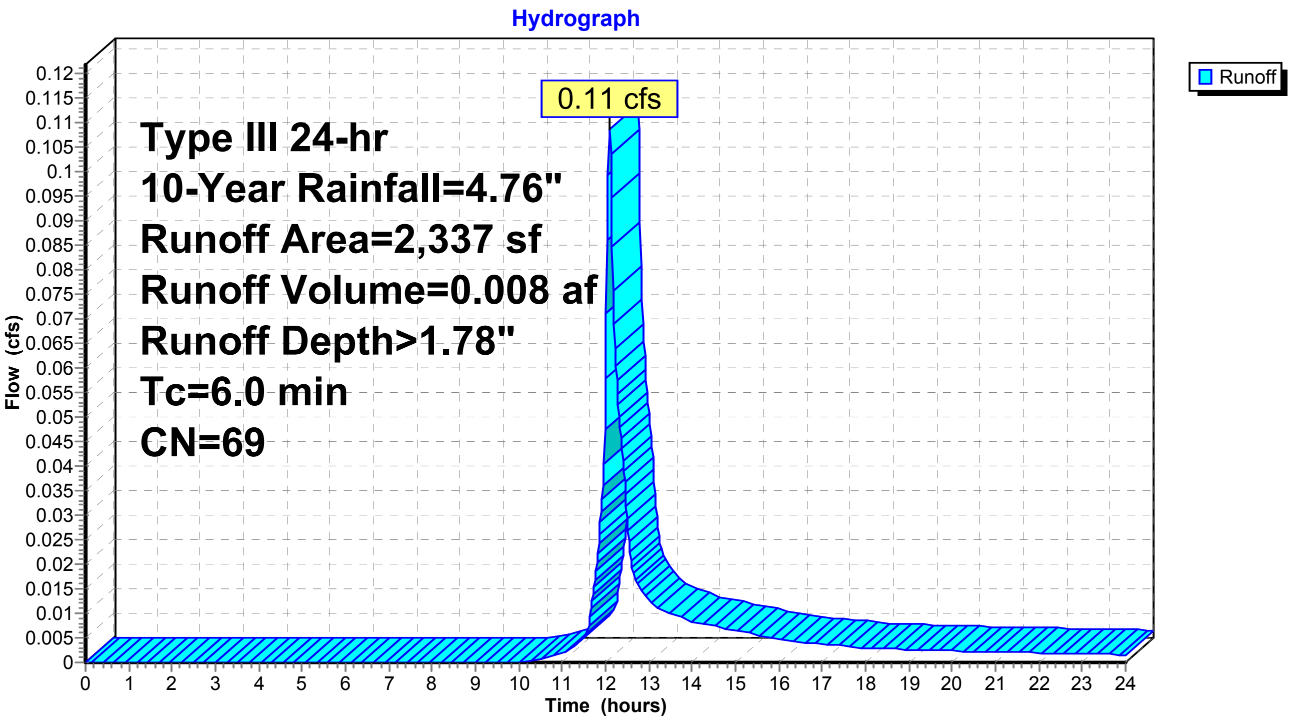
Runoff = 0.11 cfs @ 12.09 hrs, Volume= 0.008 af, Depth> 1.78"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 10-Year Rainfall=4.76"

Area (sf)	CN	Description
2,337	69	50-75% Grass cover, Fair, HSG B
2,337		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment 28S: Area4



Summary for Reach 10R: Grassed Swale

Inflow Area = 0.895 ac, 61.82% Impervious, Inflow Depth > 3.34" for 10-Year event
Inflow = 3.73 cfs @ 12.06 hrs, Volume= 0.249 af
Outflow = 3.36 cfs @ 12.15 hrs, Volume= 0.248 af, Atten= 10%, Lag= 5.5 min

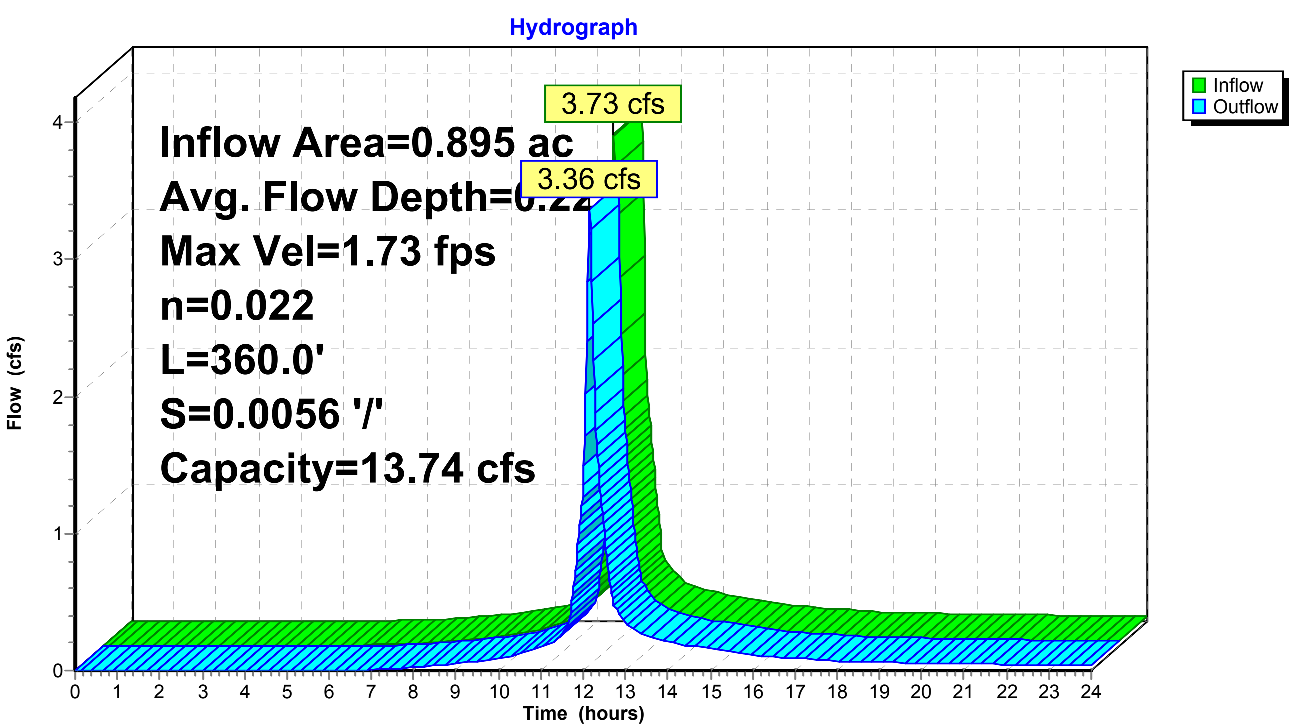
Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Max. Velocity= 1.73 fps, Min. Travel Time= 3.5 min
Avg. Velocity = 0.44 fps, Avg. Travel Time= 13.6 min

Peak Storage= 700 cf @ 12.09 hrs
Average Depth at Peak Storage= 0.22'
Bank-Full Depth= 0.50' Flow Area= 4.9 sf, Capacity= 13.74 cfs

8.00' x 0.50' deep channel, n= 0.022 Earth, clean & straight
Side Slope Z-value= 3.0 4.0 '/' Top Width= 11.50'
Length= 360.0' Slope= 0.0056 '/'
Inlet Invert= 663.00', Outlet Invert= 661.00'

‡

Reach 10R: Grassed Swale

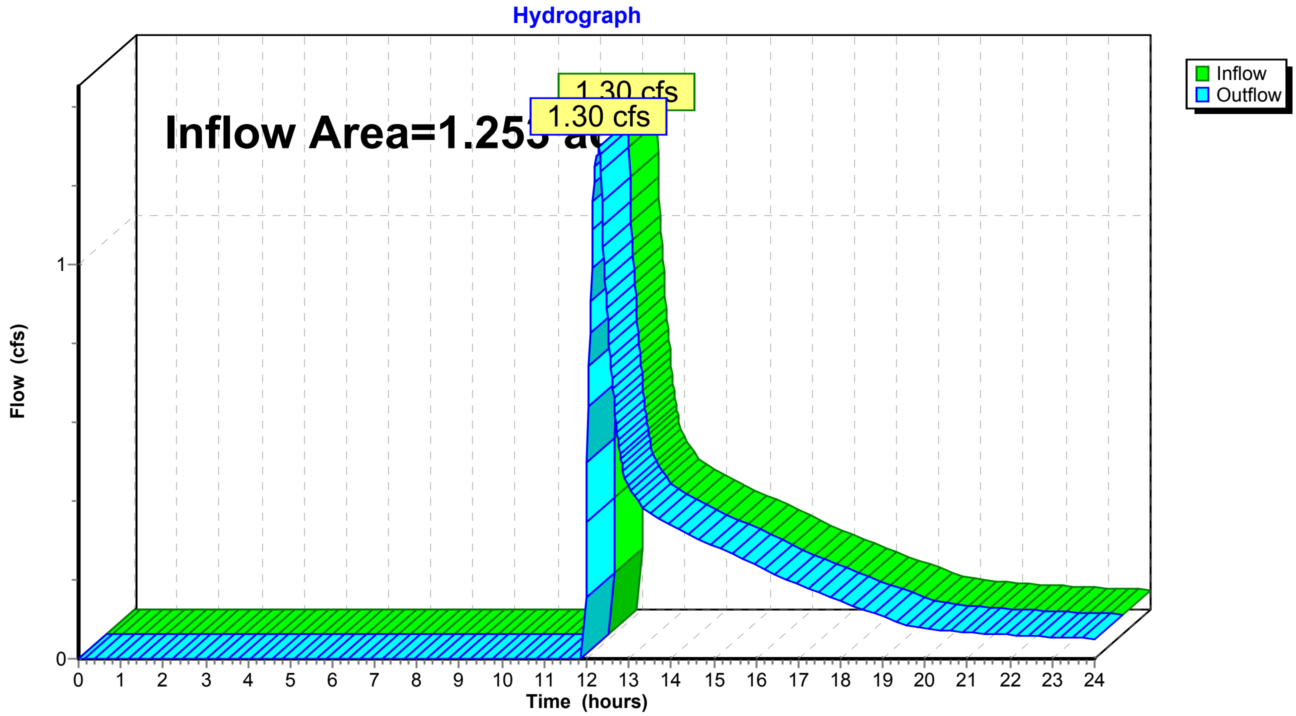


Summary for Reach 19R: downstream

Inflow Area = 1.253 ac, 44.66% Impervious, Inflow Depth > 2.06" for 10-Year event
Inflow = 1.30 cfs @ 12.30 hrs, Volume= 0.216 af
Outflow = 1.30 cfs @ 12.30 hrs, Volume= 0.216 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs

Reach 19R: downstream



Summary for Reach 23R: Wet Swale

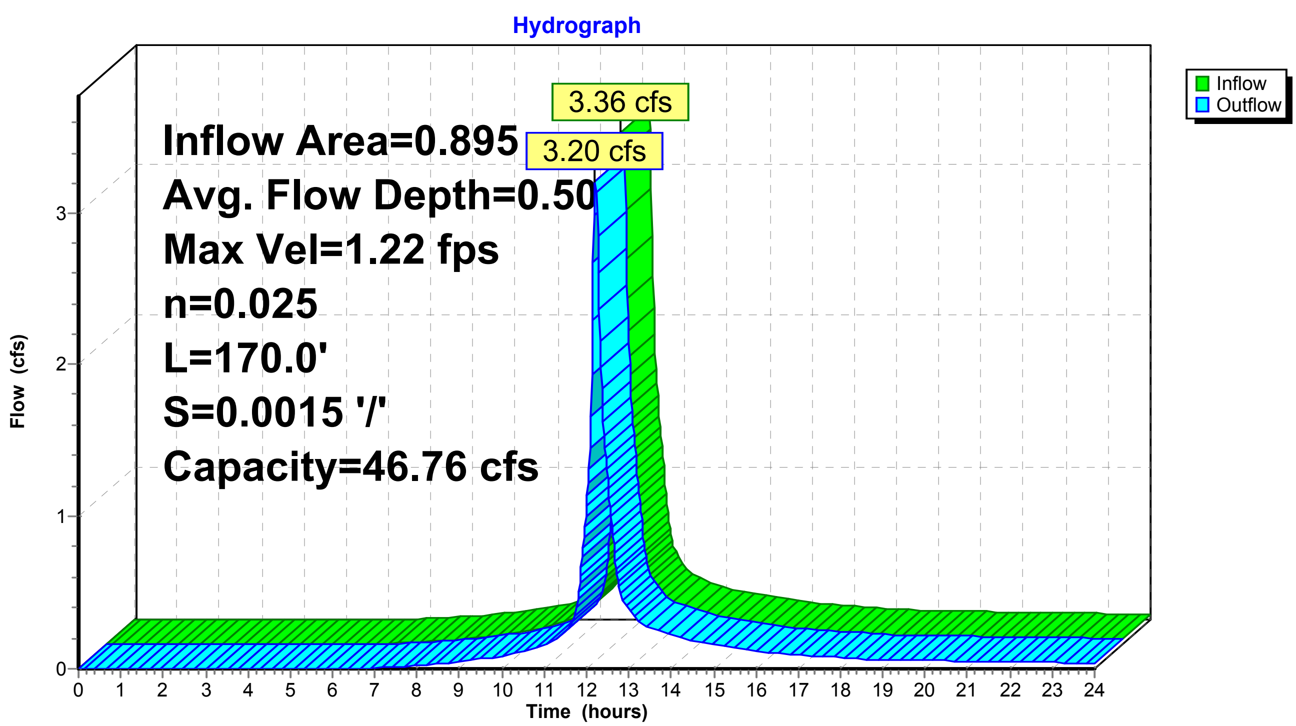
Inflow Area = 0.895 ac, 61.82% Impervious, Inflow Depth > 3.32" for 10-Year event
Inflow = 3.36 cfs @ 12.15 hrs, Volume= 0.248 af
Outflow = 3.20 cfs @ 12.21 hrs, Volume= 0.247 af, Atten= 5%, Lag= 3.9 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Max. Velocity= 1.22 fps, Min. Travel Time= 2.3 min
Avg. Velocity = 0.36 fps, Avg. Travel Time= 8.0 min

