Stormwater Pollution Prevention Plan

Hudson Valley Community College
New Gene Haas Center for Advanced Manufacturing Skills Building

City of Troy
Rensselaer County, New York

CHA Project Number: 31807

Prepared for:

Hudson Valley Community College
80 Vandenburgh Avenue
Troy, New York 12180

Prepared by:

CHA

III Winners Circle
Albany, New York 12205
(518) 453-4500

February 2017

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Executive Summary:

This Stormwater Pollution Prevention Plan (SWPPP) has been prepared in accordance with the criteria presented in the State Pollutant Discharge Elimination System (SPDES) General Permit for Construction Activities (GP-0-15-002), the New York State Stormwater Management Design Manual (January 2015), and the New York State Standards and Specifications for Erosion and Sediment Control (July 2016).

The nature of this construction project is selected below:	
	New construction with proposed standard SMPs, Green Infrastructures, and ESC measures.
X	Redevelopment with increase in impervious areas with proposed standard SMPs and ESC measures. Green Infrastructures are encouraged, but not required for redevelopment projects.
	Redevelopment with no increase in impervious areas with proposed ESC measures only and no SMPs.

The proposed Gene Haas Center for Advanced Manufacturing Skills building project is located at an existing parking lot (D-Lot) south of the Lang Technical Building and east of the Parking Garage on the Hudson Valley Community College campus in Troy, New York. This project involves removal of the existing parking lot and constructing a new building for advanced manufacturing labs and classrooms. Other site work includes replacement of paved parking spaces, access drive, and installation of concrete sidewalks, granite curbs, closed storm conveyance system, underground utilities, and restoration of grassed lawn areas with minor landscaping at the new building entrances.

In order to evaluate the potential impacts associated with the development of the site, existing and proposed condition hydrographs generated using standard NRCS TR-55 methodology. Peak flows were computed using the Bentley Pondpack Hydrology Program (Version V8i) and the required Water Quality Volume (WQ_v) and Runoff Reduction Volume (RR_v) were computed using the Runoff Frequency Spectrum (RFS) Method, discussed in the New York State Stormwater Management Design Manual.

The extent of the hydrologic model was limited to those areas impacted by the proposed improvement areas. For the purposes of the hydrologic analysis, 1 design point and 2 contributing sub-areas were defined to characterize the drainage patterns of the watershed. The proposed project will increase impervious area by 0.07 acre. Due this minor increase of impervious area, the existing hydrodynamic unit on site will remain in-place to treat the full WQv criteria per Chapter 9 Redevelopment alternative SMP sizing criteria for proprietary practices. Moreover, the minimum RRv criteria is applied to the new developed impervious area only. Thus, seven (7) new trees are proposed to be planted throughout the site to meet the minimum RRv requirement.

This SWPPP covers the entire project construction, scheduled to be determined.

Project Disturbance Area

Total Disturbed Area:	1.58± acres
Total Existing Impervious Area:	1.14± acres
Total Proposed Impervious Area:	1.21± acres

Project Information:

Project Name and Location	Owner and Operator Name and Address
Hudson Valley Community College New Gene Haas Center for Advanced Manufacturing Skills Building Troy, New York 12180	Hudson Valley Community College 80 Vandenburgh Avenue Troy, New York 12180

Project Description:

Purpose and Extent of Proposed Development

The proposed Gene Haas Center for Advanced Manufacturing Skills building project is located at an existing parking lot (D-Lot) south of the Lang Technical Building and east of the Parking Garage on the Hudson Valley Community College campus in Troy, New York (see Figure 1- Site Location Map in Appendix A). The existing asphalt pavement parking area (D-Lot) is bounded by the Lang Technical Building on the north, a parking garage structure to the west, North Drive to the east, and South Drive on the south. The ground surface generally slopes down from the northeast corner of the site towards the southwest corner, with elevations ranging from 281 feet to 274 feet.

This project involves full depth pavement removal of the existing parking lot and constructing a new two story building with a footprint of approximately 24,065 SF, for advanced manufacturing labs and classrooms. Other site work includes replacement of paved parking spaces, access drive, and installation of concrete sidewalks, granite curbs, closed storm conveyance system, underground utilities, and restoration of grassed lawn areas with minor landscaping at the new building entrances.

Description and Limitations of On-Site Soils

A subsurface investigation was conducted on the project site in May 2016 by CHA which included six (6) geotechnical test borings and three (3) infiltration test borings. The Geotechnical Report is included in Appendix B of this SWPPP. In reference to the boring logs, the seasonal ground water table was found between the depths of 4.7 to 13.7 feet below the surface. Infiltration test results were found to range from 0.1 to 0.9 inch per hour.

The soil disturbance for the proposed work is limited to 0.37 acres and consists of silt loam/ clay. Based on a review of the USDA Soil Surveys of Rensselaer County, New York, soils on the project site are described in the following list (see Figure 2 – USDA Soils Classification Map). A summary of the soil composition is shown in Table 1.

Table 1 - Soil Analysis Summary

Soil Name	Hydrologic Soil Group
HuB- Hudson silt loam, 3-8% slopes	C/D

The Hudson silt loam is a deep and moderately well drained soil formed in silt and clay deposits. Depth to bedrock is generally more than 60 inches. Based on the K-values (0.49) published, this soil exhibits a high potential for erosion.

The Natural Resource Conservation Service (NRCS, formerly known as the SCS), as part of their soil classification system, assigns each soil series to a Hydrologic Soil Group (HSG). The HSG is a four-letter index intended to indicate the minimum rate of infiltration obtained after prolonged wetting, and to indicate the relative potential for a soil type to generate runoff. The infiltration rate is the rate at which water enters the soil at the soil surface. The HSG also indicates the transmission rate – the rate at which water moves within the soil. Soil scientists define the four groups as follows:

- HSG ‘A’ (sand, loamy sand, or sandy loam): Soils have low runoff potential and high infiltration rates even when thoroughly wetted. They consist chiefly of deep, well to excessively drained sands or gravels and have a high rate of water transmission (> than 0.30 inches/hour).

- HSG ‘B’ (silt loam or loam): Soils have moderate infiltration rates when thoroughly wetted, and consist chiefly of moderately deep to deep, moderately well to well drained soils with moderately fine to fine texture. These soils have a moderate rate of water transmission (0.15 to 0.30 inches/hour).

- HSG ‘C’ (sandy clay loam): Soils have low infiltration rates when thoroughly wetted and consist chiefly of soils with a layer that impedes downward movement of water, and soils with moderately fine to fine texture. These soils have a low rate of water transmission (0.05 to 0.15 inches/hour).

- HSG ‘D’ (clay loam, silty clay loam, sandy clay, silty clay, or clay): Soils have high runoff potential. They have very low infiltration rates when thoroughly wetted, and consist chiefly of clay soils with a high swelling potential, soils with a permanent high water table, soils with a clay pan or clay layer at or near the surface, and shallow soils over nearly impervious material. These soils have a very low rate of water transmission (< 0.05 inches/hour).

- If a soil is classified to a dual hydrologic group (A/D, B/D, or C/D), the first letter represents drained conditions and the second letter represents undrained conditions.

Historic Places

The proposed project will have no impacts, whether stormwater discharge or construction activities, on a property that is listed or eligible for listing on the State or National Register of Historic Places in Fulton County, NY. This determination was confirmed based upon review by The New York State Office of Parks, Recreation and Historic Preservation (OPRHP) SHPO and a copy of the letter of No Impact (dated March 02, 2017) upon cultural resources for the HVCC New Gene Haas Center for Advanced Manufacturing Skills Building is included in Appendix B.

Sequence of Major Activities:

This SWPPP presents erosion and sediment controls, both temporary and permanent, to assist the operator in compliance with the project's SPDES General Permit for construction activity. To the degree practicable, all temporary erosion and sediment control mitigation measures shall be installed immediately before associated project areas are disturbed in anticipation of all soil disturbing activities to follow. Based upon NYS DEC regulations, 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 landuse control MS4, the MS4 (provided the MS4 is not the owner or operator of the construction activity).

It is the responsibility of the Contractor to ensure that all soils removed from the project site are spoiled in a manner consistent with all local, state, and federal regulations. Appropriate erosion and sediment controls shall be installed at all spoil sites. Additionally, the Contractor is responsible for coordinating the application for a GP-0-15-002 permit (and development of an associated SWPPP) if disturbance associated with any soil spoils area is greater than 0.4 hectares (1 acre). GP-0-15-002 applications must be signed by the owner of the lands on which soils are spoiled. Disturbances associated with offsite spoil areas do not contribute to the total disturbances associated with onsite activities.

This project will be carried out in one (1) construction phase as outlined below, while maintaining the amount of concurrently disturbed soil in compliance with the NYS DEC limit.

Construction Sequence (±1.58 acres)

- Establish work area, contractor staging area, and install stabilized temporary construction entrances.
- Install silt fence and temporary erosion and sediment control measures as shown on plans.
- Remove existing asphalt pavement, sidewalks, and landscaped areas as shown on removal plans.
- Rough grade site, excavate and re-grade foundation footprint area for the proposed building.
- Install proposed underground utilities including water, gas, sanitary, electrical, telecommunications, fiber optic cable, and stormwater pipes and structures.
- Fine grade site and install subbase to stabilize disturbed areas.
- Construct proposed building and associated amenities.
- Install curbing, asphalt pavement, and concrete sidewalks as shown on layout plans.
- Install proposed landscaping, topsoil, and seed for stabilization of all disturbed areas.
- When all disturbed areas are permanently stabilized, remove all temporary erosion and sediment controls measures.

Name of Receiving Waters

The stormwater runoff from DP-1 will flow into a 12 inch HDPE and drain westward into an 18" HDPE along South Drive and entering a closed conveyance system on NYS Route 4 (also known as Vandenburgh Avenue). Runoff will be conveyed and ultimately discharges into an unnamed tributary (Class C, Standards C) of the Hudson River, located on the west side of NYS Route 4 (across from South Drive). The receiving waters are not listed as 303(d) segment and not located in an enhanced phosphorous watershed.

Controls:

Timing of Controls/Measures

The erosion and sediment control measures shall be constructed prior to clearing or grading of any portion of the project. Where land disturbance is necessary, temporary seeding or mulching must be used on areas which will be exposed for more than 14 days. Permanent stabilization should be performed as soon as possible after completion of grading. After the entire project area is stabilized, the accumulated sediment shall be removed from the project area. Erosion control devices shall remain in place until disturbed areas are permanently stabilized. For projects where soil disturbance is greater than five (5) acres, and construction activity has temporarily or permanently ceased, temporary and/or permanent soil stabilization measures shall be installed and/or implemented within seven (7) days from the date the soil disturbance activity ceased. The soil stabilization measures selected shall be in conformance with the most current version of the technical standard, New York Standards and Specifications for Erosion and Sediment Control.

Erosion and Sediment Controls / Stabilization Practice

Applicable erosion and sediment control measures and details are included in Appendix H.

Temporary Stabilization

Topsoil stockpiles, staging areas and disturbed pervious portions of the project area where construction activity temporarily ceases for at least 14 days shall be stabilized with temporary seed and mulch no later than 14 days from the last construction activity in that area.

Temporary seed shall be ryegrass applied at the rates specified below:

- If seeding in spring, summer or early fall then seed with annual or perennial rye at a rate of 30 lbs per acre. If area is to remain stabilized over the winter into the following spring use perennial rye only.

- If seeding in late fall or early winter, use certified Aroostook winter rye (cereal rye) at a rate of 90 lbs per acre.

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. Area must be free of large rocks and debris and seeded within 24 hours of disturbance or scarification of the soil surface will be necessary prior to seeding. Fertilizer or lime is not typically used for temporary plantings.

Mulch shall be applied in conjunction with seeding and applied at the rate of 90 lbs per 1000 square feet. Mulch shall be reapplied as necessary. Areas of the project area, which are to be paved, shall be temporarily stabilized by applying temporary gravel subbase until pavement can be applied.

Sediment control fencing shall be installed around the site where depicted on the attached plan sheets. Prior to commencing any earthwork, a stabilized construction entrance shall be installed as indicated on the attached plans. This entrance shall be utilized as the exclusive construction entrance and exit to the construction areas. Construction traffic shall be limited to the construction entrance.

Permanent Stabilization

Disturbed portions of the project area where construction activities permanently cease shall be stabilized with permanent seed no later than 14 days after the last construction activity. The permanent seed mix shall be in accordance with the project specifications and plans. Construction and maintenance of erosion and siltation control measures are in accordance with the New York Standards and Specifications for Erosion and Sediment Control.

Where construction activity is complete over areas to be permanently vegetated, stabilize with permanent seeding. Verify seeding dates with engineer. If engineer determines that seed cannot be applied due to climate, topsoil shall not be spread and mulching shall be applied to the exposed surface to stabilize soils until the next recommended seeding period. Other project areas shall be permanently stabilized with pavement, concrete, gravel or building structures.

Winter Operations

If construction activities proceed through the winter season, access points should be enlarged and stabilized to provide for snow stockpiling. Drainage structures should be kept open and free of potential snow and ice dams. Inspection and maintenance are necessary to ensure the function of these practices during runoff events. For sites where construction activities temporarily cease, temporary and/or permanent soil stabilization measures shall be installed within seven (7) days from the date the soil disturbing activity ceased. Disturbed areas should be stabilized with seed and mulch, or other approved methods, even if the ground is covered by significant amounts of snow.

Winter Shutdown

Site inspections (by the qualified inspector) may be decreased to a minimum of one (1) time every thirty (30) days for sites where soil disturbing activities have ceased and at least 100% of the site has been stabilized by an approved method. Inlet protection should be installed and/or repaired before shutdown of the site. The owner or operator shall provide written notification to the respective DEC regional office prior to reducing the frequency of any site inspections.

Other Controls

Waste Disposal

Waste materials – Foreign waste materials shall be collected and stored in a secured area until removal and disposal by a licensed solid waste management company. All trash and construction debris from the project area shall be disposed of in a portable container unit. No foreign waste materials shall be buried within the project area. All personnel shall be instructed regarding the correct procedure for waste disposal. Notices stating these practices shall be posted in the project trailer and the individual who manages day-to-day project operations will be responsible for seeing that these procedures are followed.

Petroleum Impacted Waste – During the excavation activities, there is the potential that petroleum impacted soils may be encountered. In the event that field evidence of contamination is identified during the project, potentially contaminated soils will be segregated and stockpiled on polyethylene sheeting and covered in a predetermined staging area. The potentially impacted, stockpiled soils will then be sampled to determine if the soils are suitable for use as clean backfill. In the event that the soils are not suitable for re-use, the contaminated soil will be properly characterized and disposed of at an off-site NYSDEC permitted facility. The excavation will then be backfilled with clean, imported fill.

Hazardous Waste - All hazardous waste materials shall be disposed of in a manner specified by local or state regulations or by the manufacturer. Project personnel shall be instructed in these practices and the individual who manages day-to-day project operations shall be responsible for seeing that these practices are followed.

Sanitary Waste - Any sanitary waste from portable units shall be collected from the portable units by a licensed sanitary waste management contractor, as required by NYS DEC regulations.

Sediment Tracking by Vehicles

A stabilized construction entrance shall be installed (where depicted on attached plan) and maintained as necessary to help reduce vehicular tracking of sediment. The entrance shall be cleaned of sediment and redressed when voids in the crushed stone become filled and vehicular tracking of sediment is occurring. Dump trucks hauling materials to and from the construction project area shall be covered with a tarpaulin to reduce dust. Any sediment and debris tracked from work area along project adjacent roadways shall be immediately removed with a street sweeper or equivalent sweeping method.

Non-Stormwater Discharges

Non-stormwater discharges are not expected to exit the project area during construction.

Certification of Compliance with Federal, State, and Local Regulations

The stormwater pollution prevention plan reflects the New York State requirements for stormwater management and erosion and sediment control. To ensure compliance, this plan was prepared in accordance with New York State Standards. There are no other applicable State or Federal requirements for sediment and erosion plans (or permits), or stormwater management plans (or permits).

Post-Construction Stormwater Management

Hydrologic Evaluation

Methodology

The proposed project has been designed in accordance with the New York State Stormwater Management Design Manual (January 2015) and the State Pollutant Discharge Elimination System (SPDES) General Permit for Stormwater Discharges from Construction Activities (GP-0-15-002, January 2015).

In order to evaluate the potential impacts associated with the re-development of the site, existing and proposed condition hydrographs were generated. The conditions were modeled using the SCS unit hydrograph method using a type II rainfall distribution. Rainfall amounts were referenced from the New York State Stormwater Management Design Manual, January 2015. The 24-hour rainfall amounts for the 1-, 10- and 100-year design storms in the City of Troy in Rensselaer County are 2.2-, 4.0- and 6.5-inches respectively.

Runoff curve numbers and times of concentration were computed using standard NRCS TR-55 methodology. Additionally, peak stormwater flows and hydrographs for the existing and post-development conditions were computed using the Bentley Pondpack Hydrology Program (Version V8i).

The required WQ_v for the watershed area was computed using the Runoff Frequency Spectrum (RFS) Method, discussed in the New York State Stormwater Management Design Manual.

$$WQ_v = \{(P)(R_v)(A)\} / 12$$

Where:

WQ_v = *water quality volume (acre-feet)*
P = *90 % rainfall event (inches)*
R_v = *0.05 + 0.009 (I), where I is percent impervious cover*
A = *watershed area (acres)*

For Troy in Rensselaer County, the 90% of the annual runoff is generated by storms of 1.1 inches of rainfall.

Redevelopment Criteria

Redevelopment of previously developed sites is encouraged from a watershed protection standpoint because it often provides an opportunity to conserve natural resources in less impacted areas by targeting development to areas with existing services and infrastructure. Redevelopment provides an opportunity to correct existing problems and reduce pollutant discharges from previously developed areas that were constructed without effective stormwater pollution controls.

Because the technical standards contained in the New York State Stormwater Management Design Manual were primarily intended for new development projects, compliance with the standards may present a challenge on some redevelopment projects. Therefore, Chapter 9 of the New York State Stormwater Management Design Manual give the following definition for redevelopment activity on page 9-2.

***Redevelopment Activity / Activities* – Disturbance and reconstruction of existing impervious surfaces. This includes impervious surfaces that were removed within the last five (5) years.**

If the construction project includes both new development and redevelopment activities, treatment would be required for 25% of the existing, disturbed impervious area, however, the stormwater management practices for the new development portion of the project must be designed in accordance with the sizing criteria in Chapter 4.

The proposed project involves removal of the existing parking lot and constructing a new building structure with reconstruction of pavement areas and sidewalks. The proposed project will increase impervious area by 0.07 acre. Due this minor increase of impervious area, the existing hydrodynamic unit on site was substantiated to treat the full WQv criteria per Chapter 9 Redevelopment alternative SMP sizing criteria for proprietary practices. Furthermore, the minimum RRv criteria is applied to the new developed impervious area only. Seven (7) new trees are proposed to be planted throughout the site in addition to the seven (7) existing trees that will remain on site to meet the minimum RRv requirement.

Existing Condition Hydrology

For the purposes of this analysis, the extent of the hydrologic model was limited to those areas impacted by the proposed improvement areas. Based on this evaluation, the contributing watersheds consist of about 1.58 acres. For the purposes of the existing condition analysis, one (1) design point and two (2) contributing sub-areas were defined to characterize the drainage patterns of the watershed (See Figure 3- Existing Condition Drainage Area Map).

Design Point 1 (DP-1) is located at an existing storm basin structure at the southwest corner of access drive entrance into the project site from South Drive. Runoff from the existing parking lot flows to catch basin inlets and it is conveyed by the closed stormwater conveyance system and water quality volume is treated by the existing hydrodynamic CDS unit on site prior to discharging to DP-1.

Results from the existing condition analyses are shown in Table 2 below and detailed computations are included in Appendix C.

Table 2 - Existing Condition Analysis Summary

Design Point	Watershed	Area (acres)	T_c (hrs)	Curve Number	Peak Flow Rate (cfs)		
					1-yr	10-yr	100-yr
DP-1	DA-1A	1.24	0.08	94	3.01	6.06	10.21
	DA-1B	0.34	0.08	82	0.41	1.18	2.34
	Total	*1.58*			*3.41*	*7.23*	*12.55*

Proposed Condition Hydrology

The proposed improvements will increase impervious area by approximately 0.07 acre and will slightly alter the permeability of the project site. The existing condition drainage areas have been revised to reflect the adjustments of new drainage areas of the proposed watershed with one (1) design point and five (5) contributing sub-areas with DP-1 remaining to be located at an existing storm basin structure at the southwest corner of the project site on South Drive (See Figure 4 – Proposed Condition Drainage Area Map).

Drainage Area 1A North (DA-1A North) includes a portion of the proposed New Gene Haas Center building as well as the entrance drive and parking areas located on the northern side of the proposed building. Runoff in this sub-area is conveyed via roof drains and overland flow to the proposed closed stormwater conveyance system and outlets into DP-1.

Drainage Area 1A1 (DA-1A1) involves the western half of the proposed New Gene Haas Center building as well as the entrance drive and parking areas on the western side of the proposed building. Runoff in this sub-area is conveyed via roof drains and overland flow to the proposed closed stormwater conveyance system and outlets into DP-1. The proposed 24-inch HDPE pipes are over-sized to detain runoff for underground storage with low and high flow orifices located at the proposed catch basin CB-1 structure.

Drainage Area 1A2 (DA-1A2) comprises of the southeast portion of the proposed New Gene Haas Center building. Runoff in this sub-area is conveyed via roof drains to the proposed closed stormwater conveyance system and outlets into DP-1. The proposed 12-inch HDPE pipe is designed to detain stormwater runoff for underground storage with a low flow orifice located at the proposed catch basin CB-1 structure.

Drainage Area 1A3 (DA-1A3) includes a portion of the entrance drive, sidewalks, and parking area located south of the proposed building. Runoff in this sub-area is conveyed via overland flow to the proposed closed stormwater conveyance system and outlets into DP-1.

Drainage Area 1B (DA-1B) contains a portion of the entrance drive and grassed area located east and south of the proposed building. Runoff in this sub-area is conveyed via overland flow to the proposed closed stormwater conveyance system and outlets into DP-1.

Results of the proposed condition analysis are shown in Table 3 below and detailed hydrology computations are included in Appendix D.

Table 3 – Proposed Condition Analysis Summary

Design Point	Watershed	Area (acres)	T_c (hrs)	Curve Number	Peak Flow Rate (cfs)		
					1-yr	10-yr	100-yr
DP-1	DA-1A North	0.53	0.08	93	1.23	2.54	4.32
	DA-1A1	0.51	0.08	95	1.29	2.54	4.23
	DA-1A2	0.13	0.08	98	0.36	0.67	1.09
	DA-1A3	0.09	0.08	95	0.23	0.45	0.75
	DA-1B	0.32	0.08	83	0.41	1.15	2.24
	Total	*1.58*			*3.52*	*7.34*	*12.64*

Post-Development Stormwater Management Practices

Runoff Reduction Volume

In accordance with the New York State Stormwater Management Design Manual (January 2015), further reduction in the water quality volume (WQv) shall be designed to reduce the total amount of runoff leaving the project site and to replicate pre-development hydrology. This volumetric reduction is defined as the Runoff Reduction Volume (RRv). Runoff reduction shall be achieved by infiltration, groundwater recharge, reuse, recycle evaporation or evapotranspiration of 100% of the post-development water quality volumes to replicate pre-development hydrology by maintaining pre-construction infiltration, peak runoff flow, discharge volume, as well as minimizing concentrated flow by using runoff control techniques to provide treatment in a distributed manner before runoff reaches the collection system. This requirement can be accomplished by application of on-site green infrastructure techniques, standard stormwater management practices with runoff reduction capacity, and good operation and maintenance. Runoff reduction can be achieved by three methods: reduction of contributing drainage area, reduction of runoff volume through practice storage, and using standard stormwater practices with runoff reduction capacity.

Projects that cannot meet 100% of runoff reduction requirement must provide a justification that evaluates each of the green infrastructure planning and reduction techniques, and identifies the specific limitations of the site according to which application of this criterion is technically infeasible. Implementation of green infrastructure cannot be considered infeasible unless physical constraints, hydraulic conditions, soil testing, existing and proposed slopes, or other existing technical limitations are objectively documented. And determination of application of none of the runoff reduction options is feasible may not be based on the cost of implementation measures or lack of space for required footprint of the practice.

Project that do not achieve runoff reduction to pre-construction condition must, at a minimum reduce a percentage of the runoff from impervious areas to be constructed on the site. The percent reduction is based on the Hydrologic Soil Group(s) (HSG) of the site and is defined as Specific Reduction Factor (S) and is defined as the following list.

HSG A = 0.55 (55%)
HSG B = 0.40 (40%)
HSG C = 0.30 (30%)
HSG D = 0.20 (20%)

The required RRv for the watershed areas is computed using the minimum runoff reduction volume equation presented below.

RRv = {(P) (Rv) (Ai)} / 12

Where:

RRv = runoff reduction volume (acre-feet)
P = 90% rainfall event (inches)
Rv = 0.05 + 0.009 (I), where I is 100% impervious cover
Ai = impervious cover targeted for runoff reduction = (S)(Aic)
Aic = total area of new impervious cover
S = Hydrologic Soil Group (HSG) Specific Reduction Factor

Green Infrastructure Techniques

Runoff reduction was achieved for the proposed project with the application of the green infrastructure techniques including tree planting and tree preservation. Since this project proposes a total of 1.21 acre of impervious area to be constructed on site, the replacement of 1.14 acres of existing impervious area is considered redevelopment, and the remaining 0.07 acres of impervious area is considered to new development. Subsequently, the minimum RRv criteria is applied to the new developed impervious area only. The minimum RRv required for the entire project is 0.002 acre feet. Total runoff reduction is to be provided through the seven (7) trees proposed to be planted on site and the seven (7) existing trees being preserved on site is equal to 0.003 acre feet.

A summary of the practice used in the project for runoff reduction is provided in Table 4 and detailed worksheets are included in Appendix G. Runoff reduction practices not applicable for the proposed project and justification for each practice is summarized in Table 5.

Table 4 - Summary of Required Runoff Reduction Volumes

Design Point	Min. RRv Required (ac-ft)	RRv Provided (ac-ft)	Runoff Reduction Techniques
DP-1	0.002	0.003	Tree Planting / Preservation

Table 5 – Stormwater Management Practices for Runoff Reduction Not Used in Project

Practice / Technique	Reason for Not Applying the Practice / Technique to Project
Conservation of Natural	No existing natural woods or wetland areas located within or adjacent to the project site.
Riparian Buffers / Filter	No existing riparian areas within the project site or adjacent to the project site.
Rooftop Disconnection	Runoff already treated with tree planting / preservation.
Infiltration Trench	Runoff already treated with tree planting / preservation.
Drywell	Runoff already treated with tree planting / preservation.
Infiltration Basin	Runoff already treated with tree planting / preservation.
Bioretention	Runoff already treated with tree planting / preservation.
Dry Swale	Runoff already treated with tree planting / preservation.
Vegetated Swale	No medians or green grass sectors supportive of swales.
Green Roof	Not applicable to building design.
Rain Garden	Drainage area size is greater than the maximum contributing drainage area of 1,000 SF.
Planters	Drainage area size is greater than the maximum contributing drainage area of 15,000 SF.
Cisterns / Rain Barrels	No regular use for the collected water on site.
Porous Pavement	Runoff already treated with tree planting / preservation.

Water Quality

To meet the full stormwater quality (WQv) criteria, an existing hydrodynamic unit was employed to provide water quality treatment for stormwater runoff from the proposed project site. The porous pavement is standard SMP with runoff reduction capacity. Therefore, a percentage of the WQv (provided) is allocated for the RRv provided by the practices based on the Hydraulic Soil Groups (HSG) which the SMP is located. The remaining WQv provided by the SMP is calculated by the following.

$$WQv(Required) = RRv(Provided) + WQv(Provided)$$

The amount of WQv required to be treated for the entire project is 0.077 acre-feet. The minimum RRv required for the entire project is 0.002 acre feet. Total runoff reduction is to be provided through the seven (7) trees proposed to be planted on site and the seven (7) existing trees being preserved on site is equal to 0.003 acre feet. The remaining WQv to be treated is through the use of the existing hydrodynamic unit Downstream Defender (4 feet diameter) model which treats 1.38 cfs water quality flow. This peak flow is equal to the remainder of 0.074 acre-feet of water quality volume required for the proposed project. A summary of the required and provided water quality volumes (WQv) are shown in Table 7 and detailed computations are included in Appendix G.

Table 6 - Summary of Water Quality Volumes

Design Point	Total Area (ac)	Required WQv (ac-ft)	Required WQf (cfs)	Provided WQf (cfs)	Treatment Practice
DP-1	1.58	0.074	1.38	1.38	Hydrodynamic Unit

Table 7 –Summary of Required and Provided WQv and RRv

Required Water Quality Volume; WQv(Required)	0.077 acre-feet
Minimum Runoff Reduction Volume Required; RRv (Min)	0.002 acre-feet
Provided Runoff Reduction Volume; RRv (Provided)	0.003 acre-feet
Provided Water Quality Volume; WQv(Provided)	0.074 acre-feet
Sum of Total RRv Provided and WQv Provided	0.077 acre-feet

Channel Protection Volume

Due to an overall increase in total impervious area and subsequent increased discharge rates, 24-hour detention of the channel protection volume (Cpv, 1-year storm) will be required. The 1-yr, 24-hour runoff volume was computed using the TR-55 short cut sizing approach for storage volume estimation listed in Appendix B in the New York State Stormwater Management Design Manual. Detailed computations are included in Appendix G.

Table 8 - Summary of Channel Protection Volume

Design Point	Area (acres)	CPv Required (ac-ft)	CPv Provided (ac-ft)
DP-1	1.58	0.020	0.020

Peak Flow Attenuation

Based on a comparison between the existing conditions and the proposed peak flow rates, the proposed development will decrease peak rates of runoff at DP-1. A summary of the existing conditions and mitigated post-development peak flow comparison is shown in Table 9 on the following page, and detailed computations are included in Appendix E.

Table 9 – Existing Condition & Mitigated Post-Development Peak Flow Comparison

Design Point	Peak Flow Rate (cfs)								
	1-Year Storm			10-Year Storm			100-Year Storm		
	Exist (cfs)	Mitigated (cfs)	Δ (cfs)	Exist (cfs)	Mitigated (cfs)	Δ (cfs)	Exist (cfs)	Mitigated (cfs)	Δ (cfs)
DP-1	3.41	3.21	-0.20	7.23	6.82	-0.41	12.55	10.87	-1.68

Stormwater Conveyance Systems

The proposed closed drainage system for the proposed New Gene Haas Center for Advanced Manufacturing Skills Building project has been designed for the 10-year, 24-hour event, while also providing safe overland conveyance of the 100-year, 24-hour event. Detailed computations are included in Appendix F.

Floodplains

Based on a review of the FEMA Flood Insurance Rate Map for City of Troy, Rensselaer County, NY (dated March 18, 1980); the entire project site is not located in the 100-year floodplain (see Figure 5 – FEMA FIRM).

Maintenance/Inspection Procedures:

Erosion and Sediment Control Inspection and Maintenance Practices

These are the minimum required inspection and maintenance practices that shall be used to maintain erosion and sediment controls:

Owner/Operator Inspection Requirements-

- Prior to construction activity the owner/operator shall have contractors and sub contractors identify a trained individual responsible for the implementation of the SWPPP. The trained individual must be on-site on a daily basis when soil disturbing activities are occurring.
- The owner/operator shall inspect the erosion and sediment control measures as identified in the SWPPP to ensure that they are being maintained in effective operating conditions at all times. Where soil disturbing activities temporarily cease (e.g. winter shutdown) and temporary stabilization measures have been applied to all disturbed areas, the owner/operator can reduce frequency of inspections, but shall maintain a minimum of monthly inspections, and after significant rain storms and snow thaws. The owner/operator shall resume inspections when soil disturbing activities begin again.
- Where soil disturbing activities have ceased with partial project completion, the owner/operator can stop conducting inspections when disturbed areas have reached final stabilization. The qualified inspector shall coordinate and obtain approval from the Owner and Engineer that final stabilization has been achieved. All post construction stormwater management practices required for the completed areas shall have been constructed in conformance with the SWPPP and be fully operational. 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.
- The owner/operator shall notify the DEC Regional Office’s stormwater contact person prior to any reduction in the frequency of site inspections.
- The owner/operator shall retain copies of the NOI, NOI acknowledgment letter, SWPPP, MS4 SWPPP acceptance form and any inspection reports submitted in conjunction with this permit and records or all data used to complete the NOI to be covered by this permit for a period of at least five (5) years from the date that the site is finally stabilized.

Qualified Inspector Inspection Requirements-

- The qualified inspector is defined as 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), licensed Landscape Architect, or other Department endorsed individual(s). It may also mean someone working under the direct supervision of the licensed Professional Engineer or licensed 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 the person has received four (4) hours of training endorsed by the Department and shall receive four (4) hours of training every three (3) years after the initial training.

- A site inspection shall be conducted at least once every seven (7) days by the qualified inspector when soil disturbing activities are occurring. A copy of the "Construction Duration Inspection Form" is included in the Appendix I section of this plan.
- All measures shall be maintained in good working order; if any repairs or corrective actions are necessary, it is the responsibility of the qualified inspector to notify the owner/operator and appropriate contractor within one business day. The contactor shall begin implementing the corrective action within one business day of being notified.
- All inspection forms must be signed by a qualified inspector.
- For construction sites where soil disturbing activities are temporarily suspended, temporary stabilization measures shall be applied and the qualified inspector shall conduct a site inspection at least once every thirty (30) calendar days.
- Where soil disturbing activities have ceased with partial project completion the qualified inspector can stop conducting inspections when disturbed areas have reached final stabilization and all post construction stormwater management practices required for the completed areas have been constructed in conformance with the SWPPP and are fully operational.
- Where soil disturbing activities are not resumed within two (2) years, from the date of shut down of partial project completion, the qualified inspector shall perform a final inspection and certify that all disturbed areas have achieved final stabilization, all temporary and permanent erosion control measures have been removed, and post-construction stormwater management practices have been constructed in conformance with the SWPPP. Qualified inspector shall sign the "Final Stabilization" and "Post-Construction Stormwater Management Practice" certification statements on the Notice of Termination (NOT).

General Requirements

- A copy of the SPDES General Permit (GP-0-15-002), the signed Notice of Intent (NOI), NOI acknowledgement letter, SWPPP, and inspection reports shall be maintained onsite until the site has achieved final stabilization.
- Built up sediment shall be removed from any silt fence when it has reached one-third the height of the fence / dike.
- Sediment fencing and wetland protection barrier shall be inspected for depth of sediment, and tears, to see if fabric is securely attached to the fence posts, and to see that the fence posts are firmly in the ground.
- The construction entrance shall be cleaned of sediment and redressed when voids in the crushed stone become filled and vehicular tracking of sediment is occurring.
- Dust shall be controlled on access points and other disturbed areas subject to surface dust movement and blowing.
- Stabilization fabric and rock dams shall be inspected to ensure that slopes and swales are not being eroded. Fabric shall be replaced / reinstalled and rock dams added as necessary to prevent any such erosion
- Inspection of diversion swales shall be conducted to check condition of swale.
- The temporary sediment trap shall be inspected to check condition of trap. They shall be cleaned at a minimum frequency of twice a year or immediately once accumulated sediment reaches a depth of 1/3 the depth of the trap.
- Inspection must verify that all practices are adequately operational, maintained properly and that sediment is removed from all control structures.
- Inspection must look for evidence of soil erosion on the site, potential of pollutants entering drainage systems, problems at the discharge points, and signs of soil and mud transport from the site to the public road.

Post-Construction Stormwater Inspection and Maintenance Practices

Hudson Valley Community College will maintain ownership of the hydrodynamic units on site. Long-term inspection forms and long-term maintenance for the stormwater management practices (included in Appendix I of this plan) are referenced from Appendix G of the New York State Stormwater Management Design Manual.

Inventory for Pollution Prevention Plan:

The materials or substances listed below are expected to be within the project area during construction:
- Portland cement concrete.
- Fertilizers / seeding materials.
- Stone.
- Bituminous asphalt.
- Petroleum based products.
- Silt fence fabric.
- Lumber.
- Pavement marking paint.
- PVC and HDPE.

Spill Prevention:

The following are the material management practices that shall be used to reduce the risk of spills or other accidental exposure of materials and substances to stormwater runoff.

Good Housekeeping
The following good housekeeping practices shall be followed within project areas during construction:
- An effort shall be made to store only enough products required to do the job.
- All materials stored within project areas shall be stored in a neat, orderly manner in their appropriate containers and, if possible, under a roof or other enclosure.
- Products shall be kept in their original containers with the original manufacturer's label.
- Substances shall not be mixed with one another unless recommended by the manufacturer.
- Whenever possible, all of a product shall be used up before disposing of the container.
- Manufacturers' recommendations for proper use and disposal shall be followed.
- The project superintendent shall inspect daily to ensure proper use and disposal of materials.

Hazardous Products
These practices are used to reduce the risks associated with hazardous materials:
- Products shall be kept in original containers unless they are not resealable.
- Original labels and material safety data shall be retained.
- If surplus product must be disposed of, manufacturers' or local and state recommended methods of proper disposal shall be followed.
- Material Safety Data Sheets for all hazardous products shall be within the project area for the duration of construction.

Product Specific Practices
The following product-specific practices shall be followed within the project areas.

Petroleum Products

All project related vehicles shall be monitored for leaks and receive regular preventive maintenance to reduce the chance of leakage. Petroleum products shall be stored in tightly sealed containers which are clearly labeled. Any asphalt substances used during construction shall be applied according to the manufacturer's recommendations.

Fertilizers

Fertilizers used shall be applied only in the minimum amounts recommended by the manufacturer. Once applied, fertilizer shall be worked into the soil to limit exposure to stormwater. Fertilizers shall be stored in a covered or other contained area.

Paints

All containers shall be tightly sealed and stored when not required for use. Excess paint shall not be discharged to the storm sewer system but shall be properly disposed of according to manufacturer’s instructions or State regulations.

Concrete Trucks

Concrete trucks shall be allowed to wash out within project areas provided that the contractor provides an area which collects and contains any concrete / slurry material washed from trucks for recovery and disposal at a later time. No concrete / slurry shall be discharged from the property at any time of construction. If such washing is anticipated, the contractor shall submit a plan detailing the control of concrete / slurry to the engineer for approval.

Watercourse Protection

Construction operations shall be conducted in such a manner as to prevent damage to watercourses from pollution of debris, sediment, or other foreign material, or from manipulation, from equipment and/or materials in or near the watercourse. The contractor shall not return directly to the watercourse any water used for wash purposes or other similar operations which may cause the water to become polluted with sand, silt, cement, oil or other impurities. If the contractor uses water from the water course, the contractor shall construct an intake or temporary dam to protect and maintain watercourse water quality.

Spill Control Practices

The contractor will be responsible for preparing a project area specific spill control plan in accordance with local and NYS DEC regulations. At a minimum this plan should:

- Reduce stormwater contact if there is a spill.
- Contain the spill.
- Stop the source of the spill.
- Dispose of contaminated material in accordance with manufactures procedures, and NYS DEC regulations.
- Identify responsible and trained personnel.
- Ensure spill area is well ventilated.

Updating the SWPPP:

The SWPPP shall be updated/revised as conditions merit or as directed by the regulating authority. The attached inspection forms included with this document allows for the certification of any updates/revisions.

SWPPP Certification:

Contracting Firm Information:

Contracting Firm

Address

City/Town ***State*** ***Zip***

Site Location:

Hudson Valley Community College
80 Vandenburgh Avenue
Troy, New York 12780

Contractor's Certification

I hereby certify that I understand and agree to comply with the terms and conditions of the SWPPP and agree to implement any corrective actions identified by the qualified inspector during a site inspection. I also understand that the owner or operator must comply with the terms and conditions of the New York State Pollutant Discharge Elimination System (SPDES) general permit for stormwater discharges from construction activities and that it is unlawful for any person to cause or contribute to a violation of water quality standards. Furthermore, I understand that certifying false, incorrect or inaccurate information is a violation of the referenced permit and the laws of the State of New York and could subject me to criminal, civil and/or administrative proceedings.

Signature (Contractor/Subcontractor) ***Date***

For

Responsible For

Signature (Trained Individual) ***Date***

For

Responsible For

Signature (Contractor/Subcontractor) ***Date***

For

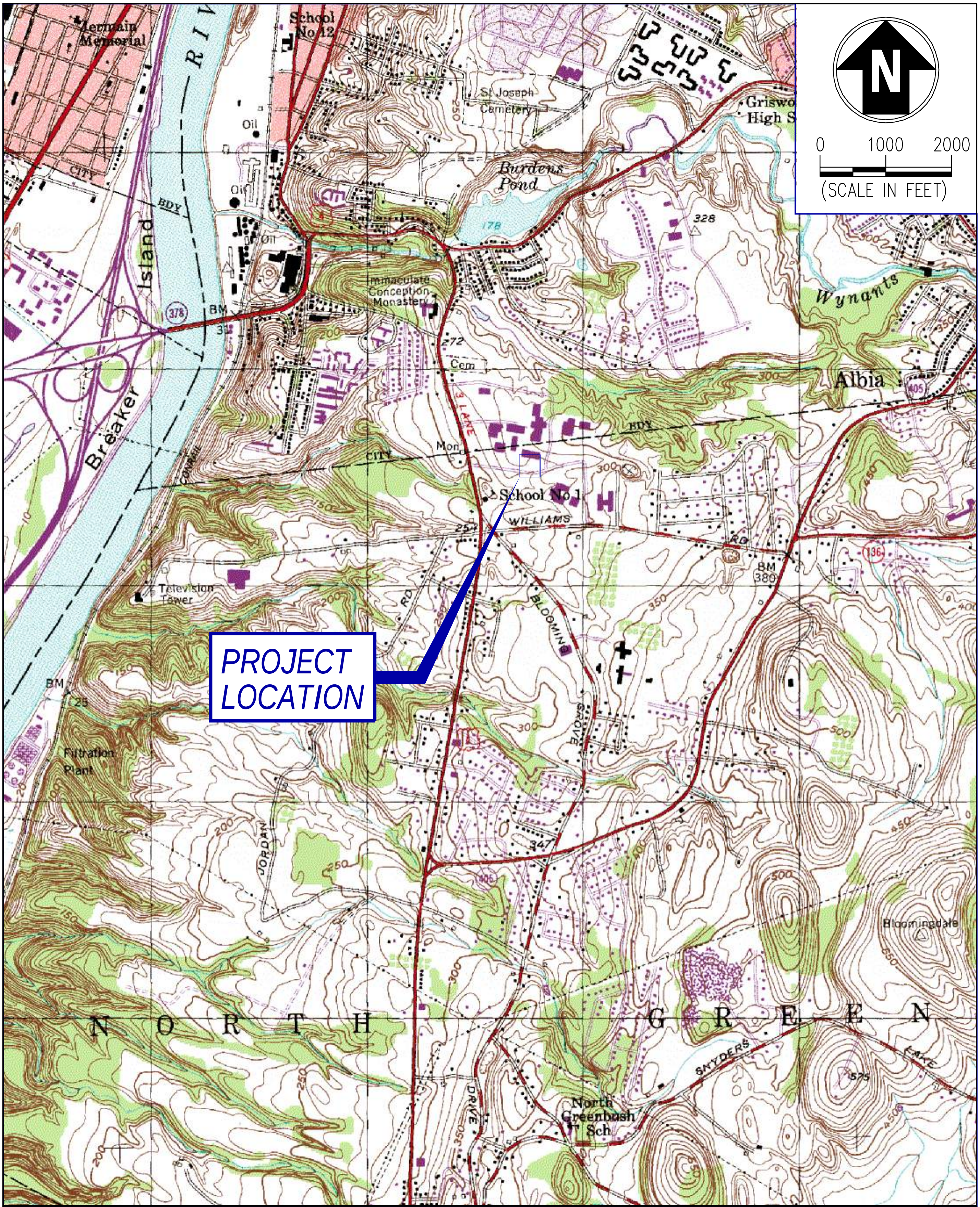
Responsible For

Signature (Trained Individual) ***Date***

For

Responsible For

Appendix A
Figures



CHA
III Winners Circle, PO Box 5269
Albany, NY 12205-0269
518.453.4500 · www.chacompanies.com

SITE LOCATION MAP
HUDSON VALLEY COMMUNITY COLLEGE
ADVANCED MANUFACTURING FACILITY

TROY, NEW YORK

PROJECT NO. 31807	
JAN 2017	
FIGURE 1	

Hydrologic Soil Group—Rensselaer County, New York
(HVCC Advanced Manufacturing Facility)

Map Scale: 1:570 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0, 5, 10, 20, 30

Feet: 0, 25, 50, 100, 150

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

Figure 2 - USDA Soils Classification Map

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features

- Streams and Canals

Transportation

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

Background

- Aerial Photography

MAP INFORMATION

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

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: Rensselaer County, New York
Survey Area Data: Version 13, Sep 24, 2016

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

Date(s) aerial images were photographed: Data not available.

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.

Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — Rensselaer County, New York (NY083)				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
HuB	Hudson silt loam, 3 to 8 percent slopes	C/D	1.7	100.0%
Totals for Area of Interest			**1.7**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

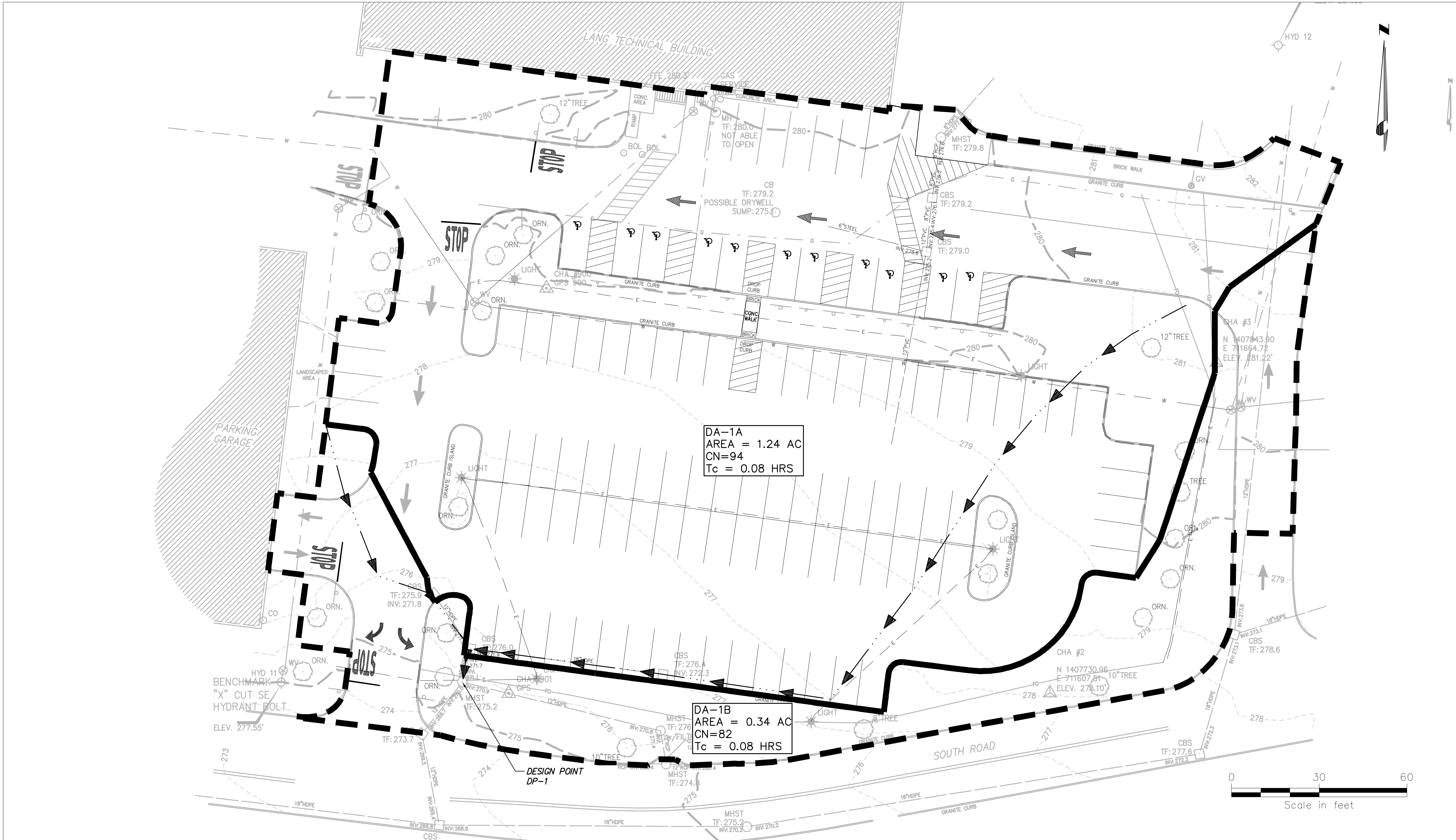
If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher



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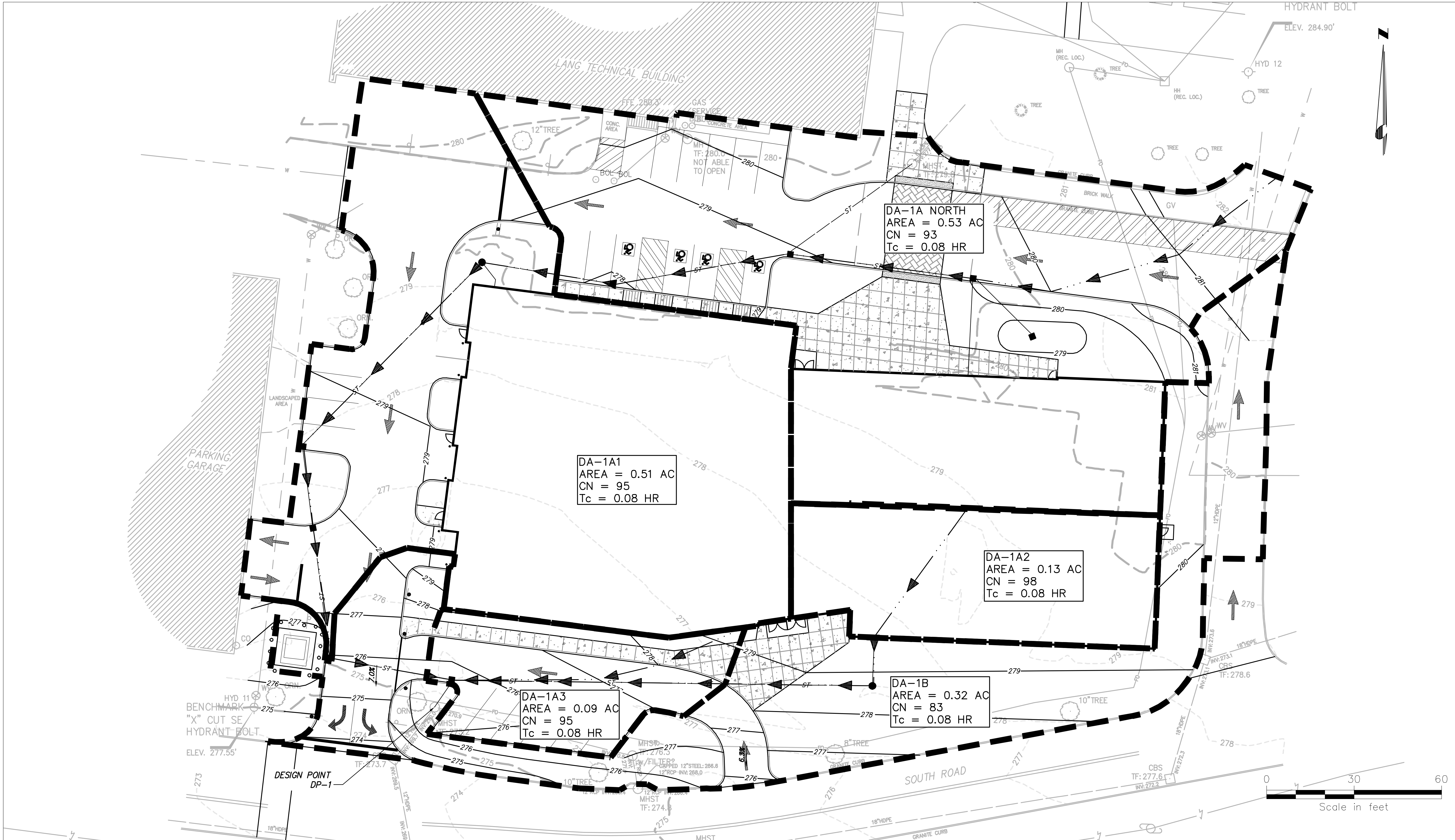
EXISTING CONDITION DRAINAGE AREA MAP

HUDSON VALLEY COMMUNITY COLLEGE
NEW GENE HAAS CENTER FOR ADVANCED
MANUFACTURING SKILLS BLDG.
TROY, NEW YORK

PROJECT NO. 31807	
FEB. 2017	
FIGURE 3	



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III Winners Circle, PO Box 5269
Albany, NY 12205-0269
518.453.4500 · www.chacompanies.com

PROPOSED CONDITION DRAINAGE AREA MAP	PROJECT NO. 31807
HUDSON VALLEY COMMUNITY COLLEGE NEW GENE HAAS CENTER FOR ADVANCED MANUFACTURING SKILLS BLDG. TROY, NEW YORK	FEB. 2017
	FIGURE 4

Figure 5 - FEMA FIRM

Appendix B
Historic Resource and Geotechnical Borings

March 02, 2017

Ms. Heather Wyld
Civil Engineer
CHA Consulting Inc
3 Winners Circle
Albany, NY 12205

Re: DEC
HVCC New Gene Haas Center for Advanced Manufacturing Skills Building
80 vandenburgh ave, troy, NY 12180
17PR01314

Dear Ms. Wyld:

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

Based upon this review, it is the New York State Office of Parks, Recreation and Historic Preservation's opinion that your project will have no impact on archaeological and/or historic resources listed in or eligible for the New York State and National Registers of Historic Places.

If further correspondence is required regarding this project, please be sure to refer to the OPRHP Project Review (PR) number noted above.

Sincerely,

Michael F. Lynch

Michael F. Lynch, P.E., AIA
Director, Division for Historic Preservation

Geotechnical Borings

This report has been prepared and reviewed by the following qualified engineers employed by CHA.

Report Prepared By:

Ryan Larmouth

Geotechnical Engineer

Report Reviewed By:

Scott M. Doehla, P.E.

Section Manager – Geotechnical

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1.0 INTRODUCTION

CHA performed a geotechnical exploration for the construction of a new manufacturing classroom building at Hudson Valley Community College in Troy, NY. The project site is shown on Figure 1 - Site Location Map, included in Appendix A.

The primary objectives of the exploration were to evaluate subsurface conditions at the proposed building and to provide geotechnical recommendations for design and construction of the building foundations. This report summarizes the results of the geotechnical exploration.

2.0 PROJECT AND SITE DESCRIPTION

The project site is located on the campus of Hudson Valley Community College, having a main address at 80 Vandenburgh Avenue, Troy, New York. The project is generally located in the southern portion of the campus at an existing parking lot identified as "D-Lot". The existing site consists of an asphalt pavement parking lot, access drives, and landscaped areas. The ground surface generally slopes downward from the northeast of the site to the southwest, approximately 5 to 6 feet, with elevations ranging from approximately from + 275 to +281 feet. The project site is bounded by South Drive to the south, a parking garage structure to the west, an access drive and a parking lot to the west, and the Lang Technical Building to the north. Photographs of the site are provided in a log contained in Appendix B.

The proposed manufacturing classroom building is planned to be two stories in height, and it is our understanding that a basement is not planned. The proposed manufacturing classroom building footprint will be approximately 110 feet by 250 feet, and will be located within the existing D-Lot parking area. The finish floor elevation (FFE) has not been finalized at this time, but is anticipated the FFE will be similar to the existing grades onsite. Cutting or filling of up to 4 feet may be required depending on the selection of the FFE. Based on the preliminary discussions with the structural engineer, we understand that column loading for the proposed building will be on the order of 50 to 75 kips.

3.0 SUBSURFACE EXPLORATION

3.1 Test Boring Program

CHA conducted a subsurface exploration program consisting of six (6) geotechnical test borings designated B-1 through B-6, and three (3) infiltration test borings designated as IT-1 through IT-3. The exploration began on May 23, 2016 and was completed May 27, 2016. The geotechnical borings were advanced to depths ranging from 23 feet to 35.5 feet below surface grade (bsg) and the infiltration test borings were advanced to 10 feet bsg. The borings were backfilled with drilled cuttings upon completion of drilling. Borings within paved areas were patched at the ground surface with cold-patch asphalt.

The boring locations were surveyed on-site by CHA. Surface elevations at the boring locations were determined by CHA. Locations and elevations of the borings should only be considered as accurate as the method used to obtain them. The approximate boring locations are shown on the attached Boring Location Plan, Figure 2, included in Appendix A of this report.

CHA retained the services of Underground Surveying, LLC to perform non-destructive, non-intrusive subsurface utility surveying within the vicinity of the borings and infiltration testing. Utilities detected by underground surveying within these limited areas were marked and boring locations were adjusted as needed to avoid conflict with these utilities.

CHA retained Aquifer Drilling and Testing, Inc. of Waterford, New York to advance the borings. The field exploration was performed under the observation of a CHA geotechnical engineer who confirmed proper drilling and sampling methods were utilized for the exploration, inspected and described soil and bedrock samples, and prepared field logs documenting the subsurface conditions. Typed copies of the boring logs are included in Appendix C.

The borings were advanced with a rubber tired truck mounted drill rig using flush joint casing with an inside diameter of 4 inches or hollow-stem augers with an inside diameter of 4.25 inches. Split-spoon samples were obtained in the borings continuously to 12 feet bsg, and at 5-foot intervals thereafter, except at boring B-1A where no soil sampling was performed. Sampling was performed in general accordance with ASTM International Standard D 1586. The split spoon samples were advanced by a 140 (±) pound hammer free falling 30 (

the boring logs, and indicate the penetration resistance for a 6-inch advancement of the split spoon. Initially, the spoon is driven six inches to seat the sampler in undisturbed material. The number of blows required to drive the sampler the next 12 inches is taken as the standard penetration test (SPT) resistance or "N" value. This value is indicative of the soil's in-place density or consistency. The final 6-

Refusal is defined as a resistance of greater than 50 blows per six inches of penetration.

Coring was performed using an NX-size, double-tube core barrel at borings B-2, B-4 and B-5 for a length of 5 feet after encountering auger refusal. The rock quality designation (RQD) of the cored interval was then determined in the field for the core sample. RQD is defined as the sum of the length of core pieces 4 inches and longer, divided by the length of the core run, expressed as a percentage. Fractures within the core samples that are deemed to be the result of the drilling process are ignored when computing the RQD. The RQD values provide an indication of the relative degree of jointing or fracturing of the bedrock. Core samples were obtained within general conformance to ASTM Standard D2113, and RQD measurements were made in general conformance with ASTM Standard D6032. RQD values for each cored interval are provided on the boring logs in Appendix C.

Infiltration testing was performed at locations adjacent to infiltration borings IT-1, IT-2 and IT-3. Solid steel casing with a diameter of 4 inches was installed at a depth of 5 feet and the casing was flushed with water to remove the soil. Testing was then performed including the pre-soak period, in accordance with Appendix D of the New York State Stormwater Management Design Manual.

Upon completion of the infiltration testing, the infiltration casing was pulled, and the borings were backfilled.

Groundwater level observations were made during drilling operations through observation of soil sample moisture content and by direct measurement of standing water within each borehole.

3.2 Laboratory Analysis

Select soil samples were submitted for laboratory analysis to aid in development of the geotechnical engineering recommendations. The test results for specific samples are included on the boring logs in Appendix C and complete results of the testing are included in Appendix D.

4.0 SUBSURFACE CONDITIONS

The subsurface conditions at the site were assessed based on a review of published geologic maps and the results of the previous and current subsurface explorations performed on-site and are summarized below.

4.1 Regional Geology

According to the *Surficial Geologic Map of New York – Hudson-Mowhawk Sheet* (D.H. Caldwell, R. J. Dineen, 1987) the site is located within an area mapped as lacustrine silt and clay.

According to the *Geologic Bedrock Map of New York State:* (D.W. Fisher, Y.W. Isachsen, L. V. Rickard, 1970) the site is located within an area mapped as the Taconic Melange.

4.2 Subsurface Stratigraphy

Subsurface conditions encountered in individual borings are detailed and described on the boring logs included in Appendix D of this report. Subsurface conditions can generally be described as follows, in order of increasing depth:

<u>Topsoil/Asphalt Pavement</u> –Asphalt Pavement was encountered at the ground surface in borings B-1 through B-5, IT-1 and IT-3 to depths ranging from 3 to 6 inches. Topsoil was encountered at the ground surface in borings B-6 and IT-2 to depths ranging from 3 to 6 inches and below the asphalt in B-2 to a depth of 6 inches.

<u>Fill</u> - Fill was encountered below the topsoil and asphalt layers in borings B-1, B-3, B-4, B-5, B-6, IT-1, IT-2 and IT-3, and extended to depths approximately ranging from 2 to 8 feet below grade. The fill material consisted primarily of fine to coarse sand with varying amounts of fine to coarse

gravel, silt and clay, or clayey silt with varying amounts of fine to coarse sand and fine to coarse gravel. The fill was brown or gray in color and visually classified as moist or wet. SPT "N" values within cohesionless fill ranged from 4 to 60 blows per foot (bpf), indicating the fill material ranged from very loose to very compact in density. SPT "N" values within cohesive fill ranged from 10 to 16 bpf, indicating the fill material was stiff to very stiff in consistency.

<u>Silt or Clayey Silt</u> – Silt or Clayey silt was encountered below the fill layer in borings B-1, B-2, B-3, B-4, B-6 and IT-2, and extended to depths ranging from 4.3 to 30.5 feet. A layer of clayey silt was encountered at a depth of 16.5 feet within boring B-5 and extended to a depth of 21.5 feet. Clayey silt was also encountered at a depth of 8 feet within boring IT-1 and extended to boring termination depth of 10 feet, and encountered at a depth of 6.8 feet and extending to 8 feet within boring IT-3. The clayey silt deposits contained varying proportions of fine to coarse sand and fine to coarse gravel, was gray or brown in color and visually classified as moist to wet. SPT "N" values within the silt ranged from 2 to 5 bpf indicating very loose to loose conditions, and within the clayey silt deposits ranged from 0 to 22 bpf, indicating the clayey silt ranged from very soft to very stiff in consistency.

<u>Sand</u> – Sand was encountered below the fill within borings B-5, IT-1 and IT-3, and below the clayey silt layer within borings B-1, B-3, B-6 and IT-2 and extended to depths ranging from 10 to 26.5 feet. The sand deposits consisted of fine to coarse sand, with varying amounts of clayey silt, and fine to coarse gravel. The sand was brown, gray or dark gray in color, and visually described as moist to wet. SPT "N" values within the sand deposits ranged from 0 bpf to 34 bpf, indicating the sand ranged from very loose to compact in density.

<u>Till</u> **–** Till was encountered below the clayey silt and sand layers in borings B-1, B-2, B-3, B-4 and B-6 and extended to depths between 26.5 and 32 feet. The till generally consisted of fine to coarse sand with varying amounts of clayey silt and some fine to coarse gravel. The till was gray in color

and visually classified as wet. Based on SPT "N" values that ranged from 30 bpf to refusal, the till was medium compact to very compact in density.

Completely Weathered Bedrock – Completely weathered bedrock was encountered below the sand and clayey silt deposits in boring B-5, and extended to boring termination depth at 23.2 feet. The weathered rock consisted of fine to coarse sand with little clayey silt. The weathered rock was gray in color, and visually described as wet. Based on SPT "N" value indicating refusal, the completely weathered bedrock was very compact in density.

Bedrock – Roller-bit refusal or auger refusal was encountered at depths between 14 and 32.1 feet within borings B-1 through B-6. Siltstone bedrock was encountered within the core samples taken from B-2, B-4 and B-6. The siltstone was gray in color, medium hard, slightly weathered with medium wide fracture spacing. Within the core samples obtained in borings B-2 and B-6, a layer of conglomerate bedrock consisting of siltstone fragments within a matrix of other sedimentary deposits was encountered below the siltstone. Within boring B-2, this layer extended to termination at 35.5 feet, and within boring B-6 this layer extended to 30.3 feet and overlies approximately 0.5 feet thick alternating layers of siltstone and conglomerate. The conglomerate was gray to black, had thin fracture spacing, was slightly weathered and was medium hard. Both rock types contained seams of calcite. The RQD values within the cores ranged from 47 to 96 percent, indicating poor to excellent rock mass conditions.

4.3 Groundwater Conditions

Groundwater observations were made during drilling in all borings. The following table outlines the groundwater observations made during drilling.

Table 1: Groundwater Level Measurements

Boring Number	Depth Below Surface (ft)	Approximate Elevation of Water Table (ft)
B-1	10.8	267.4
B-2	10.4	269.0
B-3	11.2	269.8
B-4	4.7	271.5
B-5	13.7	263.7
B-6	10.1	269.4

Water was used in the drilling process in borings B-2, B-4 and B-6, so groundwater measurements obtained during drilling may not represent static conditions. Additionally, seasonal factors such as temperature and precipitation can also affect groundwater levels.

4.4 Infiltration Testing Results

Infiltration testing was completed adjacent to borings IT-1, IT-2, and IT-3 at a depth of 5 feet below the ground surface. Four-inch interior diameter steel casing was installed and flushed of soil, and 2-feet of water was added for a minimum 24 hour presoak period. The water was then refilled to a minimum of 2 feet from the bottom of the casing, and the water level was measured after one hour. The casings were subsequently refilled and the process was repeated for four (4) additional one-hour intervals. The following table presents the change in water level measured after each interval.

Table 2: Infiltration Testing Results

Boring ID No.	IT-1	IT-2	IT-3
Measurement Interval	**Water Level Drop (ft)**		
1st Hour	0.06	0.08	0.02
2nd Hour	0.01	0.16	0.01
3rd Hour	0.02	0.05	0.02
4th Hour	0.01	0.04	0.00
5th Hour	0.00	0.06	0.00

5.0 GEOTECHNICAL RECOMMENDATIONS

The recommendations provided in this report are based on the results of the subsurface exploration and laboratory testing. The following sections outline our recommendations for design and construction of the project.

5.1 Shallow Foundations

Shallow foundations are suitable for support of the proposed building. Footings should bear on natural soils, such as the medium stiff to stiff clayey silt or fine sand, or on structural fill placed over these materials. Existing fill soil is not suitable for foundation support. Any existing fill or loose soil should be removed from the foundation zone of influence as defined in Figure 3: Limits of Structural Fill Detail. Footings may be designed utilizing a net allowable bearing pressure of 2,000 psf.

Isolated spread footings should be a minimum of 36 inches in least dimension and continuous strip footings be a minimum of 18 inches wide. Exterior footings should bear at least 4 feet below outside grade for protection against frost penetration. Interior footings in heated areas may be founded at a minimum of 2 feet below the bottom of the floor slab. All foundations should be designed in accordance with the 2010 New York State Building Code.

Foundations should be constructed or structural fill placed and compacted as soon as possible after excavation to minimize the risk of disturbance of the bearing surface by exposure to precipitation or other adverse conditions. Any disturbed, frozen or softened subgrade soil should be removed and replaced with structural fill or the bottom of the foundation should be lowered as required to minimize detrimental impacts to foundation performance.

Foot traffic for placing forms and reinforcement during wet weather may create soft or unstable areas in the native site soils containing fines. Soft or disturbed soils should be removed prior to placing concrete to minimize detrimental impacts to foundation performance. If it is anticipated that foundation subgrades will be exposed for some time or if wet weather conditions are anticipated, we recommend that a mud mat comprised of 2 to 3 inches of concrete be placed on bearing grades immediately after exposure. The mud mat will provide a firm and stable working platform during foundation construction and will protect the subgrade soils. Use of a mud mat will also aid in keeping the foundation reinforcement clean.

An alternative method of protecting the subgrade would be to place geotextile fabric on the exposed bearing grade and placing at least 6 inches of crushed stone on the geotextile. This alternative to a mud mat will provide a stable and firm working platform and allow free drainage of water to temporary sumps and pumps. The geotextile should be a 6 oz per square yard or heavier, non-woven filter fabric, with an apparent (AOS) equal to or smaller than the U.S. Standard sieve size of 70, such as a Mirafi 160N or a geotextile of similar quality. The stone should be an open graded, free draining crushed aggregate such as a clean ¾-inch crushed stone.

A detailed settlement analysis was beyond the scope of this study. However, based on preliminary analysis, it is anticipated that spread footings designed for bearing pressures of 2,000 psf would result in total settlement less than 1 inch, and different settlement less than ½ inch over a distance of 30 feet.

5.2 Floor Slabs

Construction of the proposed slabs-on-grade would likely require primarily cutting into existing grades and minimal filling. Within fill areas, the subgrade should consist of compacted structural fill. The floor slabs should be designed in accordance with the following recommendations:

- Any deleterious material found within the soil subgrade for the floor slab should be removed and replaced with compacted structural fill as described in *Section 5.5*.
- Existing fill should be removed to a depth at least 3 feet below the floor slab. Existing fill may be used as subgrade material for placement of structural fill provided that the top of the existing fill layer is at least 3 feet below the base of the floor slab, the subgrade is prepared as recommended in *Section 5.4*, and structural fill is placed as described in *Section 5.5*.
- A minimum of 6 inches of clean, compacted crushed stone should be placed beneath the slab to enhance support and provide a working base above the soil subgrade. The actual thickness of the stone layer should be based on structural design requirements. The crushed stone should be a 50/50 mix of NYSDOT No. 1 and No. 2 stone or equivalent. The stone should be underlain by a 6 ounce per square yard or heavier, non-woven filter fabric with an apparent opening size (AOS) equal to or smaller than the U.S. Standard sieve size of 70 such as a Mirafi 160N or a geotextile of similar qualities. This will provide separation between the stone and underlying sand or silt soils.
- The crushed stone should be kept moist, but not wet, immediately prior to the slab concrete placement.
- A polyethylene vapor barrier should be used between the crushed stone and the concrete slab.
- If a polyethylene vapor barrier is used, adequate curing procedures should be specified to prevent slab curling due to excessive moisture loss in the slab surface.
- A subgrade modulus of 100 pounds per cubic inch should be used for design of concrete floor slabs bearing on the existing site soils or compacted structural fill.

5.3 Retaining Walls

The permanent building foundation walls that retain earth will be restrained against lateral movement and should be designed for "at-rest" earth pressures. Retaining walls which are free to rotate such as temporary walls or site retaining walls may be designed using "active" earth pressure conditions. Structural fill should be placed in compacted lifts within the area extending a distance behind the retaining walls at least half the wall height.

Where structural fill extends a distance behind the walls at least one-half the maximum wall height, those walls should be designed based on the following engineering properties of the structural fill as described in this report:

- Total unit weight: 125 pcf
- Angle of internal friction: 32 degrees
- Friction factor, concrete footing on crushed stone: 0.45

Where placement of structural fill behind new retaining walls to the distance indicated above is not feasible, the walls should be designed to retain existing site soils. Walls that retain on-site soil should be designed based on the following engineering properties of soil:

- Total unit weight: 110 pcf
- Angle of internal friction: 28 degrees

Appropriate surcharge loads should be included in design of the foundation and basement walls. A 12-inch layer of open graded, free draining crushed stone is recommended behind the building retaining walls that ties into perforated perimeter drain pipes and directs water away from the basement walls and footings. A non-woven geotextile filter fabric should be placed on subgrade materials beneath the crushed stone and between the vertical drainage stone layer and the backfill material. The geotextile should be 6 ounce per square yard or heavier with an AOS equal or smaller than the U.S. Standard Sieve size of 70 such as Mirafi N-Series Nonwoven Polyproylene Geotextile 160N or a geotextile of similar properties. All wall drains should be connected to a storm sewer or otherwise daylighted to permit groundwater transport away from the walls.

5.4 Site Preparation

The areas within the footprint of proposed construction should be stripped of any existing structures, topsoil, vegetation, concrete and asphalt. Existing fill soil should be removed from within the proposed building foundation footprints in its entirety, and from within slab subgrade areas to a depth at least 3 feet below the floor slab. Subsequent to removing the surficial materials and structures, and excavating to proposed grades, the exposed subgrade soil should be proof rolled using a pneumatic tamper operating in its vibratory mode. Any areas which pump or weave during proof rolling should be undercut by a minimum of 12 inches and stabilized with structural fill. Where remedial removals are performed, structural fill should be used to restore the subgrade elevation.

5.5 Structural Fill

Structural fill shall be used for backfilling foundation excavations, backfilling undercuts, and backfilling retaining walls. Material suitable for structural fill shall consist of sound, durable, non-plastic sand and gravel, free of stumps, roots, other organics and any frozen or deleterious materials.

Structural fill shall be placed in loose lifts not exceeding 8 inches in thickness and should be compacted to at least 95 percent of the maximum laboratory dry density as determined by the modified Proctor test (ASTM D-1557). Structural fill shall conform to the gradation in Table 3.

Table 3: Gradation Requirements for Structural Fill

Sieve Size	Percent Passing by Weight
4 inch	100
No. 40	0 to 70
No. 200	0 to 10

The on-site soils do not qualify as structural fill.

5.6 Seismic Site Classification and Design Parameters

Based upon the subsurface conditions encountered in the borings and in accordance with the Building Code of New York, 2010 Edition, the site class for the project site is defined as D for the proposed site improvements. In addition, the following seismic design site coefficients were determined:

- Mapped Spectral Response Acceleration for Short Periods (S_S) 0.182g
- Mapped Spectral Response Acceleration for 1.0-Second Period (S_1) 0.070g
- Site Coefficient F_a 1.6
- Site Coefficient F_v 2.4

5.7 Groundwater and Control of Water

Based on observations made during the subsurface exploration we anticipate that groundwater may be encountered during construction of the proposed manufacturing classroom building. Therefore temporary groundwater protection may be required during construction. Permanent groundwater protection is not required provided that the building contains no building levels extending more than 5 feet below existing grade.

Project specifications should require that groundwater be maintained at a minimum depth of two feet below the deepest excavation at all times to maintain stable conditions. It should be the responsibility of the contractor to maintain dry conditions so that foundation construction may be completed in the dry. Dewatering methods suitable for this site include the use of sumps and pumps, diversion and drainage ditches, and other similar methods. Pumps should be of sufficient capacity to control the groundwater, and operated in a manner which will limit the withdrawal of fines from the soil. It is recommended that pumps be installed in sumps lined with filter fabric and crushed stone. In addition, surface runoff should be diverted away from excavations during construction.

It should be understood that the site soils are highly moisture sensitive and should be protected from moisture to ensure the load-carrying capacity of the soil.

6.0 EXCAVATIONS

In general, all excavation should be performed in accordance with the Occupational Safety and Health Administration (OSHA) standards and other applicable State and Federal regulations. In areas where sufficient sloping of excavation cuts is not possible, the excavation should be shored, sheeted and braced. All excavation support systems should be designed by a Professional Engineer licensed in the State of New York.

7.0 OBSERVATION DURING CONSTRUCTION

A qualified geotechnical engineer should carefully inspect the final excavation surface for spread foundations and concrete slabs to ascertain that the subgrade has been properly prepared. The inspection of subgrade should include probing at select locations, specifically to verify the bearing capacity of the supporting soils and where load bearing soils may have been disturbed.

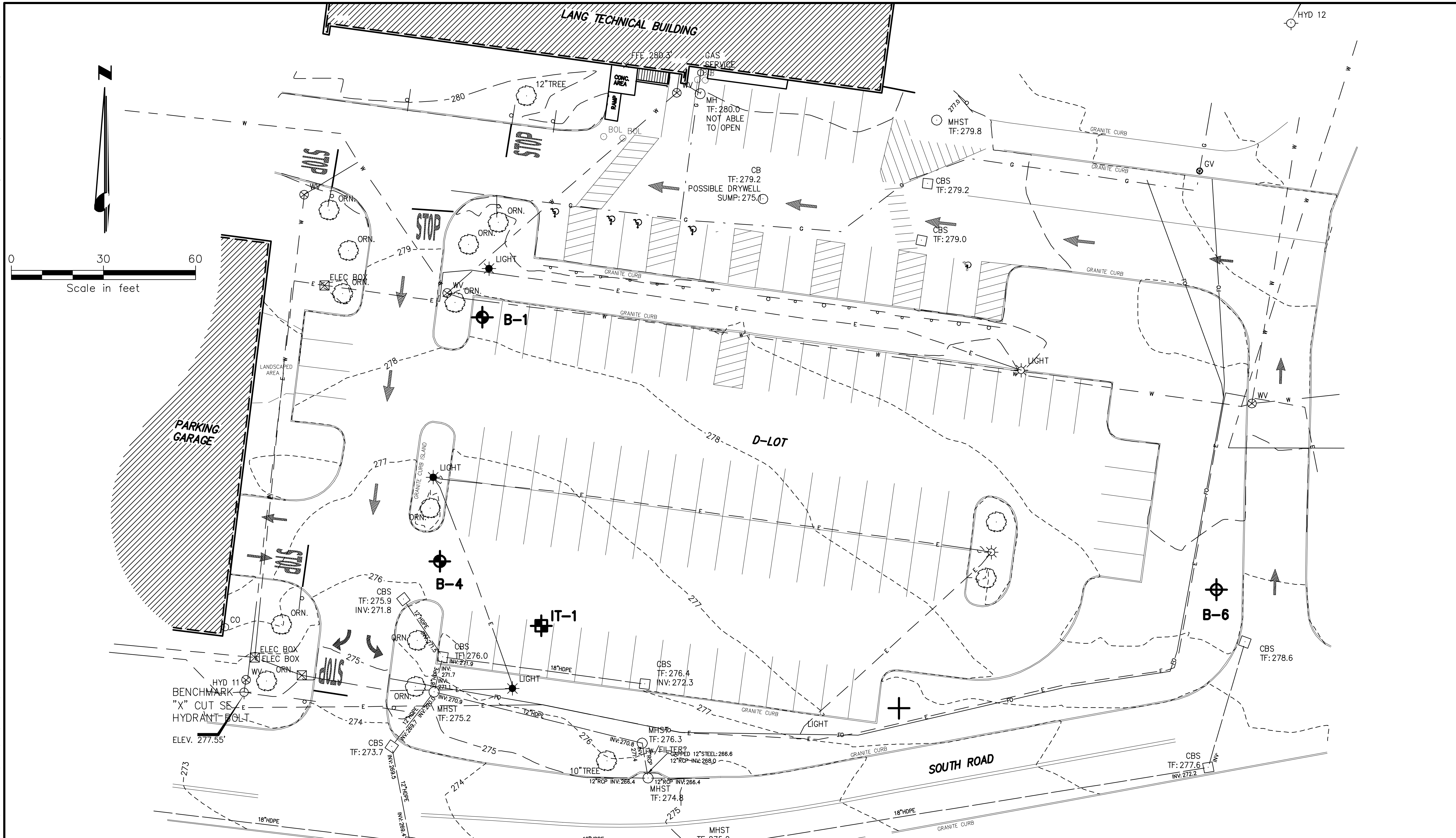
Materials used as structural fill, including those used beneath footings, floor slabs and pavement should be tested by a qualified soils laboratory to verify they meet the specified gradations and to determine their maximum dry density for compaction. In-place density tests should be performed to verify that compaction methods and equipment achieve the required densities.

8.0 CLOSURE

The geotechnical recommendations presented in this report are based, in part, on project and subsurface information available at the time this report was prepared and in accordance with generally accepted soil and foundation engineering practices. No other warranty, expressed or implied, is made. Some variation of subsurface conditions may occur between locations explored that may not become evident until construction. Depending on the nature and extent of the variations, it may be necessary to re-evaluate the recommendations presented in this report.

CHA does not accept responsibility for designs based upon our recommendations unless we are engaged to review the final plans and specifications to determine whether any changes in the project affect the validity of our recommendations and whether our recommendations have been properly implemented in the design.

This report has been prepared solely for design purposes and shall not be incorporated by reference or other means in the Contract Documents. If this report is included in the Contract Documents, it shall be for information only. Earthwork specification clauses shall take precedence.



LEGEND

B-1 APPROXIMATE BORING LOCATION

IT-1 APPROXIMATE INFILTRATION TEST LOCATION

PROJECT NUMBER: 31673.1000.32000

Troy, NY	DRILL FLUID:
	HAMMER TYPE:
	During Drilling
	Completion

SAMP LEN.	REC	"N" or	SA	D (	GR.	DESCRIPTION AND CLASSIFICATION			
								LL: NV PL: NP PI: NP MC: 25.6%	

SAMI NU	SAMP LEN.	REC		"N" or	SA	DI (	GRA	DESCRIPTION AND CLASSIFICATION			
S-8	0.7	0.7									

PROJECT NUMBER: 31673.1000.32000

Troy, NY	DRILL FLUID:
	HAMMER TYPE:

SAMP LEN.	REC		"N or	SA	D (	GR	DESCRIPTION AND CLASSIFICATION			
							(FILL)			
									conditions.	

PROJECT NUMBER: 31673.1000.32000

SAMI NU	SAMP LEN.	REC		"N" or	SA	DI (I	GRA	DESCRIPTION AND CLASSIFICATION			

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PROJECT NUMBER: 31673.1000.32000

Troy, NY

DRILL FLUID:

HAMMER TYPE:

SAMF LEN.	REC		"N or	SA	D (	GR.	DESCRIPTION AND CLASSIFICATION			

SAM NU	SAMP LEN.	REC		"N" or	SA	D (	GRA	DESCRIPTION AND CLASSIFICATION			
								(SM-FILL)			

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PROJECT NUMBER: 31673.1000.32000

Troy, NY

DRILL FLUID:

HAMMER TYPE:

SAMF LEN. REC

"N or

SA

D (

GR.

DESCRIPTION AND CLASSIFICATION

R

PROJECT NUMBER: 31673.1000.32000

Troy, NY

DRILL FLUID:

HAMMER TYPE:

SAMF LEN. REC

"N or SA

D (

GR.

DESCRIPTION AND CLASSIFICATION

(FILL)

SAMI NU	SAMP LEN.	REC		"N" or	SA	DI (	GRA	DESCRIPTION AND CLASSIFICATION			
S-8	0.2	0.1		R							

V:\PROJECTS\ANY\K4\31673\DATA\BORING_LOGS\31673_BORINGLOGS.GPJ

PROJECT NUMBER: 31673.1000.32000

Troy, NY	DRILL FLUID:
	HAMMER TYPE:

SAMP LEN.	REC	"N or	SA	D (	GR.	DESCRIPTION AND CLASSIFICATION			

SAMI NU	SAMP LEN.	REC		"N" or l	SA	DI (l	GRA	DESCRIPTION AND CLASSIFICATION			

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PROJECT NUMBER: 31673.1000.32000

Troy, NY

DRILL FLUID:

HAMMER TYPE:

SAMF LEN.	REC		"N or	SA	D (	GR.	DESCRIPTION AND CLASSIFICATION			

Troy, NY

DRILL FLUID:

HAMMER TYPE:

SAMF LEN. REC	"N or	SA	D (	GR.	DESCRIPTION AND CLASSIFICATION
					moist (FILL)

PROJECT NUMBER: 31673.1000.32000

Troy, NY

DRILL FLUID:

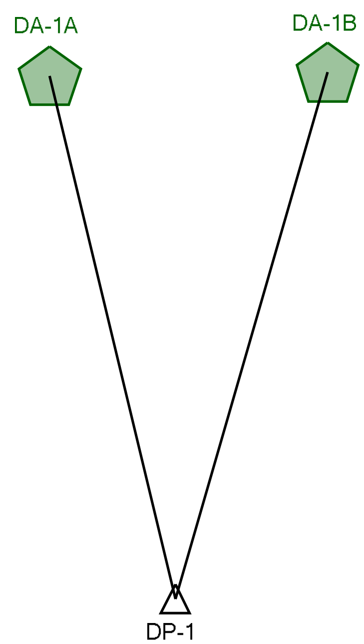
HAMMER TYPE:

SAMF LEN. REC | "N or | SA | D (| GR. | DESCRIPTION AND CLASSIFICATION

V:\PROJECTS\ANY\K4\31673\DATA\BORING_LOGS\31673_BORINGLOGS.GPJ

Appendix C
Existing Condition Pondpack Model

Scenario: Rensselaer County - , 1 yrs



Project Summary

Title	HVCC Gene Haas Center
Engineer	JMC
Company	CHA
Date	9/22/2016

Notes	Hudson Valley Community College Training Facility City of Troy, Rensselaer County, NY

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Subsection: Master Network Summary

Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft³/s)
DA-1A	Rensselaer County - , 1 yrs	1	0.164	11.920	3.01
DA-1A	Rensselaer County - , 10 yrs	10	0.344	11.920	6.06
DA-1A	Rensselaer County - , 100 yrs	100	0.599	11.920	10.21
DA-1B	Rensselaer County - , 1 yrs	1	0.022	11.930	0.41
DA-1B	Rensselaer County - , 10 yrs	10	0.062	11.920	1.18
DA-1B	Rensselaer County - , 100 yrs	100	0.126	11.920	2.34

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft³/s)
DP-1	Rensselaer County - , 1 yrs	1	0.186	11.920	3.41
DP-1	Rensselaer County - , 10 yrs	10	0.406	11.920	7.23
DP-1	Rensselaer County - , 100 yrs	100	0.725	11.920	12.55

Time-Depth Curve: TypeII 24hr 100YR	
Label	TypeII 24hr 100YR
Start Time	0.000 hours
Increment	0.100 hours
End Time	24.000 hours
Return Event	100 years

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
0.000	0.0	0.0	0.0	0.0	0.0
0.500	0.0	0.0	0.0	0.1	0.1
1.000	0.1	0.1	0.1	0.1	0.1
1.500	0.1	0.1	0.1	0.1	0.1
2.000	0.1	0.2	0.2	0.2	0.2
2.500	0.2	0.2	0.2	0.2	0.2
3.000	0.2	0.2	0.2	0.2	0.3
3.500	0.3	0.3	0.3	0.3	0.3
4.000	0.3	0.3	0.3	0.3	0.3
4.500	0.4	0.4	0.4	0.4	0.4
5.000	0.4	0.4	0.4	0.4	0.5
5.500	0.5	0.5	0.5	0.5	0.5
6.000	0.5	0.5	0.5	0.6	0.6
6.500	0.6	0.6	0.6	0.6	0.6
7.000	0.6	0.7	0.7	0.7	0.7
7.500	0.7	0.7	0.7	0.8	0.8
8.000	0.8	0.8	0.8	0.8	0.8
8.500	0.9	0.9	0.9	0.9	0.9
9.000	1.0	1.0	1.0	1.0	1.0
9.500	1.1	1.1	1.1	1.1	1.2
10.000	1.2	1.2	1.2	1.3	1.3
10.500	1.3	1.4	1.4	1.4	1.5
11.000	1.5	1.6	1.6	1.7	1.8
11.500	1.8	2.0	2.3	2.8	3.7
12.000	4.3	4.4	4.5	4.6	4.7
12.500	4.8	4.8	4.9	4.9	5.0
13.000	5.0	5.1	5.1	5.1	5.2
13.500	5.2	5.2	5.3	5.3	5.3
14.000	5.3	5.4	5.4	5.4	5.4
14.500	5.4	5.5	5.5	5.5	5.5
15.000	5.5	5.6	5.6	5.6	5.6
15.500	5.6	5.7	5.7	5.7	5.7
16.000	5.7	5.7	5.7	5.8	5.8
16.500	5.8	5.8	5.8	5.8	5.8
17.000	5.9	5.9	5.9	5.9	5.9

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
17.500	5.9	5.9	6.0	6.0	6.0
18.000	6.0	6.0	6.0	6.0	6.0
18.500	6.0	6.1	6.1	6.1	6.1
19.000	6.1	6.1	6.1	6.1	6.1
19.500	6.1	6.2	6.2	6.2	6.2
20.000	6.2	6.2	6.2	6.2	6.2
20.500	6.2	6.2	6.2	6.3	6.3
21.000	6.3	6.3	6.3	6.3	6.3
21.500	6.3	6.3	6.3	6.3	6.3
22.000	6.4	6.4	6.4	6.4	6.4
22.500	6.4	6.4	6.4	6.4	6.4
23.000	6.4	6.4	6.4	6.4	6.5
23.500	6.5	6.5	6.5	6.5	6.5
24.000	6.5	(N/A)	(N/A)	(N/A)	(N/A)

Time-Depth Curve: TypeII 24hr 10YR	
Label	TypeII 24hr 10YR
Start Time	0.000 hours
Increment	0.100 hours
End Time	24.000 hours
Return Event	10 years

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
0.000	0.0	0.0	0.0	0.0	0.0
0.500	0.0	0.0	0.0	0.0	0.0
1.000	0.0	0.0	0.1	0.1	0.1
1.500	0.1	0.1	0.1	0.1	0.1
2.000	0.1	0.1	0.1	0.1	0.1
2.500	0.1	0.1	0.1	0.1	0.1
3.000	0.1	0.1	0.1	0.2	0.2
3.500	0.2	0.2	0.2	0.2	0.2
4.000	0.2	0.2	0.2	0.2	0.2
4.500	0.2	0.2	0.2	0.2	0.2
5.000	0.3	0.3	0.3	0.3	0.3
5.500	0.3	0.3	0.3	0.3	0.3
6.000	0.3	0.3	0.3	0.3	0.3
6.500	0.4	0.4	0.4	0.4	0.4
7.000	0.4	0.4	0.4	0.4	0.4
7.500	0.4	0.4	0.5	0.5	0.5
8.000	0.5	0.5	0.5	0.5	0.5
8.500	0.5	0.5	0.6	0.6	0.6
9.000	0.6	0.6	0.6	0.6	0.6
9.500	0.7	0.7	0.7	0.7	0.7
10.000	0.7	0.7	0.8	0.8	0.8
10.500	0.8	0.8	0.9	0.9	0.9
11.000	0.9	1.0	1.0	1.0	1.1
11.500	1.1	1.2	1.4	1.7	2.3
12.000	2.7	2.7	2.8	2.9	2.9
12.500	2.9	3.0	3.0	3.0	3.1
13.000	3.1	3.1	3.1	3.2	3.2
13.500	3.2	3.2	3.2	3.2	3.3
14.000	3.3	3.3	3.3	3.3	3.3
14.500	3.4	3.4	3.4	3.4	3.4
15.000	3.4	3.4	3.4	3.4	3.5
15.500	3.5	3.5	3.5	3.5	3.5
16.000	3.5	3.5	3.5	3.5	3.6
16.500	3.6	3.6	3.6	3.6	3.6
17.000	3.6	3.6	3.6	3.6	3.6
17.500	3.6	3.7	3.7	3.7	3.7

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
18.000	3.7	3.7	3.7	3.7	3.7
18.500	3.7	3.7	3.7	3.7	3.7
19.000	3.8	3.8	3.8	3.8	3.8
19.500	3.8	3.8	3.8	3.8	3.8
20.000	3.8	3.8	3.8	3.8	3.8
20.500	3.8	3.8	3.8	3.8	3.9
21.000	3.9	3.9	3.9	3.9	3.9
21.500	3.9	3.9	3.9	3.9	3.9
22.000	3.9	3.9	3.9	3.9	3.9
22.500	3.9	3.9	3.9	3.9	4.0
23.000	4.0	4.0	4.0	4.0	4.0
23.500	4.0	4.0	4.0	4.0	4.0
24.000	4.0	(N/A)	(N/A)	(N/A)	(N/A)

Time-Depth Curve: TypeII 24hr 1YR	
Label	TypeII 24hr 1YR
Start Time	0.000 hours
Increment	0.100 hours
End Time	24.000 hours
Return Event	1 years

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
0.000	0.0	0.0	0.0	0.0	0.0
0.500	0.0	0.0	0.0	0.0	0.0
1.000	0.0	0.0	0.0	0.0	0.0
1.500	0.0	0.0	0.0	0.0	0.0
2.000	0.0	0.1	0.1	0.1	0.1
2.500	0.1	0.1	0.1	0.1	0.1
3.000	0.1	0.1	0.1	0.1	0.1
3.500	0.1	0.1	0.1	0.1	0.1
4.000	0.1	0.1	0.1	0.1	0.1
4.500	0.1	0.1	0.1	0.1	0.1
5.000	0.1	0.1	0.1	0.1	0.2
5.500	0.2	0.2	0.2	0.2	0.2
6.000	0.2	0.2	0.2	0.2	0.2
6.500	0.2	0.2	0.2	0.2	0.2
7.000	0.2	0.2	0.2	0.2	0.2
7.500	0.2	0.2	0.2	0.3	0.3
8.000	0.3	0.3	0.3	0.3	0.3
8.500	0.3	0.3	0.3	0.3	0.3
9.000	0.3	0.3	0.3	0.3	0.4
9.500	0.4	0.4	0.4	0.4	0.4
10.000	0.4	0.4	0.4	0.4	0.4
10.500	0.4	0.5	0.5	0.5	0.5
11.000	0.5	0.5	0.6	0.6	0.6
11.500	0.6	0.7	0.8	0.9	1.2
12.000	1.5	1.5	1.5	1.6	1.6
12.500	1.6	1.6	1.7	1.7	1.7
13.000	1.7	1.7	1.7	1.7	1.7
13.500	1.8	1.8	1.8	1.8	1.8
14.000	1.8	1.8	1.8	1.8	1.8
14.500	1.8	1.9	1.9	1.9	1.9
15.000	1.9	1.9	1.9	1.9	1.9
15.500	1.9	1.9	1.9	1.9	1.9
16.000	1.9	1.9	1.9	2.0	2.0
16.500	2.0	2.0	2.0	2.0	2.0
17.000	2.0	2.0	2.0	2.0	2.0
17.500	2.0	2.0	2.0	2.0	2.0