Peak Storage= 446 cf @ 12.17 hrs
Average Depth at Peak Storage= 0.50'
Bank-Full Depth= 2.00' Flow Area= 18.0 sf, Capacity= 46.76 cfs

4.00' x 2.00' deep channel, n= 0.025 Earth, clean & winding
Side Slope Z-value= 3.0 2.0 '/' Top Width= 14.00'
Length= 170.0' Slope= 0.0015 '/'
Inlet Invert= 660.25', Outlet Invert= 660.00'

Reach 23R: Wet Swale

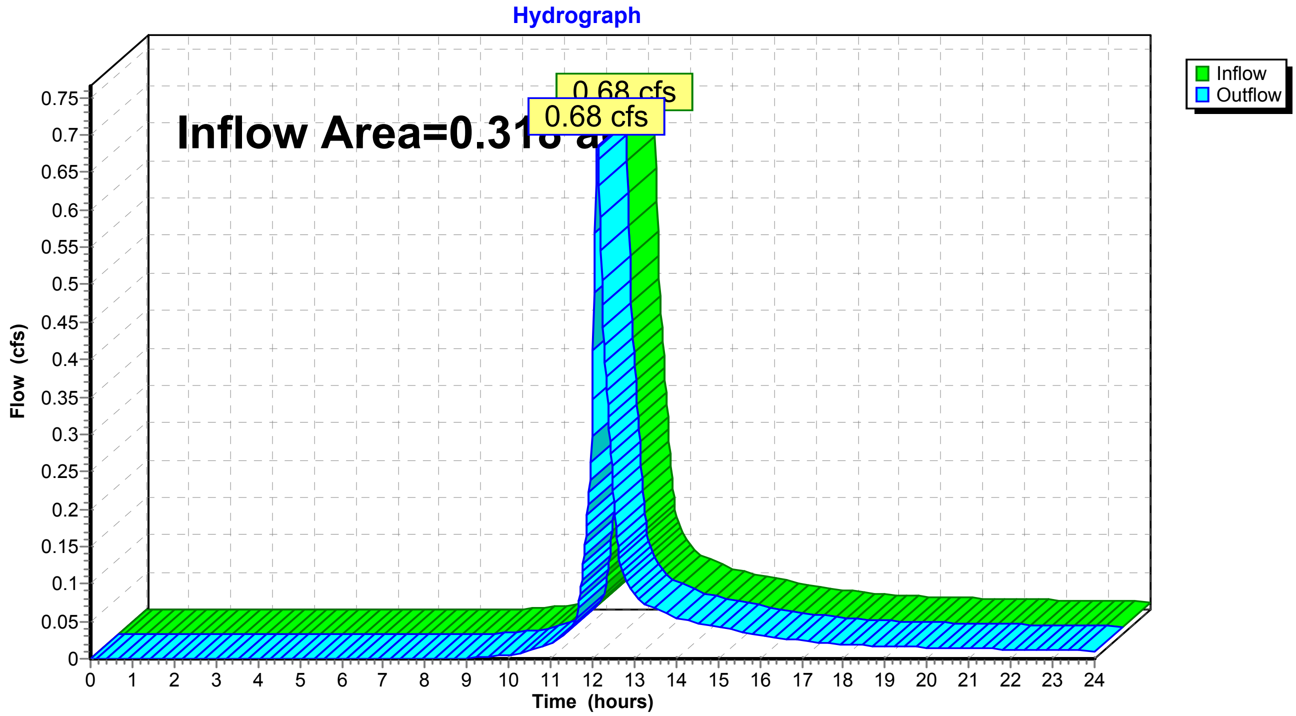


Summary for Reach 25R: downstream 2

Inflow Area = 0.318 ac, 4.66% Impervious, Inflow Depth > 2.07" for 10-Year event
Inflow = 0.68 cfs @ 12.12 hrs, Volume= 0.055 af
Outflow = 0.68 cfs @ 12.12 hrs, Volume= 0.055 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs

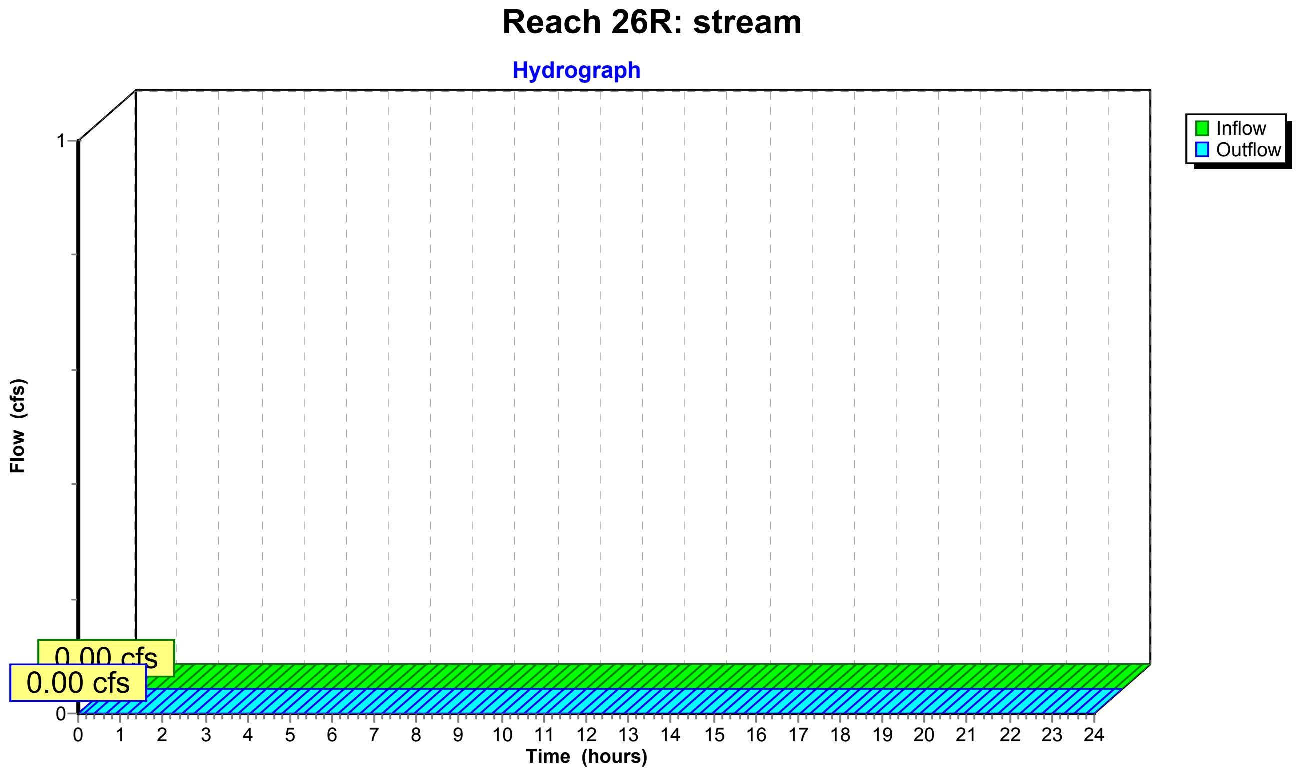
Reach 25R: downstream 2



Summary for Reach 26R: stream

Inflow	=	0.00 cfs @	0.00 hrs, Volume=	0.000 af	
Outflow	=	0.00 cfs @	0.00 hrs, Volume=	0.000 af,	Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs



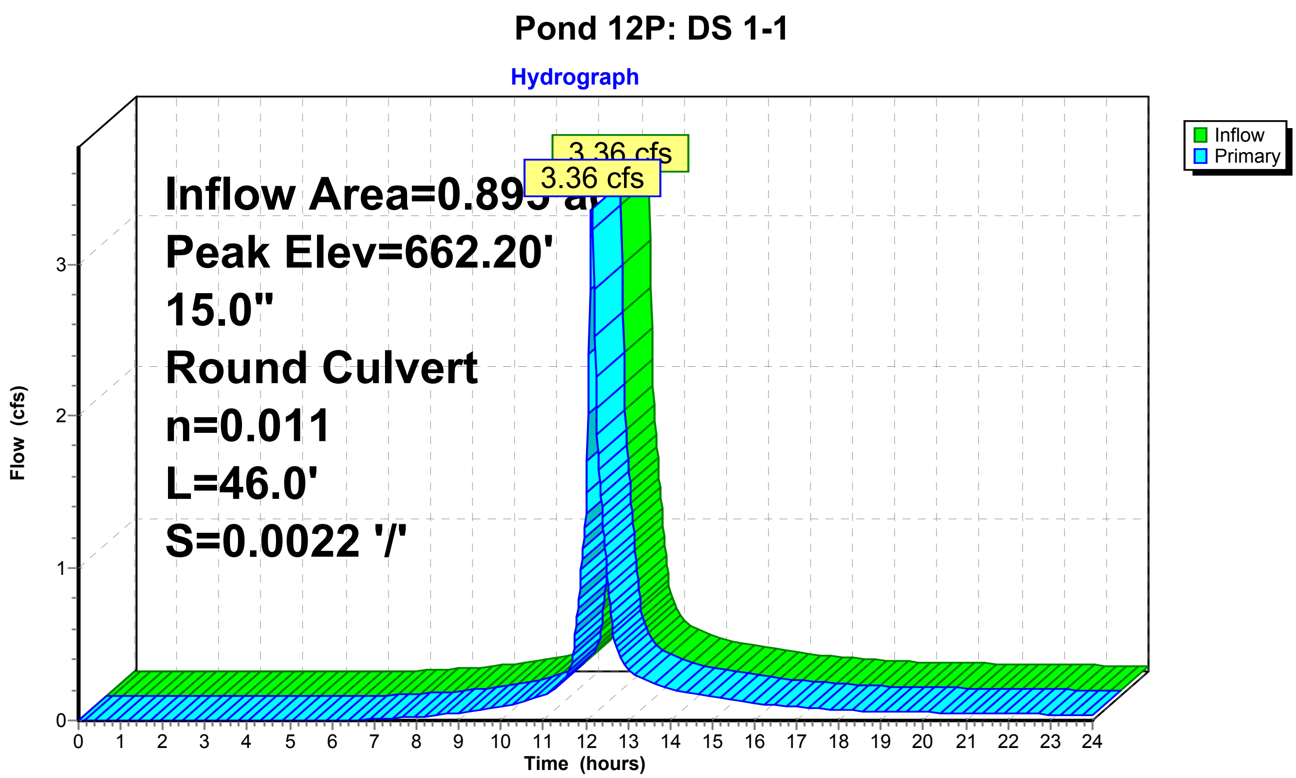
Summary for Pond 12P: DS 1-1

Inflow Area = 0.895 ac, 61.82% Impervious, Inflow Depth > 3.32" for 10-Year event
Inflow = 3.36 cfs @ 12.15 hrs, Volume= 0.248 af
Outflow = 3.36 cfs @ 12.15 hrs, Volume= 0.248 af, Atten= 0%, Lag= 0.0 min
Primary = 3.36 cfs @ 12.15 hrs, Volume= 0.248 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Peak Elev= 662.20' @ 12.15 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	660.95'	**15.0" Round Culvert** L= 46.0' CMP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 660.95' / 660.85' S= 0.0022 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 1.23 sf

Primary OutFlow Max=3.34 cfs @ 12.15 hrs HW=662.20' (Free Discharge)
1=Culvert (Barrel Controls 3.34 cfs @ 3.40 fps)



Summary for Pond 17P: Bioretention

Inflow Area = 1.199 ac, 46.66% Impervious, Inflow Depth > 2.96" for 10-Year event
Inflow = 3.59 cfs @ 12.21 hrs, Volume= 0.296 af
Outflow = 3.46 cfs @ 12.24 hrs, Volume= 0.246 af, Atten= 3%, Lag= 1.6 min
Primary = 1.29 cfs @ 12.24 hrs, Volume= 0.089 af
Secondary = 2.18 cfs @ 12.24 hrs, Volume= 0.157 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Peak Elev= 659.90' @ 12.24 hrs Surf.Area= 2,746 sf Storage= 2,552 cf

Plug-Flow detention time= 103.4 min calculated for 0.246 af (83% of inflow)
Center-of-Mass det. time= 35.1 min (855.9 - 820.8)

Volume	Invert	Avail.Storage	Storage Description
#1	655.84'	5,212 cf	**Custom Stage Data (Irregular)** Listed below (Recalc) 13,065 cf Overall - 7,853 cf Embedded = 5,212 cf
#2	656.51'	317 cf	**Custom Stage Data (Irregular)** Listed below (Recalc) Inside #1 6,333 cf Overall x 5.0% Voids
#3	655.84'	608 cf	**Custom Stage Data (Irregular)** Listed below (Recalc) Inside #1 1,520 cf Overall x 40.0% Voids
		6,137 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
655.84	2,303	357.0	0	0	2,303
659.26	2,303	357.0	7,876	7,876	3,524
660.00	2,822	370.0	1,893	9,769	4,323
660.50	3,282	395.0	1,525	11,294	5,857
661.00	3,811	410.0	1,772	13,065	6,838