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
18.000	2.0	2.0	2.0	2.0	2.0
18.500	2.0	2.0	2.1	2.1	2.1
19.000	2.1	2.1	2.1	2.1	2.1
19.500	2.1	2.1	2.1	2.1	2.1
20.000	2.1	2.1	2.1	2.1	2.1
20.500	2.1	2.1	2.1	2.1	2.1
21.000	2.1	2.1	2.1	2.1	2.1
21.500	2.1	2.1	2.1	2.1	2.1
22.000	2.1	2.2	2.2	2.2	2.2
22.500	2.2	2.2	2.2	2.2	2.2
23.000	2.2	2.2	2.2	2.2	2.2
23.500	2.2	2.2	2.2	2.2	2.2
24.000	2.2	(N/A)	(N/A)	(N/A)	(N/A)

Time of Concentration Results

Segment #1: User Defined Tc	
Time of Concentration	0.083 hours

Time of Concentration (Composite)	
Time of Concentration (Composite)	0.083 hours

==== User Defined

Tc =	Value entered by user
Where:	Tc= Time of concentration, hours

Time of Concentration Results

Segment #1: User Defined Tc	
Time of Concentration	0.083 hours

Time of Concentration (Composite)	
Time of Concentration (Composite)	0.083 hours

==== User Defined

Tc =	Value entered by user
Where:	Tc= Time of concentration, hours

Subsection: Runoff CN-Area
Label: DA-1A

Return Event: 1 years
Storm Event: TypeII 24hr 1YR

Runoff Curve Number Data

Soil/Surface Description	CN	Area (acres)	C (%)	UC (%)	Adjusted CN
Open Space - Good Cond (HSG C)	74.000	0.210	0.0	0.0	74.000
Impervious (HSG C)	98.000	1.030	0.0	0.0	98.000
COMPOSITE AREA & WEIGHTED CN --->	(N/A)	1.240	(N/A)	(N/A)	93.935

Subsection: Runoff CN-Area | Return Event: 1 years
Label: DA-1B | Storm Event: TypeII 24hr 1YR

Runoff Curve Number Data

Soil/Surface Description	CN	Area (acres)	C (%)	UC (%)	Adjusted CN
Open Space - Good Cond (HSG C)	74.000	0.230	0.0	0.0	74.000
Impervious Area (HSG C)	98.000	0.110	0.0	0.0	98.000
COMPOSITE AREA & WEIGHTED CN --->	(N/A)	0.340	(N/A)	(N/A)	81.765

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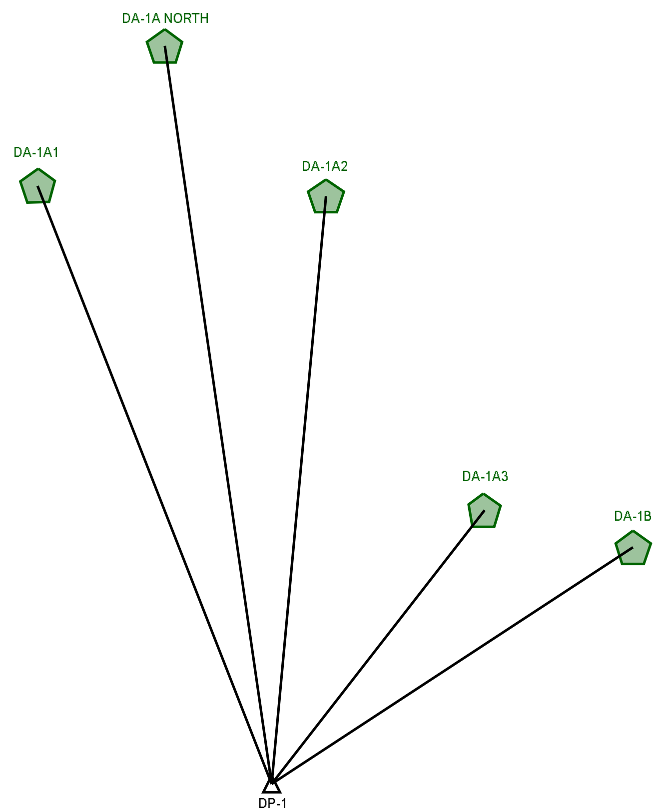
Appendix D
Proposed Condition Pondpack Model

Scenario: Rensselaer County - , 1 yrs



Project Summary

Title	HVCC Gene Haas Center
Engineer	JMC
Company	CHA
Date	2/21/2017

Notes	Hudson Valley Community College Training Facility City of Troy, Rensselaer County, NY

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Subsection: Master Network Summary

Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft³/s)
DA-1A NORTH	Rensselaer County - , 1 yrs	1	0.066	11.920	1.23
DA-1A NORTH	Rensselaer County - , 10 yrs	10	0.142	11.920	2.54
DA-1A NORTH	Rensselaer County - , 100 yrs	100	0.251	11.920	4.32
DA-1B	Rensselaer County - , 1 yrs	1	0.022	11.930	0.41
DA-1B	Rensselaer County - , 10 yrs	10	0.061	11.920	1.15
DA-1B	Rensselaer County - , 100 yrs	100	0.122	11.920	2.24
DA-1A2	Rensselaer County - , 1 yrs	1	0.021	11.920	0.36
DA-1A2	Rensselaer County - , 10 yrs	10	0.041	11.920	0.67
DA-1A2	Rensselaer County - , 100 yrs	100	0.068	11.920	1.09
DA-1A3	Rensselaer County - , 1 yrs	1	0.013	11.920	0.23
DA-1A3	Rensselaer County - , 10 yrs	10	0.026	11.920	0.45
DA-1A3	Rensselaer County - , 100 yrs	100	0.044	11.920	0.75
DA-1A1	Rensselaer County - , 1 yrs	1	0.071	11.920	1.29
DA-1A1	Rensselaer County - , 10 yrs	10	0.146	11.920	2.54
DA-1A1	Rensselaer County - , 100 yrs	100	0.251	11.920	4.23

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft³/s)
DP-1	Rensselaer County - , 1 yrs	1	0.194	11.920	3.52
DP-1	Rensselaer County - , 10 yrs	10	0.416	11.920	7.34
DP-1	Rensselaer County - , 100 yrs	100	0.735	11.920	12.64

Time-Depth Curve: TypeII 24hr 100YR	
Label	TypeII 24hr 100YR
Start Time	0.000 hours
Increment	0.100 hours
End Time	24.000 hours
Return Event	100 years

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
0.000	0.0	0.0	0.0	0.0	0.0
0.500	0.0	0.0	0.0	0.1	0.1
1.000	0.1	0.1	0.1	0.1	0.1
1.500	0.1	0.1	0.1	0.1	0.1
2.000	0.1	0.2	0.2	0.2	0.2
2.500	0.2	0.2	0.2	0.2	0.2
3.000	0.2	0.2	0.2	0.2	0.3
3.500	0.3	0.3	0.3	0.3	0.3
4.000	0.3	0.3	0.3	0.3	0.3
4.500	0.4	0.4	0.4	0.4	0.4
5.000	0.4	0.4	0.4	0.4	0.5
5.500	0.5	0.5	0.5	0.5	0.5
6.000	0.5	0.5	0.5	0.6	0.6
6.500	0.6	0.6	0.6	0.6	0.6
7.000	0.6	0.7	0.7	0.7	0.7
7.500	0.7	0.7	0.7	0.8	0.8
8.000	0.8	0.8	0.8	0.8	0.8
8.500	0.9	0.9	0.9	0.9	0.9
9.000	1.0	1.0	1.0	1.0	1.0
9.500	1.1	1.1	1.1	1.1	1.2
10.000	1.2	1.2	1.2	1.3	1.3
10.500	1.3	1.4	1.4	1.4	1.5
11.000	1.5	1.6	1.6	1.7	1.8
11.500	1.8	2.0	2.3	2.8	3.7
12.000	4.3	4.4	4.5	4.6	4.7
12.500	4.8	4.8	4.9	4.9	5.0
13.000	5.0	5.1	5.1	5.1	5.2
13.500	5.2	5.2	5.3	5.3	5.3
14.000	5.3	5.4	5.4	5.4	5.4
14.500	5.4	5.5	5.5	5.5	5.5
15.000	5.5	5.6	5.6	5.6	5.6
15.500	5.6	5.7	5.7	5.7	5.7
16.000	5.7	5.7	5.7	5.8	5.8
16.500	5.8	5.8	5.8	5.8	5.8
17.000	5.9	5.9	5.9	5.9	5.9

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
17.500	5.9	5.9	6.0	6.0	6.0
18.000	6.0	6.0	6.0	6.0	6.0
18.500	6.0	6.1	6.1	6.1	6.1
19.000	6.1	6.1	6.1	6.1	6.1
19.500	6.1	6.2	6.2	6.2	6.2
20.000	6.2	6.2	6.2	6.2	6.2
20.500	6.2	6.2	6.2	6.3	6.3
21.000	6.3	6.3	6.3	6.3	6.3
21.500	6.3	6.3	6.3	6.3	6.3
22.000	6.4	6.4	6.4	6.4	6.4
22.500	6.4	6.4	6.4	6.4	6.4
23.000	6.4	6.4	6.4	6.4	6.5
23.500	6.5	6.5	6.5	6.5	6.5
24.000	6.5	(N/A)	(N/A)	(N/A)	(N/A)

Time-Depth Curve: TypeII 24hr 10YR	
Label	TypeII 24hr 10YR
Start Time	0.000 hours
Increment	0.100 hours
End Time	24.000 hours
Return Event	10 years

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
0.000	0.0	0.0	0.0	0.0	0.0
0.500	0.0	0.0	0.0	0.0	0.0
1.000	0.0	0.0	0.1	0.1	0.1
1.500	0.1	0.1	0.1	0.1	0.1
2.000	0.1	0.1	0.1	0.1	0.1
2.500	0.1	0.1	0.1	0.1	0.1
3.000	0.1	0.1	0.1	0.2	0.2
3.500	0.2	0.2	0.2	0.2	0.2
4.000	0.2	0.2	0.2	0.2	0.2
4.500	0.2	0.2	0.2	0.2	0.2
5.000	0.3	0.3	0.3	0.3	0.3
5.500	0.3	0.3	0.3	0.3	0.3
6.000	0.3	0.3	0.3	0.3	0.3
6.500	0.4	0.4	0.4	0.4	0.4
7.000	0.4	0.4	0.4	0.4	0.4
7.500	0.4	0.4	0.5	0.5	0.5
8.000	0.5	0.5	0.5	0.5	0.5
8.500	0.5	0.5	0.6	0.6	0.6
9.000	0.6	0.6	0.6	0.6	0.6
9.500	0.7	0.7	0.7	0.7	0.7
10.000	0.7	0.7	0.8	0.8	0.8
10.500	0.8	0.8	0.9	0.9	0.9
11.000	0.9	1.0	1.0	1.0	1.1
11.500	1.1	1.2	1.4	1.7	2.3
12.000	2.7	2.7	2.8	2.9	2.9
12.500	2.9	3.0	3.0	3.0	3.1
13.000	3.1	3.1	3.1	3.2	3.2
13.500	3.2	3.2	3.2	3.2	3.3
14.000	3.3	3.3	3.3	3.3	3.3
14.500	3.4	3.4	3.4	3.4	3.4
15.000	3.4	3.4	3.4	3.4	3.5
15.500	3.5	3.5	3.5	3.5	3.5
16.000	3.5	3.5	3.5	3.5	3.6
16.500	3.6	3.6	3.6	3.6	3.6
17.000	3.6	3.6	3.6	3.6	3.6
17.500	3.6	3.7	3.7	3.7	3.7

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
18.000	3.7	3.7	3.7	3.7	3.7
18.500	3.7	3.7	3.7	3.7	3.7
19.000	3.8	3.8	3.8	3.8	3.8
19.500	3.8	3.8	3.8	3.8	3.8
20.000	3.8	3.8	3.8	3.8	3.8
20.500	3.8	3.8	3.8	3.8	3.9
21.000	3.9	3.9	3.9	3.9	3.9
21.500	3.9	3.9	3.9	3.9	3.9
22.000	3.9	3.9	3.9	3.9	3.9
22.500	3.9	3.9	3.9	3.9	4.0
23.000	4.0	4.0	4.0	4.0	4.0
23.500	4.0	4.0	4.0	4.0	4.0
24.000	4.0	(N/A)	(N/A)	(N/A)	(N/A)

Time-Depth Curve: TypeII 24hr 1YR	
Label	TypeII 24hr 1YR
Start Time	0.000 hours
Increment	0.100 hours
End Time	24.000 hours
Return Event	1 years

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
0.000	0.0	0.0	0.0	0.0	0.0
0.500	0.0	0.0	0.0	0.0	0.0
1.000	0.0	0.0	0.0	0.0	0.0
1.500	0.0	0.0	0.0	0.0	0.0
2.000	0.0	0.1	0.1	0.1	0.1
2.500	0.1	0.1	0.1	0.1	0.1
3.000	0.1	0.1	0.1	0.1	0.1
3.500	0.1	0.1	0.1	0.1	0.1
4.000	0.1	0.1	0.1	0.1	0.1
4.500	0.1	0.1	0.1	0.1	0.1
5.000	0.1	0.1	0.1	0.1	0.2
5.500	0.2	0.2	0.2	0.2	0.2
6.000	0.2	0.2	0.2	0.2	0.2
6.500	0.2	0.2	0.2	0.2	0.2
7.000	0.2	0.2	0.2	0.2	0.2
7.500	0.2	0.2	0.2	0.3	0.3
8.000	0.3	0.3	0.3	0.3	0.3
8.500	0.3	0.3	0.3	0.3	0.3
9.000	0.3	0.3	0.3	0.3	0.4
9.500	0.4	0.4	0.4	0.4	0.4
10.000	0.4	0.4	0.4	0.4	0.4
10.500	0.4	0.5	0.5	0.5	0.5
11.000	0.5	0.5	0.6	0.6	0.6
11.500	0.6	0.7	0.8	0.9	1.2
12.000	1.5	1.5	1.5	1.6	1.6
12.500	1.6	1.6	1.7	1.7	1.7
13.000	1.7	1.7	1.7	1.7	1.7
13.500	1.8	1.8	1.8	1.8	1.8
14.000	1.8	1.8	1.8	1.8	1.8
14.500	1.8	1.9	1.9	1.9	1.9
15.000	1.9	1.9	1.9	1.9	1.9
15.500	1.9	1.9	1.9	1.9	1.9
16.000	1.9	1.9	1.9	2.0	2.0
16.500	2.0	2.0	2.0	2.0	2.0
17.000	2.0	2.0	2.0	2.0	2.0
17.500	2.0	2.0	2.0	2.0	2.0

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
18.000	2.0	2.0	2.0	2.0	2.0
18.500	2.0	2.0	2.1	2.1	2.1
19.000	2.1	2.1	2.1	2.1	2.1
19.500	2.1	2.1	2.1	2.1	2.1
20.000	2.1	2.1	2.1	2.1	2.1
20.500	2.1	2.1	2.1	2.1	2.1
21.000	2.1	2.1	2.1	2.1	2.1
21.500	2.1	2.1	2.1	2.1	2.1
22.000	2.1	2.2	2.2	2.2	2.2
22.500	2.2	2.2	2.2	2.2	2.2
23.000	2.2	2.2	2.2	2.2	2.2
23.500	2.2	2.2	2.2	2.2	2.2
24.000	2.2	(N/A)	(N/A)	(N/A)	(N/A)

Time of Concentration Results

Segment #1: User Defined Tc	
Time of Concentration	0.083 hours

Time of Concentration (Composite)	
Time of Concentration (Composite)	0.083 hours

==== User Defined

Tc =	Value entered by user
Where:	Tc= Time of concentration, hours

Time of Concentration Results

Segment #1: User Defined Tc	
Time of Concentration	0.083 hours

Time of Concentration (Composite)	
Time of Concentration (Composite)	0.083 hours

==== User Defined

Tc =	Value entered by user
Where:	Tc= Time of concentration, hours

Time of Concentration Results

Segment #1: User Defined Tc	
Time of Concentration	0.086 hours

Time of Concentration (Composite)	
Time of Concentration (Composite)	0.086 hours

==== User Defined

Tc =	Value entered by user
Where:	Tc= Time of concentration, hours

Time of Concentration Results

Segment #1: User Defined Tc	
Time of Concentration	0.083 hours

Time of Concentration (Composite)	
Time of Concentration (Composite)	0.083 hours

==== User Defined

Tc =	Value entered by user
Where:	Tc= Time of concentration, hours

Time of Concentration Results

Segment #1: User Defined Tc	
Time of Concentration	0.083 hours

Time of Concentration (Composite)	
Time of Concentration (Composite)	0.083 hours

==== User Defined

Tc =	Value entered by user
Where:	Tc= Time of concentration, hours

Runoff Curve Number Data

Soil/Surface Description	CN	Area (acres)	C (%)	UC (%)	Adjusted CN
Open Space - Good Cond (HSG C)	74.000	0.100	0.0	0.0	74.000
Impervious (HSG C)	98.000	0.430	0.0	0.0	98.000
COMPOSITE AREA & WEIGHTED CN --->	(N/A)	0.530	(N/A)	(N/A)	93.472

Subsection: Runoff CN-Area | Return Event: 1 years
Label: DA-1A1 | Storm Event: TypeII 24hr 1YR

Runoff Curve Number Data

Soil/Surface Description	CN	Area (acres)	C (%)	UC (%)	Adjusted CN
Open Space - Good Cond (HSG C)	74.000	0.060	0.0	0.0	74.000
Impervious (HSG C)	98.000	0.450	0.0	0.0	98.000
COMPOSITE AREA & WEIGHTED CN --->	(N/A)	0.510	(N/A)	(N/A)	95.176

Runoff Curve Number Data

Soil/Surface Description	CN	Area (acres)	C (%)	UC (%)	Adjusted CN
Impervious (HSG-C)	98.000	0.130	0.0	0.0	98.000
COMPOSITE AREA & WEIGHTED CN --->	(N/A)	0.130	(N/A)	(N/A)	98.000

Subsection: Runoff CN-Area

Label: DA-1A3

Return Event: 1 years

Storm Event: TypeII 24hr 1YR

Runoff Curve Number Data

Soil/Surface Description	CN	Area (acres)	C (%)	UC (%)	Adjusted CN
Impervious (HSG-C)	98.000	0.080	0.0	0.0	98.000
Open Space - Good Cond (HSG C)	74.000	0.010	0.0	0.0	74.000
COMPOSITE AREA & WEIGHTED CN --->	(N/A)	0.090	(N/A)	(N/A)	95.333

Runoff Curve Number Data

Soil/Surface Description	CN	Area (acres)	C (%)	UC (%)	Adjusted CN
Open Space - Good Cond (HSG C)	74.000	0.200	0.0	0.0	74.000
Impervious Area (HSG C)	98.000	0.120	0.0	0.0	98.000
COMPOSITE AREA & WEIGHTED CN --->	(N/A)	0.320	(N/A)	(N/A)	83.000

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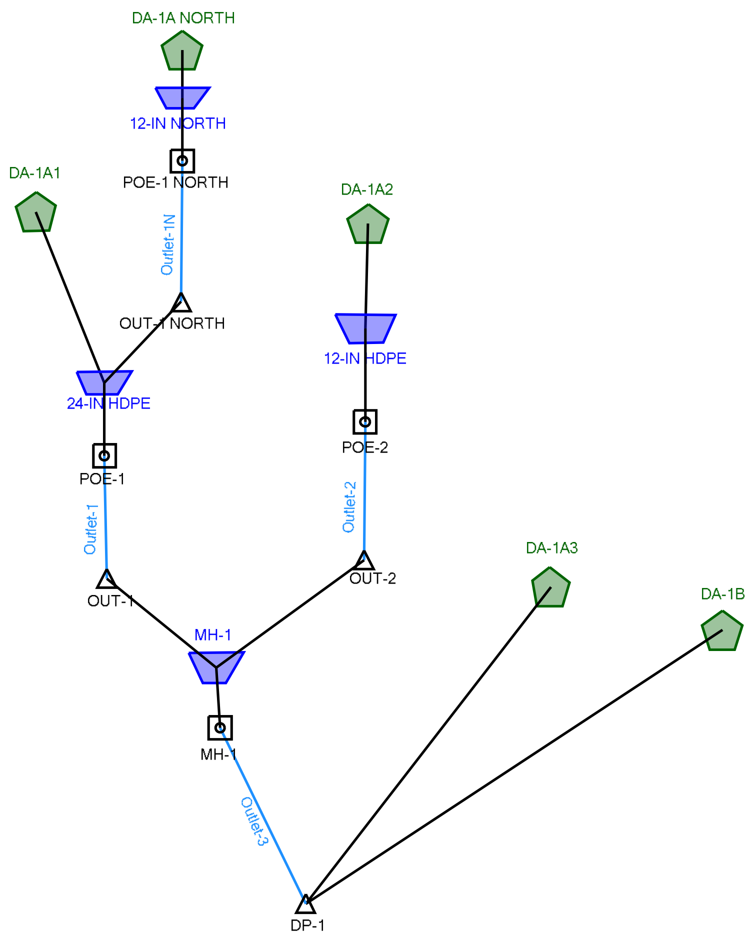
Appendix E
Proposed Mitigated Condition Pondpack Model

Scenario: Rensselaer County - , 1 yrs



Project Summary

Title	HVCC Gene Haas Center
Engineer	JMC
Company	CHA
Date	2/21/2017

Notes	Hudson Valley Community College Training Facility City of Troy, Rensselaer County, NY

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Subsection: Master Network Summary

Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft³/s)
DA-1A NORTH	Rensselaer County - , 1 yrs	1	0.066	11.920	1.23
DA-1A NORTH	Rensselaer County - , 10 yrs	10	0.142	11.920	2.54
DA-1A NORTH	Rensselaer County - , 100 yrs	100	0.251	11.920	4.32
DA-1B	Rensselaer County - , 1 yrs	1	0.022	11.930	0.41
DA-1B	Rensselaer County - , 10 yrs	10	0.061	11.920	1.15
DA-1B	Rensselaer County - , 100 yrs	100	0.122	11.920	2.24
DA-1A2	Rensselaer County - , 1 yrs	1	0.021	11.920	0.36
DA-1A2	Rensselaer County - , 10 yrs	10	0.041	11.920	0.67
DA-1A2	Rensselaer County - , 100 yrs	100	0.068	11.920	1.09
DA-1A3	Rensselaer County - , 1 yrs	1	0.013	11.920	0.23
DA-1A3	Rensselaer County - , 10 yrs	10	0.026	11.920	0.45
DA-1A3	Rensselaer County - , 100 yrs	100	0.044	11.920	0.75
DA-1A1	Rensselaer County - , 1 yrs	1	0.071	11.920	1.29
DA-1A1	Rensselaer County - , 10 yrs	10	0.146	11.920	2.54
DA-1A1	Rensselaer County - , 100 yrs	100	0.251	11.920	4.23

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft³/s)
DP-1	Rensselaer County - , 1 yrs	1	0.194	11.960	3.21
DP-1	Rensselaer County - , 10 yrs	10	0.416	11.950	6.82
DP-1	Rensselaer County - , 100 yrs	100	0.728	11.910	10.87

Pond Summary

Subsection: Master Network Summary

Pond Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft³/s)	Maximum Water Surface Elevation (ft)	Maximum Pond Storage (ac-ft)
24-IN HDPE (IN)	Rensselaer County - , 1 yrs	1	0.137	11.920	2.50	(N/A)	(N/A)
24-IN HDPE (OUT)	Rensselaer County - , 1 yrs	1	0.137	11.960	2.28	272.05	0.005
24-IN HDPE (IN)	Rensselaer County - , 10 yrs	10	0.288	11.920	5.05	(N/A)	(N/A)
24-IN HDPE (OUT)	Rensselaer County - , 10 yrs	10	0.288	11.950	4.69	272.86	0.011
24-IN HDPE (IN)	Rensselaer County - , 100 yrs	100	0.502	11.930	8.46	(N/A)	(N/A)
24-IN HDPE (OUT)	Rensselaer County - , 100 yrs	100	0.494	11.900	7.11	274.10	0.014
12-IN HDPE (IN)	Rensselaer County - , 1 yrs	1	0.021	11.920	0.36	(N/A)	(N/A)
12-IN HDPE (OUT)	Rensselaer County - , 1 yrs	1	0.021	11.930	0.36	272.83	0.000
12-IN HDPE (IN)	Rensselaer County - , 10 yrs	10	0.041	11.920	0.67	(N/A)	(N/A)
12-IN HDPE (OUT)	Rensselaer County - , 10 yrs	10	0.041	11.940	0.64	273.11	0.001
12-IN HDPE (IN)	Rensselaer County - , 100 yrs	100	0.068	11.920	1.09	(N/A)	(N/A)
12-IN HDPE (OUT)	Rensselaer County - , 100 yrs	100	0.068	11.960	0.99	273.74	0.002
MH-1 (IN)	Rensselaer County - , 1 yrs	1	0.159	11.950	2.62	(N/A)	(N/A)
MH-1 (OUT)	Rensselaer County - , 1 yrs	1	0.159	11.960	2.61	271.46	0.001
MH-1 (IN)	Rensselaer County - , 10 yrs	10	0.329	11.950	5.33	(N/A)	(N/A)

Subsection: Master Network Summary

Pond Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft³/s)	Maximum Water Surface Elevation (ft)	Maximum Pond Storage (ac-ft)
MH-1 (OUT)	Rensselaer County - , 10 yrs	10	0.329	11.960	5.32	271.94	0.001
MH-1 (IN)	Rensselaer County - , 100 yrs	100	0.562	11.900	7.98	(N/A)	(N/A)
MH-1 (OUT)	Rensselaer County - , 100 yrs	100	0.562	11.960	7.91	272.36	0.002
12-IN NORTH (IN)	Rensselaer County - , 1 yrs	1	0.066	11.920	1.23	(N/A)	(N/A)
12-IN NORTH (OUT)	Rensselaer County - , 1 yrs	1	0.066	11.930	1.22	272.84	0.000
12-IN NORTH (IN)	Rensselaer County - , 10 yrs	10	0.142	11.920	2.54	(N/A)	(N/A)
12-IN NORTH (OUT)	Rensselaer County - , 10 yrs	10	0.142	11.920	2.52	273.24	0.001
12-IN NORTH (IN)	Rensselaer County - , 100 yrs	100	0.251	11.920	4.32	(N/A)	(N/A)
12-IN NORTH (OUT)	Rensselaer County - , 100 yrs	100	0.251	11.930	4.28	275.39	0.003

Time-Depth Curve: TypeII 24hr 100YR	
Label	TypeII 24hr 100YR
Start Time	0.000 hours
Increment	0.100 hours
End Time	24.000 hours
Return Event	100 years

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
0.000	0.0	0.0	0.0	0.0	0.0
0.500	0.0	0.0	0.0	0.1	0.1
1.000	0.1	0.1	0.1	0.1	0.1
1.500	0.1	0.1	0.1	0.1	0.1
2.000	0.1	0.2	0.2	0.2	0.2
2.500	0.2	0.2	0.2	0.2	0.2
3.000	0.2	0.2	0.2	0.2	0.3
3.500	0.3	0.3	0.3	0.3	0.3
4.000	0.3	0.3	0.3	0.3	0.3
4.500	0.4	0.4	0.4	0.4	0.4
5.000	0.4	0.4	0.4	0.4	0.5
5.500	0.5	0.5	0.5	0.5	0.5
6.000	0.5	0.5	0.5	0.6	0.6
6.500	0.6	0.6	0.6	0.6	0.6
7.000	0.6	0.7	0.7	0.7	0.7
7.500	0.7	0.7	0.7	0.8	0.8
8.000	0.8	0.8	0.8	0.8	0.8
8.500	0.9	0.9	0.9	0.9	0.9
9.000	1.0	1.0	1.0	1.0	1.0
9.500	1.1	1.1	1.1	1.1	1.2
10.000	1.2	1.2	1.2	1.3	1.3
10.500	1.3	1.4	1.4	1.4	1.5
11.000	1.5	1.6	1.6	1.7	1.8
11.500	1.8	2.0	2.3	2.8	3.7
12.000	4.3	4.4	4.5	4.6	4.7
12.500	4.8	4.8	4.9	4.9	5.0
13.000	5.0	5.1	5.1	5.1	5.2
13.500	5.2	5.2	5.3	5.3	5.3
14.000	5.3	5.4	5.4	5.4	5.4
14.500	5.4	5.5	5.5	5.5	5.5
15.000	5.5	5.6	5.6	5.6	5.6
15.500	5.6	5.7	5.7	5.7	5.7
16.000	5.7	5.7	5.7	5.8	5.8
16.500	5.8	5.8	5.8	5.8	5.8
17.000	5.9	5.9	5.9	5.9	5.9

Subsection: Time-Depth Curve | Return Event: 100 years
Label: Rensselaer County | Storm Event: TypeII 24hr 100YR

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
17.500	5.9	5.9	6.0	6.0	6.0
18.000	6.0	6.0	6.0	6.0	6.0
18.500	6.0	6.1	6.1	6.1	6.1
19.000	6.1	6.1	6.1	6.1	6.1
19.500	6.1	6.2	6.2	6.2	6.2
20.000	6.2	6.2	6.2	6.2	6.2
20.500	6.2	6.2	6.2	6.3	6.3
21.000	6.3	6.3	6.3	6.3	6.3
21.500	6.3	6.3	6.3	6.3	6.3
22.000	6.4	6.4	6.4	6.4	6.4
22.500	6.4	6.4	6.4	6.4	6.4
23.000	6.4	6.4	6.4	6.4	6.5
23.500	6.5	6.5	6.5	6.5	6.5
24.000	6.5	(N/A)	(N/A)	(N/A)	(N/A)

Time-Depth Curve: TypeII 24hr 10YR	
Label	TypeII 24hr 10YR
Start Time	0.000 hours
Increment	0.100 hours
End Time	24.000 hours
Return Event	10 years

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
0.000	0.0	0.0	0.0	0.0	0.0
0.500	0.0	0.0	0.0	0.0	0.0
1.000	0.0	0.0	0.1	0.1	0.1
1.500	0.1	0.1	0.1	0.1	0.1
2.000	0.1	0.1	0.1	0.1	0.1
2.500	0.1	0.1	0.1	0.1	0.1
3.000	0.1	0.1	0.1	0.2	0.2
3.500	0.2	0.2	0.2	0.2	0.2
4.000	0.2	0.2	0.2	0.2	0.2
4.500	0.2	0.2	0.2	0.2	0.2
5.000	0.3	0.3	0.3	0.3	0.3
5.500	0.3	0.3	0.3	0.3	0.3
6.000	0.3	0.3	0.3	0.3	0.3
6.500	0.4	0.4	0.4	0.4	0.4
7.000	0.4	0.4	0.4	0.4	0.4
7.500	0.4	0.4	0.5	0.5	0.5
8.000	0.5	0.5	0.5	0.5	0.5
8.500	0.5	0.5	0.6	0.6	0.6
9.000	0.6	0.6	0.6	0.6	0.6
9.500	0.7	0.7	0.7	0.7	0.7
10.000	0.7	0.7	0.8	0.8	0.8
10.500	0.8	0.8	0.9	0.9	0.9
11.000	0.9	1.0	1.0	1.0	1.1
11.500	1.1	1.2	1.4	1.7	2.3
12.000	2.7	2.7	2.8	2.9	2.9
12.500	2.9	3.0	3.0	3.0	3.1
13.000	3.1	3.1	3.1	3.2	3.2
13.500	3.2	3.2	3.2	3.2	3.3
14.000	3.3	3.3	3.3	3.3	3.3
14.500	3.4	3.4	3.4	3.4	3.4
15.000	3.4	3.4	3.4	3.4	3.5
15.500	3.5	3.5	3.5	3.5	3.5
16.000	3.5	3.5	3.5	3.5	3.6
16.500	3.6	3.6	3.6	3.6	3.6
17.000	3.6	3.6	3.6	3.6	3.6
17.500	3.6	3.7	3.7	3.7	3.7

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
18.000	3.7	3.7	3.7	3.7	3.7
18.500	3.7	3.7	3.7	3.7	3.7
19.000	3.8	3.8	3.8	3.8	3.8
19.500	3.8	3.8	3.8	3.8	3.8
20.000	3.8	3.8	3.8	3.8	3.8
20.500	3.8	3.8	3.8	3.8	3.9
21.000	3.9	3.9	3.9	3.9	3.9
21.500	3.9	3.9	3.9	3.9	3.9
22.000	3.9	3.9	3.9	3.9	3.9
22.500	3.9	3.9	3.9	3.9	4.0
23.000	4.0	4.0	4.0	4.0	4.0
23.500	4.0	4.0	4.0	4.0	4.0
24.000	4.0	(N/A)	(N/A)	(N/A)	(N/A)

Time-Depth Curve: TypeII 24hr 1YR	
Label	TypeII 24hr 1YR
Start Time	0.000 hours
Increment	0.100 hours
End Time	24.000 hours
Return Event	1 years

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
0.000	0.0	0.0	0.0	0.0	0.0
0.500	0.0	0.0	0.0	0.0	0.0
1.000	0.0	0.0	0.0	0.0	0.0
1.500	0.0	0.0	0.0	0.0	0.0
2.000	0.0	0.1	0.1	0.1	0.1
2.500	0.1	0.1	0.1	0.1	0.1
3.000	0.1	0.1	0.1	0.1	0.1
3.500	0.1	0.1	0.1	0.1	0.1
4.000	0.1	0.1	0.1	0.1	0.1
4.500	0.1	0.1	0.1	0.1	0.1
5.000	0.1	0.1	0.1	0.1	0.2
5.500	0.2	0.2	0.2	0.2	0.2
6.000	0.2	0.2	0.2	0.2	0.2
6.500	0.2	0.2	0.2	0.2	0.2
7.000	0.2	0.2	0.2	0.2	0.2
7.500	0.2	0.2	0.2	0.3	0.3
8.000	0.3	0.3	0.3	0.3	0.3
8.500	0.3	0.3	0.3	0.3	0.3
9.000	0.3	0.3	0.3	0.3	0.4
9.500	0.4	0.4	0.4	0.4	0.4
10.000	0.4	0.4	0.4	0.4	0.4
10.500	0.4	0.5	0.5	0.5	0.5
11.000	0.5	0.5	0.6	0.6	0.6
11.500	0.6	0.7	0.8	0.9	1.2
12.000	1.5	1.5	1.5	1.6	1.6
12.500	1.6	1.6	1.7	1.7	1.7
13.000	1.7	1.7	1.7	1.7	1.7
13.500	1.8	1.8	1.8	1.8	1.8
14.000	1.8	1.8	1.8	1.8	1.8
14.500	1.8	1.9	1.9	1.9	1.9
15.000	1.9	1.9	1.9	1.9	1.9
15.500	1.9	1.9	1.9	1.9	1.9
16.000	1.9	1.9	1.9	2.0	2.0
16.500	2.0	2.0	2.0	2.0	2.0
17.000	2.0	2.0	2.0	2.0	2.0
17.500	2.0	2.0	2.0	2.0	2.0

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
18.000	2.0	2.0	2.0	2.0	2.0
18.500	2.0	2.0	2.1	2.1	2.1
19.000	2.1	2.1	2.1	2.1	2.1
19.500	2.1	2.1	2.1	2.1	2.1
20.000	2.1	2.1	2.1	2.1	2.1
20.500	2.1	2.1	2.1	2.1	2.1
21.000	2.1	2.1	2.1	2.1	2.1
21.500	2.1	2.1	2.1	2.1	2.1
22.000	2.1	2.2	2.2	2.2	2.2
22.500	2.2	2.2	2.2	2.2	2.2
23.000	2.2	2.2	2.2	2.2	2.2
23.500	2.2	2.2	2.2	2.2	2.2
24.000	2.2	(N/A)	(N/A)	(N/A)	(N/A)

Time of Concentration Results

Segment #1: User Defined Tc	
Time of Concentration	0.083 hours

Time of Concentration (Composite)	
Time of Concentration (Composite)	0.083 hours

==== User Defined

Tc =	Value entered by user
Where:	Tc= Time of concentration, hours

Time of Concentration Results

Segment #1: User Defined Tc	
Time of Concentration	0.083 hours

Time of Concentration (Composite)	
Time of Concentration (Composite)	0.083 hours

==== User Defined

Tc =	Value entered by user
Where:	Tc= Time of concentration, hours

Time of Concentration Results

Segment #1: User Defined Tc	
Time of Concentration	0.086 hours

Time of Concentration (Composite)	
Time of Concentration (Composite)	0.086 hours

==== User Defined

Tc =	Value entered by user
Where:	Tc= Time of concentration, hours

Time of Concentration Results

Segment #1: User Defined Tc	
Time of Concentration	0.083 hours

Time of Concentration (Composite)	
Time of Concentration (Composite)	0.083 hours

==== User Defined

Tc =	Value entered by user
Where:	Tc= Time of concentration, hours

Time of Concentration Results

Segment #1: User Defined Tc	
Time of Concentration	0.083 hours

Time of Concentration (Composite)	
Time of Concentration (Composite)	0.083 hours

==== User Defined

Tc =	Value entered by user
Where:	Tc= Time of concentration, hours

Subsection: Runoff CN-Area
Label: DA-1A NORTH

Return Event: 1 years
Storm Event: TypeII 24hr 1YR

Runoff Curve Number Data

Soil/Surface Description	CN	Area (acres)	C (%)	UC (%)	Adjusted CN
Open Space - Good Cond (HSG C)	74.000	0.100	0.0	0.0	74.000
Impervious (HSG C)	98.000	0.430	0.0	0.0	98.000
COMPOSITE AREA & WEIGHTED CN --->	(N/A)	0.530	(N/A)	(N/A)	93.472

Subsection: Runoff CN-Area | Return Event: 1 years
Label: DA-1A1 | Storm Event: TypeII 24hr 1YR

Runoff Curve Number Data

Soil/Surface Description	CN	Area (acres)	C (%)	UC (%)	Adjusted CN
Open Space - Good Cond (HSG C)	74.000	0.060	0.0	0.0	74.000
Impervious (HSG C)	98.000	0.450	0.0	0.0	98.000
COMPOSITE AREA & WEIGHTED CN --->	(N/A)	0.510	(N/A)	(N/A)	95.176

Runoff Curve Number Data

Soil/Surface Description	CN	Area (acres)	C (%)	UC (%)	Adjusted CN
Impervious (HSG-C)	98.000	0.130	0.0	0.0	98.000
COMPOSITE AREA & WEIGHTED CN --->	(N/A)	0.130	(N/A)	(N/A)	98.000

Runoff Curve Number Data

Soil/Surface Description	CN	Area (acres)	C (%)	UC (%)	Adjusted CN
Impervious (HSG-C)	98.000	0.080	0.0	0.0	98.000
Open Space - Good Cond (HSG C)	74.000	0.010	0.0	0.0	74.000
COMPOSITE AREA & WEIGHTED CN --->	(N/A)	0.090	(N/A)	(N/A)	95.333

Subsection: Runoff CN-Area | Return Event: 1 years
Label: DA-1B | Storm Event: TypeII 24hr 1YR

Runoff Curve Number Data

Soil/Surface Description	CN	Area (acres)	C (%)	UC (%)	Adjusted CN
Open Space - Good Cond (HSG C)	74.000	0.200	0.0	0.0	74.000
Impervious Area (HSG C)	98.000	0.120	0.0	0.0	98.000
COMPOSITE AREA & WEIGHTED CN --->	(N/A)	0.320	(N/A)	(N/A)	83.000

Volume Results (Pipe)	
Pipe Storage Upstream Invert	273.60 ft
Pipe Storage Downstream Invert	272.40 ft
Pipe Storage Length	146.00 ft
Pipe Storage Diameter	12.0 in
Pipe Storage Number of Barrels	1
Pipe Storage Slice Width	1.00 ft
Pipe Storage Vertical Increment	0.10 ft

Elevation (ft)	Perpendicular Downstream Depth (ft)	Perpendicular Downstream Area (ft²)	Wetted Length (ft)	Filled Length (ft)	Perpendicular Upstream Depth (ft)	Perpendicular Upstream Area (ft²)	Total Volume (ac-ft)
272.40	0.00	0.0	0.00	0.00	0.00	0.0	0.000
272.50	0.09	0.0	12.17	0.00	0.00	0.0	0.000
272.60	0.19	0.1	24.33	0.00	0.00	0.0	0.000
272.70	0.29	0.2	36.50	0.00	0.00	0.0	0.000
272.80	0.39	0.3	48.67	0.00	0.00	0.0	0.000
272.90	0.49	0.4	60.83	0.00	0.00	0.0	0.000
273.00	0.59	0.5	73.00	0.00	0.00	0.0	0.000
273.10	0.69	0.6	85.17	0.00	0.00	0.0	0.001
273.20	0.79	0.7	97.33	0.00	0.00	0.0	0.001
273.30	0.89	0.7	109.50	0.00	0.00	0.0	0.001
273.40	1.00	0.8	121.67	0.00	0.00	0.0	0.001
273.50	1.00	0.8	133.83	12.17	0.00	0.0	0.001
273.60	1.00	0.8	146.00	24.34	0.00	0.0	0.002
273.70	1.00	0.8	146.00	36.50	0.10	0.0	0.002
273.80	1.00	0.8	146.00	48.67	0.20	0.1	0.002
273.90	1.00	0.8	146.00	60.84	0.30	0.2	0.002
274.00	1.00	0.8	146.00	73.00	0.40	0.3	0.002
274.10	1.00	0.8	146.00	85.17	0.50	0.4	0.002
274.20	1.00	0.8	146.00	97.34	0.60	0.5	0.003
274.30	1.00	0.8	146.00	109.50	0.70	0.6	0.003
274.40	1.00	0.8	146.00	121.67	0.80	0.7	0.003
274.50	1.00	0.8	146.00	133.84	0.90	0.7	0.003
274.60	1.00	0.8	146.00	146.00	1.00	0.8	0.003

Volume Results (Pipe)	
Pipe Storage Upstream Invert	274.60 ft
Pipe Storage Downstream Invert	272.20 ft
Pipe Storage Length	193.00 ft
Pipe Storage Diameter	12.0 in
Pipe Storage Number of Barrels	1
Pipe Storage Slice Width	1.00 ft
Pipe Storage Vertical Increment	0.10 ft

Elevation (ft)	Perpendicular Downstream Depth (ft)	Perpendicular Downstream Area (ft²)	Wetted Length (ft)	Filled Length (ft)	Perpendicular Upstream Depth (ft)	Perpendicular Upstream Area (ft²)	Total Volume (ac-ft)
272.20	0.00	0.0	0.00	0.00	0.00	0.0	0.000
272.30	0.09	0.0	8.04	0.00	0.00	0.0	0.000
272.40	0.19	0.1	16.08	0.00	0.00	0.0	0.000
272.50	0.29	0.2	24.13	0.00	0.00	0.0	0.000
272.60	0.39	0.3	32.17	0.00	0.00	0.0	0.000
272.70	0.49	0.4	40.21	0.00	0.00	0.0	0.000
272.80	0.59	0.5	48.25	0.00	0.00	0.0	0.000
272.90	0.69	0.6	56.29	0.00	0.00	0.0	0.000
273.00	0.79	0.7	64.33	0.00	0.00	0.0	0.000
273.10	0.89	0.7	72.37	0.00	0.00	0.0	0.001
273.20	1.00	0.8	80.42	0.01	0.00	0.0	0.001
273.30	1.00	0.8	88.46	8.05	0.00	0.0	0.001
273.40	1.00	0.8	96.50	16.09	0.00	0.0	0.001
273.50	1.00	0.8	104.54	24.13	0.00	0.0	0.001
273.60	1.00	0.8	112.58	32.17	0.00	0.0	0.001
273.70	1.00	0.8	120.62	40.21	0.00	0.0	0.001
273.80	1.00	0.8	128.67	48.26	0.00	0.0	0.002
273.90	1.00	0.8	136.71	56.30	0.00	0.0	0.002
274.00	1.00	0.8	144.75	64.34	0.00	0.0	0.002
274.10	1.00	0.8	152.79	72.38	0.00	0.0	0.002
274.20	1.00	0.8	160.83	80.42	0.00	0.0	0.002
274.30	1.00	0.8	168.87	88.46	0.00	0.0	0.002
274.40	1.00	0.8	176.92	96.51	0.00	0.0	0.002
274.50	1.00	0.8	184.96	104.55	0.00	0.0	0.003
274.60	1.00	0.8	193.00	112.59	0.00	0.0	0.003
274.70	1.00	0.8	193.00	120.63	0.10	0.0	0.003
274.80	1.00	0.8	193.00	128.67	0.20	0.1	0.003
274.90	1.00	0.8	193.00	136.71	0.30	0.2	0.003
275.00	1.00	0.8	193.00	144.76	0.40	0.3	0.003
275.10	1.00	0.8	193.00	152.80	0.50	0.4	0.003
275.20	1.00	0.8	193.00	160.84	0.60	0.5	0.003
275.30	1.00	0.8	193.00	168.88	0.70	0.6	0.003

Subsection: Pipe Volume | Return Event: 1 years
Label: 12-IN NORTH | Storm Event: TypeII 24hr 1YR

Elevation (ft)	Perpendicular Downstream Depth (ft)	Perpendicular Downstream Area (ft²)	Wetted Length (ft)	Filled Length (ft)	Perpendicular Upstream Depth (ft)	Perpendicular Upstream Area (ft²)	Total Volume (ac-ft)
275.40	1.00	0.8	193.00	176.92	0.80	0.7	0.003
275.50	1.00	0.8	193.00	184.96	0.90	0.7	0.003
275.60	1.00	0.8	193.00	193.01	1.00	0.8	0.003

Subsection: Pipe Volume | Return Event: 1 years
Label: 24-IN HDPE | Storm Event: TypeII 24hr 1YR

Volume Results (Pipe)	
Pipe Storage Upstream Invert	272.10 ft
Pipe Storage Downstream Invert	270.60 ft
Pipe Storage Length	194.00 ft
Pipe Storage Diameter	24.0 in
Pipe Storage Number of Barrels	1
Pipe Storage Slice Width	1.00 ft
Pipe Storage Vertical Increment	0.10 ft

Elevation (ft)	Perpendicular Downstream Depth (ft)	Perpendicular Downstream Area (ft²)	Wetted Length (ft)	Filled Length (ft)	Perpendicular Upstream Depth (ft)	Perpendicular Upstream Area (ft²)	Total Volume (ac-ft)
270.60	0.00	0.0	0.00	0.00	0.00	0.0	0.000
270.70	0.09	0.1	12.93	0.00	0.00	0.0	0.000
270.80	0.19	0.2	25.87	0.00	0.00	0.0	0.000
270.90	0.29	0.3	38.80	0.00	0.00	0.0	0.000
271.00	0.39	0.4	51.73	0.00	0.00	0.0	0.000
271.10	0.49	0.6	64.67	0.00	0.00	0.0	0.000
271.20	0.59	0.8	77.60	0.00	0.00	0.0	0.001
271.30	0.69	1.0	90.53	0.00	0.00	0.0	0.001
271.40	0.79	1.2	103.47	0.00	0.00	0.0	0.001
271.50	0.89	1.4	116.40	0.00	0.00	0.0	0.002
271.60	0.99	1.6	129.33	0.00	0.00	0.0	0.002
271.70	1.09	1.8	142.27	0.00	0.00	0.0	0.002
271.80	1.19	2.0	155.20	0.00	0.00	0.0	0.003
271.90	1.29	2.1	168.13	0.00	0.00	0.0	0.004
272.00	1.39	2.3	181.07	0.00	0.00	0.0	0.004
272.10	1.49	2.5	194.00	0.00	0.00	0.0	0.005
272.20	1.59	2.7	194.00	0.00	0.10	0.1	0.006
272.30	1.69	2.8	194.00	0.00	0.20	0.2	0.007
272.40	1.79	3.0	194.00	0.00	0.30	0.3	0.007
272.50	1.89	3.1	194.00	0.00	0.40	0.4	0.008
272.60	2.00	3.1	194.00	0.01	0.50	0.6	0.009
272.70	2.00	3.1	194.00	12.94	0.60	0.8	0.010
272.80	2.00	3.1	194.00	25.87	0.70	1.0	0.010
272.90	2.00	3.1	194.00	38.81	0.80	1.2	0.011
273.00	2.00	3.1	194.00	51.74	0.90	1.4	0.012
273.10	2.00	3.1	194.00	64.67	1.00	1.6	0.012
273.20	2.00	3.1	194.00	77.61	1.10	1.8	0.012
273.30	2.00	3.1	194.00	90.54	1.20	2.0	0.013
273.40	2.00	3.1	194.00	103.47	1.30	2.2	0.013
273.50	2.00	3.1	194.00	116.41	1.40	2.3	0.013
273.60	2.00	3.1	194.00	129.34	1.50	2.5	0.014
273.70	2.00	3.1	194.00	142.27	1.60	2.7	0.014

Subsection: Pipe Volume | Return Event: 1 years
Label: 24-IN HDPE | Storm Event: TypeII 24hr 1YR

Elevation (ft)	Perpendicular Downstream Depth (ft)	Perpendicular Downstream Area (ft²)	Wetted Length (ft)	Filled Length (ft)	Perpendicular Upstream Depth (ft)	Perpendicular Upstream Area (ft²)	Total Volume (ac-ft)
273.80	2.00	3.1	194.00	155.21	1.70	2.8	0.014
273.90	2.00	3.1	194.00	168.14	1.80	3.0	0.014
274.00	2.00	3.1	194.00	181.07	1.90	3.1	0.014
274.10	2.00	3.1	194.00	194.01	2.00	3.1	0.014

Subsection: Elevation-Area Volume Curve

Return Event: 1 years

Label: MH-1

Storm Event: TypeII 24hr 1YR

Elevation (ft)	Planimeter (ft²)	Area (acres)	A1+A2+sqr (A1*A2) (acres)	Volume (ac-ft)	Volume (Total) (ac-ft)
270.50	0.0	0.001	0.000	0.000	0.000
271.50	0.0	0.001	0.003	0.001	0.001
272.50	0.0	0.001	0.003	0.001	0.002
273.50	0.0	0.001	0.003	0.001	0.003
274.50	0.0	0.001	0.003	0.001	0.004
275.90	0.0	0.001	0.003	0.001	0.005

Requested Pond Water Surface Elevations	
Minimum (Headwater)	272.20 ft
Increment (Headwater)	0.50 ft
Maximum (Headwater)	275.60 ft

Outlet Connectivity

Structure Type	Outlet ID	Direction	Outfall	E1 (ft)	E2 (ft)
Orifice-Circular	Orifice - 1 NORTH	Forward	TW	272.20	275.60
Tailwater Settings	Tailwater			(N/A)	(N/A)

Structure ID: Orifice - 1 NORTH
Structure Type: Orifice-Circular

Number of Openings	1
Elevation	272.20 ft
Orifice Diameter	12.0 in
Orifice Coefficient	0.600

Requested Pond Water Surface Elevations	
Minimum (Headwater)	270.60 ft
Increment (Headwater)	0.10 ft
Maximum (Headwater)	274.10 ft

Outlet Connectivity

Structure Type	Outlet ID	Direction	Outfall	E1 (ft)	E2 (ft)
Orifice-Circular	Orifice - 1A1LOW	Forward	TW	270.60	274.10
Orifice-Circular	Orifice - 1A1HIGH	Forward	TW	271.76	274.10
Tailwater Settings	Tailwater			(N/A)	(N/A)

Structure ID: Orifice - 1A1LOW Structure Type: Orifice-Circular	
Number of Openings	1
Elevation	270.60 ft
Orifice Diameter	10.0 in
Orifice Coefficient	0.600

Structure ID: Orifice - 1A1HIGH Structure Type: Orifice-Circular	
Number of Openings	1
Elevation	271.76 ft
Orifice Diameter	10.0 in
Orifice Coefficient	0.600

Requested Pond Water Surface Elevations	
Minimum (Headwater)	272.40 ft
Increment (Headwater)	0.10 ft
Maximum (Headwater)	274.60 ft

Outlet Connectivity

Structure Type	Outlet ID	Direction	Outfall	E1 (ft)	E2 (ft)
Orifice-Circular	Orifice - 1A2	Forward	TW	272.40	274.60
Tailwater Settings	Tailwater			(N/A)	(N/A)

Structure ID: Orifice - 1A2
Structure Type: Orifice-Circular

Number of Openings	1
Elevation	272.40 ft
Orifice Diameter	6.0 in
Orifice Coefficient	0.600

Requested Pond Water Surface Elevations	
Minimum (Headwater)	270.50 ft
Increment (Headwater)	0.10 ft
Maximum (Headwater)	275.90 ft

Outlet Connectivity

Structure Type	Outlet ID	Direction	Outfall	E1 (ft)	E2 (ft)
Culvert-Circular	Culvert - MH1	Forward	TW	270.50	275.90
Tailwater Settings	Tailwater			(N/A)	(N/A)

Structure ID: Culvert - MH1
Structure Type: Culvert-Circular

Number of Barrels	1
Diameter	18.0 in
Length	13.00 ft
Length (Computed Barrel)	13.00 ft
Slope (Computed)	0.008 ft/ft

Outlet Control Data

Manning's n	0.013
Ke	0.500
Kb	0.018
Kr	0.500
Convergence Tolerance	0.00 ft

Inlet Control Data

Equation Form	Form 1
K	0.0098
M	2.0000
C	0.0398
Y	0.6700
T1 ratio (HW/D)	1.156
T2 ratio (HW/D)	1.303
Slope Correction Factor	-0.500

Use unsubmerged inlet control 0 equation below T1 elevation.
Use submerged inlet control 0 equation above T2 elevation

In transition zone between unsubmerged and submerged inlet control,
interpolate between flows at T1 & T2...