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
656.51	2,303	357.0	0	0	2,303
659.26	2,303	357.0	6,333	6,333	3,285

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
655.84	2,303	357.0	0	0	2,303
656.50	2,303	357.0	1,520	1,520	2,539

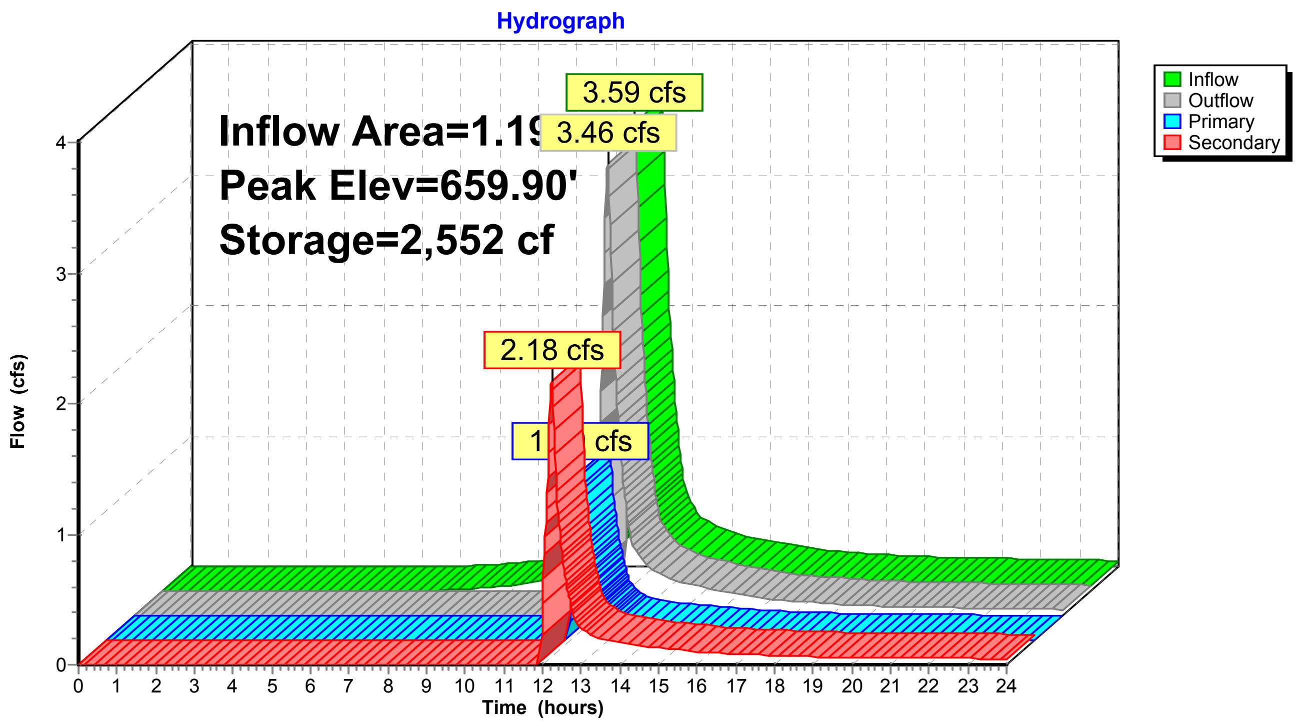
Device	Routing	Invert	Outlet Devices
#1	Primary	657.60'	**12.0" Round Culvert** L= 57.0' CMP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 657.60' / 657.25' S= 0.0061 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 0.79 sf
#2	Secondary	659.75'	**15.0' long x 12.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.57 2.62 2.70 2.67 2.66 2.67 2.66 2.64
#3	Device 1	659.26'	**0.250 in/hr Exfiltration over Surface area above 659.26'** Excluded Surface area = 2,303 sf

#4 Device 1 659.76' **2.5" x 3.8" Horiz. Orifice/Grate X 11.00**
C= 0.600 in 33.5" x 38.0" Grate (8% open area)
Limited to weir flow at low heads

Primary OutFlow Max=1.29 cfs @ 12.24 hrs HW=659.90' (Free Discharge)
└─**1=Culvert** (Passes 1.29 cfs of 4.47 cfs potential flow)
  ├─**3=Exfiltration** (Exfiltration Controls 0.00 cfs)
  └─**4=Orifice/Grate** (Orifice Controls 1.29 cfs @ 1.77 fps)

Secondary OutFlow Max=2.15 cfs @ 12.24 hrs HW=659.90' (Free Discharge)
└─**2=Broad-Crested Rectangular Weir** (Weir Controls 2.15 cfs @ 0.98 fps)

Pond 17P: Bioretention



Summary for Pond 20P: DS 1-2

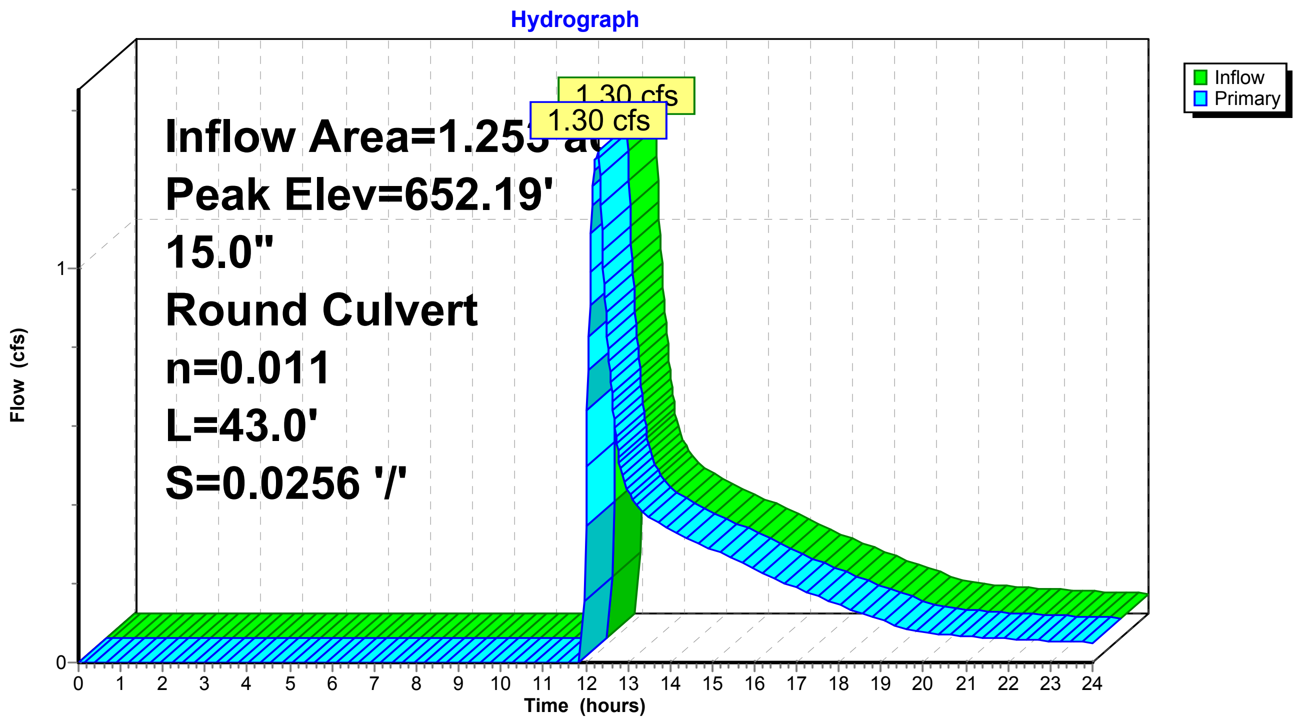
Inflow Area =	1.253 ac,	44.66% Impervious,	Inflow Depth > 2.06"	for 10-Year event
Inflow =	1.30 cfs @	12.30 hrs, Volume=	0.216 af	
Outflow =	1.30 cfs @	12.30 hrs, Volume=	0.216 af,	Atten= 0%, Lag= 0.0 min
Primary =	1.30 cfs @	12.30 hrs, Volume=	0.216 af	

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Peak Elev= 652.19' @ 12.30 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	651.60'	**15.0" Round Culvert** L= 43.0' CMP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 651.60' / 650.50' S= 0.0256 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 1.23 sf

Primary OutFlow Max=1.30 cfs @ 12.30 hrs HW=652.19' (Free Discharge)
↑—**1=Culvert** (Inlet Controls 1.30 cfs @ 2.30 fps)

Pond 20P: DS 1-2



Summary for Pond 21P: Shallow Wetland

Inflow Area = 0.054 ac, 0.00% Impervious, Inflow Depth > 37.01" for 10-Year event
Inflow = 2.24 cfs @ 12.23 hrs, Volume= 0.165 af
Outflow = 0.24 cfs @ 13.23 hrs, Volume= 0.127 af, Atten= 89%, Lag= 59.5 min
Primary = 0.24 cfs @ 13.23 hrs, Volume= 0.127 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Peak Elev= 658.59' @ 13.23 hrs Surf.Area= 2,868 sf Storage= 3,061 cf

Plug-Flow detention time= 197.1 min calculated for 0.127 af (77% of inflow)
Center-of-Mass det. time= 103.3 min (982.4 - 879.1)

Volume	Invert	Avail.Storage	Storage Description
#1	656.50'	6,117 cf	**Custom Stage Data (Irregular)**Listed below (Recalc)

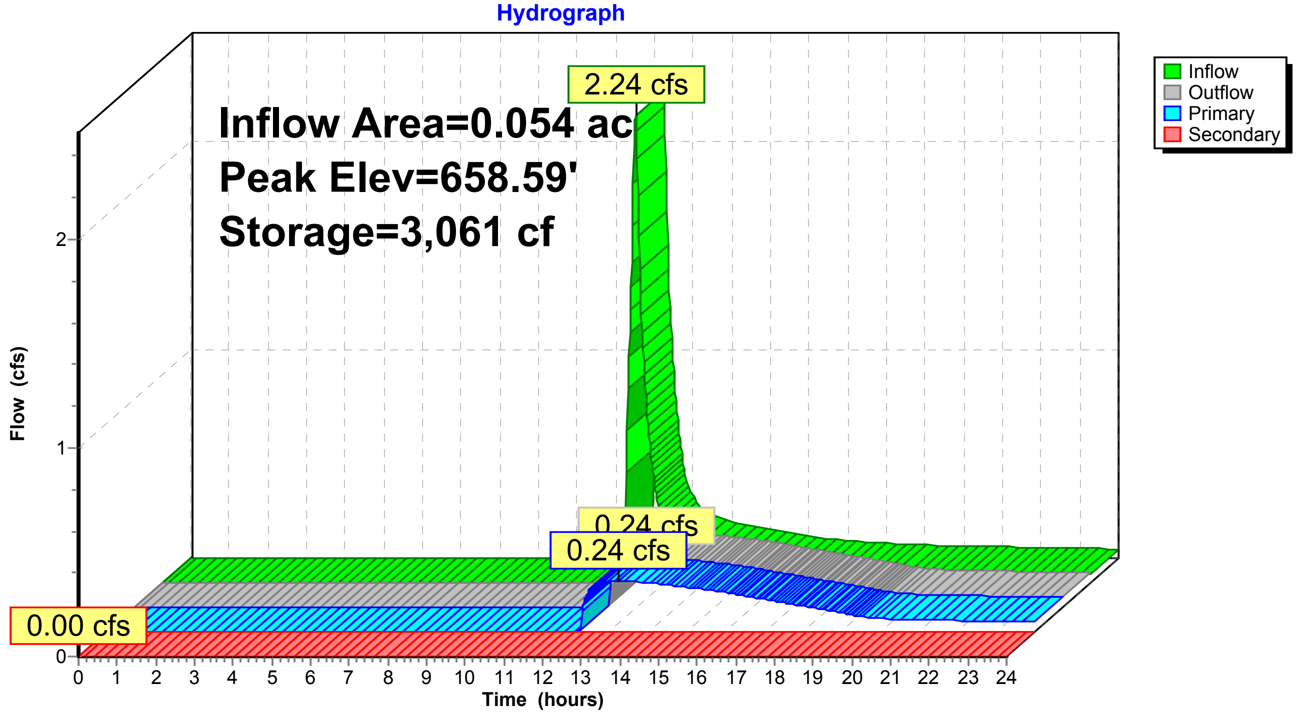
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
656.50	106	43.0	0	0	106
657.00	342	80.0	106	106	469
657.50	1,626	315.0	452	559	7,857
658.00	2,331	218.0	984	1,543	11,973
658.50	2,787	237.0	1,278	2,820	12,671
659.00	3,281	256.0	1,515	4,336	13,426
659.50	3,853	277.0	1,782	6,117	14,327

Device	Routing	Invert	Outlet Devices
#1	Primary	653.50'	**15.0" Round Culvert** L= 28.0' RCP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 653.50' / 653.00' S= 0.0179 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 1.23 sf
#2	Device 1	658.00'	**2.5" x 3.8" Horiz. Orifice/Grate** C= 0.600 in 33.5" x 38.0" Grate (1% open area) Limited to weir flow at low heads
#3	Secondary	659.25'	**13.0' long x 8.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64 2.64 2.65 2.65 2.66 2.66 2.68 2.70 2.74

Primary OutFlow Max=0.24 cfs @ 13.23 hrs HW=658.59' (Free Discharge)
└─**1=Culvert** (Passes 0.24 cfs of 11.01 cfs potential flow)
  └─**2=Orifice/Grate** (Orifice Controls 0.24 cfs @ 3.68 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=656.50' (Free Discharge)
└─**3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 21P: Shallow Wetland



Summary for Pond 24P: DS 1-3

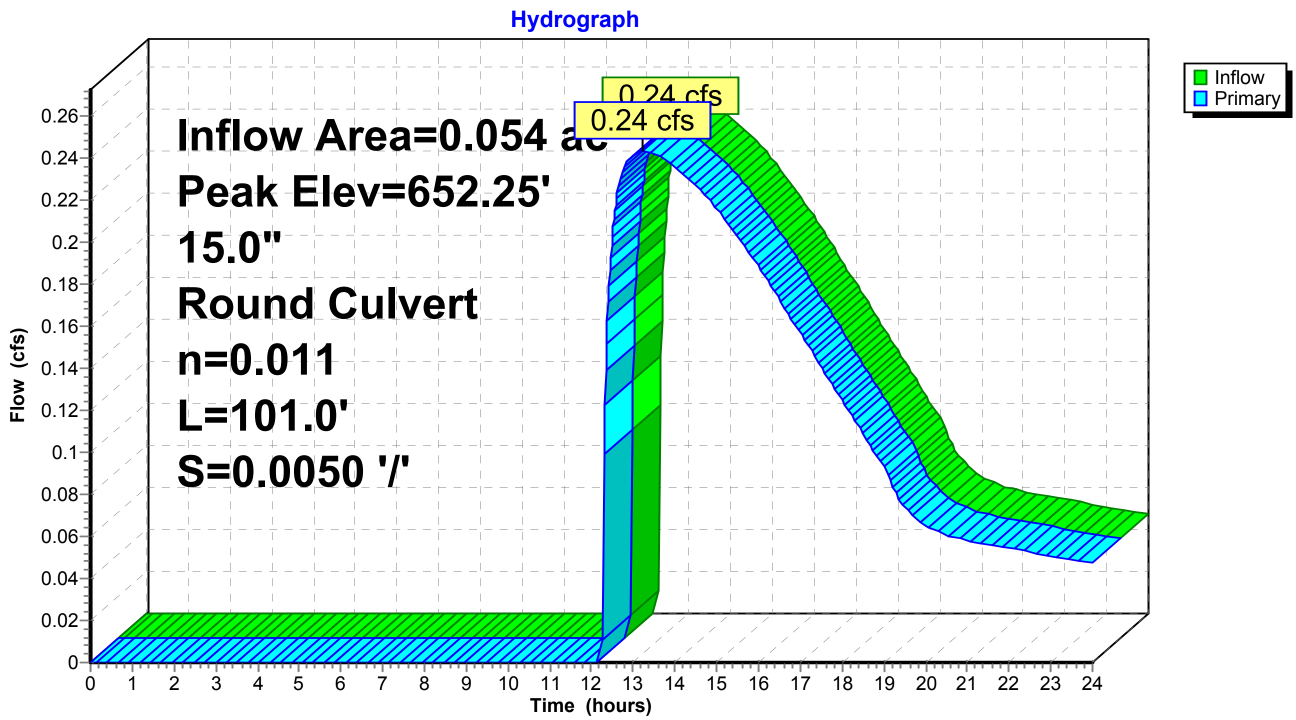
Inflow Area = 0.054 ac, 0.00% Impervious, Inflow Depth > 28.40" for 10-Year event
Inflow = 0.24 cfs @ 13.23 hrs, Volume= 0.127 af
Outflow = 0.24 cfs @ 13.23 hrs, Volume= 0.127 af, Atten= 0%, Lag= 0.0 min
Primary = 0.24 cfs @ 13.23 hrs, Volume= 0.127 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Peak Elev= 652.25' @ 13.23 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	652.00'	**15.0" Round Culvert** L= 101.0' RCP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 652.00' / 651.50' S= 0.0050 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 1.23 sf

Primary OutFlow Max=0.24 cfs @ 13.23 hrs HW=652.25' (Free Discharge)
↑**1=Culvert** (Barrel Controls 0.24 cfs @ 2.12 fps)

Pond 24P: DS 1-3



Time span=0.00-24.00 hrs, dt=0.02 hrs, 1201 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 4S: Area1 Runoff Area=38,969 sf 61.82% Impervious Runoff Depth>6.74"
Flow Length=424' Tc=3.7 min CN=87 Runoff=7.27 cfs 0.502 af

Subcatchment 5S: Area2 Runoff Area=13,279 sf 2.17% Impervious Runoff Depth>4.84"
Flow Length=90' Tc=5.2 min CN=71 Runoff=1.78 cfs 0.123 af

Subcatchment 8S: Area3 Runoff Area=7,323 sf 8.82% Impervious Runoff Depth>5.42"
Flow Length=109' Slope=0.0229 '/' Tc=9.9 min CN=76 Runoff=0.93 cfs 0.076 af

Subcatchment 27S: Area5 Runoff Area=6,530 sf 0.00% Impervious Runoff Depth>4.60"
Tc=6.0 min CN=69 Runoff=0.81 cfs 0.057 af

Subcatchment 28S: Area4 Runoff Area=2,337 sf 0.00% Impervious Runoff Depth>4.60"
Tc=6.0 min CN=69 Runoff=0.29 cfs 0.021 af

Reach 10R: Grassed Swale Avg. Flow Depth=0.33' Max Vel=2.22 fps Inflow=7.27 cfs 0.502 af
n=0.022 L=360.0' S=0.0056 '/' Capacity=13.74 cfs Outflow=6.72 cfs 0.501 af

Reach 19R: downstream Inflow=2.15 cfs 0.455 af
Outflow=2.15 cfs 0.455 af

Reach 23R: Wet Swale Avg. Flow Depth=0.74' Max Vel=1.51 fps Inflow=6.72 cfs 0.501 af
n=0.025 L=170.0' S=0.0015 '/' Capacity=46.76 cfs Outflow=6.44 cfs 0.500 af

Reach 25R: downstream 2 Inflow=1.68 cfs 0.133 af
Outflow=1.68 cfs 0.133 af

Reach 26R: stream Inflow=3.50 cfs 0.098 af
Outflow=3.50 cfs 0.098 af

Pond 12P: DS 1-1 Peak Elev=663.25' Inflow=6.72 cfs 0.501 af
15.0" Round Culvert n=0.011 L=46.0' S=0.0022 '/' Outflow=6.72 cfs 0.501 af

Pond 17P: Bioretention Peak Elev=660.02' Storage=2,905 cf Inflow=7.51 cfs 0.623 af
Primary=1.79 cfs 0.206 af Secondary=5.54 cfs 0.366 af Outflow=7.33 cfs 0.572 af

Pond 20P: DS 1-2 Peak Elev=652.38' Inflow=2.15 cfs 0.455 af
15.0" Round Culvert n=0.011 L=43.0' S=0.0256 '/' Outflow=2.15 cfs 0.455 af

Pond 21P: Shallow Wetland Peak Elev=659.48' Storage=6,038 cf Inflow=5.71 cfs 0.387 af
Primary=0.39 cfs 0.249 af Secondary=3.50 cfs 0.098 af Outflow=3.89 cfs 0.347 af

Pond 24P: DS 1-3 Peak Elev=652.31' Inflow=0.39 cfs 0.249 af
15.0" Round Culvert n=0.011 L=101.0' S=0.0050 '/' Outflow=0.39 cfs 0.249 af

Total Runoff Area = 1.571 ac Runoff Volume = 0.779 af Average Runoff Depth = 5.95"
63.44% Pervious = 0.997 ac 36.56% Impervious = 0.574 ac

Summary for Subcatchment 4S: Area1

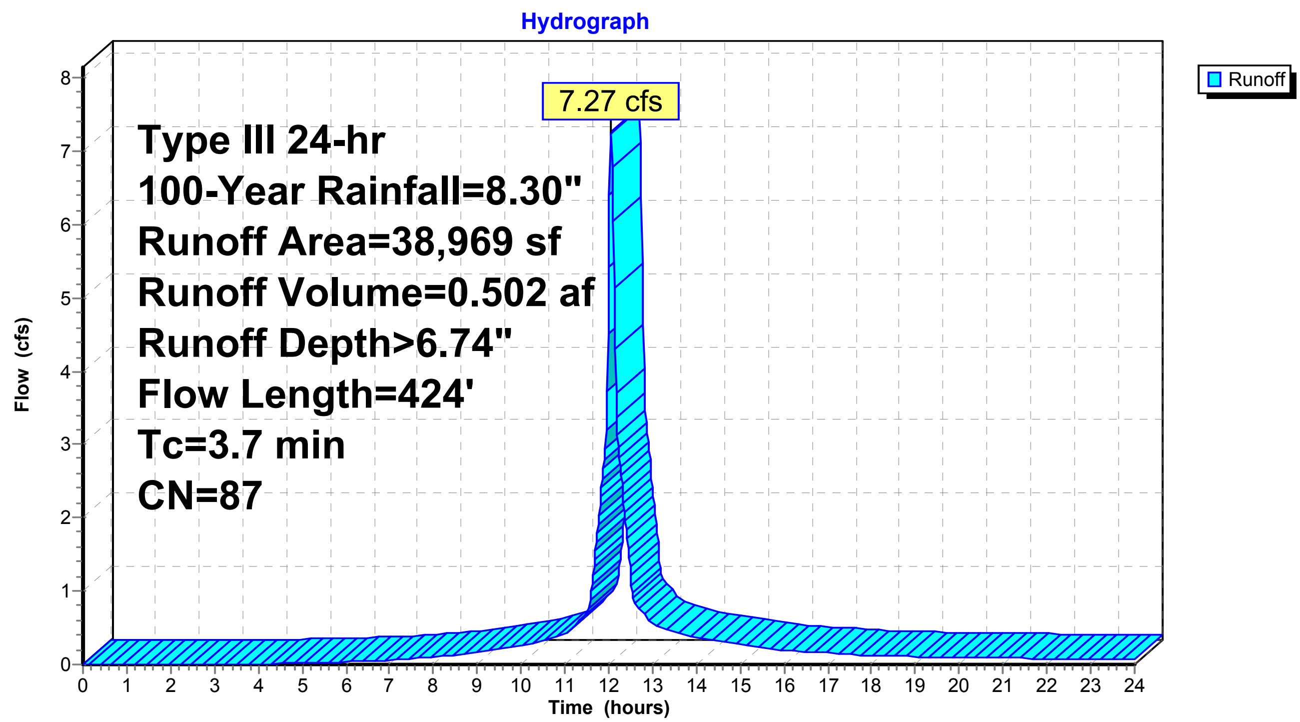
Runoff = 7.27 cfs @ 12.05 hrs, Volume= 0.502 af, Depth> 6.74"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-Year Rainfall=8.30"

Area (sf)	CN	Description
23,109	98	Paved parking, HSG B
14,880	69	50-75% Grass cover, Fair, HSG B
980	98	Paved parking, HSG D
38,969	87	Weighted Average
14,880		38.18% Pervious Area
24,089		61.82% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	34	0.0735	1.88		**Sheet Flow, segmentAB** Smooth surfaces n= 0.011 P2= 3.24"
0.5	10	0.3160	0.33		**Sheet Flow, segmentBC** Grass: Short n= 0.150 P2= 3.24"
2.9	380	0.0050	2.16	1.80	**Parabolic Channel, segmentCD** W=2.50' D=0.50' Area=0.8 sf Perim=2.7' n= 0.022 Earth, clean & straight
3.7	424	Total			

Subcatchment 4S: Area1



Summary for Subcatchment 5S: Area2

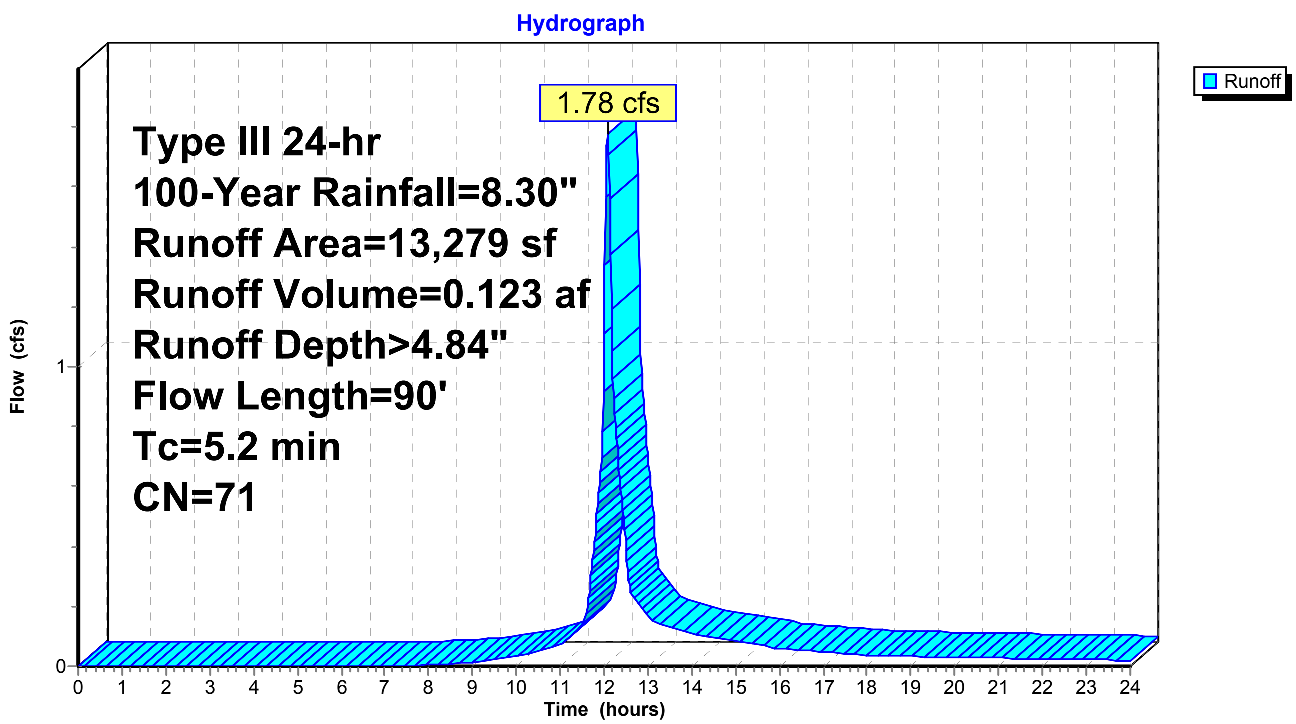
Runoff = 1.78 cfs @ 12.08 hrs, Volume= 0.123 af, Depth> 4.84"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-Year Rainfall=8.30"