T1 Elevation	272.23 ft	T1 Flow	7.58 ft³/s
T2 Elevation	272.45 ft	T2 Flow	8.66 ft³/s

Structure ID: TW
Structure Type: TW Setup, DS Channel

Tailwater Type	Free Outfall

Convergence Tolerances

Maximum Iterations	30
Tailwater Tolerance (Minimum)	0.01 ft
Tailwater Tolerance (Maximum)	0.50 ft
Headwater Tolerance (Minimum)	0.01 ft
Headwater Tolerance (Maximum)	0.50 ft
Flow Tolerance (Minimum)	0.001 ft³/s
Flow Tolerance (Maximum)	10.000 ft³/s

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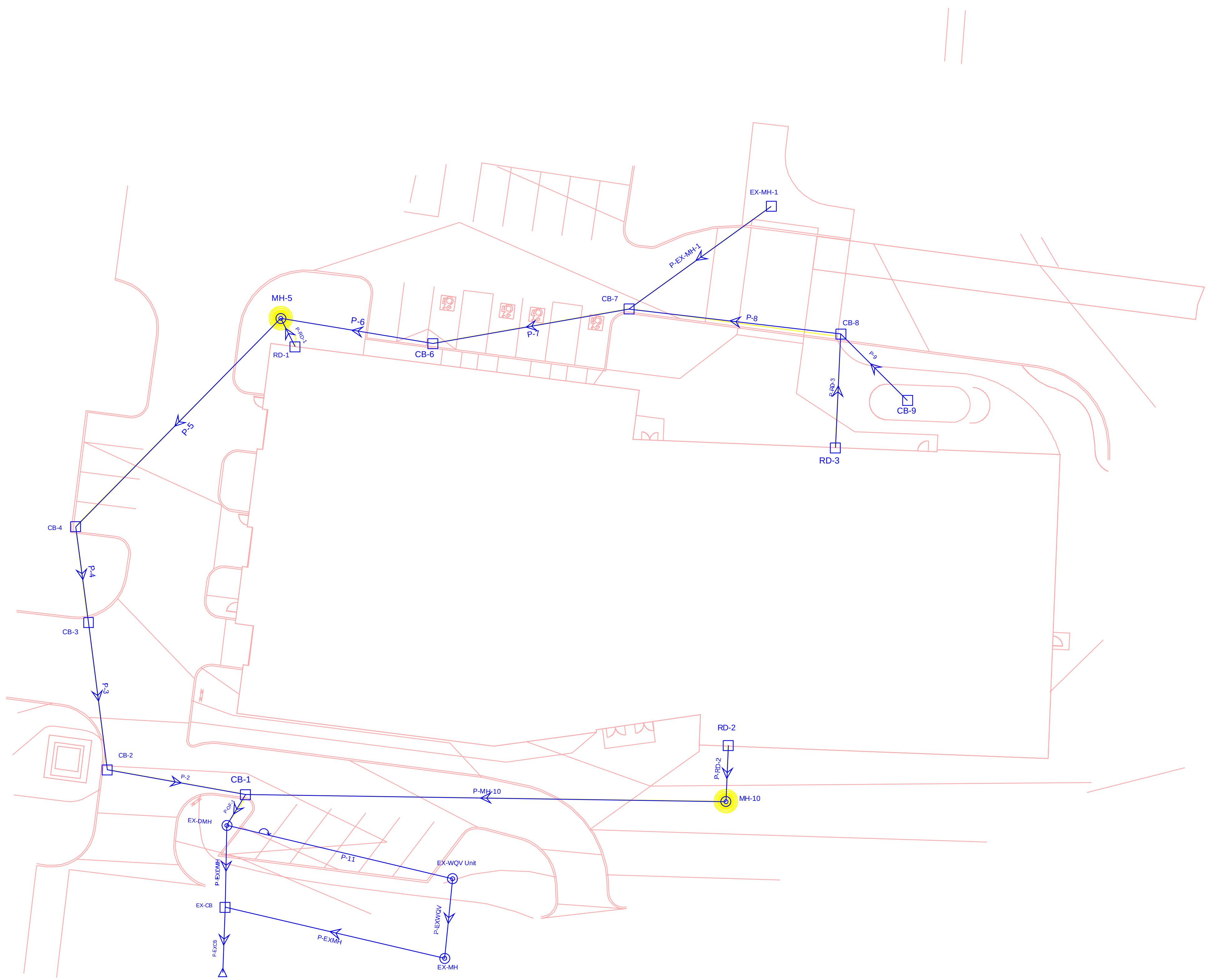
Appendix F
StormCAD Model Output

Scenario: Base



Conduit FlexTable: Combined Pipe/Node Report (31807_HVCC_Haas_Center_10YR.stc)

Label	Start Node	Stop Node	Invert (Upstream) (ft)	Invert (Downstream) (ft)	Length (User Defined) (ft)	Diameter (in)	Slope (ft/ft)	Material	Manning's n	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Capacity (Full Flow) (ft³/s)	Flow / Capacity (Full) (%)	Velocity (Out Link) (ft/s)	Flow (Link) (ft³/s)
P-2	CB-2	CB-1	270.80	270.60	40.0	24.0	0.005	Corrugated HDPE (Smooth Interior)	0.012	271.80	271.81	17.33	26.1	2.27	4.52
P-3	CB-3	CB-2	271.20	270.90	43.0	24.0	0.007	Corrugated HDPE (Smooth Interior)	0.012	271.93	271.88	20.47	20.9	2.80	4.28
P-4	CB-4	CB-3	271.50	271.30	26.0	24.0	0.008	Corrugated HDPE (Smooth Interior)	0.012	272.22	271.91	21.49	19.5	5.14	4.19
P-5	MH-5	CB-4	272.10	271.60	87.0	24.0	0.006	Corrugated HDPE (Smooth Interior)	0.012	272.78	272.38	18.58	20.3	3.34	3.77
P-6	CB-6	MH-5	272.90	272.20	45.0	12.0	0.016	Corrugated HDPE (Smooth Interior)	0.012	273.58	272.93	4.81	52.5	4.12	2.53
P-7	CB-7	CB-6	273.60	273.00	60.0	12.0	0.010	Corrugated HDPE (Smooth Interior)	0.012	274.20	273.77	3.86	51.1	3.06	1.97
P-8	CB-8	CB-7	274.30	273.70	61.0	12.0	0.010	Corrugated HDPE (Smooth Interior)	0.012	274.72	274.45	3.83	26.3	1.59	1.00
P-9	CB-9	CB-8	274.60	274.40	27.0	12.0	0.007	Corrugated HDPE (Smooth Interior)	0.012	274.81	274.82	3.32	3.1	0.33	0.10
P-11	EX-DMH	EX-WQV Unit	270.90	270.80	70.0	12.0	0.001	Corrugated HDPE (Smooth Interior)	0.012	(N/A)	(N/A)	1.46	272.4	(N/A)	3.97
P-EXCB	EX-CB	OF-1	269.50	269.40	32.0	12.0	0.003	Corrugated HDPE (Smooth Interior)	0.012	271.04	270.34	2.16	257.3	7.24	5.55
P-EXDMH	EX-DMH	EX-CB	270.00	269.70	22.4	12.0	0.013	Corrugated HDPE (Smooth Interior)	0.012	271.53	271.50	4.47	30.9	1.76	1.38
P-EXMH	EX-MH	EX-CB	270.10	269.60	84.0	12.0	0.006	Corrugated HDPE (Smooth Interior)	0.012	272.39	271.50	2.98	133.2	5.05	3.97
P-EX-MH-1	EX-MH-1	CB-7	276.30	275.40	51.0	12.0	0.018	Corrugated HDPE (Smooth Interior)	0.012	276.57	275.59	5.13	8.1	3.93	0.42
P-EXWQV	EX-WQV Unit	EX-MH	270.40	270.20	11.5	12.0	0.017	Corrugated HDPE (Smooth Interior)	0.012	272.83	272.71	5.09	78.1	5.06	3.97
P-MH-10	MH-10	CB-1	273.60	272.40	142.0	12.0	0.008	Corrugated HDPE (Smooth Interior)	0.012	273.92	272.67	3.55	16.5	3.34	0.59
P-OF-1	CB-1	EX-DMH	270.50	270.40	13.0	18.0	0.008	Corrugated HDPE (Smooth Interior)	0.012	271.56	271.57	9.98	53.7	3.62	5.36
P-RD-1	RD-1	MH-5	275.00	274.80	10.0	10.0	0.020	Corrugated HDPE (Smooth Interior)	0.012	275.51	275.19	3.36	38.9	5.17	1.31
P-RD-2	RD-2	MH-10	275.00	274.70	15.0	8.0	0.020	Corrugated HDPE (Smooth Interior)	0.012	275.36	274.96	1.85	31.7	4.55	0.59
P-RD-3	RD-3	CB-8	275.00	274.80	33.0	8.0	0.006	Corrugated HDPE (Smooth Interior)	0.012	275.36	275.16	1.02	57.7	3.05	0.59

FlexTable: Catch Basin Table (31807_HVCC_Haas_Center_10YR.stc)

Label	Elevation (Ground) (ft)	Elevation (Rim) (ft)	Elevation (Invert) (ft)	Headloss Method	Headloss Coefficient (Standard)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Velocity (In-Governing Node) (ft/s)	Velocity (Out Node) (ft/s)	Flow (Known) (ft^3/s)	Flow (Total Bypassed) (ft^3/s)	Flow (Total Out) (ft^3/s)
CB-1	275.90	275.90	270.50	Standard	1.000	271.81	271.56	2.27	4.02	0.00	0.00	5.36
CB-2	276.00	276.00	269.80	Standard	0.600	271.88	271.80	2.80	2.87	0.00	0.00	4.52
CB-3	277.60	277.60	270.20	Standard	0.000	271.93	271.93	5.14	4.15	0.00	0.00	4.28
CB-4	278.50	278.50	270.50	Standard	0.600	272.38	272.22	3.34	4.13	0.00	0.00	4.19
CB-6	277.90	277.90	271.90	Standard	0.600	273.77	273.58	3.06	4.44	0.00	0.00	2.53
CB-7	278.90	278.90	272.60	Standard	1.000	274.45	274.20	1.59	4.01	0.00	0.00	1.97
CB-8	279.50	279.50	273.40	Standard	0.600	274.82	274.72	0.33	3.20	0.00	0.00	1.00
CB-9	278.60	278.60	273.60	Standard	0.500	274.82	274.81	0.84	0.84	0.00	0.00	0.10
EX-CB	273.70	273.70	268.50	Standard	0.600	271.50	271.04	5.05	7.07	0.00	0.00	5.55
EX-MH-1	280.00	280.00	275.30	Standard	0.500	276.61	276.57	2.48	2.48	0.00	0.00	0.42
RD-1	279.50	279.50	275.00	Standard	0.500	275.62	275.51	3.73	3.73	0.00	0.00	1.31
RD-2	279.50	279.50	275.00	Standard	0.500	275.43	275.36	3.05	3.05	0.00	0.00	0.59
RD-3	279.50	279.50	275.00	Standard	0.500	275.43	275.36	3.02	3.02	0.00	0.00	0.59

FlexTable: Catchment Table (31807_HVCC_Haas_Center_10YR.stc)

Label	Outflow Node	Area (ft²)	Area (Unified) (ft²)	Rational C	Catchment CA (ft²)	Time of Concentration (min)	Catchment Intensity (in/h)	Catchment Rational Flow (ft³/s)
DA-2	CB-1	3,724.0	3,724.0	0.727	2,706.8	5.000	5.570	0.35
DA-3	CB-2	3,038.0	3,038.0	0.736	2,236.6	5.000	5.570	0.29
DA-4	CB-3	1,124.3	1,124.3	0.800	899.4	5.000	5.570	0.12
DA-5	CB-4	5,560.0	5,560.0	0.702	3,900.6	5.000	5.570	0.50
DA-6	CB-6	5,789.0	5,789.0	0.800	4,631.2	5.000	5.570	0.60
DA-7	CB-7	6,070.0	6,070.0	0.745	4,520.0	5.000	5.570	0.58
DA-8	CB-8	3,156.0	3,156.0	0.800	2,524.8	5.000	5.570	0.33
DA-9	CB-9	4,000.0	4,000.0	0.200	800.0	5.000	5.570	0.10
DA-EX-AD	EX-MH-1	8,233.3	8,233.3	0.393	3,237.4	5.000	5.570	0.42
DA-EXCB	EX-CB	5,441.0	5,441.0	0.439	2,390.8	5.000	5.570	0.31
DA-RD-1	RD-1	12,668.0	12,668.0	0.800	10,134.4	5.000	5.570	1.31
DA-RD-2	RD-2	5,698.0	5,698.0	0.800	4,558.4	5.000	5.570	0.59
DA-RD-3	RD-3	5,698.0	5,698.0	0.800	4,558.4	5.000	5.570	0.59

FlexTable: Manhole Table (31807_HVCC_Haas_Center_10YR.stc)

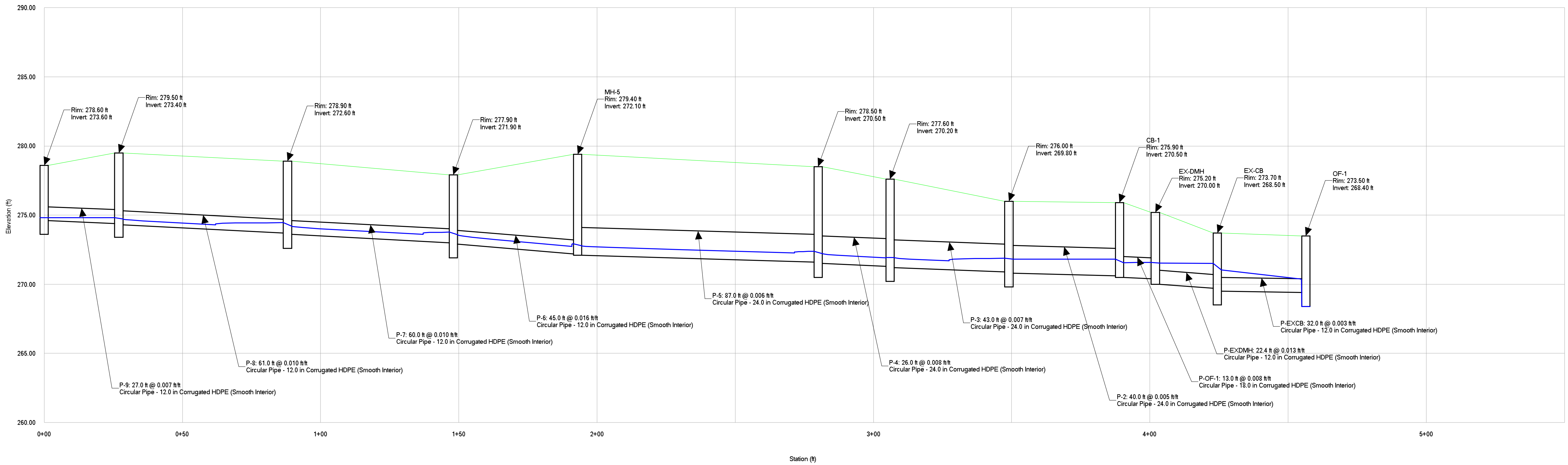
Label	Elevation (Ground) (ft)	Set Rim to Ground Elevation?	Elevation (Rim) (ft)	Elevation (Invert) (ft)	Diameter (in)	Headloss Method	Headloss Coefficient (Standard)	Flow (Total Out) (ft^3/s)	Velocity (In -Governing Node) (ft/s)	Velocity (Out Node) (ft/s)
MH-5	279.40	True	279.40	272.10	36.0	Standard	0.600	3.77	4.12	4.00
MH-10	278.75	True	278.75	273.60	36.0	Standard	0.800	0.59	4.55	2.73
EX-DMH	275.20	True	275.20	270.00	36.0	Standard	0.800	1.38	3.62	1.76
EX-WQV Unit	276.30	True	276.30	270.40	36.0	Standard	0.800	3.97	5.06	5.06
EX-MH	274.80	True	274.80	270.00	36.0	Standard	0.800	3.97	5.06	5.05

FlexTable: Outfall Table (31807_HVCC_Haas_Center_10YR.stc)

Label	Elevation (Ground) (ft)	Elevation (Invert) (ft)	Boundary Condition Type	Elevation (Tailwater) (ft)	Flow (Outfall) (ft^3/s)	System Rational Flow (ft^3/s)
OF-1	273.50	268.40	Free Outfall	0.00	5.53	5.53

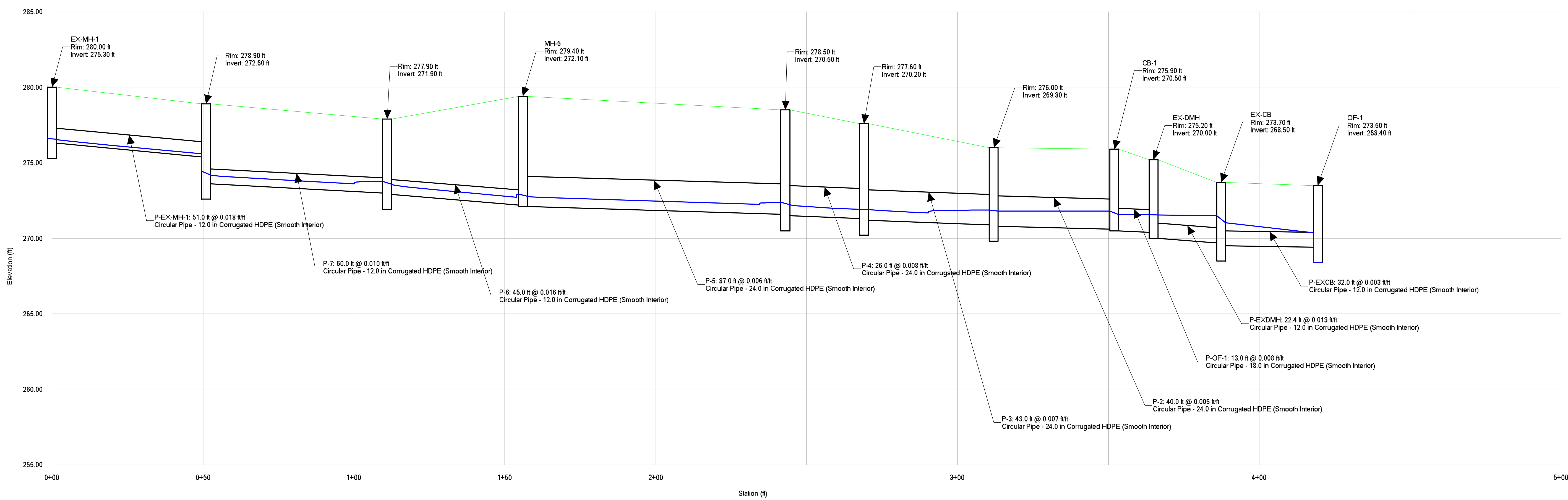
Profile Report

Engineering Profile - CB-9 to OF-1 (31807_HVCC_Haas_Center_10YR.stc)



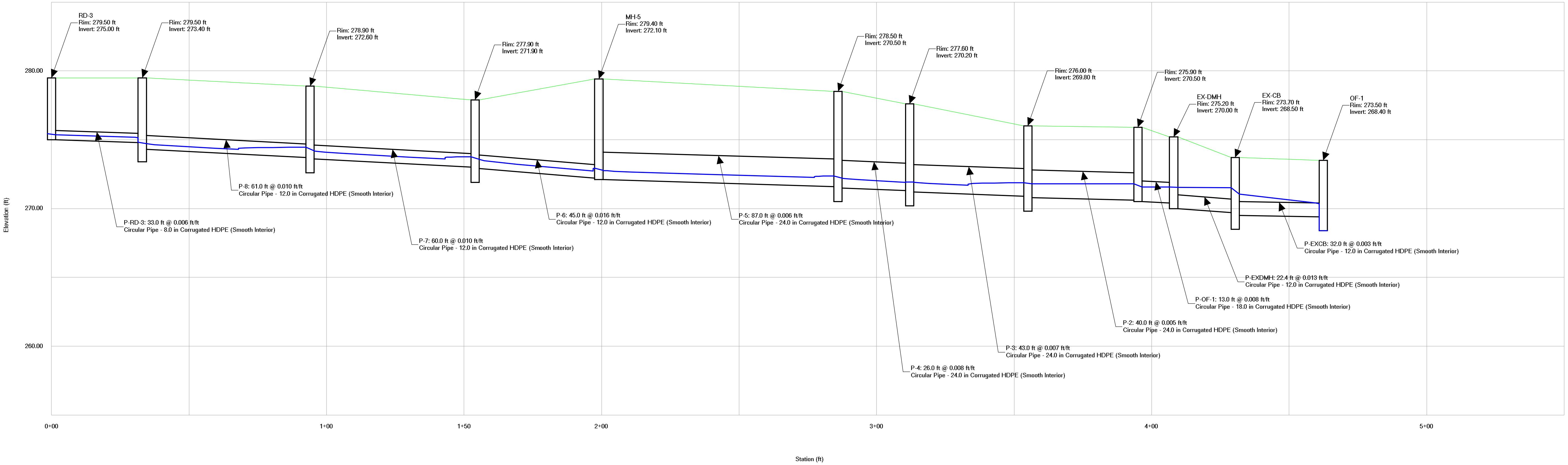
Profile Report

Engineering Profile - EX-MH-1 to OF-1 (31807_HVCC_Haas_Center_10YR.stc)



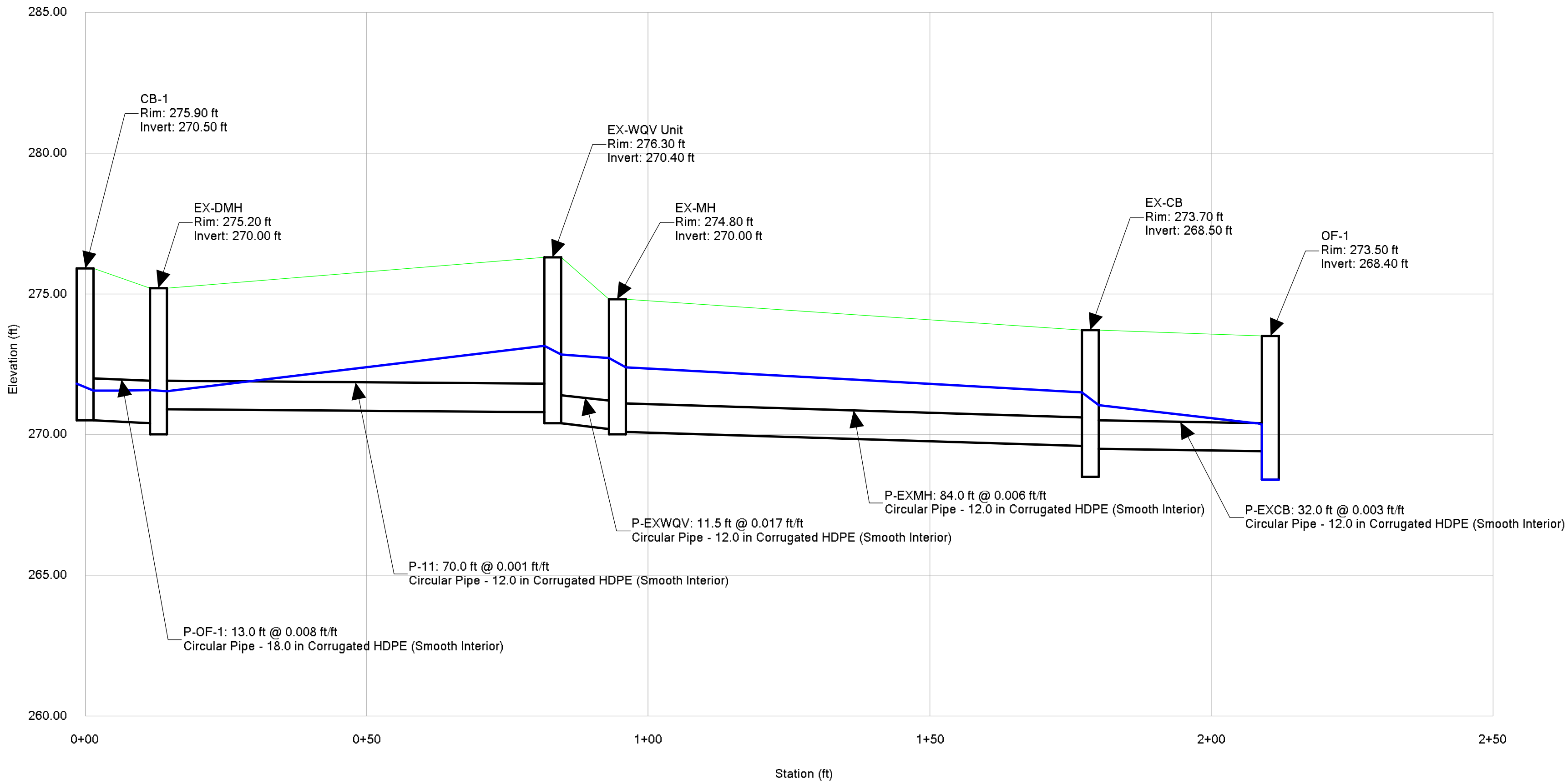
Profile Report

Engineering Profile - RD-3 to OF-1 (31807_HVCC_Haas_Center_10YR.stc)

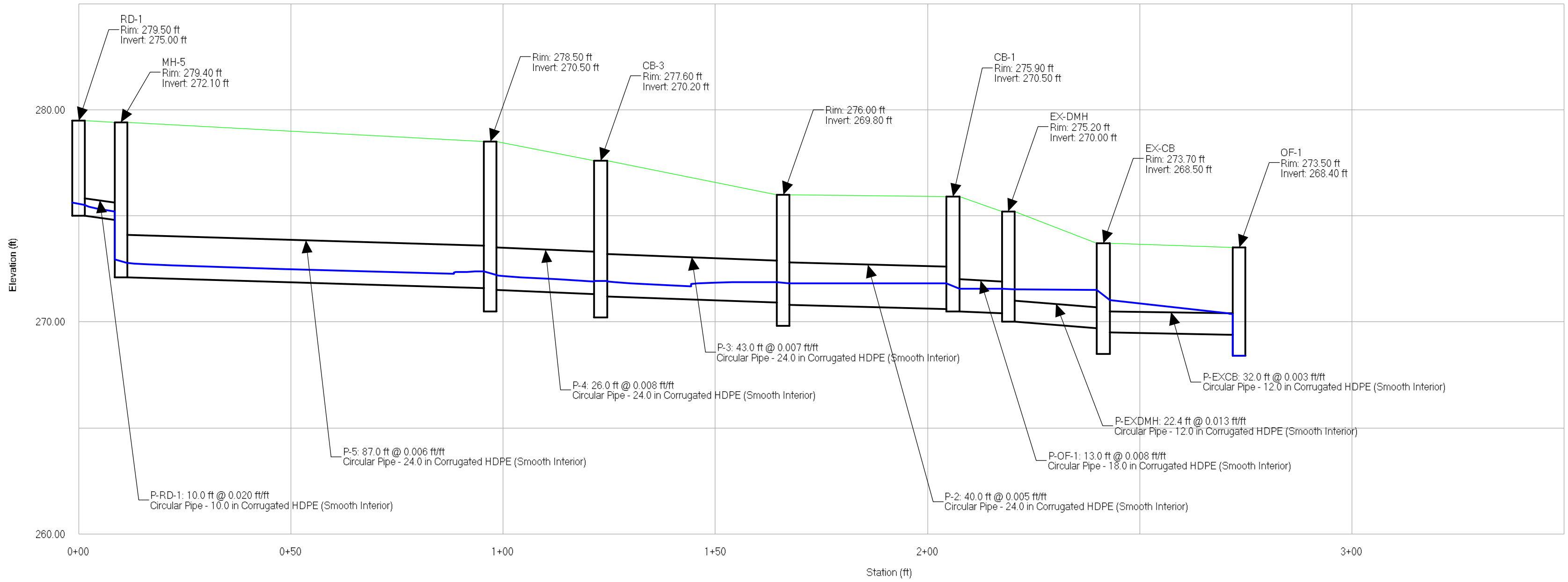


Profile Report

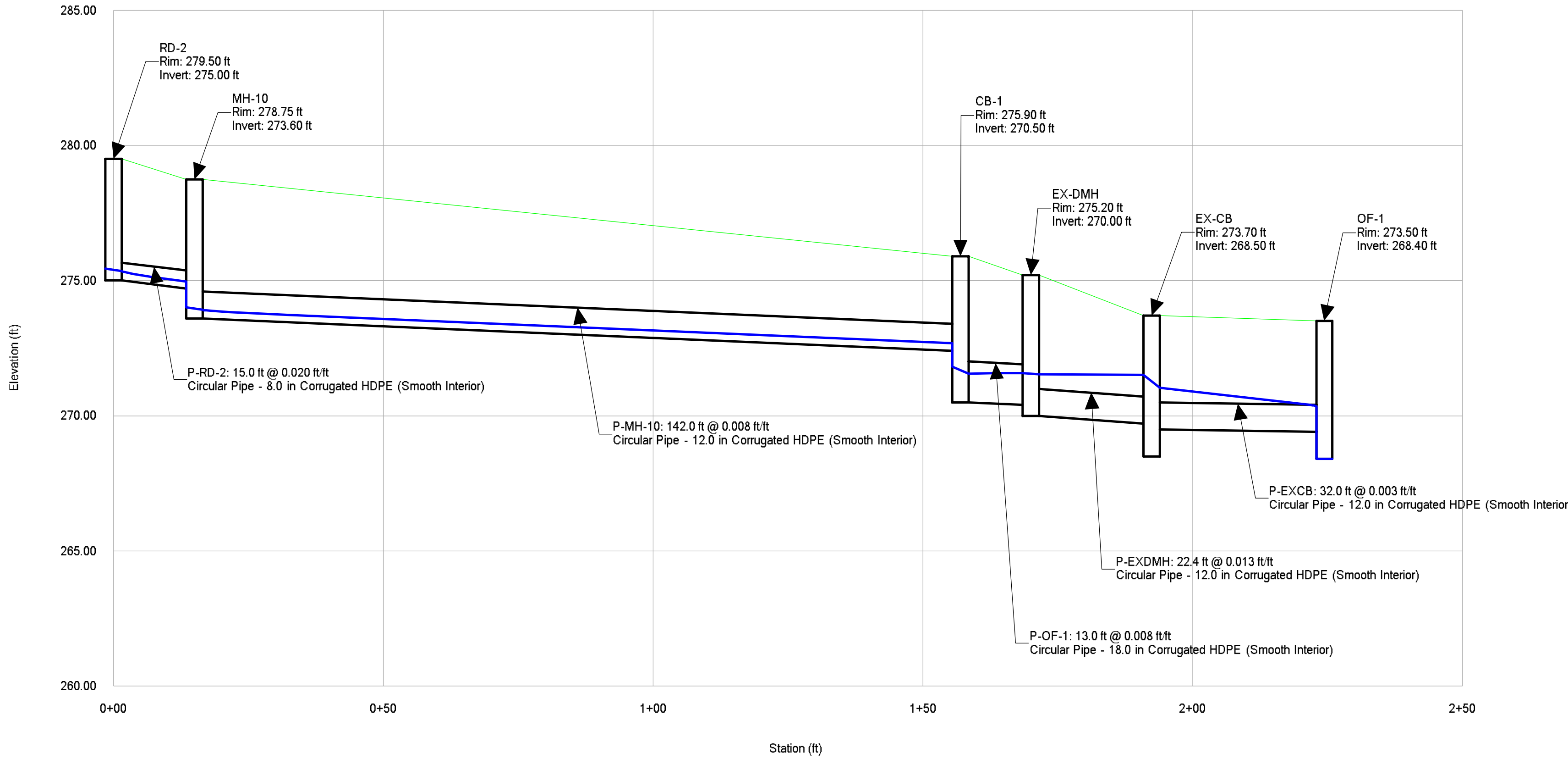
Engineering Profile - CB-1 to OF-1 (31807_HVCC_Haas_Center_10YR.stc)



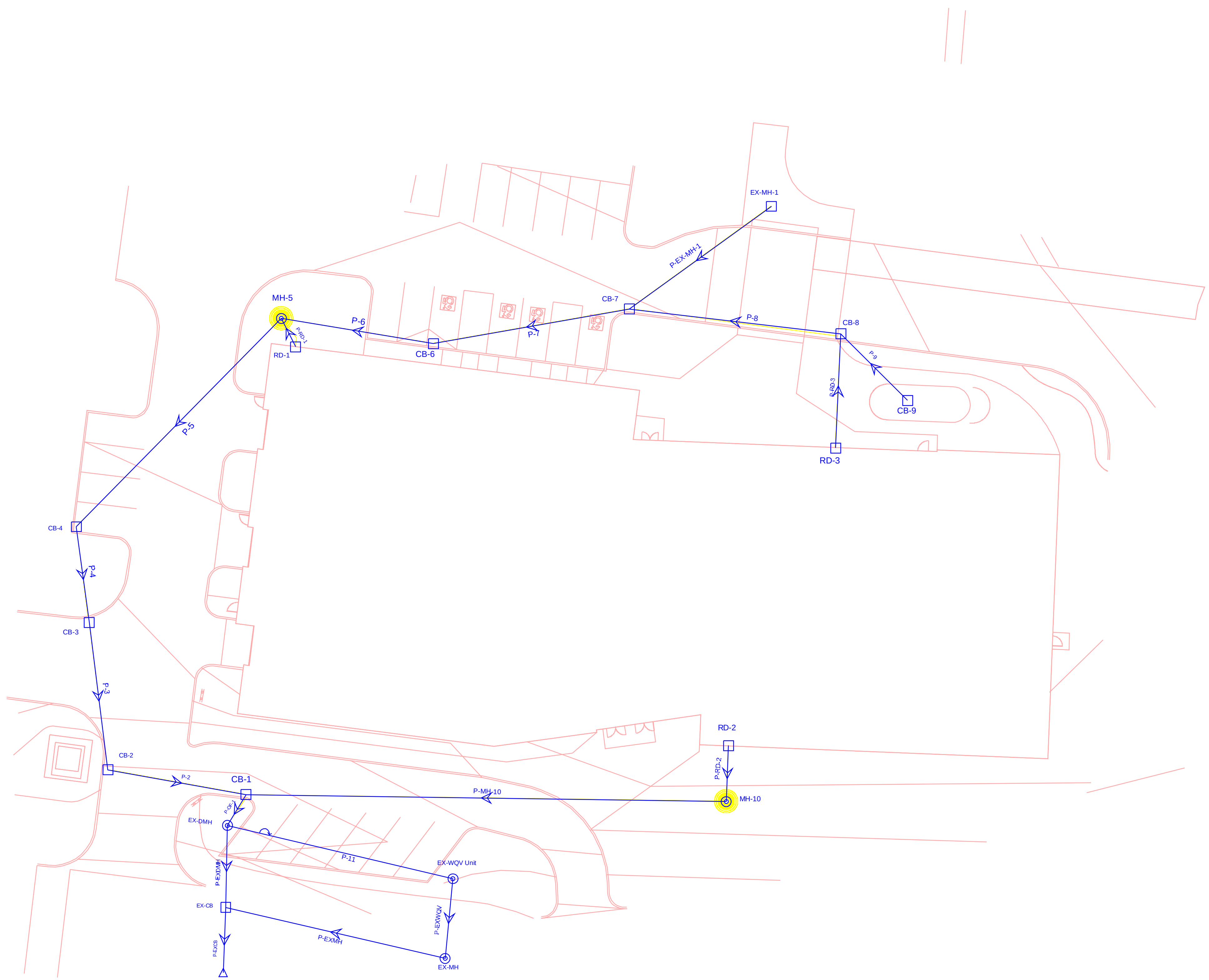
Profile Report
Engineering Profile - RD-1 to OF-1 (31807_HVCC_Haas_Center_10YR.stc)



Profile Report
Engineering Profile - RD-2 to OF-1 (31807_HVCC_Haas_Center_10YR.stc)



Scenario: Base



Conduit FlexTable: Combined Pipe/Node Report (31807_HVCC_Haas_Center_100YR.stc)

Label	Start Node	Stop Node	Invert (Upstream) (ft)	Invert (Downstream) (ft)	Length (User Defined) (ft)	Diameter (in)	Slope (ft/ft)	Material	Manning's n	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Capacity (Full Flow) (ft³/s)	Flow / Capacity (Full) (%)	Velocity (Out Link) (ft/s)	Flow (Link) (ft³/s)
P-2	CB-2	CB-1	270.80	270.60	40.0	24.0	0.005	Corrugated HDPE (Smooth Interior)	0.012	273.63	273.59	17.33	40.1	2.25	6.95
P-3	CB-3	CB-2	271.20	270.90	43.0	24.0	0.007	Corrugated HDPE (Smooth Interior)	0.012	273.70	273.67	20.47	32.5	2.15	6.65
P-4	CB-4	CB-3	271.50	271.30	26.0	24.0	0.008	Corrugated HDPE (Smooth Interior)	0.012	273.72	273.70	21.49	30.5	2.12	6.56
P-5	MH-5	CB-4	272.10	271.60	87.0	24.0	0.006	Corrugated HDPE (Smooth Interior)	0.012	273.80	273.77	18.58	31.7	1.90	5.89
P-6	CB-6	MH-5	272.90	272.20	45.0	12.0	0.016	Corrugated HDPE (Smooth Interior)	0.012	274.33	273.84	4.81	82.3	5.12	3.96
P-7	CB-7	CB-6	273.60	273.00	60.0	12.0	0.010	Corrugated HDPE (Smooth Interior)	0.012	274.97	274.58	3.86	80.2	4.00	3.10
P-8	CB-8	CB-7	274.30	273.70	61.0	12.0	0.010	Corrugated HDPE (Smooth Interior)	0.012	275.33	275.22	3.83	41.8	2.04	1.60
P-9	CB-9	CB-8	274.60	274.40	27.0	12.0	0.007	Corrugated HDPE (Smooth Interior)	0.012	275.37	275.37	3.32	4.9	0.21	0.16
P-11	EX-DMH	EX-WQV Unit	270.90	270.80	70.0	12.0	0.001	Corrugated HDPE (Smooth Interior)	0.012	(N/A)	(N/A)	1.46	463.3	(N/A)	6.76
P-EXCB	EX-CB	OF-1	269.50	269.40	32.0	12.0	0.003	Corrugated HDPE (Smooth Interior)	0.012	271.99	270.39	2.16	392.7	10.99	8.47
P-EXDMH	EX-DMH	EX-CB	270.00	269.70	22.4	12.0	0.013	Corrugated HDPE (Smooth Interior)	0.012	273.14	273.11	4.47	30.9	1.76	1.38
P-EXMH	EX-MH	EX-CB	270.10	269.60	84.0	12.0	0.006	Corrugated HDPE (Smooth Interior)	0.012	275.79	273.11	2.98	226.7	8.77	6.75
P-EX-MH-1	EX-MH-1	CB-7	276.30	275.40	51.0	12.0	0.018	Corrugated HDPE (Smooth Interior)	0.012	276.64	275.64	5.13	12.9	4.50	0.66
P-EXWQV	EX-WQV Unit	EX-MH	270.40	270.20	11.5	12.0	0.017	Corrugated HDPE (Smooth Interior)	0.012	275.17	274.80	5.09	132.8	8.78	6.76
P-MH-10	MH-10	CB-1	273.60	272.40	142.0	12.0	0.008	Corrugated HDPE (Smooth Interior)	0.012	274.01	273.59	3.55	26.3	1.19	0.93
P-OF-1	CB-1	EX-DMH	270.50	270.40	13.0	18.0	0.008	Corrugated HDPE (Smooth Interior)	0.012	273.25	273.18	9.98	81.8	4.69	8.16
P-RD-1	RD-1	MH-5	275.00	274.80	10.0	10.0	0.020	Corrugated HDPE (Smooth Interior)	0.012	275.65	275.32	3.36	61.9	5.81	2.08
P-RD-2	RD-2	MH-10	275.00	274.70	15.0	8.0	0.020	Corrugated HDPE (Smooth Interior)	0.012	275.46	275.05	1.85	50.5	5.07	0.93
P-RD-3	RD-3	CB-8	275.00	274.80	33.0	8.0	0.006	Corrugated HDPE (Smooth Interior)	0.012	275.51	275.37	1.02	91.7	2.96	0.93

FlexTable: Catch Basin Table (31807_HVCC_Haas_Center_100YR.stc)