Area (sf)	CN	Description
12,518	69	50-75% Grass cover, Fair, HSG B
473	96	Gravel surface, HSG B
288	98	Paved parking, HSG B
13,279	71	Weighted Average
12,991		97.83% Pervious Area
288		2.17% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.0	43	0.0058	0.71		**Sheet Flow, segmentAB** Smooth surfaces n= 0.011 P2= 3.24"
3.7	16	0.0058	0.07		**Sheet Flow, segmentBC** Grass: Short n= 0.150 P2= 3.24"
0.5	31	0.0160	1.00		**Sheet Flow, segmentCD** Smooth surfaces n= 0.011 P2= 3.24"
5.2	90	Total			

Subcatchment 5S: Area2



Summary for Subcatchment 8S: Area3

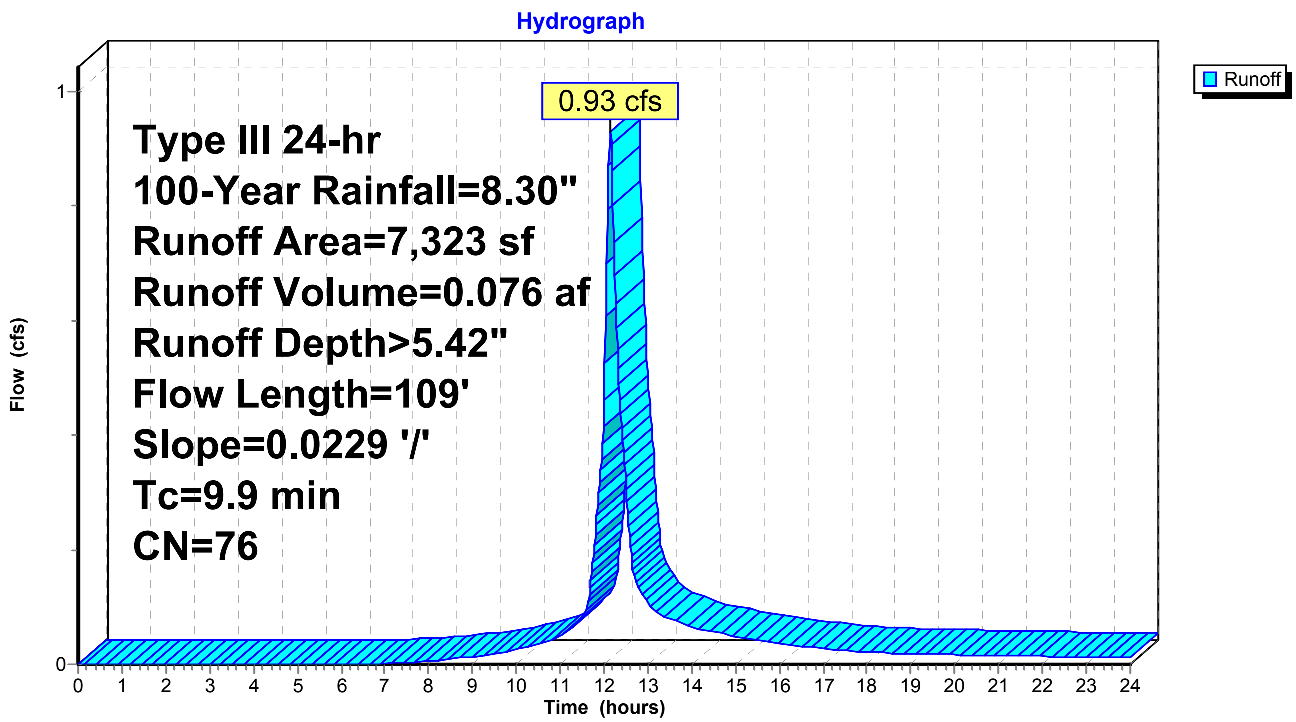
Runoff = 0.93 cfs @ 12.14 hrs, Volume= 0.076 af, Depth> 5.42"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-Year Rainfall=8.30"

Area (sf)	CN	Description
358	98	Paved parking, HSG B
5,357	69	50-75% Grass cover, Fair, HSG B
1,320	96	Gravel surface, HSG B
288	98	Paved parking, HSG B
7,323	76	Weighted Average
6,677		91.18% Pervious Area
646		8.82% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.9	109	0.0229	0.18		**Sheet Flow, semgentAB** Grass: Short n= 0.150 P2= 3.24"

Subcatchment 8S: Area3



Summary for Subcatchment 27S: Area5

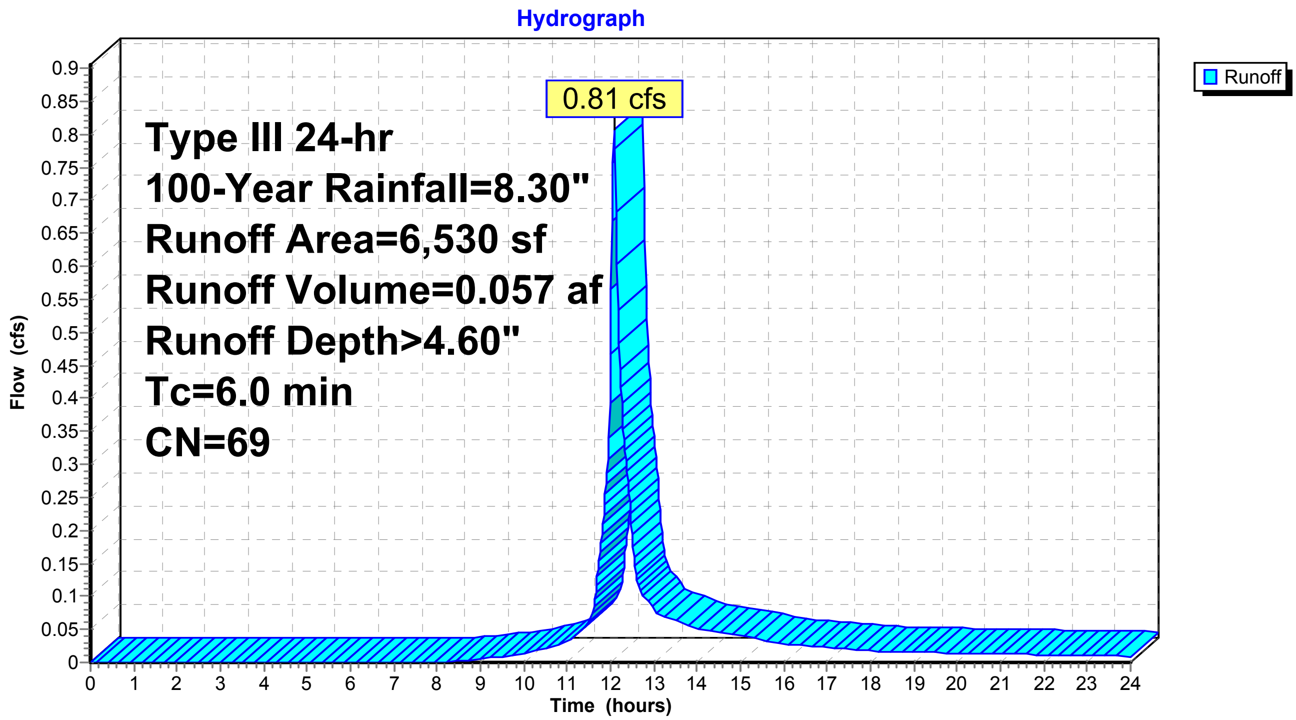
Runoff = 0.81 cfs @ 12.09 hrs, Volume= 0.057 af, Depth> 4.60"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-Year Rainfall=8.30"

Area (sf)	CN	Description
6,530	69	50-75% Grass cover, Fair, HSG B
6,530		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment 27S: Area5



Summary for Subcatchment 28S: Area4

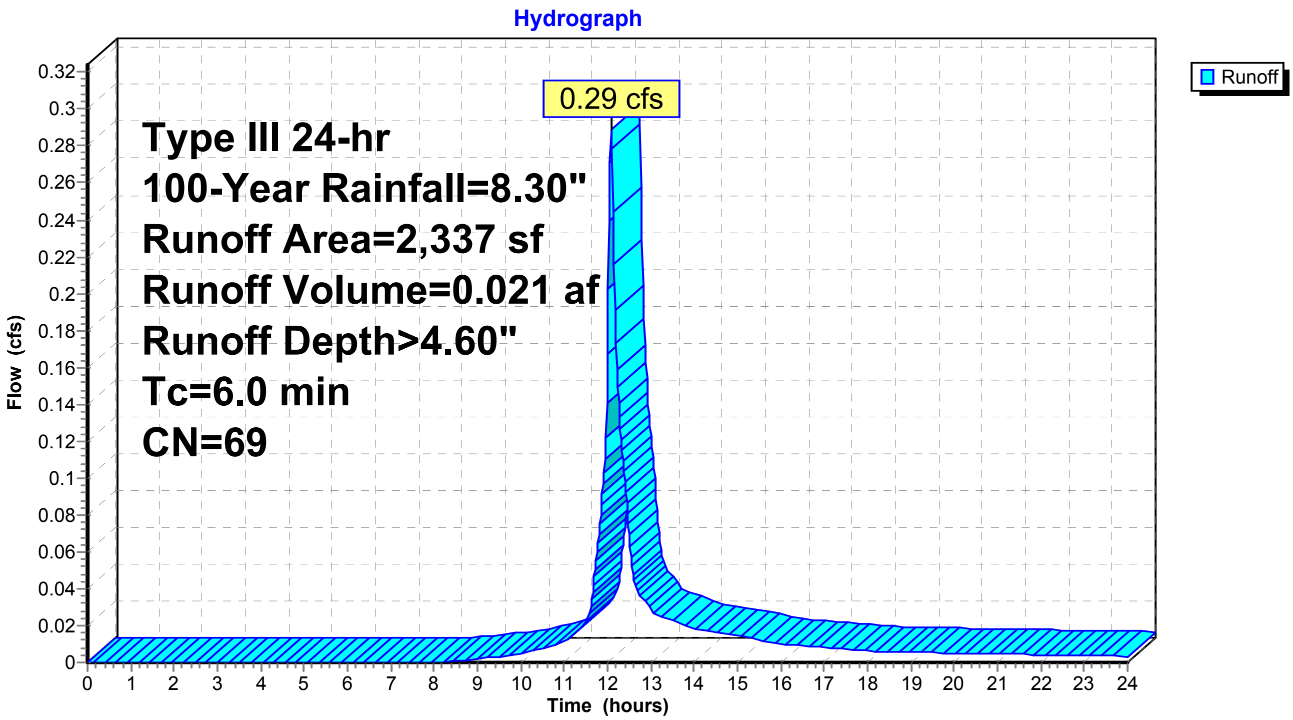
Runoff = 0.29 cfs @ 12.09 hrs, Volume= 0.021 af, Depth> 4.60"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-Year Rainfall=8.30"

Area (sf)	CN	Description
2,337	69	50-75% Grass cover, Fair, HSG B
2,337		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment 28S: Area4



Summary for Reach 10R: Grassed Swale

Inflow Area = 0.895 ac, 61.82% Impervious, Inflow Depth > 6.74" for 100-Year event
Inflow = 7.27 cfs @ 12.05 hrs, Volume= 0.502 af
Outflow = 6.72 cfs @ 12.13 hrs, Volume= 0.501 af, Atten= 8%, Lag= 4.4 min

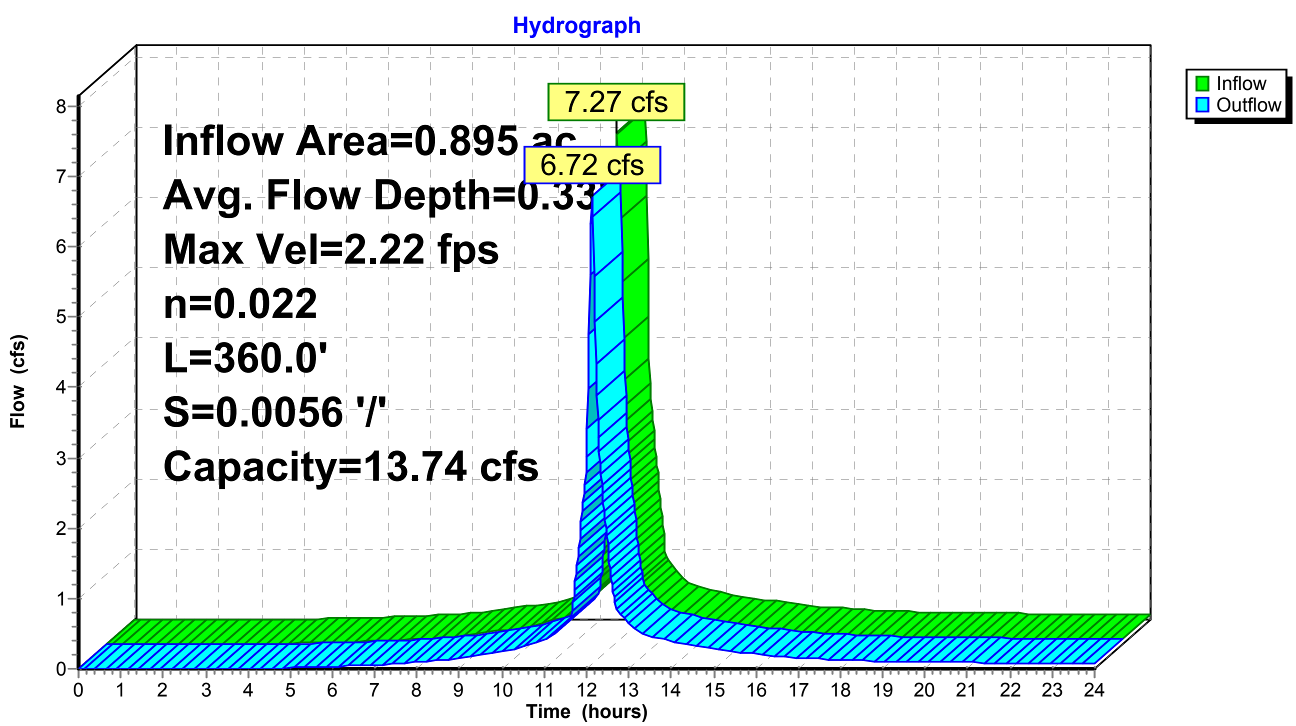
Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Max. Velocity= 2.22 fps, Min. Travel Time= 2.7 min
Avg. Velocity = 0.55 fps, Avg. Travel Time= 10.8 min

Peak Storage= 1,098 cf @ 12.08 hrs
Average Depth at Peak Storage= 0.33'
Bank-Full Depth= 0.50' Flow Area= 4.9 sf, Capacity= 13.74 cfs

8.00' x 0.50' deep channel, n= 0.022 Earth, clean & straight
Side Slope Z-value= 3.0 4.0 '/' Top Width= 11.50'
Length= 360.0' Slope= 0.0056 '/'
Inlet Invert= 663.00', Outlet Invert= 661.00'

‡

Reach 10R: Grassed Swale

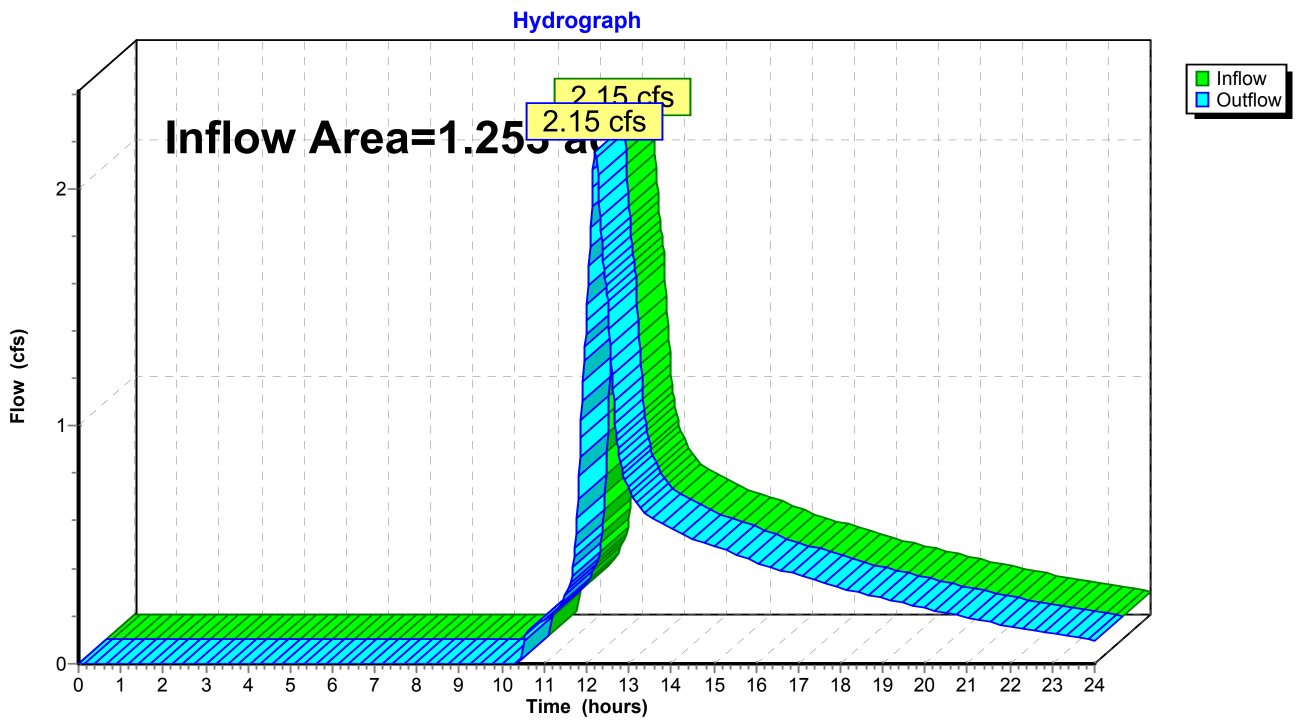


Summary for Reach 19R: downstream

Inflow Area = 1.253 ac, 44.66% Impervious, Inflow Depth > 4.36" for 100-Year event
Inflow = 2.15 cfs @ 12.21 hrs, Volume= 0.455 af
Outflow = 2.15 cfs @ 12.21 hrs, Volume= 0.455 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs

Reach 19R: downstream



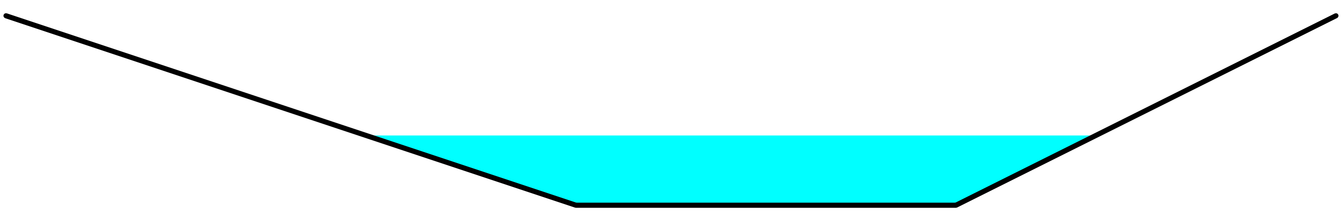
Summary for Reach 23R: Wet Swale

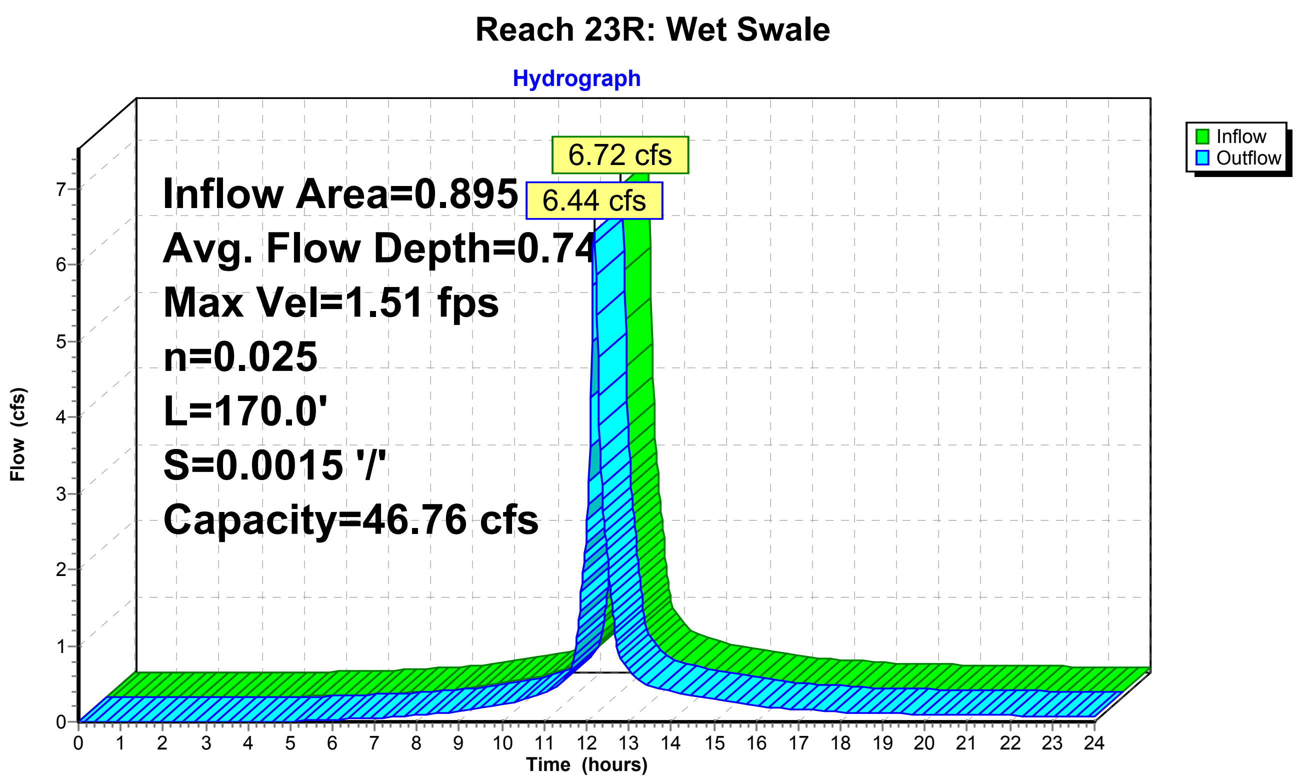
Inflow Area = 0.895 ac, 61.82% Impervious, Inflow Depth > 6.72" for 100-Year event
Inflow = 6.72 cfs @ 12.13 hrs, Volume= 0.501 af
Outflow = 6.44 cfs @ 12.18 hrs, Volume= 0.500 af, Atten= 4%, Lag= 3.3 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Max. Velocity= 1.51 fps, Min. Travel Time= 1.9 min
Avg. Velocity = 0.44 fps, Avg. Travel Time= 6.5 min

Peak Storage= 730 cf @ 12.15 hrs
Average Depth at Peak Storage= 0.74'
Bank-Full Depth= 2.00' Flow Area= 18.0 sf, Capacity= 46.76 cfs

4.00' x 2.00' deep channel, n= 0.025 Earth, clean & winding
Side Slope Z-value= 3.0 2.0 '/' Top Width= 14.00'
Length= 170.0' Slope= 0.0015 '/'
Inlet Invert= 660.25', Outlet Invert= 660.00'



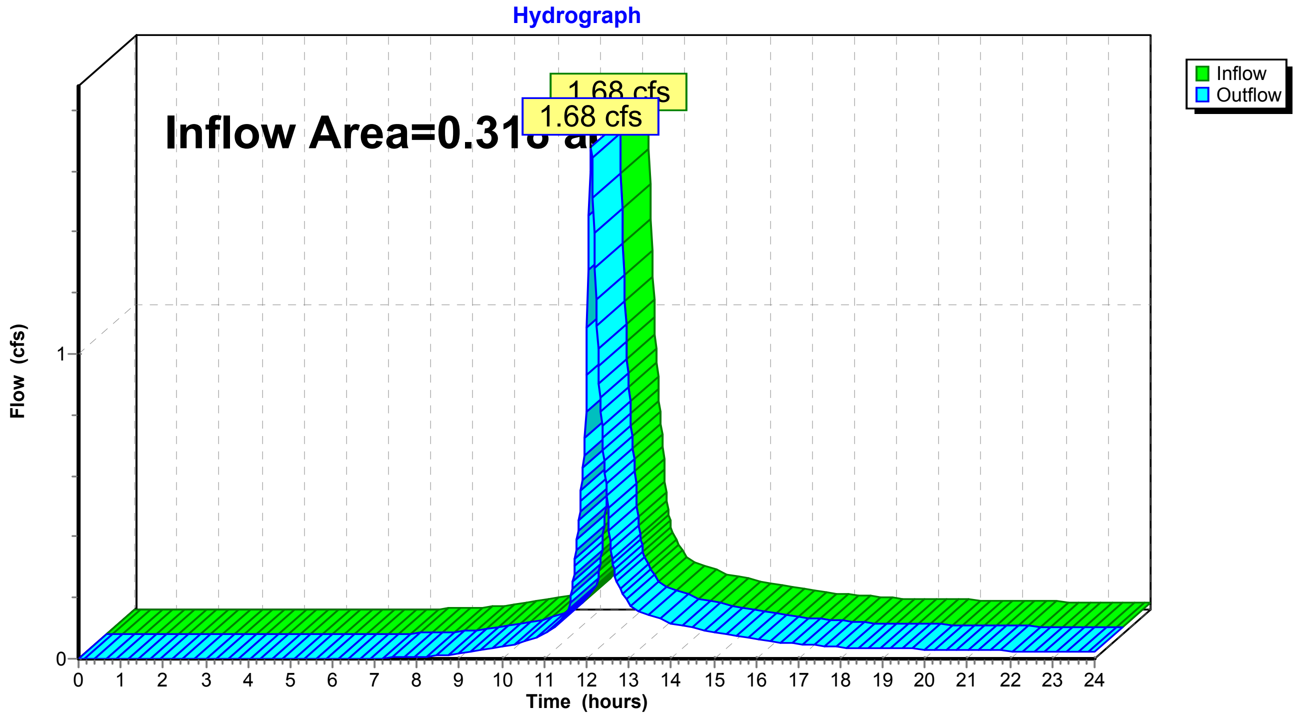


Summary for Reach 25R: downstream 2

Inflow Area =	0.318 ac,	4.66% Impervious, Inflow Depth > 5.04"	for 100-Year event
Inflow =	1.68 cfs @	12.11 hrs, Volume=	0.133 af
Outflow =	1.68 cfs @	12.11 hrs, Volume=	0.133 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs

Reach 25R: downstream 2

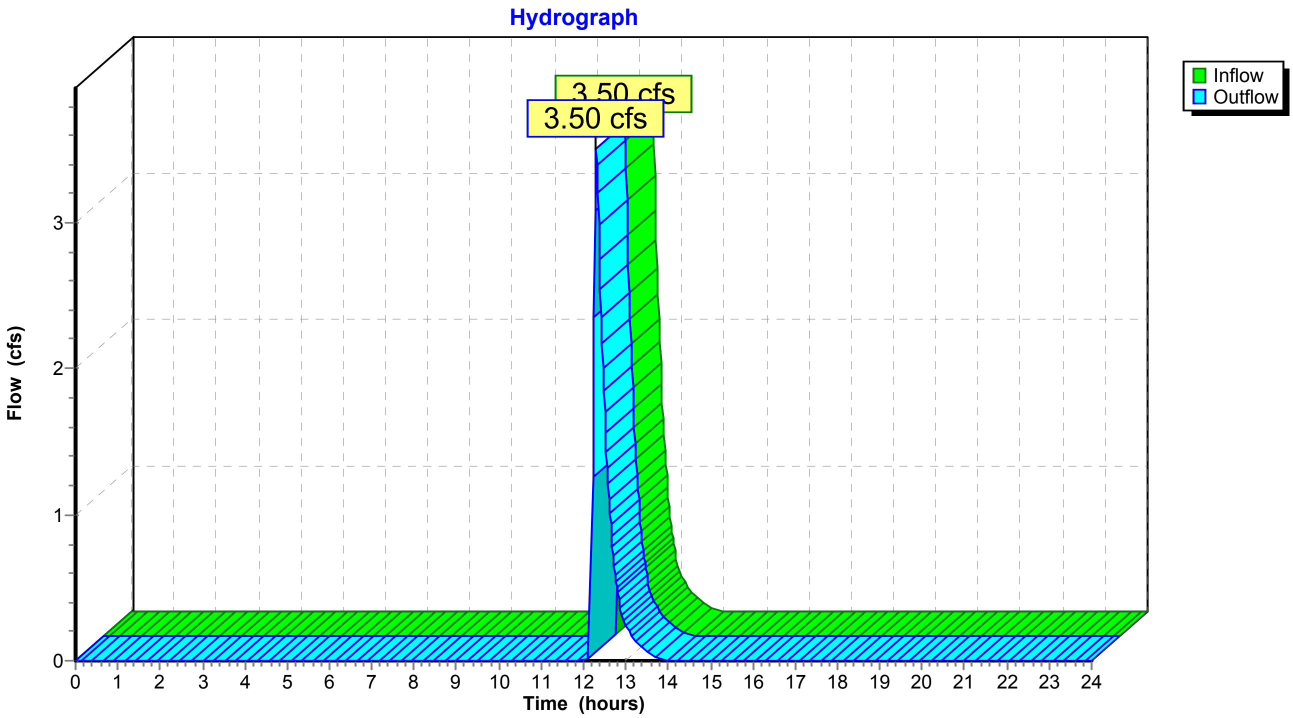


Summary for Reach 26R: stream

Inflow	=	3.50 cfs @	12.30 hrs,	Volume=	0.098 af
Outflow	=	3.50 cfs @	12.30 hrs,	Volume=	0.098 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs

Reach 26R: stream



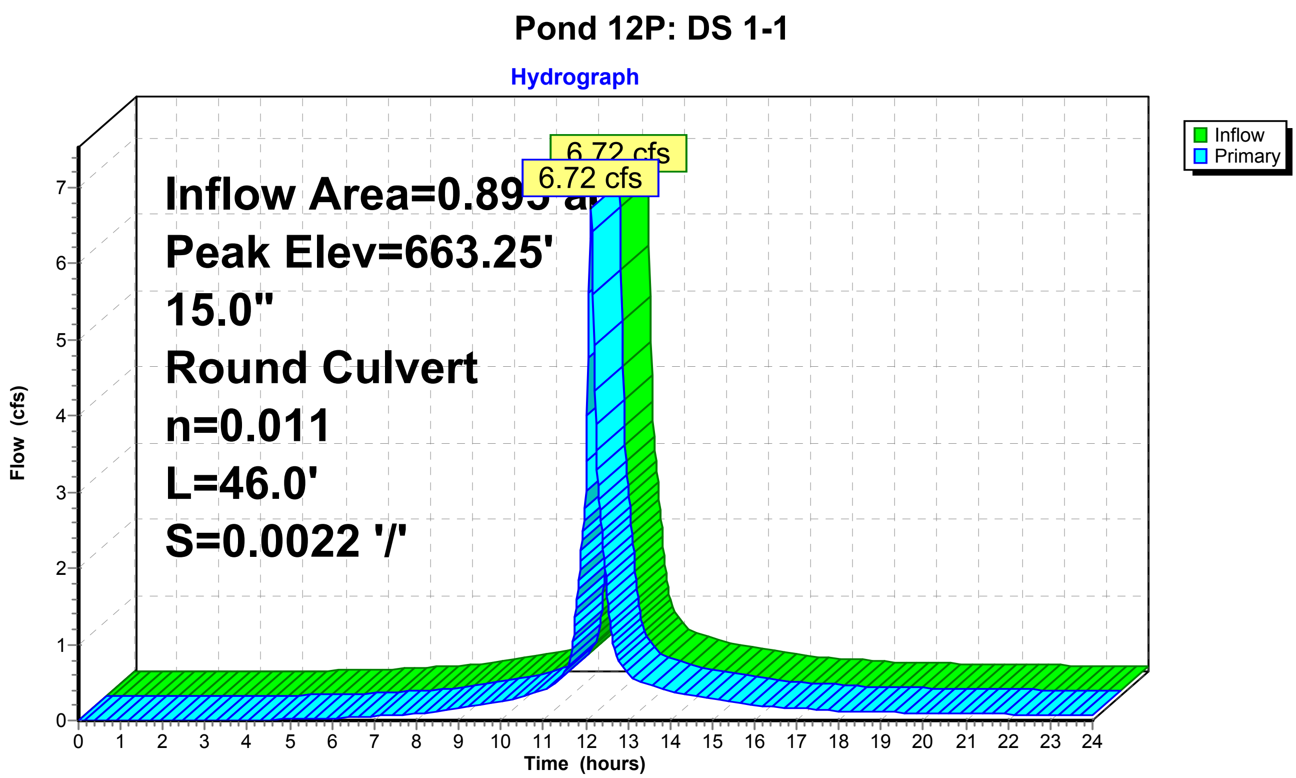
Summary for Pond 12P: DS 1-1

Inflow Area =	0.895 ac,	61.82% Impervious,	Inflow Depth > 6.72"	for 100-Year event	
Inflow =	6.72 cfs @	12.13 hrs,	Volume=	0.501 af	
Outflow =	6.72 cfs @	12.13 hrs,	Volume=	0.501 af,	Atten= 0%, Lag= 0.0 min
Primary =	6.72 cfs @	12.13 hrs,	Volume=	0.501 af	

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Peak Elev= 663.25' @ 12.13 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	660.95'	**15.0" Round Culvert** L= 46.0' CMP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 660.95' / 660.85' S= 0.0022 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 1.23 sf

Primary OutFlow Max=6.67 cfs @ 12.13 hrs HW=663.23' (Free Discharge)
1=Culvert (Barrel Controls 6.67 cfs @ 5.44 fps)



Summary for Pond 17P: Bioretention

Inflow Area = 1.199 ac, 46.66% Impervious, Inflow Depth > 6.23" for 100-Year event
Inflow = 7.51 cfs @ 12.17 hrs, Volume= 0.623 af
Outflow = 7.33 cfs @ 12.20 hrs, Volume= 0.572 af, Atten= 2%, Lag= 1.3 min
Primary = 1.79 cfs @ 12.20 hrs, Volume= 0.206 af
Secondary = 5.54 cfs @ 12.20 hrs, Volume= 0.366 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Peak Elev= 660.02' @ 12.20 hrs Surf.Area= 2,842 sf Storage= 2,905 cf

Plug-Flow detention time= 65.4 min calculated for 0.572 af (92% of inflow)
Center-of-Mass det. time= 24.8 min (823.6 - 798.9)

Volume	Invert	Avail.Storage	Storage Description
#1	655.84'	5,212 cf	**Custom Stage Data (Irregular)**Listed below (Recalc) 13,065 cf Overall - 7,853 cf Embedded = 5,212 cf
#2	656.51'	317 cf	**Custom Stage Data (Irregular)**Listed below (Recalc) Inside #1 6,333 cf Overall x 5.0% Voids
#3	655.84'	608 cf	**Custom Stage Data (Irregular)**Listed below (Recalc) Inside #1 1,520 cf Overall x 40.0% Voids
		6,137 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
655.84	2,303	357.0	0	0	2,303
659.26	2,303	357.0	7,876	7,876	3,524
660.00	2,822	370.0	1,893	9,769	4,323
660.50	3,282	395.0	1,525	11,294	5,857
661.00	3,811	410.0	1,772	13,065	6,838

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
656.51	2,303	357.0	0	0	2,303
659.26	2,303	357.0	6,333	6,333	3,285

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
655.84	2,303	357.0	0	0	2,303
656.50	2,303	357.0	1,520	1,520	2,539

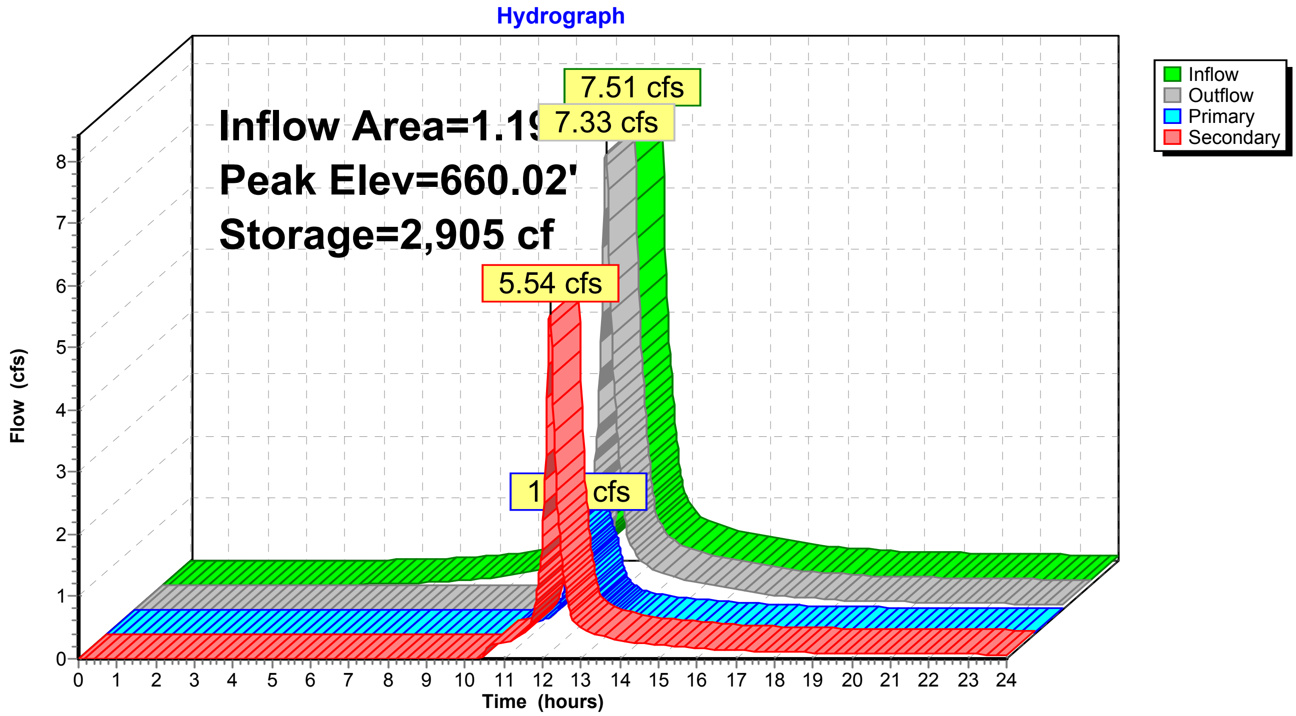
Device	Routing	Invert	Outlet Devices
#1	Primary	657.60'	**12.0" Round Culvert** L= 57.0' CMP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 657.60' / 657.25' S= 0.0061 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 0.79 sf
#2	Secondary	659.75'	**15.0' long x 12.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.57 2.62 2.70 2.67 2.66 2.67 2.66 2.64
#3	Device 1	659.26'	**0.250 in/hr Exfiltration over Surface area above 659.26'** Excluded Surface area = 2,303 sf

#4	Device 1	659.76'	**2.5" x 3.8" Horiz. Orifice/Grate X 11.00** C= 0.600 in 33.5" x 38.0" Grate (8% open area) Limited to weir flow at low heads

Primary OutFlow Max=1.79 cfs @ 12.20 hrs HW=660.02' (Free Discharge)
└─**1=Culvert** (Passes 1.79 cfs of 4.63 cfs potential flow)
  ├─**3=Exfiltration** (Exfiltration Controls 0.00 cfs)
  └─**4=Orifice/Grate** (Orifice Controls 1.79 cfs @ 2.47 fps)