Label	Elevation (Ground) (ft)	Elevation (Rim) (ft)	Elevation (Invert) (ft)	Headloss Method	Headloss Coefficient (Standard)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Velocity (In-Governing Node) (ft/s)	Velocity (Out Node) (ft/s)	Flow (Known) (ft^3/s)	Flow (Total Bypassed) (ft^3/s)	Flow (Total Out) (ft^3/s)
CB-1	275.90	275.90	270.50	Standard	1.000	273.59	273.25	1.19	4.69	0.00	0.00	8.16
CB-2	276.00	276.00	269.80	Standard	0.600	273.67	273.63	2.15	2.25	0.00	0.00	6.95
CB-3	277.60	277.60	270.20	Standard	0.000	273.70	273.70	2.12	2.15	0.00	0.00	6.65
CB-4	278.50	278.50	270.50	Standard	0.600	273.77	273.72	1.90	2.12	0.00	0.00	6.56
CB-6	277.90	277.90	271.90	Standard	0.600	274.58	274.33	4.00	5.12	0.00	0.00	3.96
CB-7	278.90	278.90	272.60	Standard	1.000	275.22	274.97	2.04	4.00	0.00	0.00	3.10
CB-8	279.50	279.50	273.40	Standard	0.600	275.37	275.33	0.21	2.04	0.00	0.00	1.60
CB-9	278.60	278.60	273.60	Standard	0.500	275.37	275.37	0.25	0.25	0.00	0.00	0.16
EX-CB	273.70	273.70	268.50	Standard	0.600	273.11	271.99	8.77	10.97	0.00	0.00	8.47
EX-MH-1	280.00	280.00	275.30	Standard	0.500	276.70	276.64	2.83	2.83	0.00	0.00	0.66
RD-1	279.50	279.50	275.00	Standard	0.500	275.81	275.65	4.58	4.58	0.00	0.00	2.08
RD-2	279.50	279.50	275.00	Standard	0.500	275.56	275.46	3.65	3.65	0.00	0.00	0.93
RD-3	279.50	279.50	275.00	Standard	0.500	275.60	275.51	3.24	3.24	0.00	0.00	0.93

FlexTable: Catchment Table (31807_HVCC_Haas_Center_100YR.stc)

Label	Outflow Node	Area (ft²)	Area (Unified) (ft²)	Rational C	Catchment CA (ft²)	Time of Concentration (min)	Catchment Intensity (in/h)	Catchment Rational Flow (ft³/s)
DA-2	CB-1	3,724.0	3,724.0	0.727	2,706.8	5.000	8.860	0.55
DA-3	CB-2	3,038.0	3,038.0	0.736	2,236.6	5.000	8.860	0.46
DA-4	CB-3	1,124.3	1,124.3	0.800	899.4	5.000	8.860	0.18
DA-5	CB-4	5,560.0	5,560.0	0.702	3,900.6	5.000	8.860	0.80
DA-6	CB-6	5,789.0	5,789.0	0.800	4,631.2	5.000	8.860	0.95
DA-7	CB-7	6,070.0	6,070.0	0.745	4,520.0	5.000	8.860	0.93
DA-8	CB-8	3,156.0	3,156.0	0.800	2,524.8	5.000	8.860	0.52
DA-9	CB-9	4,000.0	4,000.0	0.200	800.0	5.000	8.860	0.16
DA-EX-AD	EX-MH-1	8,233.3	8,233.3	0.393	3,237.4	5.000	8.860	0.66
DA-EXCB	EX-CB	5,441.0	5,441.0	0.439	2,390.8	5.000	8.860	0.49
DA-RD-1	RD-1	12,668.0	12,668.0	0.800	10,134.4	5.000	8.860	2.08
DA-RD-2	RD-2	5,698.0	5,698.0	0.800	4,558.4	5.000	8.860	0.93
DA-RD-3	RD-3	5,698.0	5,698.0	0.800	4,558.4	5.000	8.860	0.93

FlexTable: Manhole Table (31807_HVCC_Haas_Center_100YR.stc)

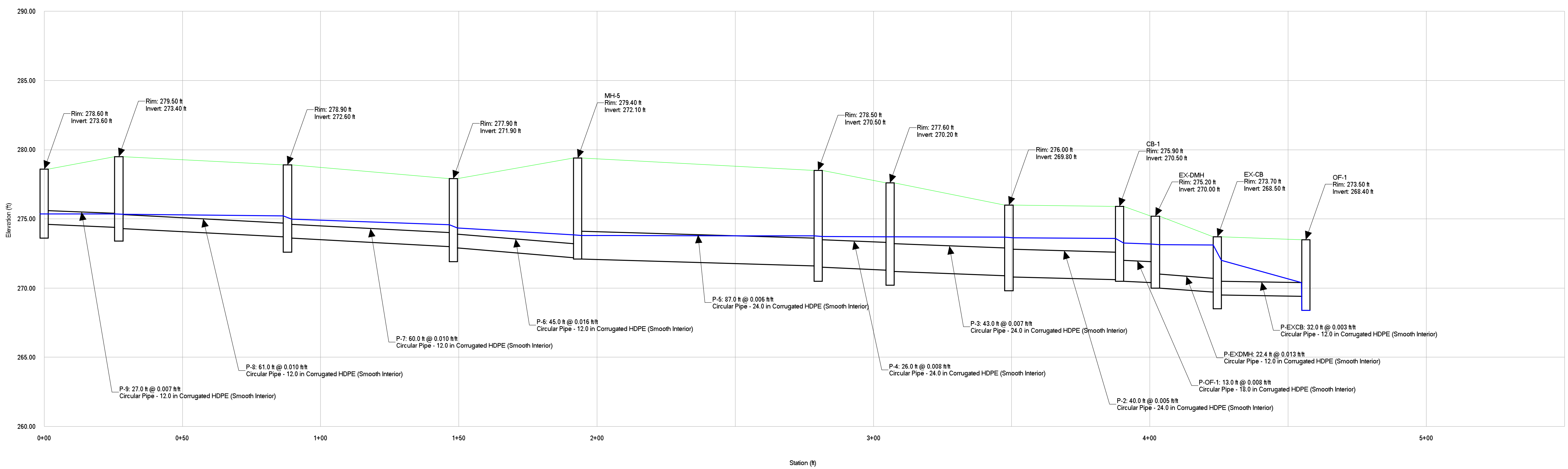
Label	Elevation (Ground) (ft)	Set Rim to Ground Elevation?	Elevation (Rim) (ft)	Elevation (Invert) (ft)	Diameter (in)	Headloss Method	Headloss Coefficient (Standard)	Flow (Total Out) (ft^3/s)	Velocity (In -Governing Node) (ft/s)	Velocity (Out Node) (ft/s)
MH-5	279.40	True	279.40	272.10	36.0	Standard	0.600	5.89	5.12	2.10
MH-10	278.75	True	278.75	273.60	36.0	Standard	0.800	0.93	5.07	3.13
EX-DMH	275.20	True	275.20	270.00	36.0	Standard	0.800	1.38	4.69	1.76
EX-WQV Unit	276.30	True	276.30	270.40	36.0	Standard	0.800	6.76	8.78	8.78
EX-MH	274.80	True	274.80	270.00	36.0	Standard	0.800	6.75	8.78	8.77

FlexTable: Outfall Table (31807_HVCC_Haas_Center_100YR.stc)

Label	Elevation (Ground) (ft)	Elevation (Invert) (ft)	Boundary Condition Type	Elevation (Tailwater) (ft)	Flow (Outfall) (ft^3/s)	System Rational Flow (ft^3/s)
OF-1	273.50	268.40	Free Outfall	0.00	8.45	8.45

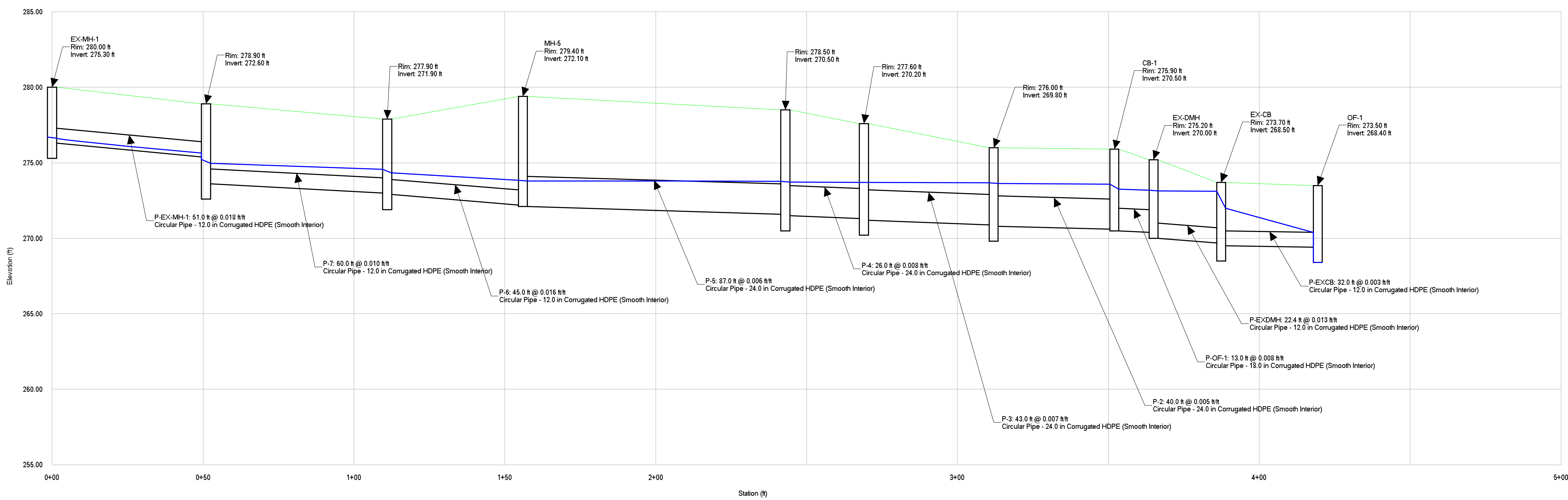
Profile Report

Engineering Profile - CB-9 to OF-1 (31807_HVCC_Haas_Center_100YR.stc)

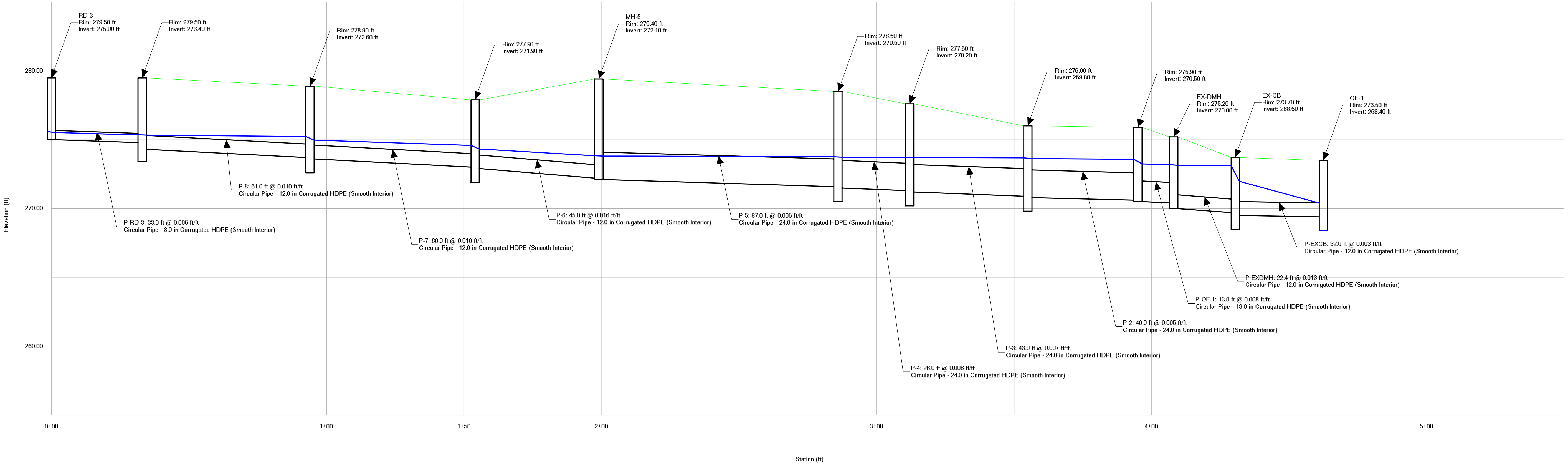


Profile Report

Engineering Profile - EX-MH-1 to OF-1 (31807_HVCC_Haas_Center_100YR.stc)

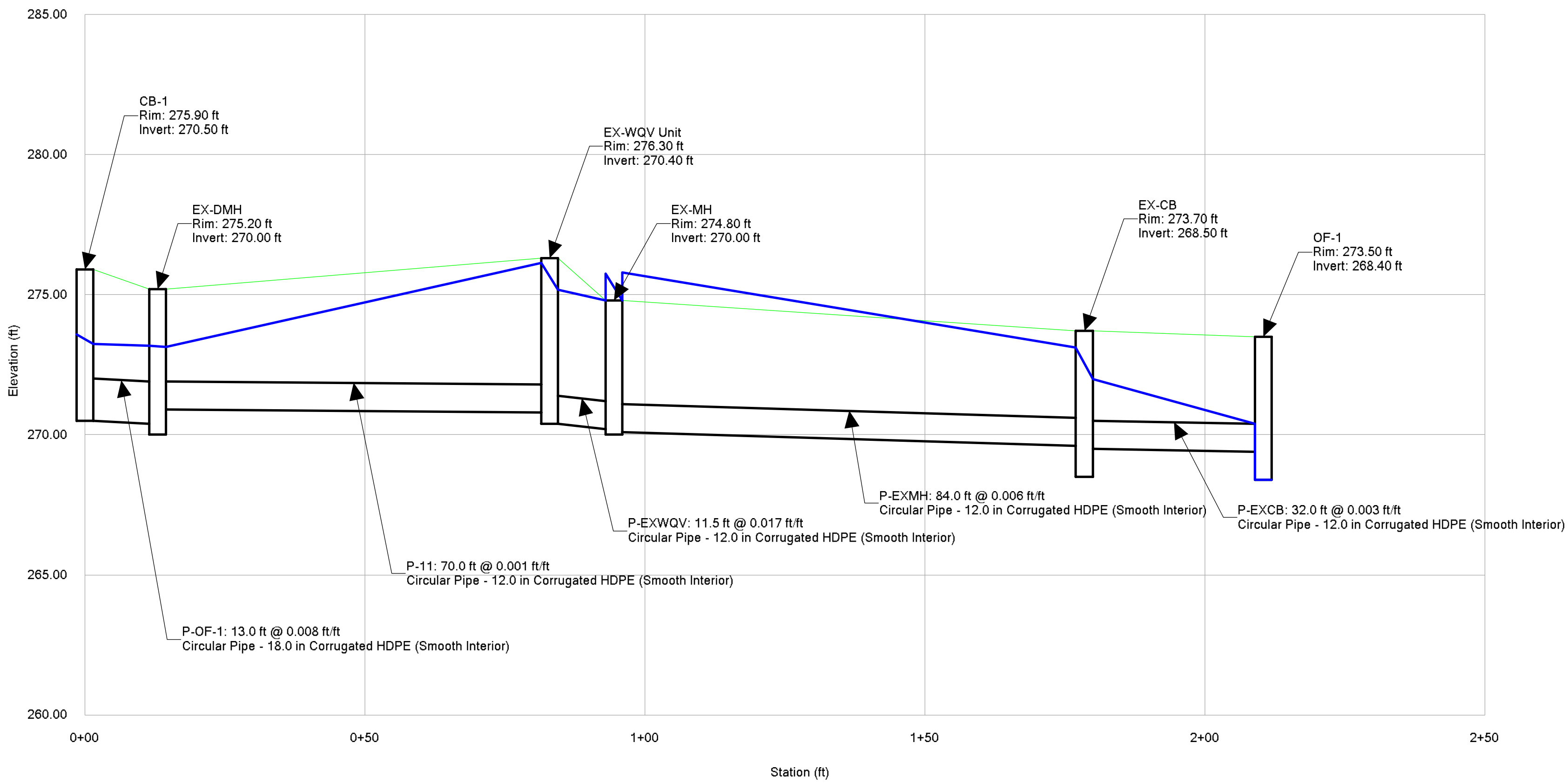


Profile Report
Engineering Profile - RD-3 to OF-1 (31807_HVCC_Haas_Center_100YR.stc)

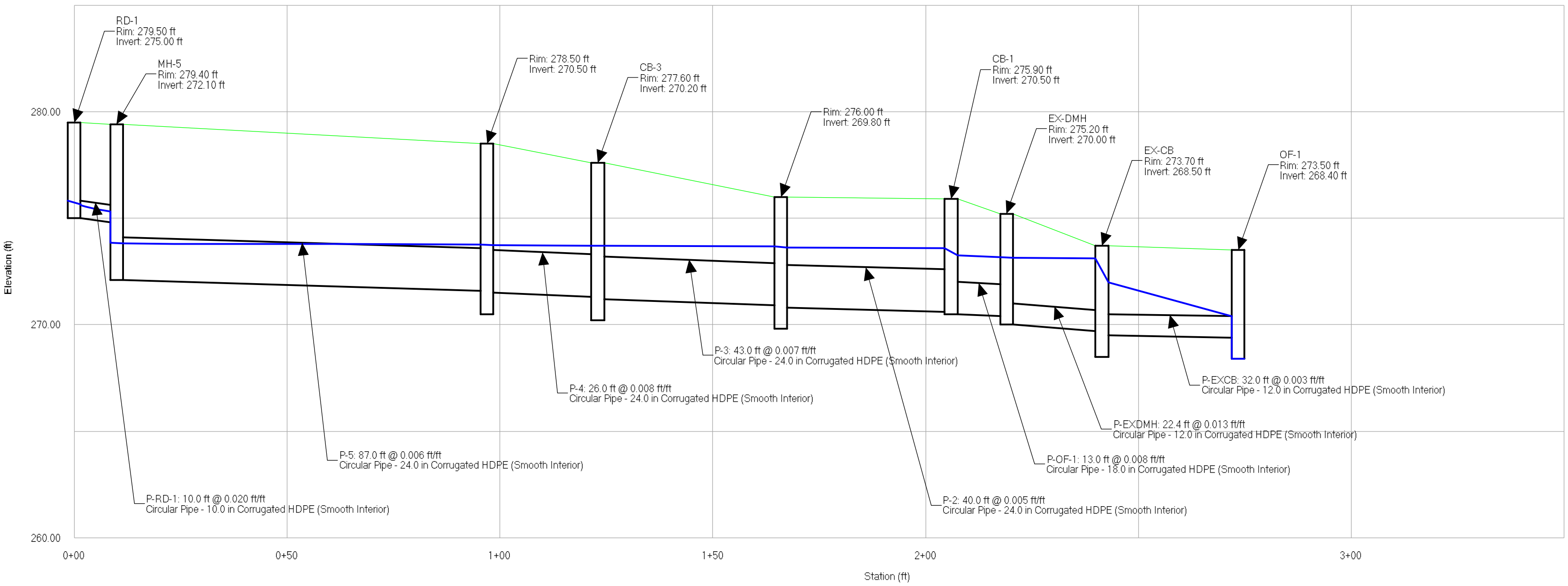


Profile Report

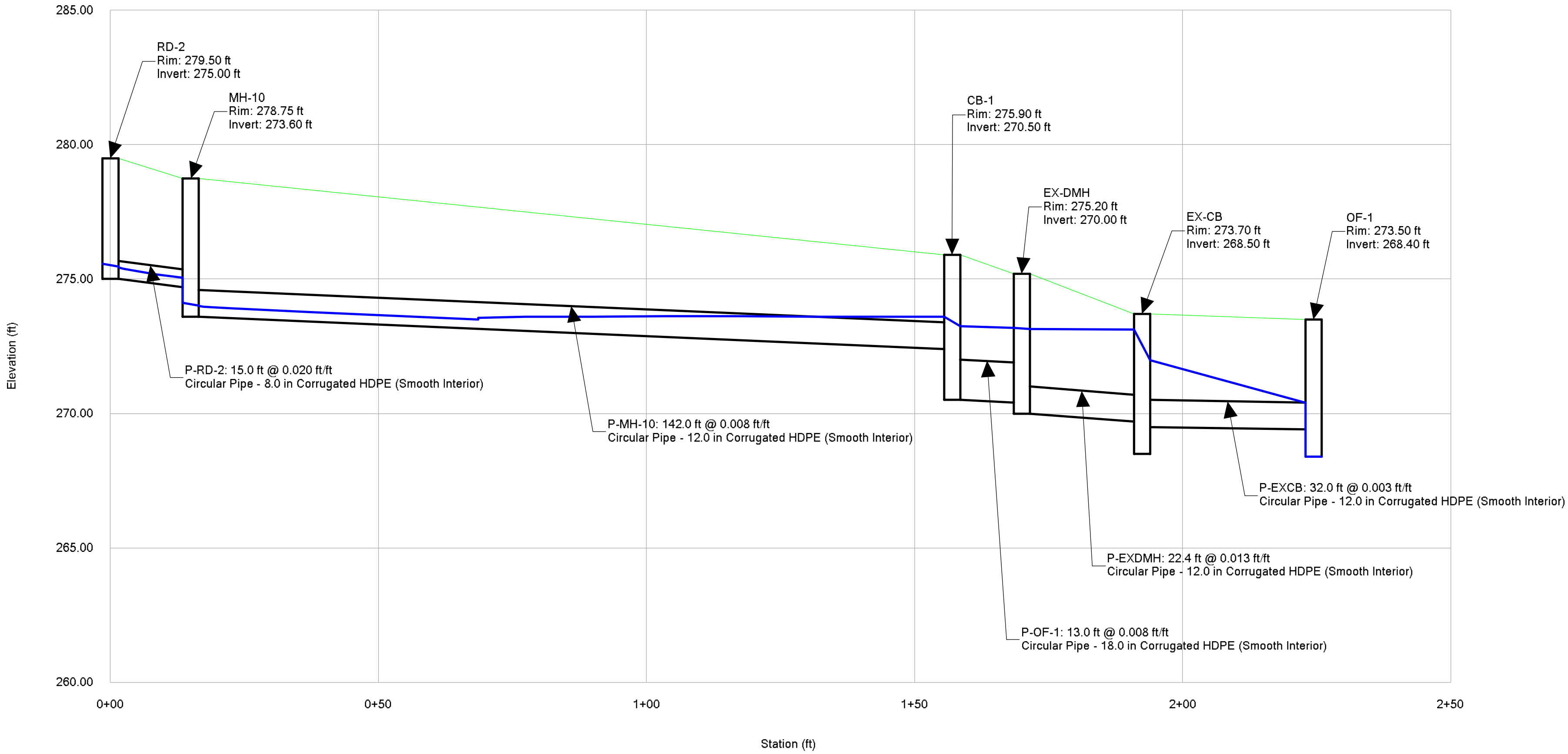
Engineering Profile - CB-1 to OF-1 (31807_HVCC_Haas_Center_100YR.stc)



Profile Report
Engineering Profile - RD-1 to OF-1 (31807_HVCC_Haas_Center_100YR.stc)



Profile Report
Engineering Profile - RD-2 to OF-1 (31807_HVCC_Haas_Center_100YR.stc)



Appendix G
Water Quality and Runoff Reduction Volume Computations

New York Stormwater Sizing Criteria
Redevelopment Water Quality Volume Computations

Water Quality Volume (WQ_v) Equation Based on the 90% Rule

$$WQ_V = \frac{(P)(R_V)(A)}{12}$$

Where:

WQ_v = Water Quality Volume (Ac-Ft)
P = 90% Rainfall Event (In)
R_v = 0.05 + 0.009(I), where I is % Impervious Cover
A = Disturbed Area (Ac) - When sizing the practice, structures should be designed based on the contributing drainage area.

Rainfall Data:

P = 1.10 in

Site Specific Data:

Design Point	Drainage Basin	Disturbed Area (Ac)	Impervious Area (Ac)	% Impervious	R_v	Adjusted Rv	WQv (Ac-Ft)	Adjusted WQv: Standard Practice* (Ac-Ft)	Adjusted WQv: Alternative Practice** (Ac-Ft)
DP-1	DA-1A	1.26	1.09	87	0.83	0.83	0.096	0.028	0.073
	DA-1B	0.32	0.12	38	0.39	0.39	0.011	0.004	0.009

Impervious Cover (Ac)		
Existing	1.03	0.11
Total Post Construction	1.09	0.12
New	0.06	0.01

*=(0.25(% of existing imp to total prop imp)+(% of new imp to total prop imp))(WQv)

**=(0.75(% of existing imp to total prop imp)+(% of new imp to total prop imp))(WQv)

WATER QUALITY FLOW SPREAD SHEET
Yellow requires user input value

TYPE II RAINFALL DISTRIBUTION ONLY
Water Quality Volume

	INPUT		
P	1.1	inches	see 90% Rainfall Contour Plan
A	1.58	**acres**	site area (contributing area)
I	70		
Rv	0.68	A minimum Rv of 0.2 will be applied to regulated sites	

Rv = 0.05 + 0.009(I) where I is the percent impervious cover
example: all pavement = 100% = 100

FORMULA *

Water Quality Volume formula has been adjusted based on Redevelopment Criteria presented in Chapter 9 of the New York State Stormwater Management Design Manual
Alternative practices require treatment of 75% of the water quality volume

WQv = $\frac{(P)(Rv)(A)}{12}$ = 0.074 **acre-feet** *

Curve Number

P 1.1 from above

Q = $\frac{WQv}{A}$ 0.04675 ft 0.5610 inches

CN = $\frac{1000}{[10 + 5P + 10Q - 10(Q^2 + 1.25QP)^{1/2}]}$ = 94

Therefore, use limit of **95**

Peak Discharge

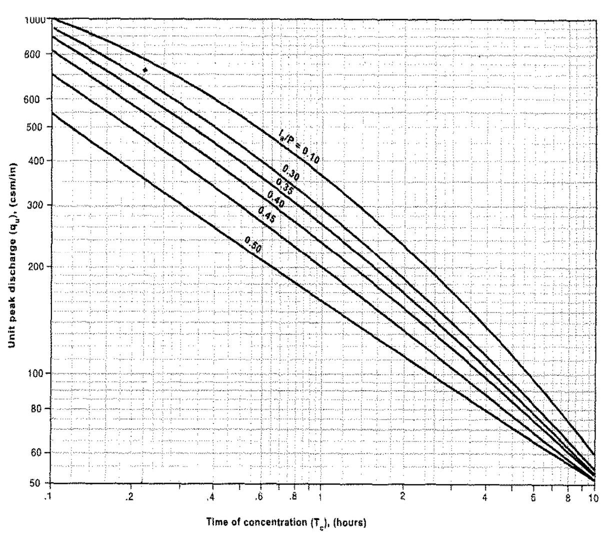
Read Ia from table 4-1 using the compute curve number Ia = 0.128
Ia/P = 0.116363636
Determine the Time of Concentration Tc(mins) = 5

	INPUT	
qu	1000	from exhibit 4-II
A	0.0024688	from above acres converted to sq-miles
Q	0.5610	from above

FORMULA

Qp = (qu)(A)(Q) = **1.38** **cfs**

Exhibit 4-II Unit peal discharge (q_u) for NRCS (SCS) type II rainfall distribution



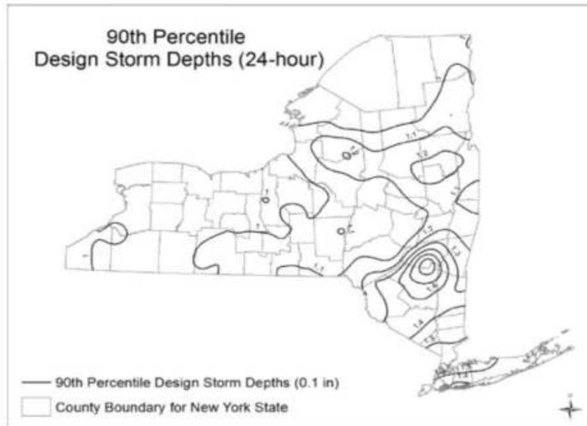


Figure 4-1 Variation of I_a / P for P and CN

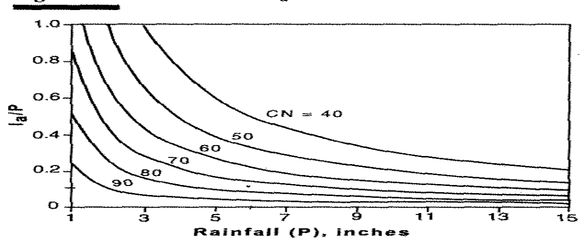


Table 4-1 I_a values for runoff curve numbers

Curve number	I_a (in)	Curve number	I_a (in)
40	3.000	70	0.857
41	2.878	71	0.817
42	2.762	72	0.778
43	2.651	73	0.740
44	2.545	74	0.703
45	2.444	75	0.667
46	2.348	76	0.632
47	2.255	77	0.597
48	2.167	78	0.564
49	2.082	79	0.532
50	2.000	80	0.500
51	1.922	81	0.469
52	1.846	82	0.439
53	1.774	83	0.410
54	1.704	84	0.381
55	1.636	85	0.353
56	1.571	86	0.326
57	1.509	87	0.299
58	1.448	88	0.273
59	1.390	89	0.247
60	1.333	90	0.222
61	1.279	91	0.198
62	1.226	92	0.174
63	1.175	93	0.151
64	1.125	94	0.128
65	1.077	95	0.105
66	1.030	96	0.083
67	0.985	97	0.062
68	0.941	98	0.041
69	0.899		

New York Stormwater Sizing Criteria
Runoff Reduction Volume Computations
Chapter 9 - Redevelopment Projects with Increase of Impervious Area

Minimum Runoff Reduction Volume (RR_v) Equation

$$RRv(min) = \frac{(P)(Rv^*)(Ai)}{12}$$

Where:

P = 90% Rainfall Event (In)
Ai = (S) (Aic)
Ai = Impervious cover targeted for runoff reduction (in acres)
(Aic) = Total area of new impervious cover (in acres)
Rv* = 0.05 + 0.009(IC), where IC is 100% impervious (Rv* = 0.95)
S = Hydrologic Soil Group (HSG) Specific Reduction Factor (This is a weighted average of the specific reduction factors for hydrologic soil groups when there is more than one hydrologic soil group within the project limits.)

Rainfall Data:

P = 1.1 in

Site Specific Data:

HSG A Area S = 0.55	HSG B Area S = 0.40	HSG C Area S = 0.30	HSG D Area S = 0.20	Total Drainage Area (Ac)	Weighted S	Total New Impervious Area (Ac)	Rv*	Ai = (S)(Aic) (Ac)	Min. RRv (Ac-Ft)
0.00	0.00	0.07	0.00	0.07	0.30	0.0700	0.95	0.021	0.002

Version 1.8 | Total Water Quality Volume Calculation
Last Updated: 11/09/2015 | WQv(acre-feet) = [(P)(Rv)(A)] /12

Is this project subject to Chapter 10 of the NYS Design Manual (i.e. WQv is equal to post-development 1 year runoff volume)?.. No

Design Point:	1		
P=	1.10	inch	

Manually enter P, Total Area and Impervious Cover.

Breakdown of Subcatchments						
Catchment Number	Total Area *(Acres)*	Impervious Area *(Acres)*	Percent Impervious *%*	Rv	WQv *(ft^3)*	Description
1	0.03	0.03	100%	0.95	114	Tree Planting/Tree Pit
2						
3						
4						
5						
6						
7						
8						
9						
10						
Subtotal (1-30)	0.03	0.03	100%	0.95	114	Subtotal 1
Total	0.03	0.03	100%	0.95	114	Initial WQv

Identify Runoff Reduction Techniques By Area			
Technique	Total Contributing Area *(Acre)*	Contributing Impervious Area *(Acre)*	Notes
Conservation of Natural Areas	0.00	0.00	*minimum 10,000 sf*
Riparian Buffers	0.00	0.00	*maximum contributing length 75 feet to 150 feet*
Filter Strips	0.00	0.00	
Tree Planting	0.03	0.03	*Up to 100 sf directly connected impervious area may be subtracted per tree*
Total	0.03	0.03	

Recalculate WQv after application of Area Reduction Techniques					
	Total Area *(Acres)*	Impervious Area *(Acres)*	Percent Impervious *%*	Runoff Coefficient Rv	WQv *(ft^3)*
"<<Initial WQv"	0.03	0.03	100%	0.95	114
Subtract Area	-0.03	-0.03			
WQv adjusted after Area Reductions	0.00	0.00	0%	0.05	0
Disconnection of Rooftops		0.00			
Adjusted WQv after Area Reduction and Rooftop Disconnect	0.00	0.00	0%	0.05	0

Runoff Reduction Volume and Treated volumes						
	Runoff Reduction Techiques/Standard SMPs		Total Contributing Area	Total Contributing Impervious Area	WQv Reduced (RRv)	WQv Treated
			(acres)	(acres)	cf	cf
Area/Volume Reduction	Conservation of Natural Areas	RR-1	0.00	0.00		
	Sheetflow to Riparian Buffers/Filter Strips	RR-2	0.00	0.00		
	Tree Planting/Tree Pit	RR-3	0.03	0.03		
	Disconnection of Rooftop Runoff	RR-4		0.00		
	Vegetated Swale	RR-5	0.00	0.00	0	
	Rain Garden	RR-6	0.00	0.00	0	
	Stormwater Planter	RR-7	0.00	0.00	0	
	Rain Barrel/Cistern	RR-8	0.00	0.00	0	
	Porous Pavement	RR-9	0.00	0.00	0	
	Green Roof (Intensive & Extensive)	RR-10	0.00	0.00	0	
Standard SMPs w/RRv Capacity	Infiltration Trench	I-1	0.00	0.00	0	0
	Infiltration Basin	I-2	0.00	0.00	0	0
	Dry Well	I-3	0.00	0.00	0	0
	Underground Infiltration System	I-4				
	Bioretention & Infiltration Bioretention	F-5	0.00	0.00	0	0
	Dry swale	O-1	0.00	0.00	0	0
Standard SMPs	Micropool Extended Detention (P-1)	P-1				
	Wet Pond (P-2)	P-2				
	Wet Extended Detention (P-3)	P-3				
	Multiple Pond system (P-4)	P-4				
	Pocket Pond (p-5)	P-5				
	Surface Sand filter (F-1)	F-1				
	Underground Sand filter (F-2)	F-2				
	Perimeter Sand Filter (F-3)	F-3				
	Organic Filter (F-4	F-4				
	Shallow Wetland (W-1)	W-1				
	Extended Detention Wetland (W-2	W-2				
	Pond/Wetland System (W-3)	W-3				
	Pocket Wetland (W-4)	W-4				
	Wet Swale (O-2)	O-2				
	Totals by Area Reduction	→	0.03	0.03	114	
	Totals by Volume Reduction	→	0.00	0.00	0	
	Totals by Standard SMP w/RRV	→	0.00	0.00	0	0
	Totals by Standard SMP	→	0.00	0.00		0
	Totals (Area + Volume + all SMPs)	→	0.03	0.03	114	0
	Impervious Cover √	okay				

Minimum RRv

Enter the Soils Data for the site		
Soil Group	Acres	S
A		55%
B		40%
C	0.03	30%
D		20%
Total Area	0.03	
Calculate the Minimum RRv		
S =	0.30	
Impervious =	0.03	*acre*
Precipitation	1.1	*in*
Rv	0.95	
Minimum RRv	34	*ft3*
	0.00	af

NOI QUESTIONS

#	NOI Question	Reported Value	
		cf	af
28	Total Water Quality Volume (WQv) Required	114	*0.003*
30	Total RRV Provided	114	*0.003*
31	Is RRv Provided ≥WQv Required?	Yes	
32	Minimum RRv	34	*0.001*
32a	Is RRv Provided ≥ Minimum RRv Required?	Yes	
33a	Total WQv Treated	0	*0.000*
34	Sum of Volume Reduced & Treated	114	*0.003*
34	Sum of Volume Reduced and Treated	114	*0.003*
35	Is Sum RRv Provided and WQv Provided ≥WQv Required?	Yes	

Apply Peak Flow Attenuation			
36	Channel Protection	*Cpv*	
37	Overbank	*Qp*	
37	Extreme Flood Control	*Qf*	
	Are Quantity Control requirements met?		

Tree Planting/Tree Pits

Design Point:	1						
Enter Site Data For Drainage Area to be Treated by Practice							
Catchment Number	Total Area *(Acres)*	Impervious Area *(Acres)*	Percent Impervious %	Rv	WQv *(ft^3)*	Precipitation *(in)*	Description
1	0.03	0.03	1.00	0.95	113.80	1.10	Tree Planting/Tree Pit
Do you intend to use this practice for area reduction or volume reduction?			Area	Design practice using criteria below			
Design Elements							
Is another area based practice applied to this area?			*No*				
Diameter of Mature Canopy			16	*ft*			
Area Reduced per Tree			100	*sf*	*For up to a 16-foot diameter canopy of a mature tree, the area considered for reduction shall be ½ the area of the tree*		
Number of Trees			14				
Total Area Reduced			1406.72	*sf*			
			0.03	*af*	*Okay*		
Area Ratio: Total to Impervious area			1.0		*Minimum loading ratio 3:1*		
Are All Criteria in Section 5.3.4 met?			*Yes*				
Area Reduction Adjustments							
Subtract			0.03	*Acres from total Area*			
Subtract			0.03	*Acres from total Impervious Area*			

COMP	JMC	DATE	2/22/2017
CHECKED BY	RKW	PROJ.NO.	31807
PROJ. Name	HVCC New Gene Haas Center for Advanced Manufacturing Skills Building		

STORAGE VOLUME ESTIMATION CALCULATIONS

Use the following equation for Type II and Type III rainfall distribution (per App. B of NYS Stormwater Management Design Manual)

$V_s/V_r = 0.682 - 1.43(q_o/q_i) + 1.64(q_o/q_i)^2 - 0.804(q_o/q_i)^3$

V_s = required storage volume (acre-feet)

V_r = runoff volume (acre-feet)

q_o = peak outflow discharge (cfs)

q_i = peak inflow discharge (cfs)

q_u = unit peak discharge (csm/in)

T = extended detention time (hr)

Q_{1pre} = qo 3.41 CFS (from PPK existing cond. model)

Q_{1post} = qi 3.52 CFS (from PPK proposed cond. model)

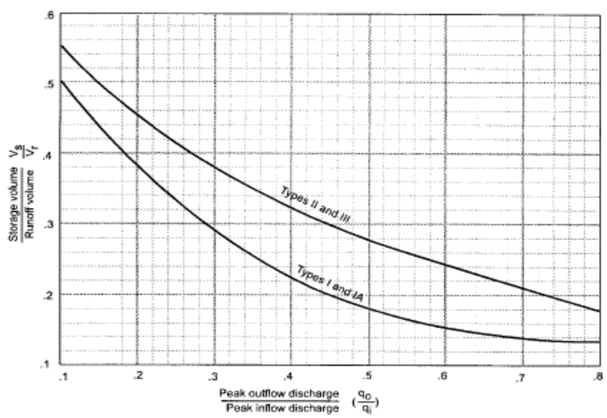
q_o/q_i = 0.96875 (estimation from Figure B.2)

V_s/V_r = 0.104833 (unitless)

$V_s = ((V_s/V_r)*(Q_d)*(A))/12$

Q_p = the post-developed runoff for the design storm (inches)

Figure B.2 Approximate Detention Basin Routing For Rainfall Types I, IA, II, and III (Source: NRCS, 1986)



Taken from Appendix B of the "New York Stormwater Management Design Manual" January 2015

A = total drainage area (acres) A = 1.58 AC

Proposed Condition Runoff Volume (ac ft) Vol. = 0.195 AC FT

Q_p = Vol. / A = 0.123418 ft = 1.481013 INCHES

Q_d = 1.481013 (inches)

A = 1.58 (acres)

V_s = 0.020 (acre-feet) = The CPv required Volume

State of New Jersey

DEPARTMENT OF ENVIRONMENTAL PROTECTION
Bureau of Nonpoint Pollution Control
Division of Water Quality
401-02B
Post Office Box 420
Trenton, New Jersey 08625-0420
609-633-7021 Fax: 609-777-0432
http://www.state.nj.us/dep/dwq/bnpc_home.htm

CHRIS CHRISTIE
Governor

KIM GUADAGNO
Lt. Governor

BOB MARTIN
Commissioner

August 18, 2015

Lisa Lemont, CPSWQ
Business Development Manager
Hydro International (Stormwater)
94 Hutchins Drive
Portland, ME 04102

Re: Revised MTD Lab Certification for the Downstream Defender Stormwater Treatment Device By Hydro International

TSS Removal Rate 50%

Dear Ms. Lemont:

This letter supersedes the previous certification letter dated January 21, 2015. Hydro International requested a new verification for the Downstream Defender Stormwater Treatment Device from the New Jersey Corporation for Advanced Technology (NJCAT) based on enhanced Maximum Treatment Flow Rate (MTFR).

The Stormwater Management rules under N.J.A.C. 7:8-5.5(b) and 5.7(c) allow the use of manufactured treatment devices (MTDs) for compliance with the design and performance standards at N.J.A.C. 7:8-5 if the pollutant removal rates have been verified by the New Jersey Corporation for Advanced Technology (NJCAT) and have been certified by the New Jersey Department of Environmental Protection (NJDEP). Hydro International has requested a Laboratory Certification for the Downstream Defender Stormwater Treatment Device.

The projects falls under the "Procedure for Obtaining Verification of a Stormwater Manufactured Treatment Device from New Jersey Corporation for Advance Technology" dated January 25, 2013. The applicable protocol is the "New Jersey Laboratory Testing Protocol to Assess Total Suspended Solids Removal by a Hydrodynamic Sedimentation Manufactured Treatment Device" dated January 25, 2013.

NJCAT verification documents submitted to the NJDEP indicate that the requirements of the aforementioned protocol have been met or exceeded. The NJCAT letter also included a recommended certification TSS removal rate and the required maintenance plan. The NJCAT Verification Report with the Verification Appendix for this device is published online at http://www.njcat.org/verification-process/technology-verification-database.html.

The NJDEP certifies the use of the Downstream Defender Stormwater Treatment Device by Hydro International at a TSS removal rate of 50% when designed, operated and maintained in accordance with the information provided in the Verification Appendix.

Be advised a detailed maintenance plan is mandatory for any project with a Stormwater BMP subject to the Stormwater Management Rules, N.J.A.C. 7:8. The plan must include all of the items identified in the Stormwater Management Rules, N.J.A.C. 7:8-5.8. Such items include, but are not limited to, the list of inspection and maintenance equipment and tools, specific corrective and preventative maintenance tasks, indication of problems in the system, and training of maintenance personnel. Additional information can be found in Chapter 8: Maintenance of the New Jersey Stormwater Best Management Practices Manual.

If you have any questions regarding the above information, please contact Mr. Titus Magnanao of my office at (609) 633-7021.

Sincerely,

James J. Murphy, ~~Chief~~
Bureau of Nonpoint Pollution Control

C: Chron File
Richard Magee, NJCAT
Madhu Guru, DLUR
Ravi Patraju, NJDEP
Titus Magnanao, BNPC

NJCAT TECHNOLOGY VERIFICATION
(See Disclaimer in Section 1.2)

Downstream Defender® Stormwater Treatment Device

Percent Removal of Sediment for Varying Particle Size Distributions

Hydro International

December, 2015

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1. Introduction

1.1 New Jersey Corporation for Advanced Technology (NJCAT) Program

NJCAT is a not-for-profit corporation to promote in New Jersey the retention and growth of technology-based businesses in emerging fields such as environmental and energy technologies. NJCAT provides innovators with the regulatory, commercial, technological and financial assistance required to bring their ideas to market successfully. Specifically, NJCAT functions to:

- Advance policy strategies and regulatory mechanisms to promote technology commercialization;
- Identify, evaluate, and recommend specific technologies for which the regulatory and commercialization process should be facilitated;
- Facilitate funding and commercial relationships/alliances to bring new technologies to market and new business to the state; and
- Assist in the identification of markets and applications for commercialized technologies.

The technology verification program specifically encourages collaboration between vendors and users of technology. Through this program, teams of academic and business professionals are formed to implement a comprehensive evaluation of vendor specific performance claims. Thus, suppliers have the competitive edge of an independent third party confirmation of claims.

Pursuant to N.J.S.A. 13:1D-134 et seq. (Energy and Environmental Technology Verification Program) the New Jersey Department of Environmental Protection (NJDEP) and NJCAT have established a Performance Partnership Agreement (PPA) whereby NJCAT performs the technology verification review and NJDEP certifies the net beneficial environmental effect of the technology. In addition, NJDEP/NJCAT work in conjunction to develop expedited or more efficient timeframes for review and decision-making of permits or approvals associated with the verified/certified technology.

The PPA also requires that:

- The NJDEP shall enter into reciprocal environmental technology agreements concerning the evaluation and verification protocols with the United States Environmental Protection Agency, other local required or national environmental agencies, entities or groups in other states and New Jersey for the purpose of encouraging and permitting the reciprocal acceptance of technology data and information concerning the evaluation and verification of energy and environmental technologies; and

- The NJDEP shall work closely with the State Treasurer to include in State bid specifications, as deemed appropriate by the State Treasurer, any technology verified under the Energy and Environment Technology Verification Program.

1.2 Technology Verification Report

The Downstream Defender® is an advanced vortex separator designed to utilize the principles of swirl-enhanced gravity separation to remove Total Suspended Solids (TSS), trash and hydrocarbons from stormwater runoff. It is a structural Best Management Practice (BMP) installed underground as a permanent part of the storm drain line to reduce the overall load of oil, solids and floatables conveyed through the storm drain to receiving waters.

Hydro International received New Jersey Corporation for Advanced Technology (NJCAT) verification of claims for the Downstream Defender in August 2015 (1) based on the *New Jersey Department of Environmental Protection Laboratory Protocol to Assess Total Suspended Solids Removal by a Hydrodynamic Sedimentation Manufactured Treatment Device (2) dated January 25, 2013*. The report was submitted to NJDEP and the Downstream Defender was subsequently NJDEP certified for use as a 50% TSS removal device on August 18, 2015.

This report summarizes subsequent Downstream Defender TSS removal efficiency testing and performance results, which were conducting according to the NJDEP protocol with three significant exceptions:

- As vortex separators such as the Downstream Defender are typically used to remove the coarser "settleable" fraction of solids in stormwater runoff, this testing evaluated the removal efficiencies of the NJDEP test sediment down to 50 µm at five tested flow rates up to a maximum tested flow rate of 1.38 cfs. Under the NJDEP protocol, performance is verified based on a broad particle size distribution with particles ranging from 0.45 µm to 1000 µm where 45% of the material is finer than 50 µm, and performance is expressed as an "annualized weighted removal efficiency" calculated by weighting the removal efficiency results from five tested flow rates.
- Over and above the requirements of the NJDEP protocol, the effluent water quality samples from the removal efficiency tests were analyzed for particle size distribution so that the TSS removal efficiency results for discrete particle size bands could be calculated.
- The Scour Testing portion of the protocol was not conducted.

Since the performance testing does not fully comply with the NJDEP Protocol, it is an inadequate basis for NJDEP certification. Consequently, Hydro International will not be submitting this NJCAT Downstream Defender verification report to NJDEP for certification.

1.3 Applicant Profile

Hydro International, founded in 1980 in the United Kingdom, was formed to promote hydrodynamic vortex separators and vortex flow controls around the world. Today the company provides a wide range of technologies to the wastewater, stormwater, industrial and combined sewer overflow sectors of the water industry. The company is headquartered in Clevedon, England and has been publicly listed on the Alternative Investment Market of the London Stock

Exchange since 2005.

Hydro International has state-of-the-art laboratory facilities located in Clevedon, England and Portland, Maine, where research and product engineers conduct development and verification programs to evaluate new and existing products. Hydro currently has 170 employees in the United Kingdom, United States, the Middle East and Asia. Its office locations include:

Americas Stormwater
94 Hutchins Drive
Portland, Maine 04102
Tel: +1 (207) 756-6200

Americas Wastewater
2925 NW Aloclek Drive, Suite 140
Hillsboro, OR 97124
Tel: +1 (503) 615-8130

Headquarters, European Stormwater
Shearwater House
Clevedon Hall Estate
Victoria Road, Clevedon BS21 7RD
Tel: +44 (0) 1275 878371

European Wastewater
Prickwillow Road
Ely, Cambridgeshire CB7 4TX
Tel: +44 (0) 1353 645700

1.4 Key Contacts

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Executive Director
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Lisa Lemont, CPSWQ
Business Development Manager
Hydro International
94 Hutchins Drive
Portland, ME 04102
207-321-3740
llemont@hydro-int.com

2. The Downstream Defender

The Downstream Defender® is an advanced vortex separator designed to utilize the principles of swirl-enhanced gravity separation to remove Total Suspended Solids (TSS), trash and hydrocarbons from stormwater runoff. The Downstream Defender has a tangential inlet to introduce a rotary flow path to the precast treatment chamber while crosslink polyethylene (PEX) flow-modifying internal components stabilize the swirling flow path to reduce turbulence **(Fig.1).**

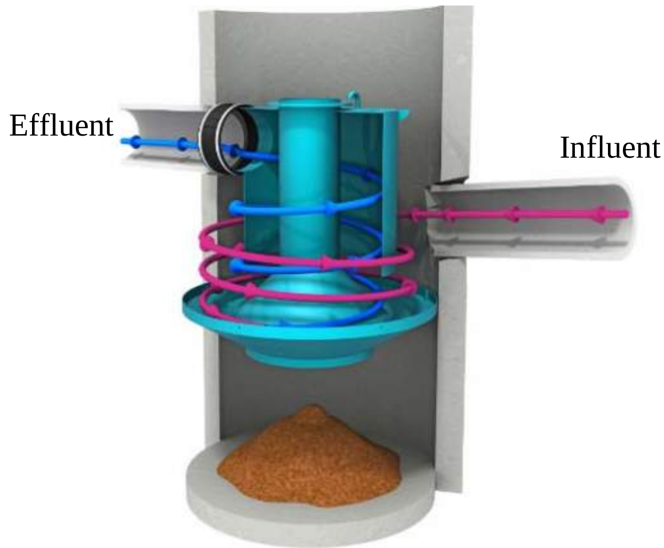


Figure 1 Swirling Flow Path of the Downstream Defender

Stormwater enters the Downstream Defender through a submerged tangential inlet. Hydrocarbons and other floatable solids rise to the surface where they are captured in the chamber as the stormwater spirals downward around the interior cylindrical baffle. When it reaches the center cone the flow changes direction from downward to upward, passing through a zero flow velocity “shear” zone where solids fall out of the flow and into the pollutant storage sump. After flow is deflected upward by the center cone, it spirals upwards around the center shaft inside the cylindrical baffle and discharged via the effluent pipe. To prevent washout, a benching skirt protects settled particles in the pollutant storage sump from high scour velocities.

The Downstream Defender is available in five standard model sizes as shown in **Table 1**.

Table 1 Specifications of Standard Downstream Defender Model Sizes

Downstream Defender Model	Manhole Diameter (ft)	Hydraulic Capacity (cfs)	Maximum Pipe Diameter (in)	Oil Storage Capacity (gal)	Sediment Storage Capacity (yd^3)
4-ft	4-ft	3.0	12	70	0.70
6-ft	6-ft	8.0	18	216	2.10
8-ft	8-ft	15.0	24	540	4.65
10-ft	10-ft	25.0	30	1,050	8.70
12-ft	12-ft	38.0	36	1,770	14.70

3. Downstream Defender Performance Evaluation

The objective of this performance evaluation was to determine the maximum flow rate at which the Downstream Defender removes >80% Total Suspended Solids when considering NJDEP test sediment in the 50 µm to 1000 µm particle size range.

The test setup and procedures were conducted in accordance with the New Jersey Department of Environmental Protection Laboratory Protocol to Assess Total Suspended Solids Removal by a Hydrodynamic Sedimentation Manufactured Treatment Device dated January 25, 2013.

The testing was conducted on a 4-ft Downstream Defender at Hydro International's hydraulic testing facility at 94 Hutchins Drive, Portland, Maine 04102 from May to June of 2015. In compliance with the requirement that the performance evaluation be independent, all testing was conducted under the supervision of third party witnesses from FB Environmental Associates, Inc.

The particle size distributions of the feed sediment samples were analyzed by the independent analytical laboratory GeoTesting Express in Acton, Massachusetts. The particle size distributions of the effluent samples were analyzed by the independent analytical laboratory Microtrac, Inc. in York, Pennsylvania.

Hydro opted to follow the sediment analysis methods as required by the ETV-Canada protocol, which uses the New Jersey Particle Size Distribution as a test blend, for analyzing the feed sediment and the effluent sediment. The ETV-Canada procedure was written by a panel of independent governing bodies, independent testing laboratories and manufacturers. The procedure requires that the influent determinations be based on the ASTM D422-63 method because of the test blend's broad spectrum of particle sizes. This method, which uses a hydrometer, was deemed the best fit to analyze concentrations at particle sizes at the specified cut points, though one of the limitations of the method is its accurateness below 20 micron.

For the effluent, however, the assumption is that much of the coarse material (>250 microns) has been removed and therefore the ISO 13320 (2009) method is preferable because laser diffraction is more accurate at analyzing fines (at many different cut points) than a hydrometer.

All water quality samples for the removal efficiency testing were collected, labeled and sealed under the direct supervision of the independent observer from FB Environmental and analyzed by Maine Environmental Laboratory, an independent laboratory located in Yarmouth, Maine.

3.1 Laboratory Setup

The test unit was a 4-ft Downstream Defender comprised of full scale, commercially available 4-ft Downstream Defender internal components installed in a 4-ft round plastic manhole chamber with a sump access/viewing port, which was consistent in all key dimensions with the precast chambers used for commercial sales **(Fig. 2)**. Measurements of the key dimensions were independently confirmed by FB Environmental Associates, Inc.

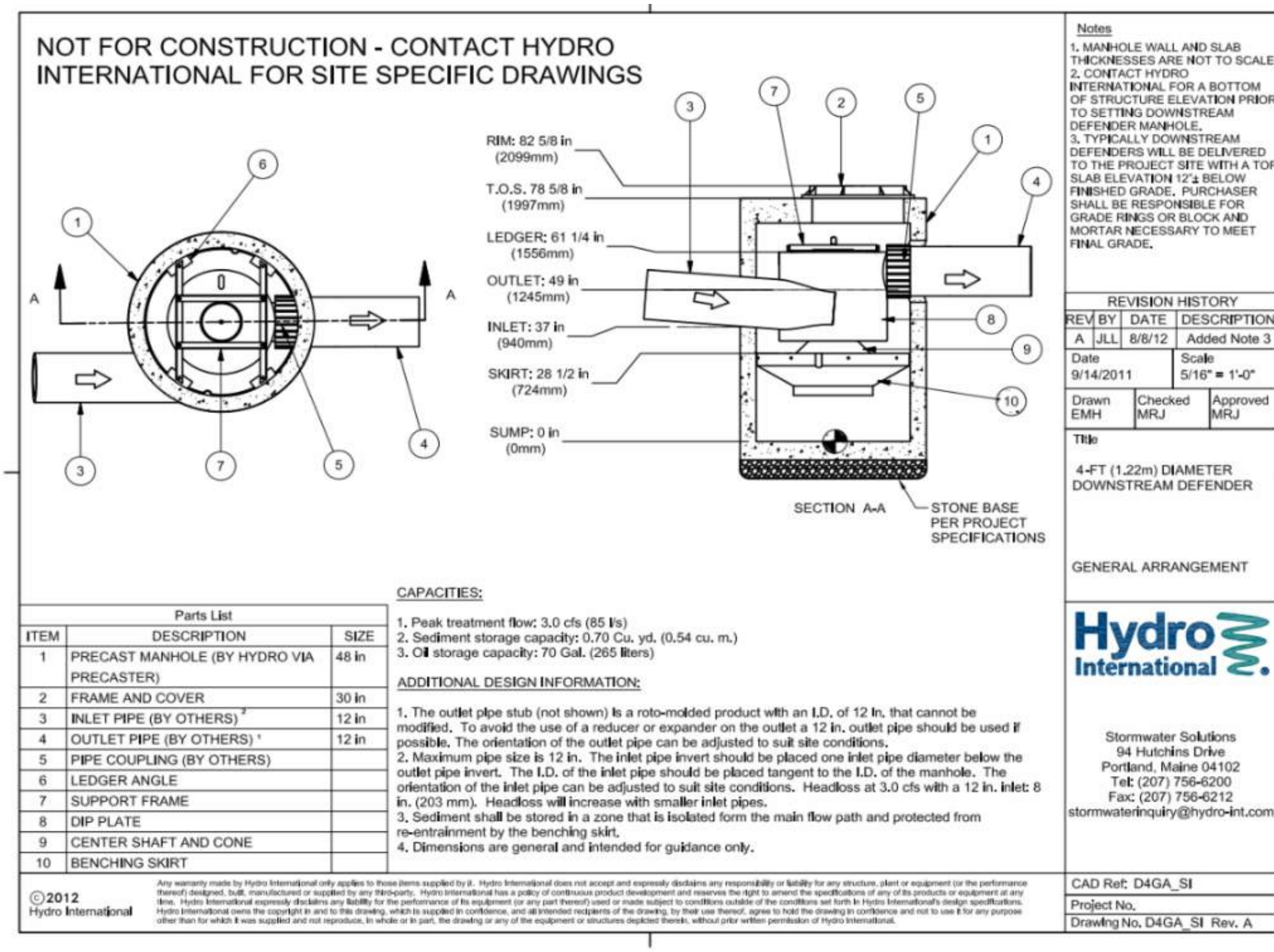


Figure 2 4-ft Downstream Defender

The laboratory setup consisted of a recirculating closed loop system with an 8-inch submersible Flygt pump that conveyed water from a 23,000 gallon reservoir through a PVC pipe network to the 4-ft Downstream Defender **(Fig. 3)**. The flow rate of the pump was controlled by a GE Fuji Electric AF-300 P11 Adjustable Frequency Drive motor and measured by an EMCO Flow Systems 4411e Electromagnetic Flow Transmitter.

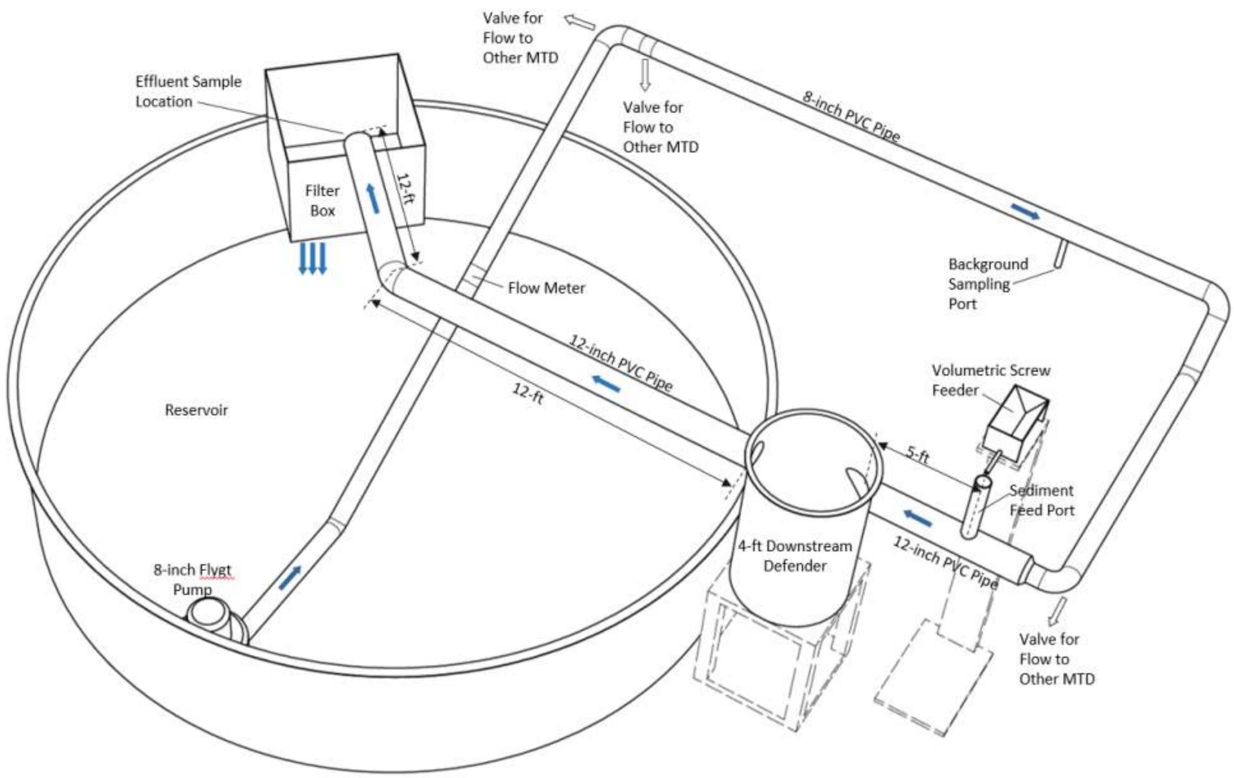


Figure 3 Laboratory Testing Arrangement

A series of three flow isolation valves were located between the Flygt pump and the Downstream Defender, which allows flow to bypass the Downstream Defender if fully opened. These valves were installed as part of the piping network to direct flow to three other manufactured stormwater and wastewater treatment systems installed at the test facility along the same piping network, and were fully closed throughout the entire period from May to June 2015 when the Downstream Defender testing was conducted.

A background sampling port was installed about 27 feet upstream of the Downstream Defender. The Downstream Defender effluent discharged freely from the effluent pipework, where grab samples were taken. The free discharge flowed through a filter box fitted with 1 micron filter socks in order to remove the majority of fine sediment that remained in the flow stream **(Fig.4).** The filter box was located on the opposite side of the reservoir as the submersible pump in order to keep the background TSS concentrations low over the duration of the removal efficiency tests.

Figure 4 Effluent Sampling Location Situated above the Filter Box

The water temperature within the reservoir was regulated by a Hayward 350FD pool heater, which is used to reduce any volatility in the test data that could potentially be caused by variability in water temperatures between test runs. The night before a test run the Hayward 350FD was set to 80°F. It was then turned off the morning of each test run at least one hour before the test began. The Hayward 350FD assembly includes a small recirculation pump that causes a gentle current in the reservoir, which could potentially cause high background concentration readings during testing by carrying sediment discharged during a test run back to the main reservoir feed pump more quickly. Turning the heater off allowed any water movement in the reservoir to stop before the beginning of testing. The Hayward 350FD remained off throughout the entire duration of each test run. The test reservoir temperature was measured and recorded at 30 second intervals by a Lascar thermometer and temperature logger over the duration of each test.

During the test runs, test sediment was introduced into the flow at a consistent, calibrated rate by an Auger Feeder Model VF-2 volumetric screw feeder situated atop a 4-inch port located 5 feet upstream of the Downstream Defender test unit. The location of the port is shown in **Fig. 5a**.

The Downstream Defender sump measures 18 inches in height from the bottom of the internal components. It was fitted with a false bottom positioned 9 inches from the true sump bottom to simulate a 50% full condition **(Fig. 5b).** This is the test condition required by the NJDEP test protocol. The false bottom was secured to the chamber and sealed around the edges to prevent any material from collecting below. Since scour testing was not conducted during this testing, the scour test false bottom shown in **Figure 5b** was not installed. It was used in prior testing to comply with the NJDEP test protocol.

The test vessel has a rectangular access port located on the sump wall (**Fig. 6a-b**). The access port eliminates the need for confined space entry into the Downstream Defender to clean the unit between test events.

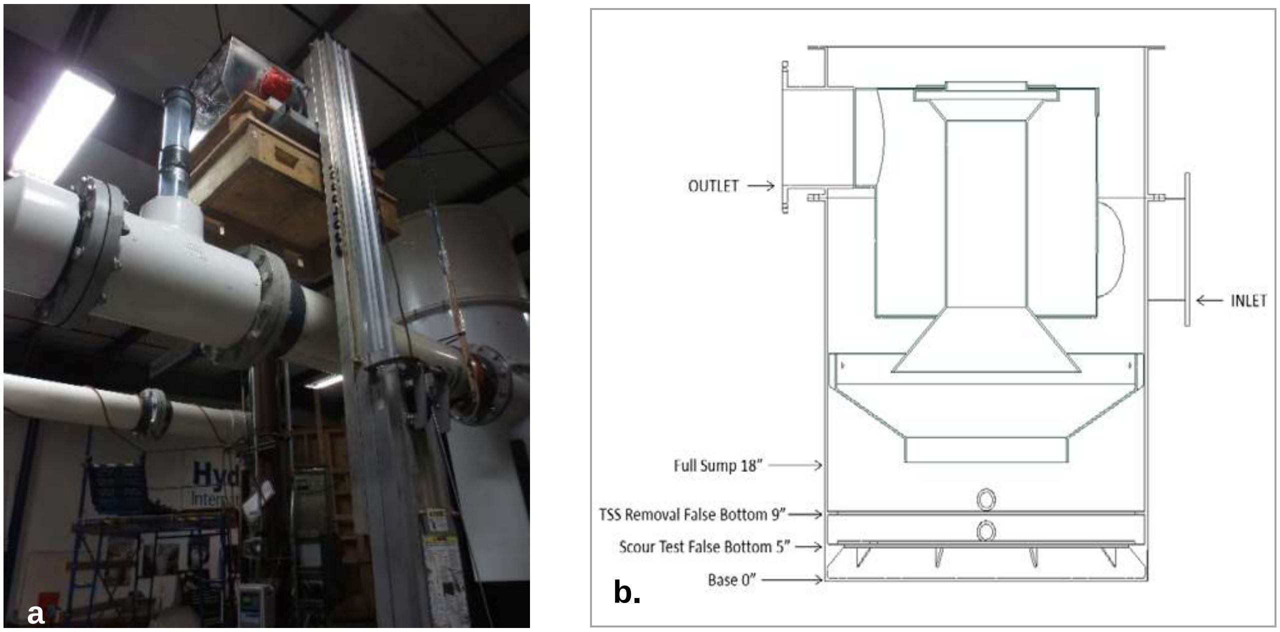


Figure 5 a) Influent Feed Port for Removal Efficiency Testing, b) False Bottom Locations

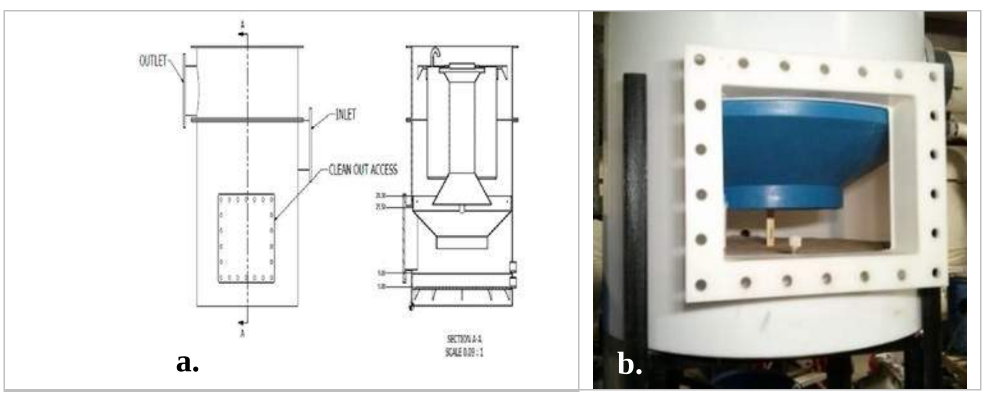


Figure 6 a) Schematic Showing Location of Sump Access Port below Active Separation Zone, b) Photo of the Sump through the Sump Clean-Out Port

To ensure dimensional consistency with a commercial unit, the inside of the sump access port is fitted with an insert fabricated to be flush with the interior of the cylindrical manhole wall (**Fig.7**). Therefore the viewing port did not provide any additional sump storage capacity and the interior of the test vessel is dimensionally consistent with a standard commercial Downstream Defender.

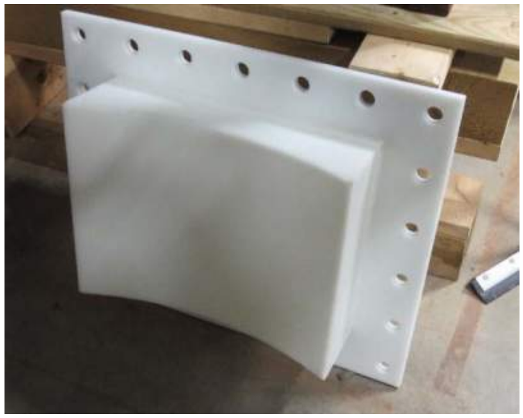


Figure 7 Sump Access Port sits Flush with Interior Manhole Wall

3.2 Test Sediment

The feed sediment used for the removal efficiency testing was high purity silica (SiO_2 99.8%) supplied by two different commercial silica suppliers, blended in the proportions required to comply with the particle size distribution required by the NJDEP protocol.

Prior to the start of the removal efficiency testing, 4 large batches of test sediment were blended by Hydro International in the presence of the independent observer. Three sediment samples approximately 400 mL in volume were composited from 100 mL subsamples collected from each of the four batches under the supervision of the independent observer. Under the supervision of the independent observer, the 4 batches were sealed in 5 gallon buckets and set aside until testing began. The three composited samples were sealed, signed and packaged for independent transport to the outside laboratory under the supervision of the independent observer. The independent laboratory, GeoTesting Express, analyzed the particle size distribution of each of the three samples using ASTM D 422-63. The three samples were then averaged and the results shown in **Table 2**.

Table 2 NJDEP Test Feed Sediment Particle Size Distribution

Particle Size	Particle Size Distribution (% Finer Than)			
(µm)	**Sample 1**	**Sample 2**	**Sample 3**	**Test Sediment Average**
1000	100	100	100	100.00
500	95	95	95	95.00
250	90	90	90	90.00
150	74	76	74	74.67
110	64	66	64	64.67
75	52	53	52	52.33
53	48	48	48	48.00
32.1	43	45	44	44.00
21	35	37	38	36.67
12.3	29	32	27	29.33
8.9	23	23	21	22.33
6.4	18	19	16	17.67
4.5	13	14	13	13.33
3.3	9	11	8	9.33
1.4	5	5	4	4.67
d_{50} (µm)	64.3	60.3	63.3	62.6

Because the verification goal was to verify the removal rate of the Downstream Defender down to 50 micron, the test sediment particle size distribution results are expressed in **Table 3** and **Fig. 8** below as both the entire particle size distribution range and the fraction of sediment greater than or equal to 50 µm.

Table 3 Test Feed Sediment Particle Size Distributions

Particle Size	Particle Size Distribution (%Finer Than)					
(μm)	NJDEP PSD	Feed Sediment Down to 250 μm	Feed Sediment Down to 150 μm	Feed Sediment Down to 100 μm	Feed Sediment Down to 75 μm	Feed Sediment Down to 50 μm
1000	100.00	100.00	100.00	100.00	100.00	100.00
500	95.00	50.00	80.26	87.13	89.51	90.49
250	90.00	0.00	60.52	74.27	79.02	80.98
150	74.67	0.00	0.00	34.82	46.86	51.82
100	61.14	0.00	0.00	0.00	18.48	26.08
75	52.33	0.00	0.00	0.00	0.00	9.33
50	47.43	0.00	0.00	0.00	0.00	0.00
20	35.92	0.00	0.00	0.00	0.00	0.00
8	20.62	0.00	0.00	0.00	0.00	0.00
5	14.41	0.00	0.00	0.00	0.00	0.00
2	6.14	0.00	0.00	0.00	0.00	0.00
d_{50} (μm)	63	500	233	188	160	146

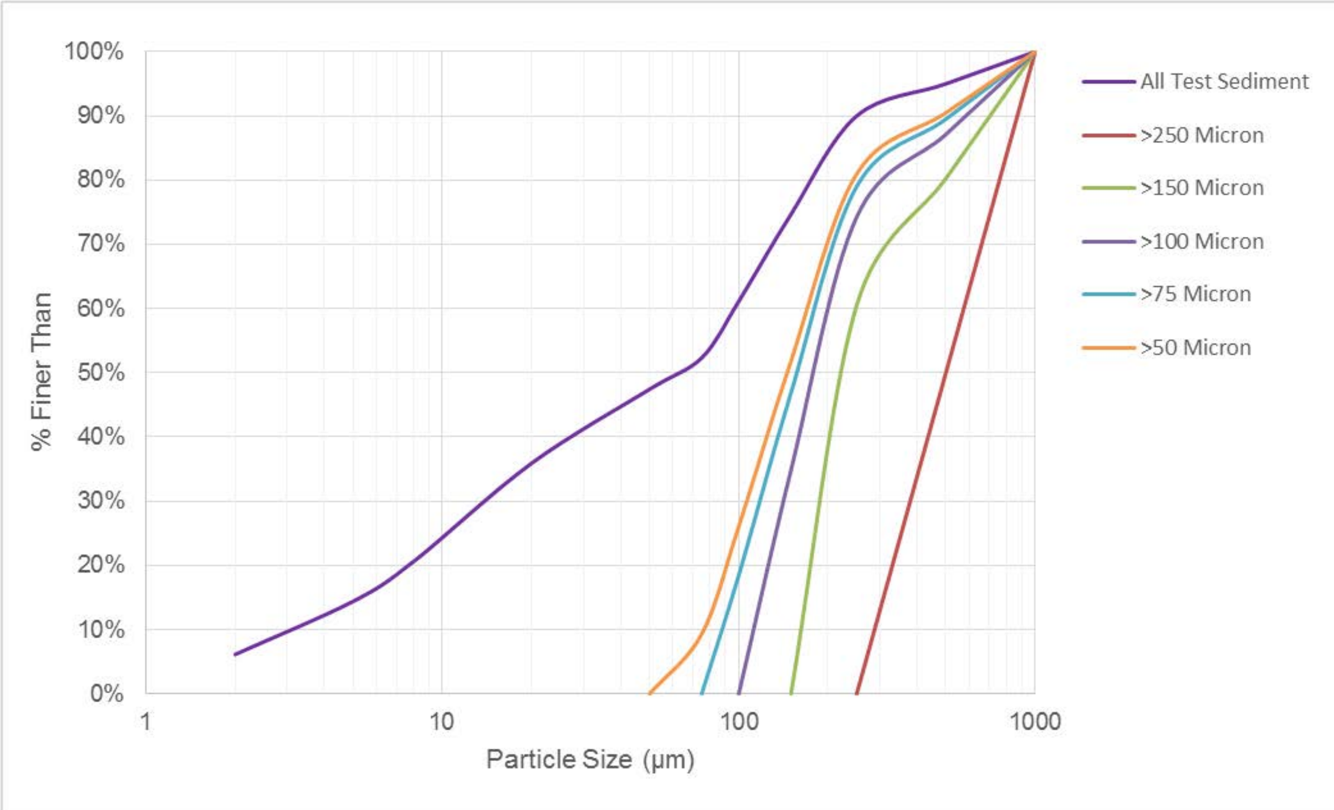


Figure 8 Particle Size Distribution of Test Sediment

3.3 Testing Procedure

Removal efficiency testing was conducted in accordance with Section 5 of the NJDEP Laboratory Protocol for HDS MTDs. Captured sediment was removed from the sump between each flow rate trial.

Flow Rate

A total of five flow rates were tested: 0.27 cfs (7.66 L/s), 0.54 cfs (15.29 L/s), 0.82 cfs (23.18 L/s), 1.07 cfs (30.31 L/s), and 1.38 cfs (39.19 L/s). During each flow rate test, the flow meter data logger recorded flow rate at a minimum of once per minute.

Up to the maximum tested flow rate of 1.38 cfs, the ***target treatment goal*** was to remove at least 80% of test sediment particles > 50 µm. An additional objective was to determine removal performance within specific particle size bands: 1000-250 µm, 1000-150 µm, 1000-100 µm, 1000-75 µm, and 1000-50 µm.

Temperature

The Hayward 350FD pool heater remained off throughout the entire duration of each test run. The water temperature was recorded at 30 second intervals by a Lascar thermometer and temperature logger over the duration of each test to ensure that the temperature did not exceed 80 degrees Fahrenheit at any time during the test.

Influent Concentration

The test sediment mass was fed into the flow stream at a known rate that would generate a total influent concentration of 200 ±10% mg/L using a screw auger with a calibrated funnel. To ensure that sediment was introduced at a rate within 10% of the targeted value of 200 mg/L influent concentration throughout the duration of the testing, six calibration samples were taken from the injection point over the course of the testing for each tested flow rate. The calibration samples were timed at evenly spaced intervals over the total duration of the test for each tested flow rate and timed such that no collection interval would exceed 1 minute in duration. Each calibration sample was a minimum of 100 mL collected in a clean 1-liter container over an interval timed to the nearest second. These samples were weighed to the nearest milligram.

The average influent TSS concentration was calculated using the total mass of the test sediment added during dosing divided by the volume of water that flowed through the MTD during dosing **(Equation 1)**. The mass extracted for calibration samples was subtracted from the total mass introduced to the system to determine the total mass of test sediment added during dosing when removal efficiency was subsequently calculated. The volume of water that flows through the MTD was calculated by multiplying the average flow rate by the time of sediment injection only.

$$\textbf{Average Influent Concentration} = \frac{\text{Total mass added}}{\begin{array}{c}\text{Total volume of water flowing}\\ \text{through the MTD during addition}\\ \text{of test sediment}\end{array}}$$

Equation 1 Calculation for Average Influent Concentration

Influent Concentration within Particle Size Bands

Since an additional objective of the testing was to quantify the Downstream Defender removal performance within specific particle size bands, the influent concentration within those specific particle size bands had to be determined. **Equation 2** was used to determine the influent concentration within a specific particle size band. The total influent concentration calculated in Equation 1 was multiplied by the % of sediment within the particle size range from **Table 3**.

$$\textbf{Influent Concentration}_{\textbf{in Range}} = (\text{\% Particles}_{\text{in Range}}) * (\text{Average Influent Concentration})$$

Equation 2 Calculation for Influent Concentration in Particle Size Band

Collection and Analysis of Effluent Samples

The Effluent Grab Sampling Method was used as per Section 5D of the NJDEP protocol. Once a constant rate of flow and test sediment feed were established, a minimum of three MTD detention times passed before the first effluent water quality sample was collected. The time interval between sequential effluent water quality samples was evenly spaced during the test sediment feed period to obtain a total of 15 water quality samples for each flow rate. Duplicate effluent samples were collected with the first, middle and last water quality samples so they could be composited and analyzed for particle size distribution. All effluent samples were collected in clean half-liter bottles using a sweeping grab sampling motion through the effluent discharge as described in Section 5D of the protocol. Samples were then time stamped and placed into separate boxes for transportation to the water quality analytical laboratory and the particle size analytical laboratory.

The collection time for each effluent sample was recorded. Each collected sample was time stamped, sealed and signed by the independent observer.

Collection and Analysis of Background Samples

Background samples were taken at the background sample port located upstream of the Downstream Defender test setup. Influent background samples were taken at the same time as odd numbered effluent grab samples (first, third, fifth, etc.). The collection time for each background sample was recorded. Each collected sample was time stamped, sealed and signed by the independent observer.

Quality Assurance and Chain of Custody

FB Environmental acted as the independent observer for the duration of all testing and packing of the water quality samples for shipment to the independent lab for analysis. At the conclusion of the test when all of the collected effluent and background water quality samples were placed into the delivery box, the box was sealed and the seal was signed by the independent observer. All water quality samples were analyzed by Maine Environmental Laboratory in accordance with ASTM D3977-97 (re-approval 2007) “Standard Test Methods for Determining Sediment Concentrations in Water Samples”. Effluent particle size samples were collected and sent to Microtrac, Inc. of York, Pennsylvania to be analyzed for particle size distribution in accordance with ISO 13320 (2009).

Removal Efficiency Calculation

The background data were plotted on a curve for use in adjusting the effluent samples for background concentration. The overall removal efficiency of the Downstream Defender was then calculated as per Equation 3.

$$\textbf{Removal Efficiency (\%)} = \frac{\left(\begin{matrix}\text{Average Influent} \\ \text{Concentration}\end{matrix} - \begin{matrix}\text{Adjusted} \\ \text{Average Effluent*} \\ \text{Concentration}\end{matrix}\right)}{\text{Average Influent Concentration}} \times 100$$

* Adjusted for background concentration

Equation 3 Equation for Calculating removal Efficiency

To determine the removal efficiency within specific particle size bands, effluent particle size distributions reported from Microtrac, Inc. were used. To determine the effluent concentration within a specific particle size range, the percentage of particles in the particle size band was multiplied by the overall adjusted average effluent concentration. The influent concentration from **Equation 2** was then used to calculate the removal efficiency within the particle size band as per **Equation 4**.

$$\textbf{Removal Efficiency}_{\textbf{in Range}}\ \textbf{(\%)} = \frac{\text{Influent Concentration}_{\text{in Range}} - \text{Effluent Concentration}_{\text{in Range}}}{\text{Influent Concentration}_{\text{in Range}}} \times 100$$

Equation 4 Equation for Calculating Particle Size Band Removal Efficiency

4. Performance Test Results

The five flow rate test measurements and calculated results are summarized in this section.

4.1 Flow Rate

Flow rate results are shown in **Table 4**. The water temperature was verified to be less than 80 °F throughout each test. The flow rate coefficient of variance (COV) was confirmed to be less than 0.03 for each flow rate.

Table 4 Flow Rate Summary Results

Mean Flow Rate (cfs / lps)	Flow Rate COV	Trial Date	Max Water Temperature °F	Detention Time (sec)	Test Duration (Sec)	Total Flow Volume (L)
0.27 / 7.66	0.026	6/4/2015	78.9	180	3,304	25,309
0.54 / 15.29	0.013	5/26/2014	79.1	90	1,646	25,167
0.82 / 23.18	0.011	5/28/2015	79.2	60	1,201	27,839
1.07 / 30.31	0.008	6/2/2015	79.2	46	974	29,522
1.38 / 39.19	0.006	6/9/2015	79.0	36	839	32,880

4.2 Sediment Dosing Rate

Sediment dosing rate data is shown in **Table 5**. Sediment was introduced at the targeted feed rate required for an average influent concentration of 200 mg/L ±10%. The average influent concentrations ranged from 196 mg/L to 213 mg/L, a variation of -2% to 6.5% from the target. Six calibration samples were collected to verify the sediment feed rate for each flow rate trial. The feed rate COVs ranged from 0.015 to 0.04 well below the <0.10 COV requirement..

Table 5 Sediment Flow Rate Dosing Rates

Mean Flow Rate (cfs / lps)	No. Calibration Samples	Calibration Sample Time (sec)	Mass of Feed Sediment Used (g)	Dosing Rate (mg/min)	Feed Rate COV	Average Influent Concentration (mg/L)
0.27 / 7.66	6	60	5,159	93,689	0.04	204
0.54 / 15.29	6	60	5,264	191,883	0.017	209
0.82 / 23.18	6	60	5,929	296,189	0.015	213
1.07 / 30.31	6	60	6,158	379,569	0.02	209
1.38 / 39.19	6	45	6,452	461,416	0.04	196

4.3 Background Concentration

Eight background samples were taken during each flow rate trial. Background concentrations ranged from ND (2 mg/L) to 16 mg/L. At no point was the background concentration shown to exceed the 20 mg/L maximum allowed by the protocol. Background concentrations are shown in **Table 6** and **Figure 9**.

Table 6 Background Concentrations

Mean Flow Rate (cfs / lps)	No. Background Samples	Measured Background Suspended Sediment Concentration (mg/L)			
		Min.	Max.	Mean	Median
0.27 / 7.66	8	2.0	11.0	6.4	6
0.54 / 15.29	8	2.0	16.0	8.3	7.5
0.82 / 23.18	8	2.0	13.0	5.6	3.0
1.07 / 30.31	8	2.0	15.0	5.5	3.0
1.38 / 39.19	8	2.0	11.0	4.9	2.0

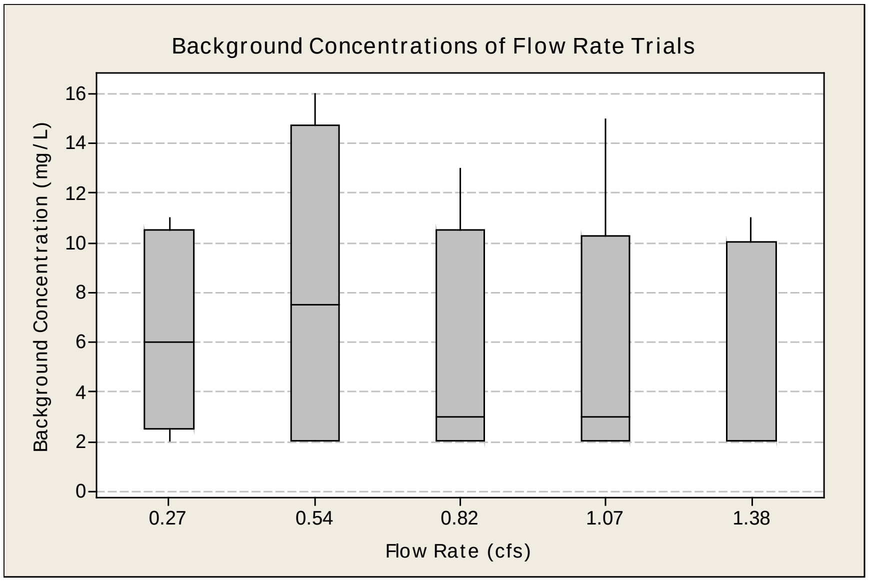


Figure 9 Background Concentrations

4.4 Removal Efficiency

This section summarizes the overall TSS removal efficiency and the removal efficiency by particle size band width for each of the five flow rates.

Overall Removal Efficiency

The effluent concentrations from each water quality sample were adjusted by subtracting the background concentration at the time the sample was taken. The overall removal efficiencies for each flow rate trial were calculated as per **Equation 3** from Section 3.3 and shown in **Table 7**.

Table 7 NJDEP Test Sediment Removal Efficiency Results

Flow Rate Trial (cfs / lps)	Average Influent Concentration (mg/L)	Adjusted Effluent Concentration (mg/L)	Removal Efficiency (%)
0.27 / 7.66	204	81	60.3
0.54 / 15.29	209	100	52.2
0.82 / 23.18	213	110	48.4
1.07 / 30.31	209	122	41.6
1.38 / 39.19	196	118	39.8

Removal Efficiency by Particle Size Band

The effluent particle size distributions were analyzed for each flow rate trial. The concentrations of sediment in the effluent down to 250, 150, 100, 75 and 50 µm were calculated using the reported PSDs, which can be found in **Appendix A**. The removal efficiency within each particle size band was then calculated as per **Equation 4** from Section 3.3. Results are shown in **Tables 8-12.**

Table 8 - 0.27 cfs Test Results by Particle Size Band

Particle Size Band	D50 for Each Band (µm)	Influent Concentration (mg/L)	Effluent Concentration (mg/L)	% Removal of TSS in Range
1,000 µm to 250 µm	500	20.4	0.0	100.0
1,000 µm to 150 µm	233	51.6	0.1	99.8
1,000 µm to 100 µm	188	79.2	0.9	98.8
1,000 µm to 75 µm	160	97.2	2.0	98.0
1,000 µm to 50 µm	146	107.2	5.2	95.2

At a flow rate of 0.27 cfs, the 4-ft Downstream Defender removed 100.0% of all test sediment down to 250 µm, 99.8% of all test sediment down to 150 µm, 98.8% of all test sediment down to 100 µm, 98.0% of all test sediment down to 75 µm and 95.2% of all test sediment down to 50 µm **(Table 8)**.

Table 9 – 0.54 cfs Test Results by Particle Size Band

Particle Size Band	D50 for Each Band (µm)	Influent Concentration (mg/L)	Effluent Concentration (mg/L)	% Removal of TSS in Range
1,000 µm to 250 µm	500	20.9	0.0	100.0
1,000 µm to 150 µm	233	53.0	1.3	97.6
1,000 µm to 100 µm	188	81.3	3.3	96.0
1,000 µm to 75 µm	160	99.7	6.6	93.3
1,000 µm to 50 µm	146	110.0	11.0	90.0

At a flow rate of 0.54 cfs, the 4-ft Downstream Defender removed 100.0% of all test sediment down to 250 µm, 97.6% of all test sediment down to 150 µm, 96.0% of all test sediment down to 100 µm, 93.3% of all test sediment down to 75 µm and 90.0% of all test sediment down to 50 µm. A summary of performance results by particle size range are shown in **Table 9**.

Table 10 – 0.82 cfs Test Results by Particle Size Band

Particle Size Band	D50 for Each Band (µm)	Influent	Effluent	% Removal of TSS in Range
		Concentration (mg/L)	Concentration (mg/L)	
1,000 µm to 250 µm	500	21.3	0.4	98.3
1,000 µm to 150 µm	233	54.0	2.3	95.7
1,000 µm to 100 µm	188	82.8	5.6	93.3
1,000 µm to 75 µm	160	101.5	9.3	90.8
1,000 µm to 50 µm	146	112.0	18.0	84.0

At a flow rate of 0.0.82 cfs, the 4-ft Downstream Defender removed 98.3% of all test sediment down to 250 µm, 95.7% down to 150 µm, 93.3% down to 100 µm, 90.8% down to 75 µm and 84.0% down to 50 µm. A summary of performance results by particle size range are shown in **Table10**.

Table 11 – 1.07 cfs Test Results by Particle Size Band

Particle Size Band	D50 for Each Band (µm)	Influent	Effluent	% Removal of TSS in Range
		Concentration (mg/L)	Concentration (mg/L)	
1,000 µm to 250 µm	500	20.9	0.4	98.0
1,000 µm to 150 µm	233	52.8	2.6	95.1
1,000 µm to 100 µm	188	81.1	6.0	92.6
1,000 µm to 75 µm	160	99.4	9.8	90.2
1,000 µm to 50 µm	146	109.7	17.2	84.3

At a flow rate of 1.07 cfs, the 4-ft Downstream Defender removed 98.0% of all test sediment down to 250 µm, 95.1% down to 150 µm, 92.6% down to 100 µm, 90.2% down to 75 µm and 84.3% down to 50 µm. A summary of performance results by particle size range are shown in **Table 11**.

Table 12 – 1.38 cfs Test Results by Particle Size Band

Particle Size Band	D50 for Each Band (µm)	Influent	Effluent	% Removal of TSS in Range
		Concentration (mg/L)	Concentration (mg/L)	
1,000 µm to 250 µm	500	19.6	0.4	97.8
1,000 µm to 150 µm	233	49.7	2.9	94.3
1,000 µm to 100 µm	188	76.2	7.0	90.8
1,000 µm to 75 µm	160	93.5	11.6	87.6
1,000 µm to 50 µm	146	103.2	20.2	80.4

At a flow rate of 1.38 cfs, the 4-ft Downstream Defender removed 97.8% of all test sediment down to 250 µm, 94.3% down to 150 µm, 90.8% down to 100 µm, 87.6% down to 75 µm and 80.4% down to 50 µm. A summary of performance results by particle size range are shown in **Table 12**.

5. Conclusions

As stated earlier, the objective of this performance evaluation was to determine the maximum flow rate at which the Downstream Defender removes >80% test sediment Total Suspended Solids in the 50 µm to 1000 µm particle size range with a d_{50} of 146 µm.

The five flow rate trials showed that at all tested flow rates up to 1.38 cfs; the Downstream Defender removed at least 97.88% of the test sediment down to 250 µm (d_{50} of 500 µm), 94.3% down to 150 µm (d_{50} of 233 µm), 90.8% down to 100 µm (d_{50} of 188 µm), 87.6% down to 75 µm (d_{50} of 160 µm), and 80.4% down to 50 µm (d_{50} of 146 µm).

The removal efficiency versus flow rate correlation for each particle size band is shown in **Figure 10**.

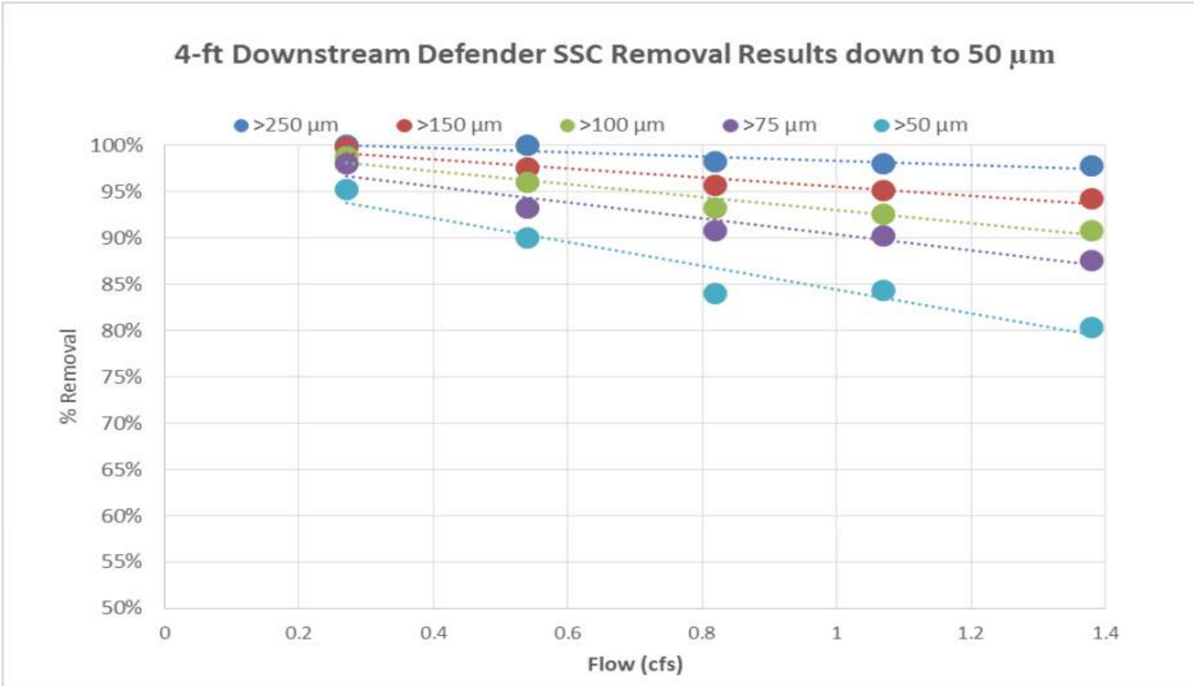


Figure 10 Downstream Defender Particle Size Band Removal Rates vs. Flow Rate

Scaling

The 4-ft Downstream Defender was found to remove 80.4% of test sediment (d_{50} of 146 µm) in the 50 µm to 1000 µm particle size range at a tested flow rate of 1.38 cfs, which corresponds to a 49.3 gpm/ft^2 loading rate. This surface loading rate is applied to the larger Downstream Defender model sizes to determine the flow rate at which they provide equivalent treatment **(Table 13)**.