Secondary OutFlow Max=5.51 cfs @ 12.20 hrs HW=660.02' (Free Discharge)
└─**2=Broad-Crested Rectangular Weir** (Weir Controls 5.51 cfs @ 1.35 fps)

Pond 17P: Bioretention



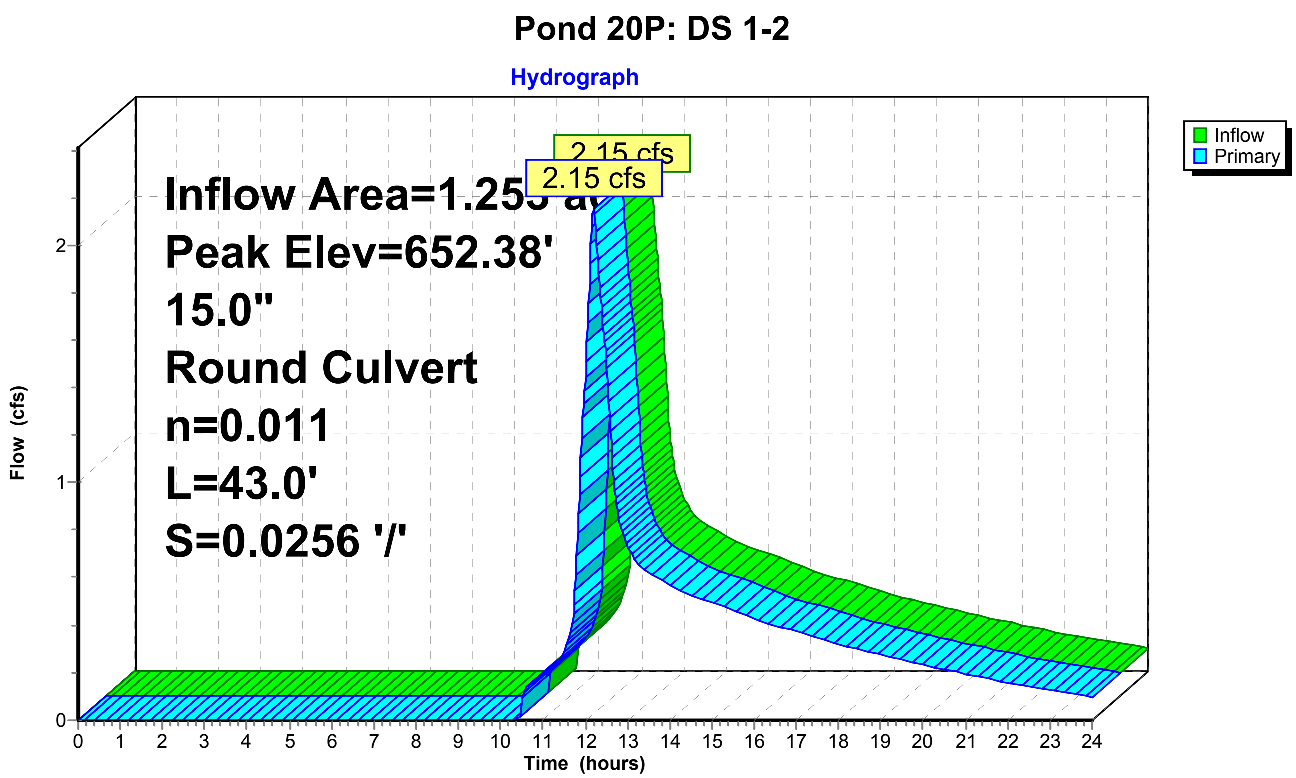
Summary for Pond 20P: DS 1-2

Inflow Area = 1.253 ac, 44.66% Impervious, Inflow Depth > 4.36" for 100-Year event
Inflow = 2.15 cfs @ 12.21 hrs, Volume= 0.455 af
Outflow = 2.15 cfs @ 12.21 hrs, Volume= 0.455 af, Atten= 0%, Lag= 0.0 min
Primary = 2.15 cfs @ 12.21 hrs, Volume= 0.455 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Peak Elev= 652.38' @ 12.21 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	651.60'	**15.0" Round Culvert** L= 43.0' CMP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 651.60' / 650.50' S= 0.0256 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 1.23 sf

Primary OutFlow Max=2.15 cfs @ 12.21 hrs HW=652.38' (Free Discharge)
└**1=Culvert** (Inlet Controls 2.15 cfs @ 2.66 fps)



Summary for Pond 21P: Shallow Wetland

Inflow Area = 0.054 ac, 0.00% Impervious, Inflow Depth > 86.54" for 100-Year event
Inflow = 5.71 cfs @ 12.19 hrs, Volume= 0.387 af
Outflow = 3.89 cfs @ 12.30 hrs, Volume= 0.347 af, Atten= 32%, Lag= 6.2 min
Primary = 0.39 cfs @ 12.30 hrs, Volume= 0.249 af
Secondary = 3.50 cfs @ 12.30 hrs, Volume= 0.098 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Peak Elev= 659.48' @ 12.30 hrs Surf.Area= 3,828 sf Storage= 6,038 cf

Plug-Flow detention time= 151.4 min calculated for 0.347 af (90% of inflow)
Center-of-Mass det. time= 101.6 min (930.0 - 828.4)

Volume	Invert	Avail.Storage	Storage Description
#1	656.50'	6,117 cf	**Custom Stage Data (Irregular)**Listed below (Recalc)

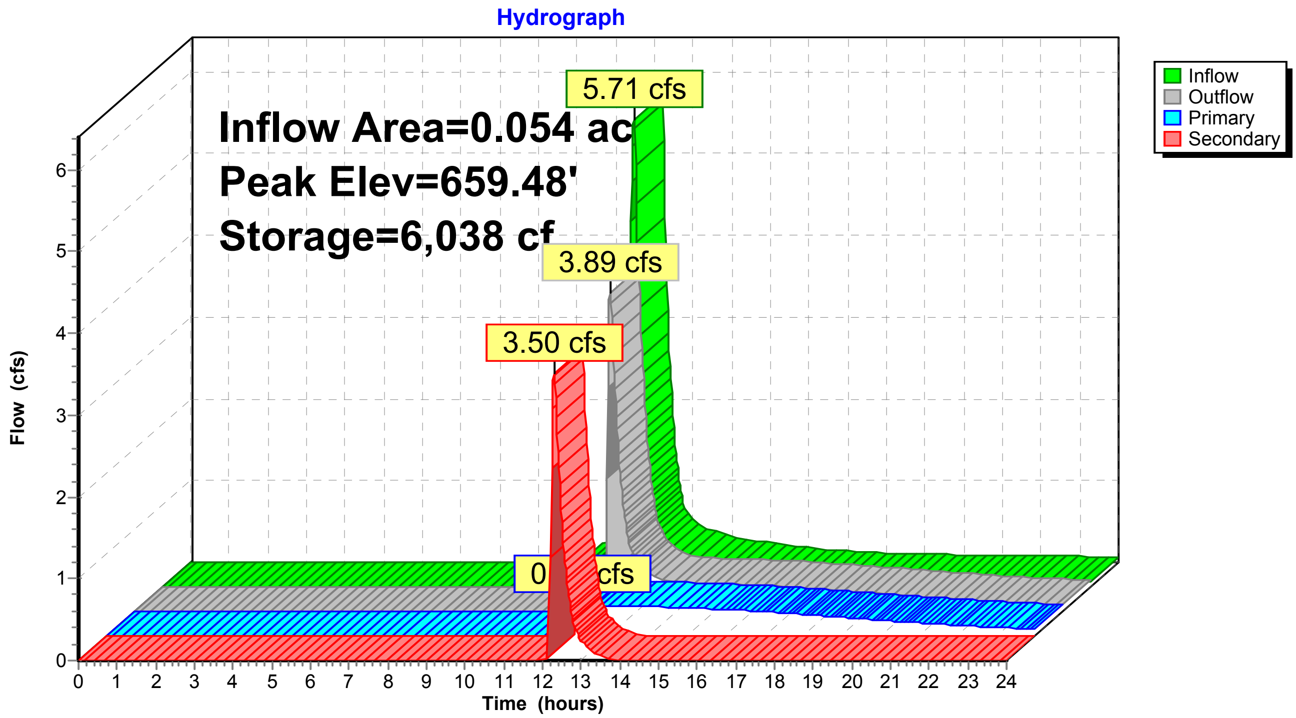
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
656.50	106	43.0	0	0	106
657.00	342	80.0	106	106	469
657.50	1,626	315.0	452	559	7,857
658.00	2,331	218.0	984	1,543	11,973
658.50	2,787	237.0	1,278	2,820	12,671
659.00	3,281	256.0	1,515	4,336	13,426
659.50	3,853	277.0	1,782	6,117	14,327

Device	Routing	Invert	Outlet Devices
#1	Primary	653.50'	**15.0" Round Culvert** L= 28.0' RCP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 653.50' / 653.00' S= 0.0179 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 1.23 sf
#2	Device 1	658.00'	**2.5" x 3.8" Horiz. Orifice/Grate** C= 0.600 in 33.5" x 38.0" Grate (1% open area) Limited to weir flow at low heads
#3	Secondary	659.25'	**13.0' long x 8.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64 2.64 2.65 2.65 2.66 2.66 2.68 2.70 2.74

Primary OutFlow Max=0.39 cfs @ 12.30 hrs HW=659.48' (Free Discharge)
└─**1=Culvert** (Passes 0.39 cfs of 12.06 cfs potential flow)
  └─**2=Orifice/Grate** (Orifice Controls 0.39 cfs @ 5.86 fps)

Secondary OutFlow Max=3.48 cfs @ 12.30 hrs HW=659.48' (Free Discharge)
└─**3=Broad-Crested Rectangular Weir** (Weir Controls 3.48 cfs @ 1.17 fps)

Pond 21P: Shallow Wetland



Summary for Pond 24P: DS 1-3

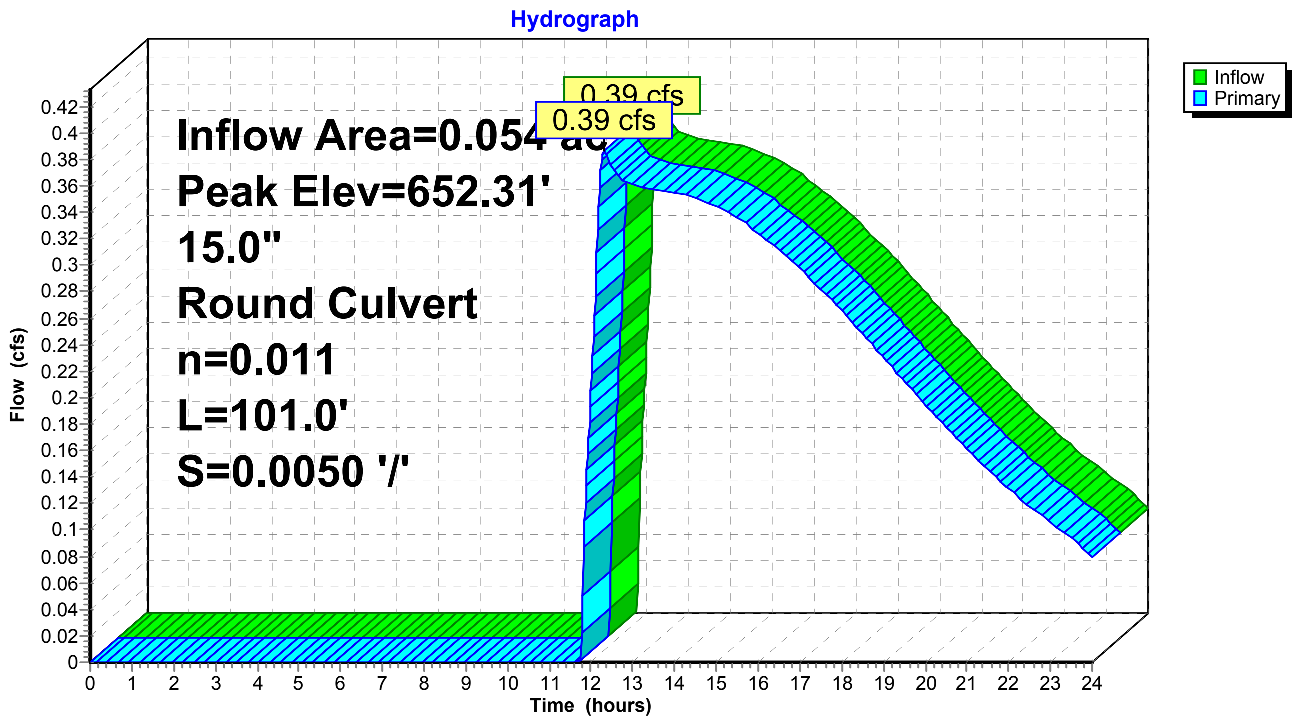
Inflow Area =	0.054 ac,	0.00% Impervious,	Inflow Depth > 55.69"	for 100-Year event	
Inflow =	0.39 cfs @	12.30 hrs,	Volume=	0.249 af	
Outflow =	0.39 cfs @	12.30 hrs,	Volume=	0.249 af,	Atten= 0%, Lag= 0.0 min
Primary =	0.39 cfs @	12.30 hrs,	Volume=	0.249 af	

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Peak Elev= 652.31' @ 12.30 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	652.00'	**15.0" Round Culvert** L= 101.0' RCP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 652.00' / 651.50' S= 0.0050 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 1.23 sf

Primary OutFlow Max=0.39 cfs @ 12.30 hrs HW=652.31' (Free Discharge)
└─**1=Culvert** (Barrel Controls 0.39 cfs @ 2.40 fps)

Pond 24P: DS 1-3



APPENDIX J

As-Built Plans of Stormwater Management Facilities