Table 13 Flow Rates for >80% TSS Removal of Test Sediment in the 1000-50 µm Particle Size Range (d_{50} of 146 µm)

Downstream Defender Model	Manhole Diameter (ft)	Flow Rate for 80% TSS Removal Down to 50 µm (cfs)	Treatment Area (ft^2)	Loading Rate (gpm/ft^2)
4-ft	4-ft	1.38	12.6	49.3
6-ft	6-ft	3.11	28.3	49.3
8-ft	8-ft	5.52	50.3	49.3
10-ft	10-ft	8.62	78.5	49.3
12-ft	12-ft	12.42	113.1	49.3

NJDEP only certifies stormwater treatment devices that satisfy all aspects of their laboratory test protocols. ***Since this verification report does not qualify for NJDEP certification it will not be submitted by NJCAT to the Department.***

6. References

ASTM D422-63. *Standard Test Method for Particle-size Analysis of Soils.*

ASTM D3977-97. *Standard Test Methods for Determining Concentrations in Water Samples*.
Hydro International 2015. *Quality Assurance Project Plan for Downstream Defender® NJDEP Testing.* Prepared by H.I.L. Technology, Inc. dba Hydro International. March 20, 2015.

Canadian Environmental Technology Verification Program 2014. *Procedure for laboratory Testing of Oil-Grit Separators.* Prepared by the Toronto and Region Conservation Authority, September 2013. Revised: June 6, 2014 – Version 3.0

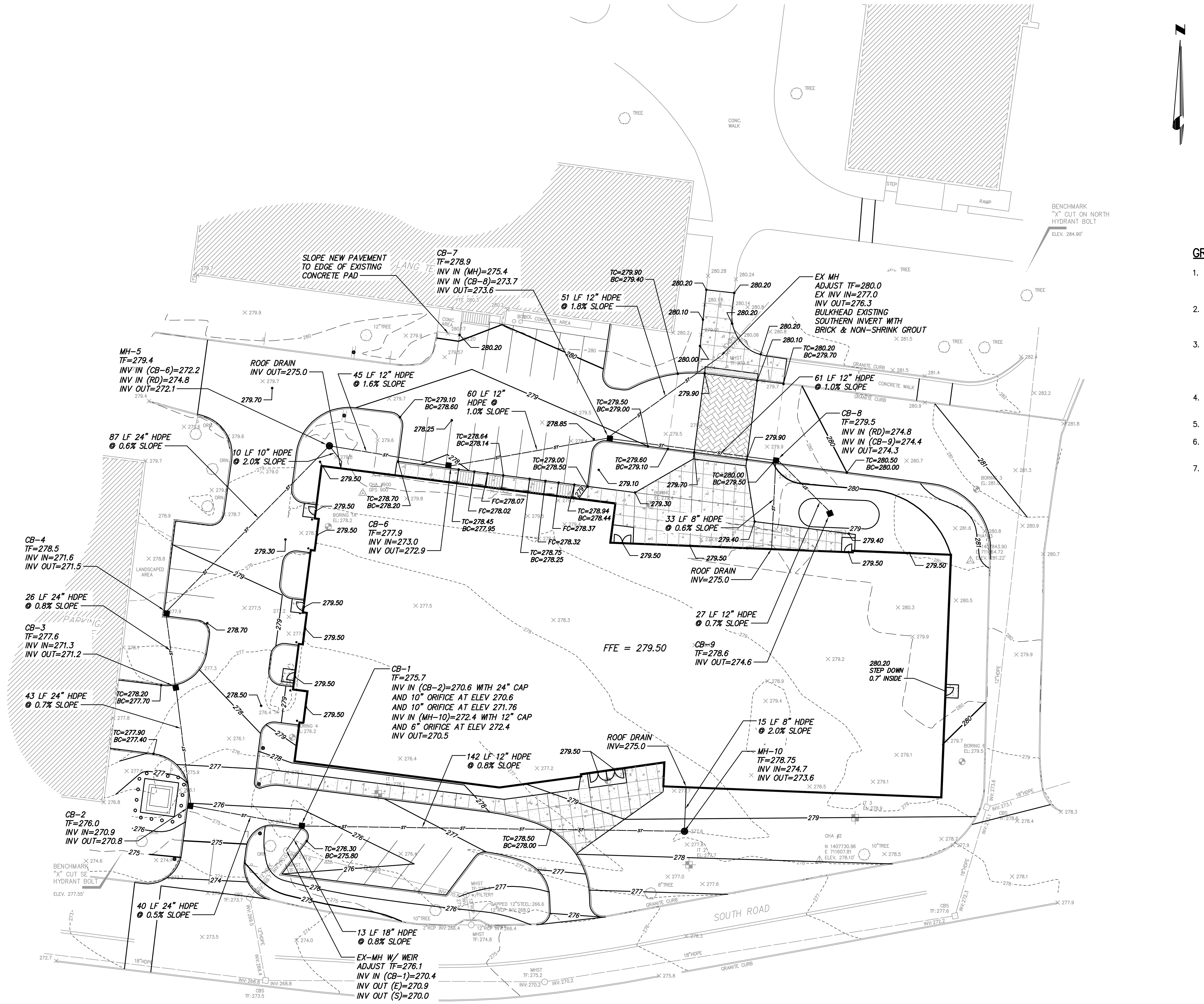
Hydro International 2015. *Verification Testing Report for the Downstream Defender® Stormwater Treatment Device*. Prepared by H.I.L. Technology, Inc. dba Hydro International. May 26, 2015.

New Jersey Corporation for Advanced Technology. *Downstream Defender® Stormwater Treatment Device: Hydro International.* August 2015.

NJDEP 2013. *New Jersey Department of Environmental Protection Procedure for Obtaining Verification of a Stormwater Manufactured Treatment Device from New Jersey Corporation for Advanced Technology*. Trenton, NJ. January 25, 2013.

NJDEP 2013. *New Jersey Department of Environmental Protection Laboratory Protocol to Assess Total Suspended Solids Removal by a Hydrodynamic Sedimentation Manufactured Treatment Device.* Trenton, NJ. January 25, 2013.

Appendix H
Grading and Erosion and Sediment Control Plans and Details



GRADING NOTES:

1. CONTRACTOR SHALL BLEND ALL NEW EARTHWORK INTO EXISTING GRADES AT LIMITS OF GRADING WORK. PROVIDE SMOOTH, ROUNDED TRANSITIONS AT ALL TOP AND BOTTOM OF SLOPES.
2. PITCH/SLOPE FINISH GRADE PAVEMENT SURFACES TO TRANSITION EVENLY BETWEEN SPOT GRADES. SURFACES SHOULD BE FREE FROM IRREGULARITIES TO PREVENT PONDING.
3. DURING GRADING OPERATIONS, DRAINAGE OF THE SITE AND ADJACENT AREAS SHALL BE MAINTAINED CONTINUOUSLY TO PREVENT EROSION OR OTHER DAMAGE. WHEN IT IS NECESSARY TO INTERRUPT SURFACE OR CLOSED DRAINAGE SYSTEMS, OR OTHER EXISTING UTILITIES, PROVIDE TEMPORARY FACILITIES UNTIL PERMANENT WORK IS COMPLETED.
4. CONTRACTOR TO GRADE ALL AREAS ON THE SITE TO PROVIDE POSITIVE DRAINAGE PER PLANS.
5. CONTOUR INTERVAL IS ONE FOOT.
6. MEET AND MATCH LINE AND GRADE OF EXISTING PAVEMENT SURFACES AND CURBS WITH NEW PAVEMENT SURFACES AND CURB INSTALLATIONS.
7. SEE EXISTING CONDITIONS PLAN FOR BENCHMARK INFORMATION.

ABBREVIATIONS:
TC = TOP OF CURB
BC = BOTTOM OF CURB
FC = FLUSH CURB
LP = LOW POINT
HP = HIGH POINT
TF = TOP OF FRAME
CB = CATCH BASIN
MH = MANHOLE

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Scale in feet

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BEFORE WORK IS STARTED, CONTRACTOR SHALL VERIFY ALL THE DIMENSIONS AT THE SITE AND IMMEDIATELY NOTIFY THE ARCHITECT OF ALL DISCREPANCIES.

ALTERATION OF THIS DOCUMENT BY OTHER THAN AN AUTHORIZED LICENSED REGISTERED ARCHITECT IS ILLEGAL AND A VIOLATION OF SECTION 7307 OF THE NEW YORK STATE EDUCATION LAW.

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Hudson Valley Community College
Troy, New York

Drawing Title :
GRADING & DRAINAGE PLAN

APN : 1612.1 | Date : February 28, 2017 | Drawn by : HAW

Drawing Number :
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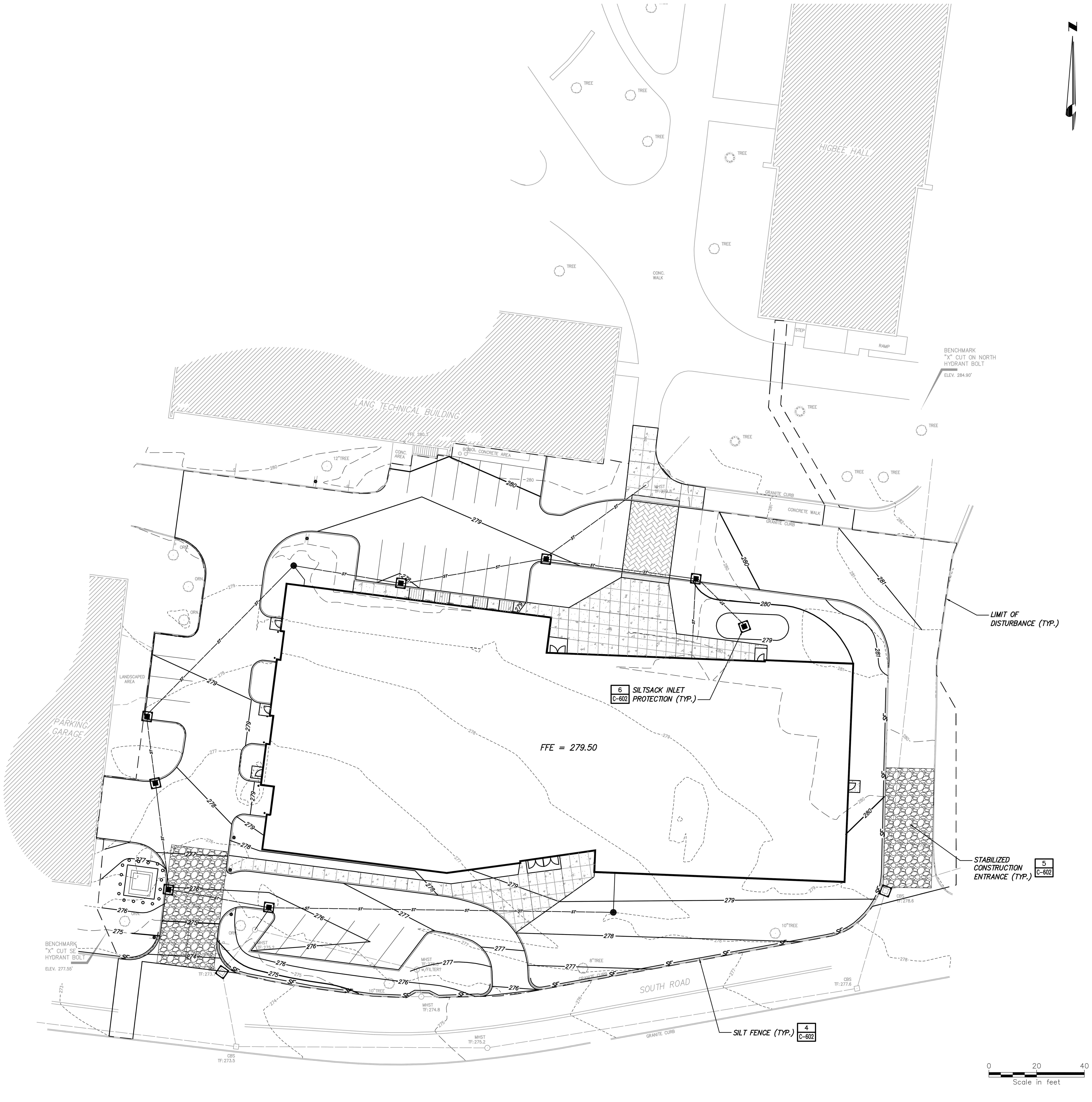

EROSION CONTROL NOTES

1. LAND DISTURBING ACTIVITIES SHALL NOT COMMENCE UNTIL APPROVAL TO DO SO HAS BEEN RECEIVED BY GOVERNING AUTHORITIES.
2. THE GENERAL CONTRACTOR SHALL STRICTLY ADHERE TO THE STORM WATER POLLUTION PREVENTION PLAN (SWPPP) DURING CONSTRUCTION OPERATIONS. EACH EROSION AND SEDIMENT CONTROL MEASURE SHALL REMAIN FOR THROUGHOUT THE DURATION OF CONSTRUCTION PERIOD UNLESS OTHERWISE SPECIFIED BY THE ENGINEER OR OWNER'S REPRESENTATIVE.
3. NO LAND CLEARING OR GRADING SHALL BEGIN UNTIL ALL PERIMETER EROSION AND SEDIMENT CONTROL MEASURES HAVE BEEN INSTALLED (SILT FENCE AND STABILIZED CONSTRUCTION ENTRANCE). TRAINED CONTRACTOR OR QUALIFIED INSPECTOR SHALL DETERMINE SIZE AND LENGTH OF EACH EROSION AND SEDIMENT CONTROL MEASURE BASED FIELD CONDITIONS.
4. SITE DISTURBANCE SHALL NOT EXCEED FIVE (5) ACRES OF SOIL AT ANY ONE TIME WITHOUT PRIOR WRITTEN AUTHORIZATION FROM NYSDEC.
5. ALL EXPOSED AREAS SHALL BE SEEDED AND MULCHED AS SPECIFIED WITHIN 7 DAYS OF FINAL GRADING.
6. INACTIVE PORTIONS OF THE SITE ARE TO BE SEEDED AND MULCHED AS SPECIFIED WITHIN 7 DAYS.
7. SEDIMENT AND EROSION CONTROL MEASURES SHALL BE INSPECTED AT LEAST ONCE EVERY SEVEN (7) DAYS OR MORE FREQUENTLY IF REQUIRED. ALL MAINTENANCE REQUIRED BY INSPECTION SHALL COMMENCE WITHIN 24 HOURS AND BE COMPLETED WITHIN 48 HOURS OF REPORT.
8. THIS PLAN SHALL NOT BE CONSIDERED ALL INCLUSIVE AS THE GENERAL CONTRACTOR SHALL TAKE ALL NECESSARY PRECAUTIONS TO PREVENT SOIL SEDIMENT FROM LEAVING THE SITE. CONTRACTOR SHALL TAKE ALL NECESSARY PRECAUTIONS TO CONTROL LITTER AND PREVENT CONSTRUCTION CHEMICALS AND DEBRIS FROM BECOMING A POLLUTANT.
9. GENERAL CONTRACTOR SHALL COMPLY WITH ALL STATE AND LOCAL ORDINANCES THAT APPLY.
10. ADDITIONAL EROSION AND SEDIMENT CONTROL MEASURES WILL BE INSTALLED IF DEEMED NECESSARY BY ON SITE INSPECTION.
11. IF INSTALLATION OF STORM DRAINAGE SYSTEM SHOULD BE INTERRUPTED BY WEATHER OR NIGHTFALL, THE PIPE ENDS SHALL BE COVERED WITH FILTER FABRIC.
12. CONTRACTOR SHALL BE RESPONSIBLE TO TAKE WHATEVER MEANS NECESSARY TO ESTABLISH PERMANENT SOIL STABILIZATION.
13. SEDIMENT SHALL BE REMOVED FROM SILT FENCE BEFORE IT IS 33% FULL.
14. AT THE END OF EACH WORK DAY DISTURBED SOILS ARE TO BE REGRADED TO DRAIN INTO TEMPORARY DIVERSION SWALES AND DISCHARGES FROM DEWATERING ACTIVITIES ARE TO BE DIRECTED INTO CATCH BASINS OR SWALES. LOCATIONS OF TEMPORARY DIVERSION SWALES SHALL BE DETERMINED BY THE TRAINED CONTRACTOR OR QUALIFIED INSPECTOR BASED ON FIELD CONDITIONS.

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Seal

New Gene Haas Center for Advanced Manufacturing Skills Building

Hudson Valley Community College
Troy, New York

Drawing Title:
EROSION & SEDIMENT CONTROL PLAN

APN: 1612.1 | Date: February 28, 2017 | Drawn by: HAW

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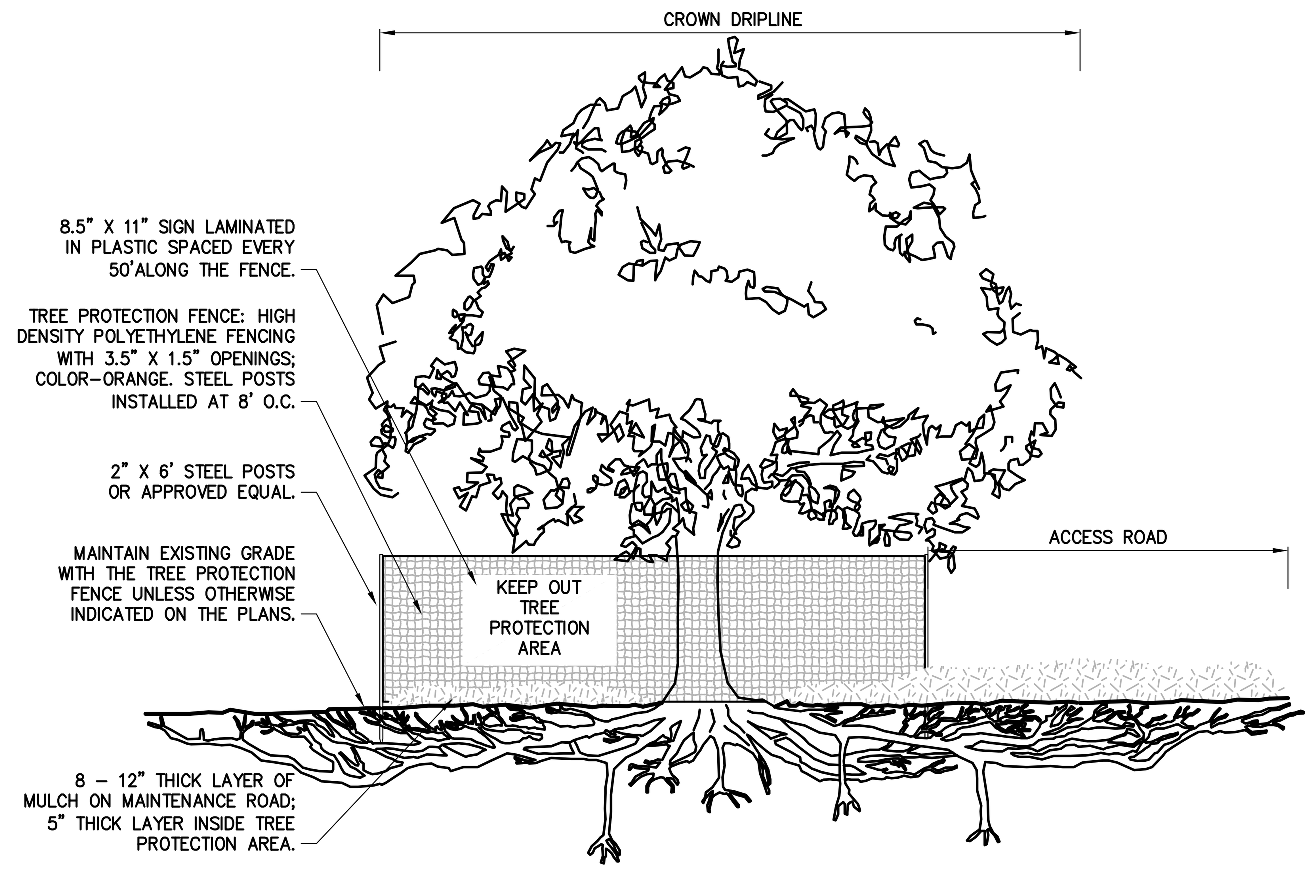
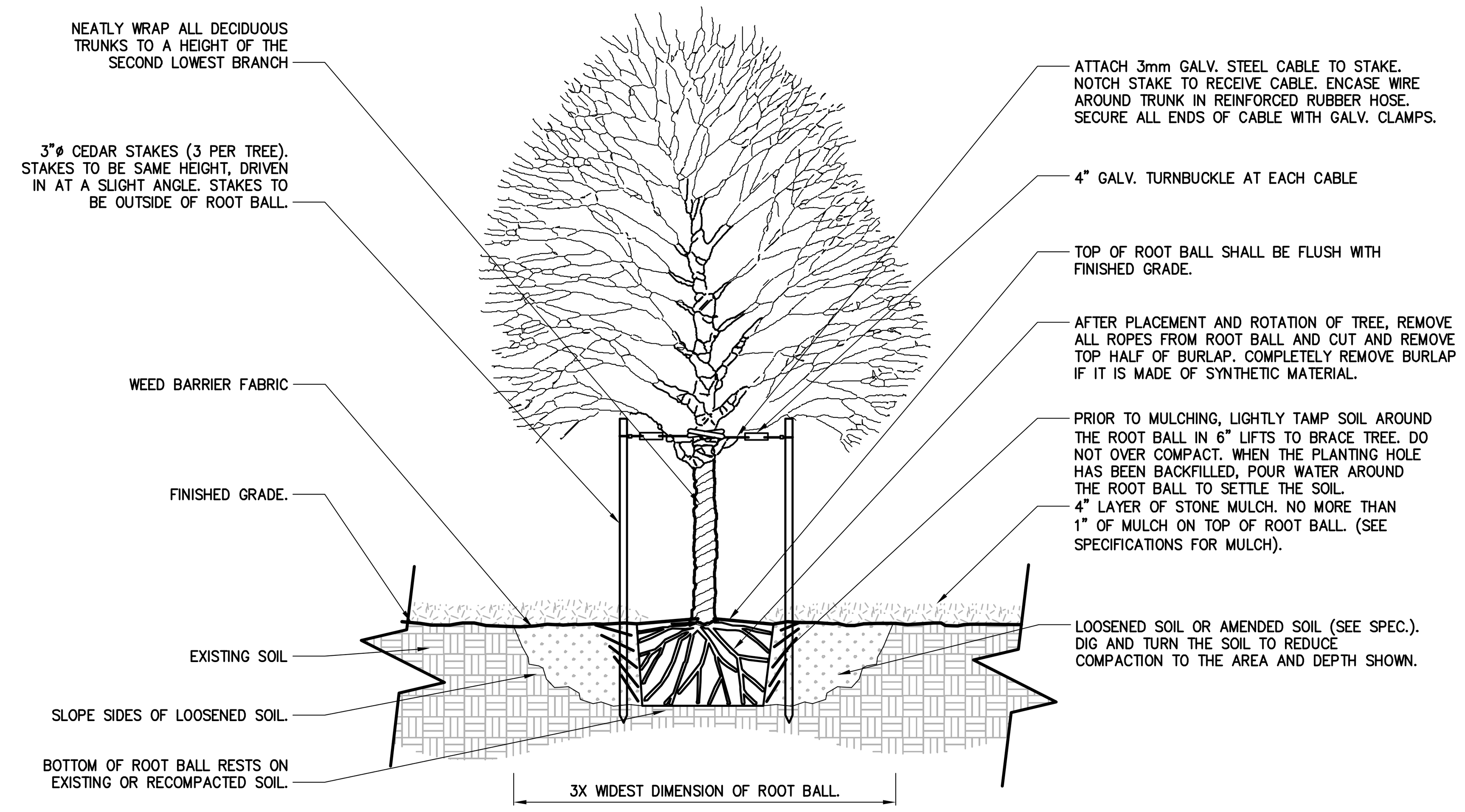


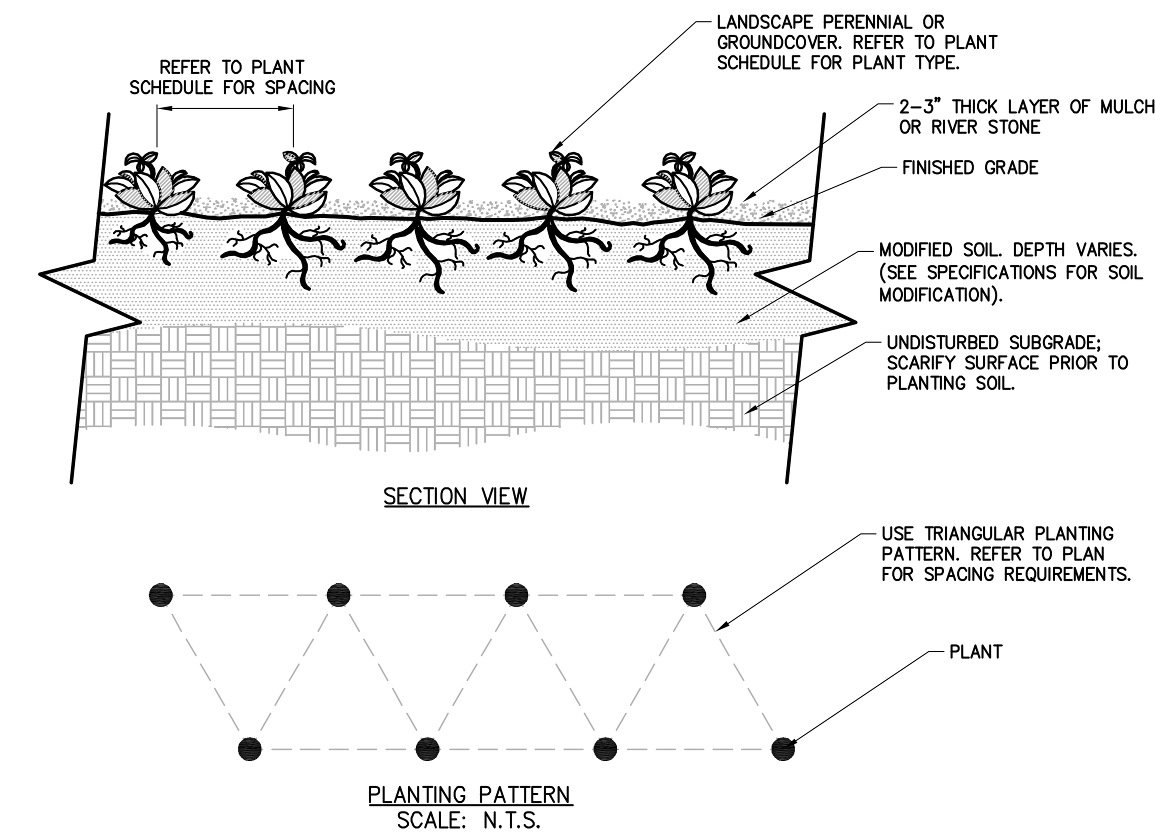
NOTES:
1. SEE SPECIFICATIONS FOR ADDITIONAL TREE PROTECTION REQUIREMENTS.
2. IF THERE IS NO EXISTING IRRIGATION, SEE SPECIFICATIONS FOR WATERING REQUIREMENTS.
3. NO PRUNING SHALL BE PERFORMED EXCEPT BY APPROVED ARBORIST.
4. NO EQUIPMENT SHALL OPERATE INSIDE THE PROTECTIVE FENCING INCLUDING DURING FENCE INSTALLATION AND REMOVAL.
5. SEE SITE PREPARATION PLAN FOR ANY MODIFICATIONS WITH THE TREE PROTECTION AREA.

1 TREE PROTECTION
NOT TO SCALE



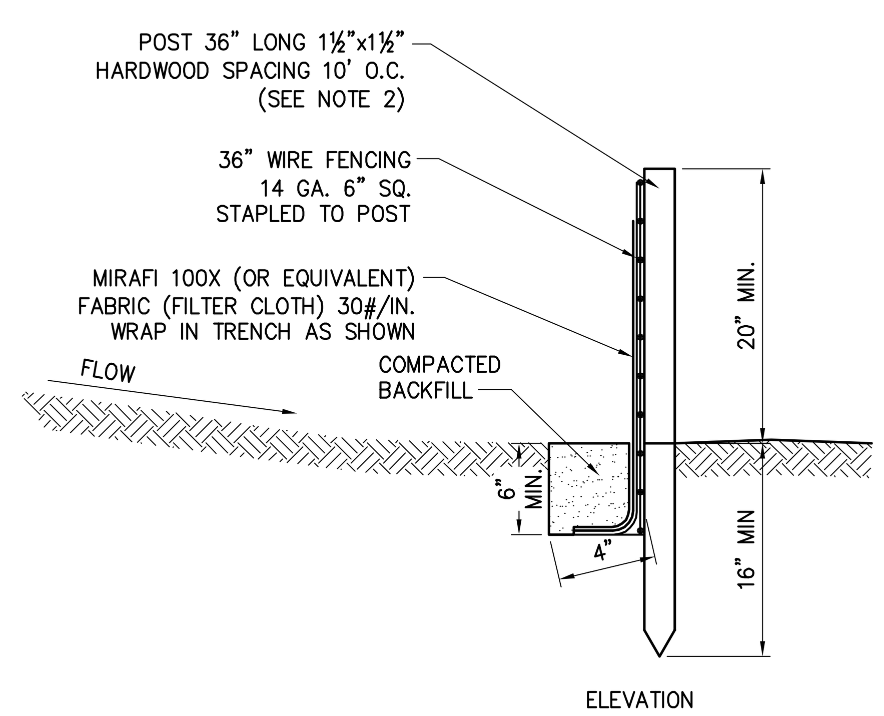
NOTES:
1. TREE SHALL BARE SAME RELATIONSHIP TO FINISH GRADE AS IN THE NURSERY.
2. PRUNE ANY BROKEN BRANCHES AFTER FINAL PLACEMENT. PRUNE PERIMETER BRANCHES AS REQUIRED BUT RETAIN NATURAL SHAPE OF TREE. NEVER CUT A LEADER. PRUNING TO BE PERFORMED BY A QUALIFIED AROBORIST/BOTANIST ONLY.
3. TREE SHALL BE PLUMB AND STRAIGHT.

2 DECIDUOUS TREE PLANTING & STAKING
NOT TO SCALE



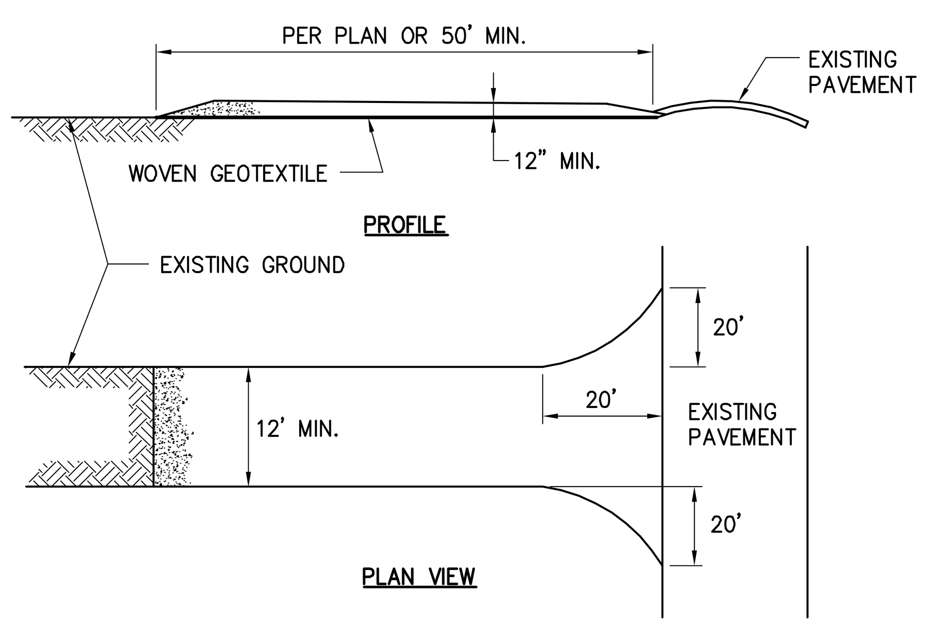
NOTES:
1. SEE PLANTING LEGEND FOR GROUNDCOVER SPECIES, SIZE, AND SPACING DIMENSION.
2. SETTLE SOIL AROUND ROOT BALL OF EACH GROUNDCOVER PRIOR TO MULCHING.

3 PERENNIAL & ORNAMENTAL GRASS PLANTING
NOT TO SCALE



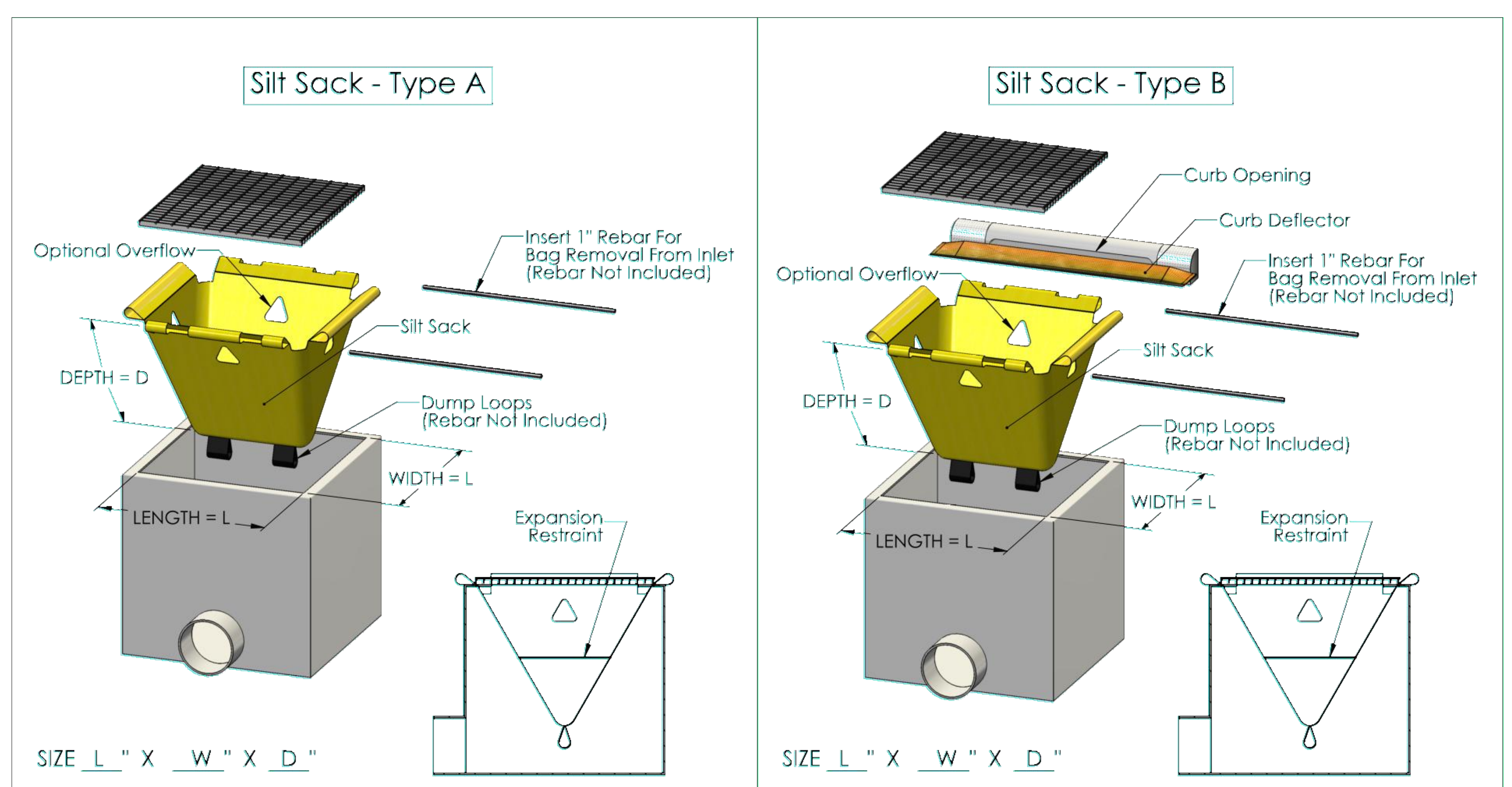
NOTES:
1. TIE FABRIC TO WIRE FENCE IN ACCORDANCE WITH MANUFACTURERS RECOMMENDATIONS.
2. IF EXTRA STRENGTH FABRIC (GREATER THAN 50#/INCH) IS USED, WIRE CAN BE DELETED IF POST SPACING IS REDUCED TO 6' O.C.
3. AT THE ENDS OF THE FENCING THE FIRST 20' SHALL BE TURNED UP THE SLOPE 2'.
4. POSTS SHOULD BE INCLINED TOWARD THE DIRECTION FLOW CAME FROM.
5. OVERLAP FABRIC A MINIMUM OF 6" AND FOLDED AT JOINTS. ATTACH FILTER FABRIS TO STAKES ALLOWING EXTENSION INTO TRENCH AS SHOWN; SECURE TO STAKES AS NOTED.
6. THE MAXIMUM AREA OF RUNOFF PER 100LF. OF FENCE SHALL NOT EXCEED 0.25 ACRES.
7. MAINTENANCE SHALL BE PERFORMED AS NECESSARY. THE FENCING SHALL BE CHECKED AFTER EVERY STORM TO ENSURE THEIR PROPER FUNCTIONING.
8. WHEN FENCE IS NO LONGER NEEDED, THE ACCUMULATED SILT, THE POSTS AND FABRIC SHALL BE REMOVED AND TRENCH BACK FILLED WITH TOPSOIL AND SEEDED.
9. FENCING SHOULD BE PLACED AS SHOWN ON THE DRAWING OR IF NOT SHOWN, 10' BEYOND THE TOE OF THE OF THE SLOPE AND AT A SPACING IN ACCORDANCE WITH THE TABLE.
10. EXCAVATE TRENCH AS PER DETAIL AND SET POSTS AT 10' O.C.
11. BACKFILL WITH COMPACTED, EXCAVATED SOIL FROM TRENCH.

4 SILT FENCE
SCALE: N.T.S.



1. STONE SIZE–USE AASHTO M43 SIZE 3 COARSE AGGREGATE, 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 12".
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. WOVEN GEOTEXTILE FABRIC WILL BE PLACED OVER THE ENTIRE AREA PRIOR TO PLACING OF STONE.
6. EXISTING ROAD SIDE DRAINAGE SHALL BE MAINTAINED.
7. SURFACE WATER – ALL SURFACE WATER FLOWING OR DIVERTED TOWARD CONSTRUCTION ENTRANCES SHALL BE PIPED BENEATH THE ENTRANCE. IF PIPING IS IMPRACTICAL, A MOUNTABLE BERM WITH 5:1 SLOPES WILL BE PERMITTED.
8. MAINTENANCE–THE ENTRANCE SHALL BE MAINTAINED IN A CONDITION WHICH WILL PREVENT TRACKING OR FLOWING OF SEDIMENT ONTO PUBLIC RIGHTS-OF-WAY. THIS MAY REQUIRE PERIODIC TOP DRESSING WITH ADDITIONAL STONE AS CONDITIONS DEMAND AND REPAIR AND/OR CLEANOUT OF ANY MEASURES USED TO TRAP SEDIMENT. ALL SEDIMENT OR STONE SPILLED, DROPPED, WASHED, OR TRACKED ONTO PUBLIC RIGHTS-OF-WAY MUST BE REMOVED IMMEDIATELY.
9. WHEN WASHING IS REQUIRED, IT SHALL BE DONE ON A AREA STABILIZED WITH STONE AND WHICH DRAINS INTO AN APPROVED SEDIMENT TRAPPING DEVICE.
10. PERIODIC INSPECTION AND NEEDED MAINTENANCE SHALL BE PROVIDED AFTER EACH RAIN.

5 STABILIZED CONSTRUCTION ENTRANCE
SCALE: N.T.S.



6 SILTSACK MANUFACTURED INSERT INLET PROTECTION DETAIL
SCALE: N.T.S.

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BEFORE WORK IS STARTED, CONTRACTOR SHALL VERIFY ALL THE DIMENSIONS AT THE SITE AND IMMEDIATELY NOTIFY THE ARCHITECT OF ALL DISCREPANCIES. ALTERATION OF THIS DOCUMENT BY OTHER THAN AN AUTHORIZED LICENSED REGISTERED ARCHITECT IS ILLEGAL AND A VIOLATION OF SECTION 7307 OF THE NEW YORK STATE EDUCATION LAW.

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Seal

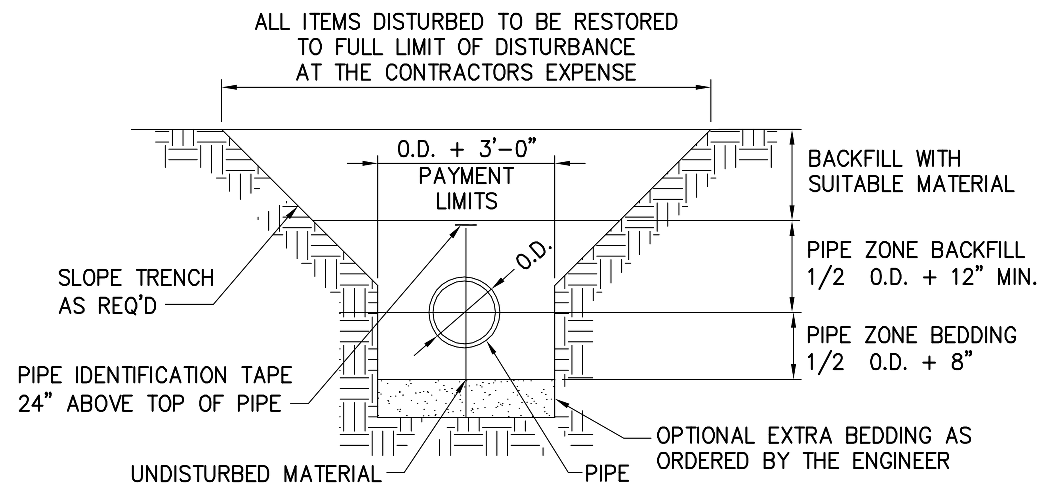
New Gene Haas Center for Advanced Manufacturing Skills Building

Hudson Valley Community College
Troy, New York

Drawing Title :
SITE DETAILS

APN : 1612.1 | Date : February 28, 2017 | Drawn by : HAW

Drawing Number :
C 602



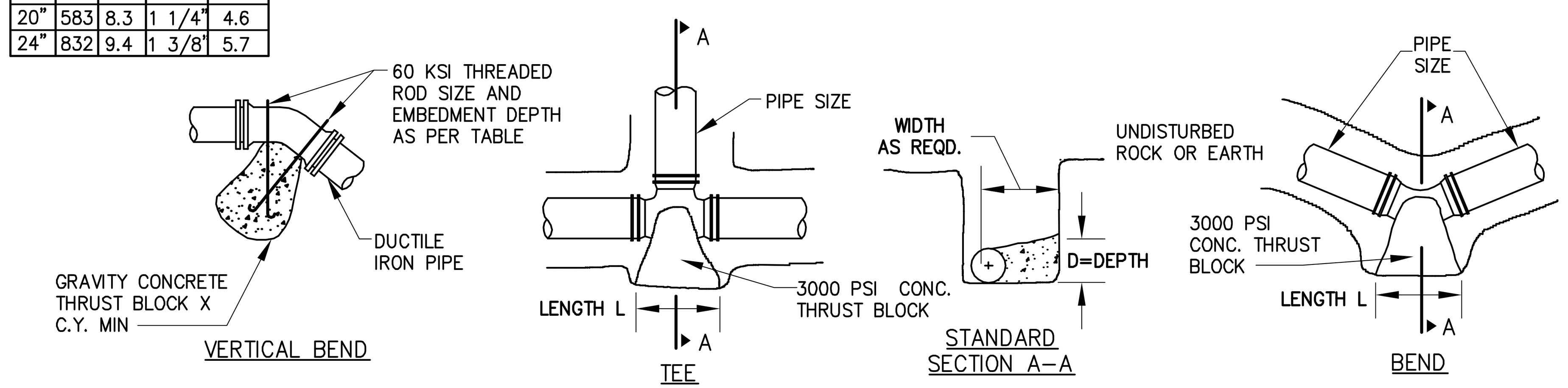
NOTE:
1. PIPE ZONE, BEDDING AND BACKFILL OFTEN THE SAME MATERIAL
2. EDIT ACCORDINGLY AND COORDINATE WITH SPECIFICATIONS

1 TYPICAL TRENCH DETAIL
SCALE: N.T.S.

TYPE A BLOCKING FOR 11 1/4° & 22 1/2° VERT BENDS					
PIPE SIZE NOM DIA(INCHES)	VERTICAL BEND DEGREES	NO. OF CUFT OF CONC BLOCKING	SIDE OF CUBE (FEET)	DIA OF SHACKLE RODS(2)* (INCHES)	DEPTH OF RODS IN CONC (FEET)
4"	11 1/4°	8	2.0	3/4"	1.6
	22 1/2°	16	2.5		
6"	11 1/4°	16	2.5	3/4"	1.6
	22 1/2°	32	3.2		
8"	11 1/4°	28	3.0	3/4"	1.6
	22 1/2°	55	3.8		
10"	11 1/4°	42	3.5	3/4"	1.6
	22 1/2°	83	4.4		
12"	11 1/4°	60	3.9	3/4"	1.6
	22 1/2°	118	4.9	7/8"	2.2
14"	11 1/4°	81	4.3	7/8"	2.2
	22 1/2°	158	5.4		
16"	11 1/4°	104	4.7	7/8"	2.2
	22 1/2°	205	5.9	1 1/8"	3.7
18"	11 1/4°	131	5.1	7/8"	2.2
	22 1/2°	257	6.4	1 1/8"	3.7
20"	11 1/4°	161	5.4	7/8"	2.2
	22 1/2°	316	6.8	1 1/4"	4.6
24"	11 1/4°	229	6.1	1"	2.9
	22 1/2°	450	7.7	1 3/8"	5.7

TYPE B BLOCKING FOR 45° VERTICAL BENDS				
PIPE SIZE NOM DIA(INCHES)	NO. OF CUFT OF CONC BLOCKING	SIDE OF CUBE (FEET)	DIA OF SHACKLE RODS(2)* (INCHES)	DEPTH OF RODS IN CONC (FEET)
4"	29	3.1	3/4"	1.6
6"	59	3.9		
8"	102	4.7		
10"	154	5.4		
12"	218	6.0		
14"	292	6.6	7/8"	2.2
16"	378	7.2	1 1/8"	3.7
18"	478	7.8		
20"	583	8.3	1 1/4"	4.6
24"	832	9.4	1 3/8"	5.7

REQUIRED BEARING AREAS & DIMENSIONS FOR CONCRETE THRUST BLOCKS										
PIPE SIZE (IN.)	TEE(See Note 5)		90°(1/4)BEND		45°(1/8)BEND		22-1/2°(1/16)BEND		11-1/4°(1/32)BEND	
	AREA Sq.Ft.	Dimen. D x L	AREA Sq.Ft.	Dimen. D x L	AREA Sq.Ft.	Dimen. D x L	AREA Sq.Ft.	Dimen. D x L	AREA Sq.Ft.	Dimen. D x L
3 & 4	1.4	1.0 x 1.5	2.0	1.0 x 2.0	1.1	1.0 x 1.5	0.6	0.5 x 1.5	0.3	0.5 x 1.0
6	3.2	1.5 x 2.5	4.5	2.0 x 2.5	2.4	1.5 x 2.0	1.2	1.0 x 1.5	0.6	1.5 x 1.5
8	5.7	2.0 x 3.0	8.0	2.0 x 4.0	4.3	2.0 x 2.5	2.2	1.5 x 1.5	1.1	1.0 x 1.5
12	12.7	3.5 x 3.5	18.0	4.0 x 4.5	9.7	2.5 x 4.0	5.0	2.0 x 2.5	2.5	1.5 x 2.0
14	24.6	6.0 x 4.5	24.6	6.0 x 4.5	13.3	3.5 x 4.0	6.8	2.0 x 3.5	3.4	1.5 x 2.5
16	50.0	6.0 x 8.5	50.0	6.0 x 8.5	27.0	5.0 x 5.5	13.8	3.5 x 4.0	6.9	2.5 x 3.0
24	72.0	8.0 x 9.0	72.0	8.0 x 9.0	39.0	5.0 x 8.0	20.0	4.0 x 5.0	10.0	3.0 x 3.5



THRUST BLOCK NOTES

1. FOR REQUIRED BEARING AREA DIMENSIONS D & L SEE TABLE. DIMENSIONS OF D & L OTHER THAN THOSE SHOWN IN THE TABLE MAY BE USED PROVIDED THEY YIELD A BEARING AREA EQUAL TO OR LARGER THAN THAT REQUIRED.
2. CONCRETE NOT TO OVERLAP ANY JOINT.
3. CONCRETE TO BE PLACED SO AS NOT TO INTERFERE WITH REMOVING OR INSTALLING ANY OF THE JOINTING HARDWARE.
4. APPROXIMATE VOLUME OF CONCRETE THRUST BLOCK:

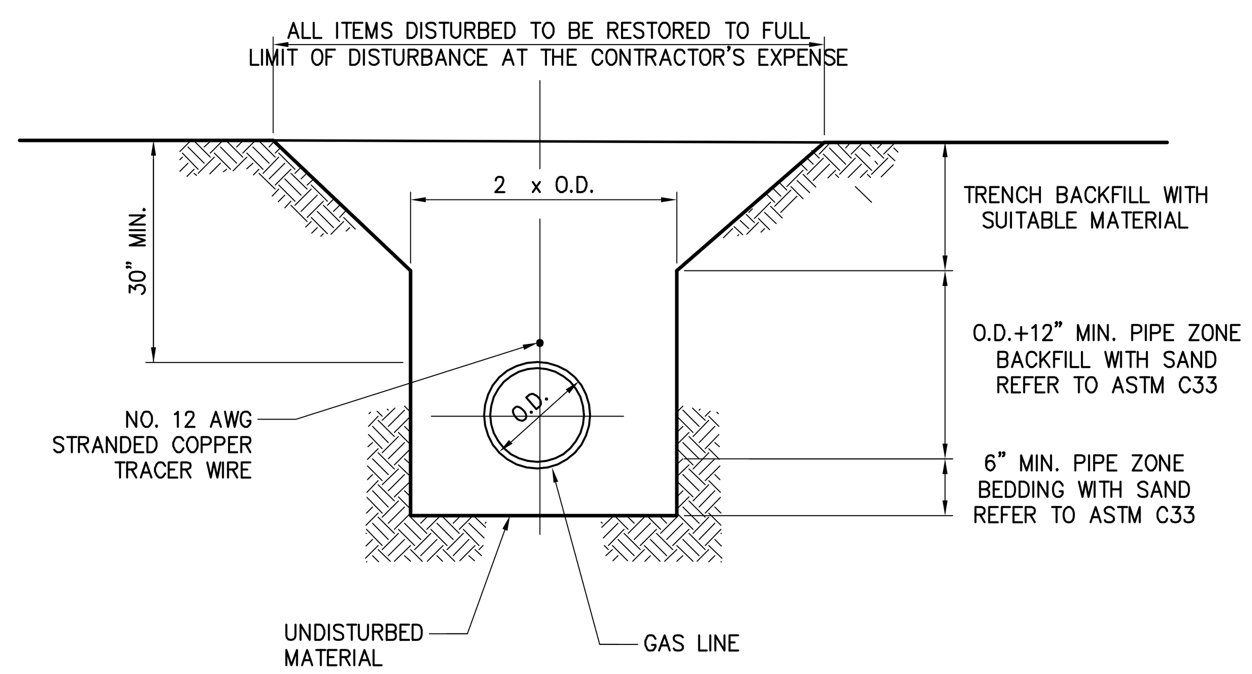
$$V = \frac{LD\ (W+ID)\ -\ ID}{81}$$

WHERE:

V = VOLUME IN CUBIC YARDS
L = LENGTH OF BLOCK IN FEET
D = DEPTH OF BLOCK IN FEET
W = WIDTH OF BLOCK IN FEET
ID = INSIDE DIAMETER OF PIPE IN FEET

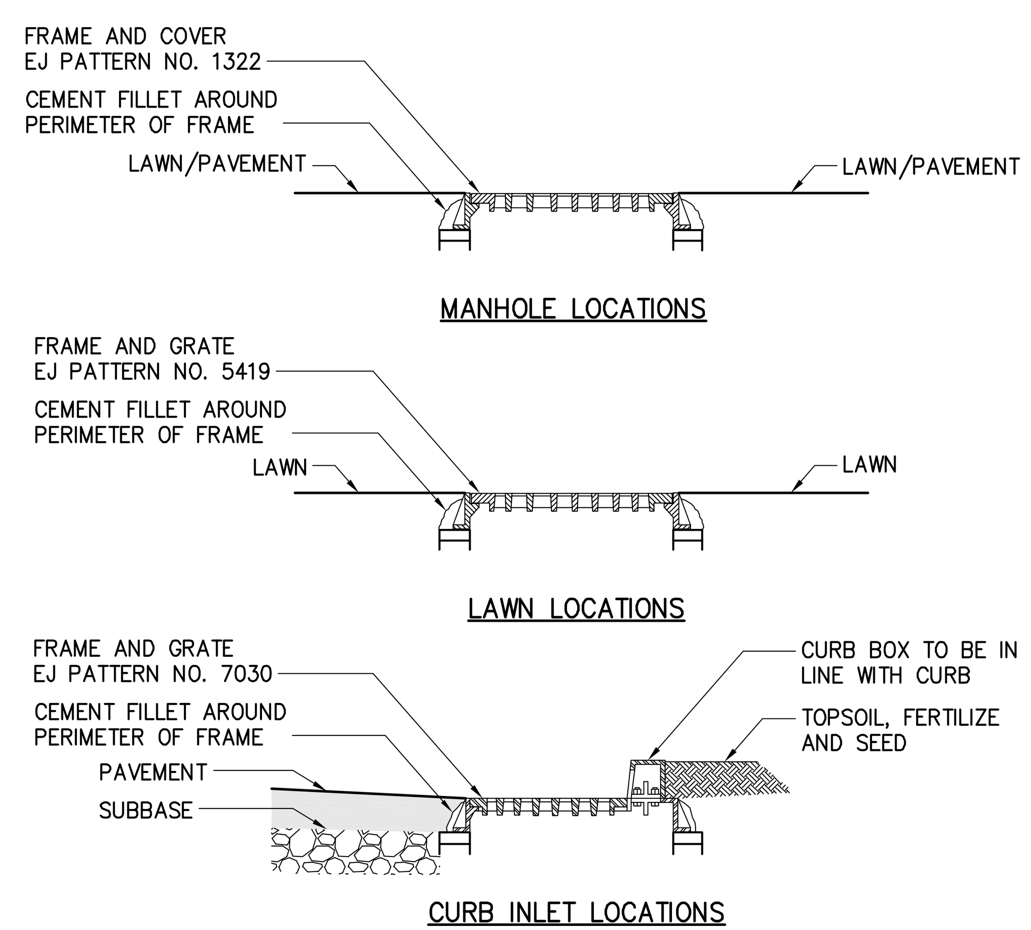
5. VALUES FOR TEE ALSO APPLY TO END PLUGS, CAPS, AND TAPPING SLEEVES.
6. REQUIRED BEARING AREAS ARE DUE TO THRUSTS CAUSED BY 150 PSI WORKING PRESSURE PLUS 50%(75 PSI) SURGE ALLOWANCE RESULTING IN 225 PSI TOTAL INTERNAL PRESSURE. NORMAL PIPE DIAMETER USED.
7. REQUIRED BEARING AREAS ARE BASED ON ALLOWABLE SOIL BEARING CAPACITY OF 2000 LBS. PER SQUARE FOOT FOR SAND. DUE TO OTHER SOIL CONDITIONS ENCOUNTERED, BEARING AREAS MAY BE MODIFIED BY THE ENGINEER.
8. IN MUCK, PEAT, OR RECENTLY PLACED FILL ALL THRUST SHALL BE RESISTED BY PILES OR TIE RODS TO SOLID FOUNDATIONS, OR BY REMOVAL OF SUCH UNSTABLE MATERIAL AND REPLACEMENT WITH BALLAST OF SUFFICIENT STABILITY TO RESIST THE THRUSTS, ALL AS REQUIRED BY THE ENGINEER.

2 THRUST BLOCK DETAILS
SCALE: N.T.S.

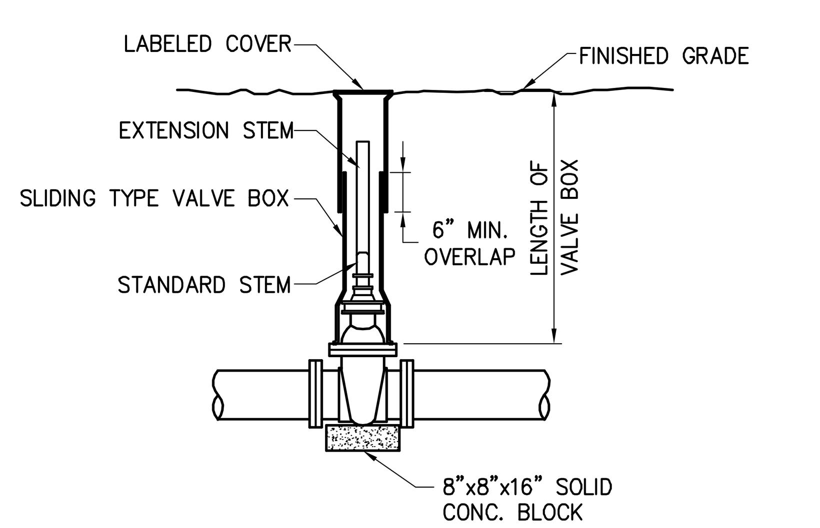


NOTES:
1. 12" VERTICAL CLEARANCE SHALL BE PROVIDED TO ANY PROPOSED OR EXISTING STRUCTURE, UTILITY OR OTHER.
2. 36" HORIZONTAL CLEARANCE SHALL BE PROVIDED TO ANY EXISTING OR PROPOSED STRUCTURES, UTILITIES OR OTHER.
3. INSPECTION AND TESTING REQUIRED BEFORE TRENCH BACKFILL.

3 GAS LINE TRENCH DETAIL
SCALE: N.T.S.

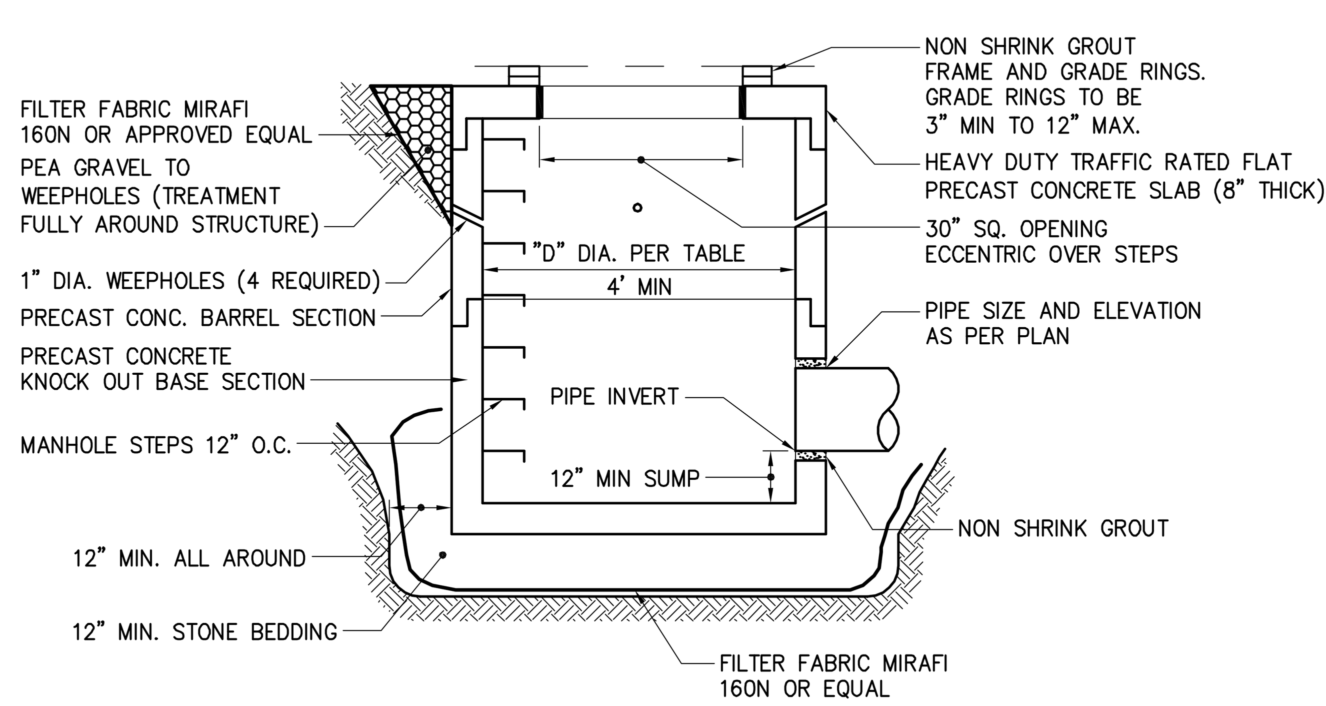


PROPOSED STORMWATER STRUCTURE TABLE		
STRUCTURE NAME	STRUCTURE TYPE	STRUCTURE SIZE
CB-1	CURB INLET	5' DIAMETER
CB-2	CURB INLET	4' DIAMETER
CB-3	CURB INLET	4' DIAMETER
CB-4	CURB INLET	4' DIAMETER
MH-5	MANHOLE	5' DIAMETER
CB-6	CURB INLET	4' DIAMETER
CB-7	CURB INLET	4' DIAMETER
CB-8	CURB INLET	4' DIAMETER
CB-9	LAWN INLET	4' DIAMETER
MH-10	MANHOLE	4' DIAMETER

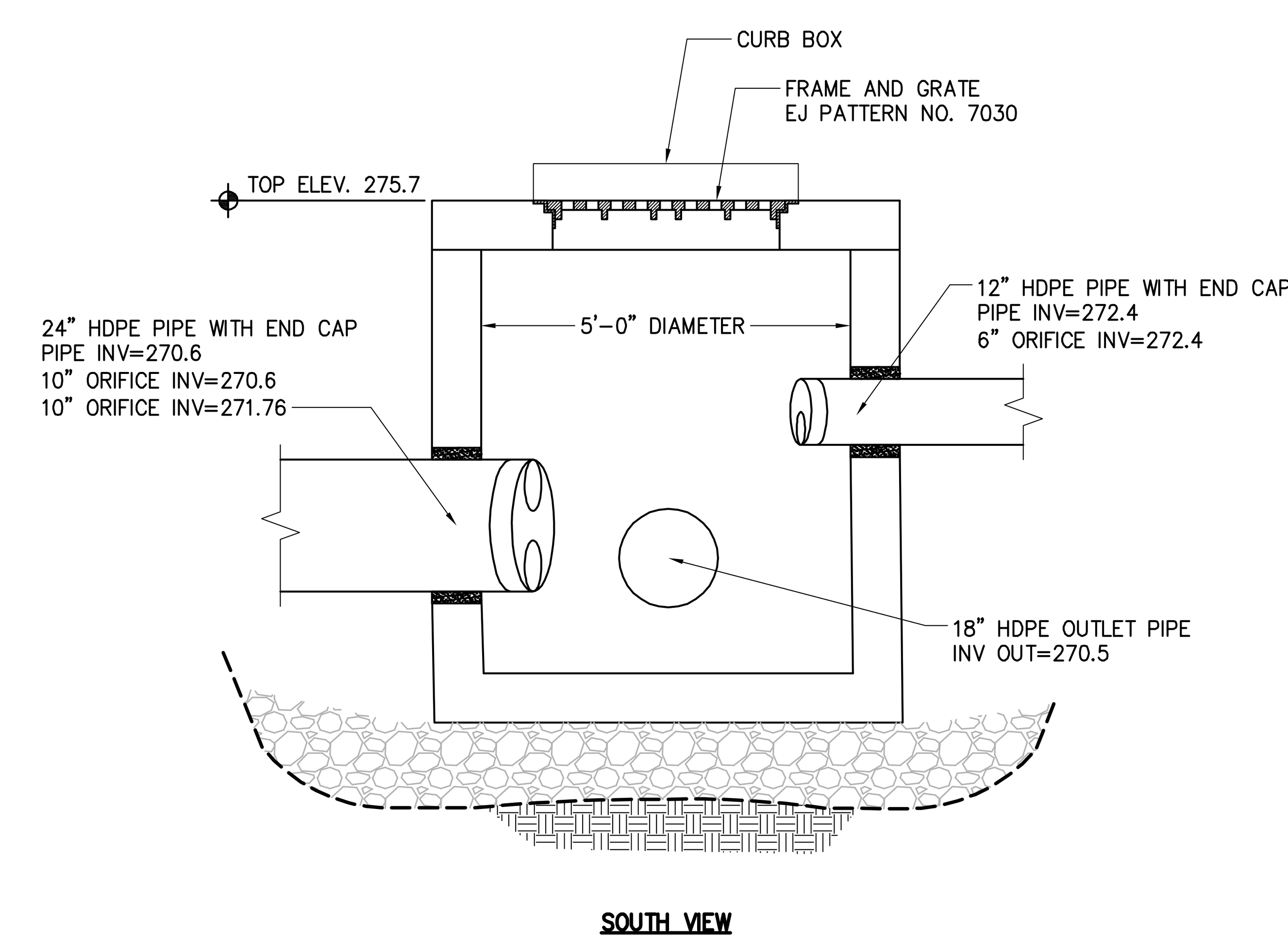


NOTES:
1. VALVE BOX COVERS SHALL BE CAST WITH AN ARROW POINTING TO THE DIRECTION OF THE OPENING AND THE WORD "OPEN". BOX AND COVER SHALL BE TAR COATED. INSTALLATION OF EXTENSION STEM REQUIRED IF STANDARD STEM IS MORE THAN FIVE (5) FEET FROM FINISHED GRADE.
2. GATE VALVE MUST MEET AWWA C509 REQUIREMENTS
3. SEE SPECIFICATIONS FOR VALVE OPEN DIRECTION REQUIRED.
4. PROVIDE A MINIMUM OF ONE VALVE KEY TO UTILITY OWNER. SEE SPECIFICATIONS FOR EXACT NUMBER TO BE REQUIRED.

4 GATE VALVE
SCALE: N.T.S.



5 ROUND PRECAST CONCRETE CATCH BASIN/STORM MANHOLE DETAIL
SCALE: N.T.S.



6 CB-1 ORIFICE DETAIL
SCALE: N.T.S.

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Mosaic Associates Architects
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Seal

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Hudson Valley Community College
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SITE DETAILS

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Drawing Number :
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Appendix I
Inspection Forms and
Post Construction Operation and Maintenance

PERMIT NUMBER: NYR-

PRE-CONSTRUCTION MEETING DOCUMENTS

Project Name ______________________________

GP-0-15-002 Permit No. ______________________ **Date of Authorization** __________

Name of Owner/Operator ______________________________

General Contractor ______________________________

The Following Information To Be Read By All Person's Involved in The Construction of Stormwater Related Activities:

Site Assessment and Inspections -

a. The Owner or Operator agrees to have a Qualified Inspector[1] conduct an assessment of the site prior to the commencement of construction. The Qualified Inspector shall 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.

b. For construction sites where soil disturbance activities have been temporarily suspended (e.g. winter shutdown) and temporary stabilization measures have been applied to all disturbed areas, the owner or operator can stop conducting inspections. The owner or operator shall resume inspections as soon as soil disturbance activities are reinitiated.

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

d. Following the commencement of construction, site inspections shall be conducted by the Qualified Inspector to ensure that erosion and sediment controls are being maintained in effective operating condition at all times. Inspections shall occur at least: (i) once every 7 calendar days for construction sites where soil disturbance activities are occurring; (ii) twice every 7 calendar days for construction sites where soil disturbance activities are occurring and the Owner/Operator has received authorization to disturb greater than five (5) acres of soil at any one time; (iii) once every thirty (30) calendar days for construction sites where soil disturbance activities have been temporarily suspended and temporary stabilization measures have been applied to all disturbed areas; and (iv) for construction sites where soil disturbance activities have been shut down with partial project completion, the Qualified Inspector can stop conducting inspections if all areas disturbed as of the project shutdown date have achieved final stabilization, and all post-construction stormwater management practices for the completed portion of the project have been constructed in conformance with the SWPPP and are operational.

e. The owner or operator shall notify the Regional Office stormwater contact person in writing prior to reducing the frequency of any inspections.

f. The Owner/Operator shall maintain a record of all inspection reports in the site log book. The site log book shall be maintained on site and be made available to the permitting authorities upon request. Prior to the commencement of construction,[2] the Owner/Operator shall certify in the site log book that the SWPPP is prepared in accordance with the State's standards and meets all Federal, State and local erosion and sediment control requirements.

g. Prior to filing of the Notice of Termination or the end of permit term, the Owner/Operator shall have the 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.

[1]"Qualified Inspector" means a person knowledgeable in the principles and practice of erosion and sediment controls, such as a Certified Professional in Erosion and Sediment Control (CPESC), soil scientist, licensed Professional Engineer (PE), licensed Landscape Architect, or other Department endorsed individual(s). It may also mean someone working under the direct supervision of, and at the same company as, the licensed Professional Engineer, Certified Professional in Erosion and Sediment Control (CPESC), or soil scientist provided that person has training in the principles and practices of erosion and sediment control. Training means that person has received four (4) hours of training endorsed by the Department and shall receive four (4) hours of training every three (3) years after the initial training session.
[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 disturbance activities at the site have been completed and a uniform, perennial vegetative cover with a density of eighty (80) percent over the entire pervious surface has been established, or equivalent stabilization measures (such as the use of mulches or geotextiles, rock rip-rap or washed/crushed stone) have been employed on all disturbed areas that are not covered by permanent structures, concrete or pavement.

PRE-CONSTRUCTION SITE ASSESSMENT FORM

Inspector Name and Title	**Date and Time of Inspection**
Qualified Inspector	**Qualified Inspector Signature**

The above signed acknowledges that, to the best of his/her knowledge, all information provided on the following forms is accurate and complete.

a. 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? ____________________
☐	☐	☐	Have all contractors involved with implementing the erosion and sediment control portions of the SWPPP signed the contractor's certification?

b. 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, etc. have been flagged for protection.
☐	☐	☐	Creek crossings installed prior to land-disturbing activity, including clearing and blasting.

c. Surface Water Protection

Yes	No	NA	
☐	☐	☐	Clean stormwater runoff has been diverted away 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 waters are installed.

d. Stabilized Construction Entrance

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.

e. Perimeter 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
☐	☐	☐	Sediment traps and barriers are installed.

PERMIT NUMBER: **INSPECTION REPORT #__ :**

Location **Date and Time of Inspection**

Qualified Inspector (name and title) **Qualified Inspector Signature**

The above signed acknowledges that, to the best of his/her knowledge, all information provided on the following forms is accurate and complete.

☐ **Weekly Inspection**

Current Phase of Construction (if applicable):

Estimated Current Total Disturbed Area:

IMMEDIATE ACTION ITEMS / INSPECTION SUMMARY:

It is the responsibility of the Qualified Inspector to notify the owner/operator and appropriate contractor of any corrective actions that need to be taken within one (1) business day of the completion of an inspection. It is the responsibility of the contractor (subcontractor) to begin implementing the corrective actions within one (1) business day of this notification and complete the corrective action within a reasonable time frame. If there are action items from the previous inspection which have not been addressed, so note.

Per the GP-0-15-002, Digital photographs with date stamp, that clearly show the condition of all practices that have been identified as needing corrective actions shall be included with each inspection report. 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. Paper color copies of these digital photographs shall be attached to the inspection report, documenting the completion of the corrective action work within seven (7) calendar days of that inspection.

1. GENERAL HOUSEKEEPING

Includes description of the weather and soil conditions (e.g. dry, wet, saturated) during the time of the inspection, a description of the condition of the runoff at all points of discharge from the construction site (including identification of any discharges of sediments from construction site), inspection for stream/pond turbidity, oil and floating substances, visible oil film, or globules or grease, contractor preparedness for implementation of erosion and sediment control, impact on adjacent property, and dust control.

Yes **No**

☐ ☐ Is there immediate action required regarding General Housekeeping?

Notes:

2. EXCAVATION DEWATERING

Includes inspection ensuring that clean water from upstream pool is being pumped to the downstream pool, that sediment laden water from work area is being discharged to a silt-trapping device, and that constructed upstream berm has one-foot minimum freeboard.

Yes **No**

☐ ☐ Is there immediate action required regarding Excavation Dewatering?

Notes:

3. INTERCEPTOR DIKES AND SWALES

Includes inspection ensuring that dikes and swales are installed per plan with minimum side slopes 2H:1V or flatter, are stabilized by geotextile fabric, seed, or mulch with no erosion occurring, and that sediment-laden runoff is directed to sediment trapping structure.

Yes **No**

☐ ☐ Is there immediate action required regarding an Interceptor Dike or Swale?

Notes:

4. EROSION & SEDIMENT CONTROL

Includes inspection ensuring that erosion and sediment control practices are located and installed correctly, BMPs are maintained per specifications, stockpiles are stabilized and contained, de-watering operations prevent direct discharges to sensitive features, and that clearing and grading operations are divided into stages for large areas. Identification of all erosion and sediment control practices that need repair or maintenance.

Yes **No**

☐ ☐ Is there immediate action required regarding Erosion & Sediment Control?

Notes:

5. AREAS OF DISTURBANCE

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

Yes **No**

☐ ☐ Is there immediate action required regarding stabilizing disturbed areas?

Notes:

6. STABILIZED CONSTRUCTION ENTRANCE

Includes inspection ensuring that stone is clean enough to effectively remove mud from vehicles, is installed per standards and specifications, that all traffic use the stabilized entrance to enter and leave site, and that adequate drainage is provided to prevent ponding at entrance.

Yes **No**

☐ ☐ Is there immediate action required regarding a Stabilized Construction Entrance?

Notes:

7. REINFORCED SILT FENCE

Includes inspection ensuring that silt fence is installed on contour, 10 feet from toe of slope, joints are constructed by wrapping the two ends together for continuous support, steel posts installed (if applicable), installed on downstream side of slope, maximum 6' intervals with 6 x 6 inch 14 gage wire, fabric is buried minimum of 6 inches, posts are stable, fabric is tight and without rips or frayed areas, and that sediment accumulation is less than 1/3 the height of the silt fence.

Yes **No**

☐ ☐ Is there immediate action required regarding Silt Fence?

Notes:

8. FILTER FABRIC (DROP) INLET PROTECTION

Includes inspection ensuring that protection is installed with 2-inch x 4-inch wood frame and wood posts, with maximum 3-foot spacing, is buried a minimum of 8 inches and secured to frame/posts with staples at max 8-inch spacing, has posts with 3-foot maximum spacing between posts, has posts that are stable, fabric is tight and without rips or frayed areas, and that sediment accumulation is within design capacity.

Yes **No**

☐ ☐ Is there immediate action required regarding Filter Fabric (Drop) Inlet Protection?

Notes:

9. SILTSACK® INLET PROTECTION

Includes inspection ensuring that protection is installed per manufacturers specifications and is maintained per manufacturers recommendations.

Yes **No**

☐ ☐ Is there immediate action required regarding the Inlet Protection?

Notes:

10. CONCRETE WASHOUT

Includes inspection ensuring that the concrete washout is constructed and maintained per the approved plan or drawing.

Yes	No	
☐	☐	Is there immediate action required regarding Concrete Washouts?

Notes:

11. CURRENT PHASE OF POST-CONSTRUCTION STORMWATER PRACTICES

Includes inspection of current phase of all post-construction stormwater management practices, identification of all construction that is not in conformance with the SWPPP and technical standards, identify corrective action(s) that must be taken to install, repair, replace or maintain erosion and sediment control practices, and to correct deficiencies identified with the construction of post-construction stormwater management practice(s).

Yes	No	
☐	☐	Is there immediate action required regarding the current phase of post-construction stormwater management practices?

Notes:

ADDITIONAL NOTES / MODIFICATIONS

Operation and Maintenance Manual

Downstream Defender®

Vortex Separator for Stormwater Treatment

Stormwater Solutions

Turning Water Around ...®

Table of Contents

Hydro International (Stormwater), 94 Hutchins Drive, Portland ME 04102
Tel: (207) 756-6200 Fax: (207) 756-6212 Web: www.hydro-int.com

Downstream Defender® by Hydro International

The Downstream Defender® is an advanced Hydrodynamic Vortex Separator designed to provide high removal

The Downstream Defender® has unique, flow-modifying internal components developed from extensive full-scale testing, CFD modeling and over thirty years of hydrodynamic separation experience in wastewater, combined sewer and stormwater applications. These internal components distinguish the Downstream Defender® from simple swirl-type devices and conventional oil/grit separators by minimizing turbulence and headlosses, enhancing separation, and preventing washout of previously stored pollutants.

The high removal efficiencies and inherent low headlosses of the Downstream Defender® allow for a small footprint making it a compact and economical solution for the treatment of non-point source pollution.

See page 12 for more about Hydro International's Stormwater BMP Maintenance Contractor Certification Program.

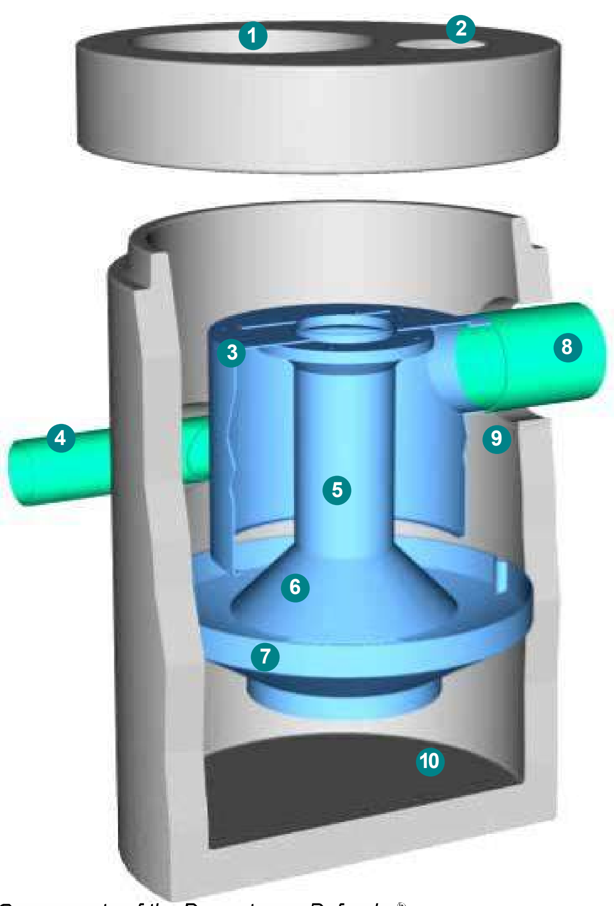


Fig.1 Components of the Downstream Defender®.

Benefits of the Downstream Defender®

- Removes sediment, floatables, oil and grease
- No pollutant washouts
- Small footprint
- No loss of treatment capacity between clean-outs
- Low headloss
- Efficient over a wide range of flows
- Easy to install
- Low maintenance

Applications

- New developments and retrofits
- Utility yards
- Streets and roadways
- Parking lots
- Pre-treatment for filters, infiltration and storage
- Industrial and commercial facilities
- Wetlands protection
- Pretreatment to Low Impact Development practices

Downstream Defender® Components

1. Central Access Port (all models)
2. Floatables Access Port (6-ft/1.8m, 8-ft/2.4m, 10-ft/3.0m and 12-ft/3.7m models only)
3. Dip Plate with Integral Floatables Lid
4. Tangential Inlet
5. Center Shaft
6. Center Cone
7. Benching Skirt
8. Outlet Pipe
9. Floatables Storage Zone
10. Isolated Sediment Storage Zone

Operation

Introduction

The Downstream Defender® operates on simple fluid hydraulics. It is self-activating, has no moving parts, no external power requirement and is manufactured from durable non-corrosive components. No manual procedures are required to operate the unit and maintenance is limited to monitoring accumulations of stored pollutants and periodic clean-outs. The Downstream Defender® has been designed to allow for easy and safe access for inspection/monitoring and clean-out procedures. Entry into the unit or removal of the internal components is not necessary for maintenance, thus safety concerns related to confined-space-entry are avoided.

Pollutant Capture and Retention

The internal components of the Downstream Defender® have been designed to protect the oil/floatables and sediment storage volumes so that separator performance is not reduced as pollutants accumulate between clean-outs (Fig.2). The Downstream Defender® vessel remains wet between storm events. Oil and floatables are stored on the water surface in the outer annulus separate from the sediment storage volume in the sump of the unit providing the option for separate oil disposal, and accessories such as adsorbant pads. Since the oil/floatables and sediment storage volumes are isolated from the active separation region, the potential for re-suspension and washout of stored pollutants between clean-outs is minimized.

Wet Sump

The sump of the Downstream Defender® retains a standing water level between storm events. The water in the sump prevents stored sediment from solidifying in the base of the unit. (The sediment must be manually removed by maintenance crews. This is a labor intensive operation in a hazardous environment.)

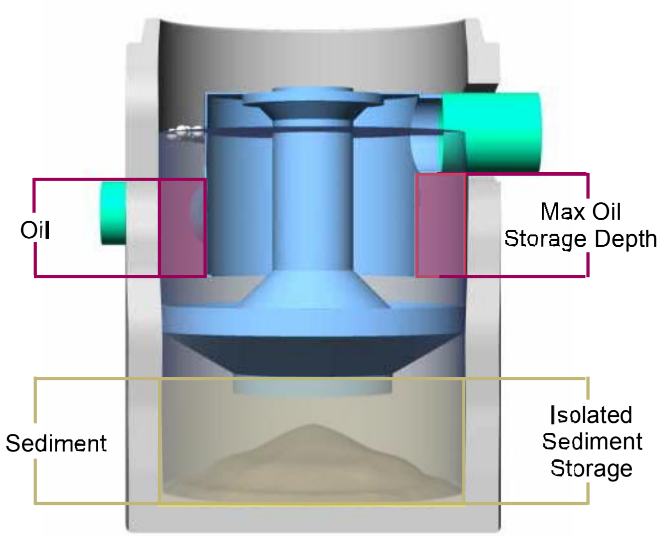


Fig.2 Pollutant storage volumes of the Downstream Defender®.

Blockage Protection

The Downstream Defender® has large clear openings and no internal restrictions or weirs, minimizing the risk of blockage and hydraulic losses. In addition to increasing the system headloss, orifices and internal weirs can increase the risk of blockage within the unit.

Maintenance

Overview

The Downstream Defender® protects the environment by removing a wide range of pollutants from stormwater runoff. Periodic removal of these captured pollutants is essential to the continuous, long-term functioning of the Downstream Defender®. The Downstream Defender® will capture and retain sediment and oil until the sediment and oil storage volumes are full to capacity. When sediment and oil storage capacities are reached, the Downstream Defender® will no longer be able to store removed sediment and oil. Maximum pollutant storage capacities are provided in Table 1.

Hydro International recommends that maintenance crews watch the Downstream Defender® maintenance training video at **www.hydro-int.com/us/products/downstream-defender**. Maintenance providers are also encouraged to participate in Hydro International's Maintenance Contractor Certification Program (see page 12).

Fig.3 Watch the Downstream Defender® instructional maintenance video at **www.hydro-int.com/us/products/downstream-defender**.

The Downstream Defender® allows for easy and safe inspection, monitoring and clean-out procedures. A commercially or municipally owned sump-vac is used to remove captured sediment and floatables. Access ports are located in the top of the manhole. On the 6-ft (1.8m), 8-ft (2.4m), 10-ft (3.0m) and 12-ft (3.7m) units, the floatables access port is above the outlet pipe between the concrete manhole wall and the dip plate. The sediment removal access ports for all Downstream Defender® models are located directly over the hollow center shaft.

Maintenance events may include Inspection, Oil & Floatables Removal, and Sediment Removal. Maintenance events do not require entry into the Downstream Defender®, nor do they require the internal components of the Downstream Defender® to be removed. In the case of inspection and floatables removal, a vactor truck is not required. However, a vactor truck is required if the maintenance event is to include oil removal and/or sediment removal.

Determining Your Maintenance Schedule

inspected every six months to determine the rate of sediment and floatables accumulation. A simple probe such as a Sludge Judge® can be used to determine the level of accumulated solids stored in the sump. This information can be recorded in the maintenance log (see page 9) to establish a routine maintenance schedule.

The vactor procedure, including both sediment and oil/floatables removal, for a 6-ft (1.8m) Downstream Defender® typically takes less than 30 minutes and removes a combined water/oil volume of about 500 gallons (1900 liters).

Inspection Procedures

Inspection is a simple process that does not involve entry into the Downstream Defender®. Maintenance crews should be familiar with the Downstream Defender® and its components prior to inspection.

Scheduling

- It is important to inspect your Downstream Defender® every
- Typically, inspection may be conducted during any season of the year
- Sediment removal is not required unless sediment depths exceed 75% of maximum clean-out depths stated in Table 1

Recommended Equipment

- Safety Equipment and Personal Protective Equipment (traffic cones, work gloves, etc.)
- Crow bar or other tool to remove grate or lid
- Pole with skimmer or net
- Sediment probe (such as a Sludge Judge®)
- Trash bag for removed floatables
- Downstream Defender® Maintenance Log

Table 1. Downstream Defender® Pollutant Storage Capacities and Max. Cleanout Depths.

Unit Diameter		Total Oil Storage		Oil Clean-out Depth		Total Sediment Storage		Sediment Clean-out Depth		Max. Liquid Volume Removed	
(ft)	(m)	(gal)	(L)	(in)	(cm)	(yd^3)	(m^3)	(in)	(cm)	(gal)	(L)
4	1.2	70	265	<16	<41	0.70	0.53	<18	<45	384	1,454
6	1.8	216	818	<23	<58	2.10	1.61	<24	<61	1,239	4,690
8	2.4	540	2,044	<33	<84	4.65	3.56	<30	<76	2,884	10,917
10	3.0	1,050	3,975	<42	<107	8.70	6.65	<36	<91	5,546	20,994
12	3.7	1,770	6,700	<49	<125	14.70	11.24	<42	<107	9,460	35,810

NOTES

1. Refer to Dowmstream Defender® Clean-out Detail (Fig.2) for measurement of depths.

2. Oil accumulation is typically less than sediment, however, removal of oil and sediment during the same service is recommended.

3. Remove floatables first, then remove sediment storage volume.

4. Sediment removal is not required unless sediment depths exceed 75% of maximum clean-out depths stated in Table 1 .

Fig.4

Fig.5

Fig.6

Inspection Procedures

1. Set up any necessary safety equipment around the access port or grate of the Downstream Defender® as stipulated by local ordinances. Safety equipment should notify passing pedestrian and road traffic that work is being done.

2. Remove the lids to the manhole (Fig. 4). NOTE: The 4-ft (1.2m) Downstream Defender® will only have one lid.

3. Without entering the vessel, look down into the chamber to inspect the inside. Make note of any irregularities. See Fig.7 and 8 for typical inspection views.

4. Without entering the vessel, use the pole with the skimmer net to remove floatables and loose debris from the outer annulus of the chamber.

5. Using a sediment probe such as a Sludge Judge®, measure the depth of sediment that has collected in the sump of the vessel (Fig.5).

6. On the Maintenance Log (see page 9), record the date, unit location, estimated volume of floatables and gross debris removed, and the depth of sediment measured. Also note any apparent irregularities such as damaged components or blockages.

7. Securely replace the grate or lid.

8. Take down safety equipment.

9. Notify Hydro International of any irregularities noted during inspection.

Floatables and Sediment Cleanout

Floatables cleanout is typically done in conjunction with sediment removal. A commercially or municipally owned sump-vac is used to remove captured sediment and floatables (Fig.6).

Floatables and loose debris can also be netted with a skimmer and pole. The access port located at the top of the manhole provides unobstructed access for a vactor hose and skimmer pole to be lowered to the base of the sump.

Scheduling

- Floatables and sump cleanout are typically conducted once a year during any season.

- If sediment depths are greater than 75% of maximum clean-out depths stated in Table 1, sediment removal is required.

- Floatables and sump cleanout should occur as soon as possible following a spill in the contributing drainage area.

Fig.7 View over center shaft into sediment storage zone.

Fig.8 View of outer annulus of floatables and oil collection zone.

Recommended Equipment

- Safety Equipment (traffic cones, etc)
- Crow bar or other tool to remove grate or lid
- Pole with skimmer or net (if only floatables are being removed)
- Sediment probe (such as a Sludge Judge®)
- Vactor truck (6-inch/150mm diameter flexible hose recommended)
- Downstream Defender® Maintenance Log

Floatables and Sediment Clean Out Procedures

1. Set up any necessary safety equipment around the access port or grate of the Downstream Defender® as stipulated by local ordinances. Safety equipment should notify passing pedestrian and road traffic that work is being done.
2. Remove the lids to the manhole NOTE: The 4-ft (1.2m) Downstream Defender® will only have one lid.
3. Without entering the vessel, look down into the chamber to inspect the inside. Make note of any irregularities.
4. Using the Floatables Port for access, remove oil and floatables stored on the surface of the water with the vactor hose or the skimmer net (Fig.9, top).
5. Using a sediment probe such as a Sludge Judge®, measure the depth of sediment that has collected in the sump of the vessel and record it in the Maintenance Log (Pg.9).
6. Once all floatables have been removed, drop the vactor hose to the base of the sump via the Central Access Port. Vactor out the sediment and gross debris off the sump floor (Fig.6 and 9).
7. Retract the vactor hose from the vessel.
8. On the Maintenance Log provided by Hydro International, record the date, unit location, estimated volume of floatables and gross debris removed, and the depth of sediment measured. Also note any apparent irregularities such as damaged components or blockages.
9. Securely replace the grate or lid.

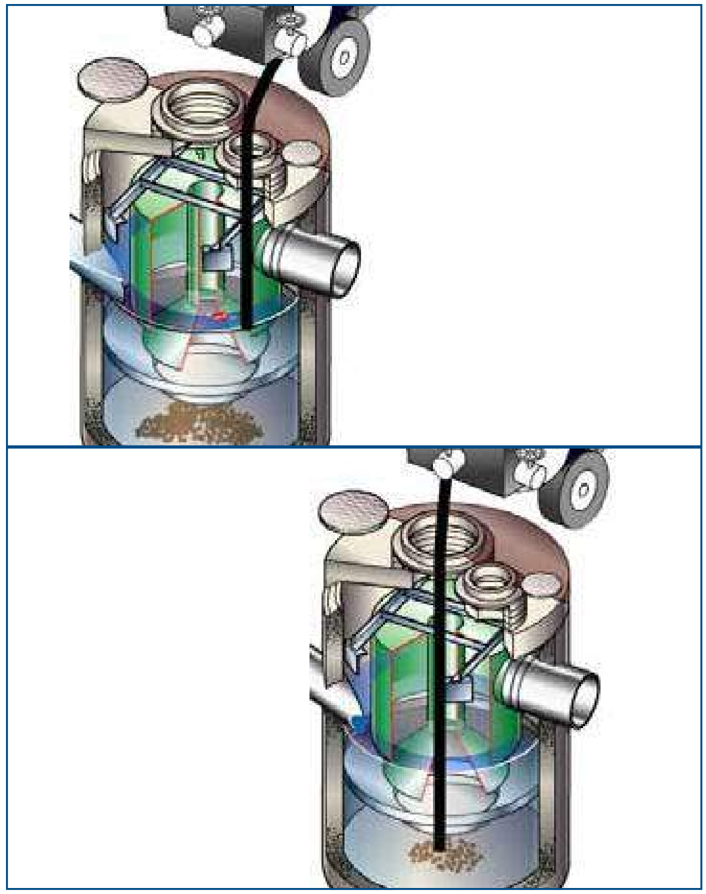


Fig.9 Floatables and sediment are removed with a vactor hose

Maintenance at a Glance

Activity	Frequency
Inspection	
Oil and Floatables Removal	- Once per year, with sediment removal - Following a spill in the drainage area
Sediment Removal	- Once per year or as needed - Following a spill in the drainage area
NOTE: For most cleanouts it is not necessary to remove the entire volume of liquid in the vessel. Only removing the first few inches of oils/floatables and the sediment storage volume is required.	

Downstream Defender® Installation Log

HYDRO INTERNATIONAL REFERENCE NUMBER:	
SITE NAME:	
SITE LOCATION:	
OWNER:	CONTRACTOR:
CONTACT NAME:	CONTACT NAME:
COMPANY NAME:	COMPANY NAME:
ADDRESS:	ADDRESS:
TELEPHONE:	TELEPHONE:
FAX:	FAX:

INSTALLATION DATE: / /

MODEL (CIRCLE ONE): **4-FT (1.2m)** **6-FT (1.8m)** **8-FT (2.4m)** **10-FT (3m)** **12-FT (3.7m)**

Downstream Defender® Maintenance Log

Site Name: ____ Owner Change since last inspection? Y N

Location: ____

Owner Name: ____

Address: ____ Phone Number: ___________________

Site Status: ____

Date: _____________ Time: _____________ Site conditions*: ___________________________________

(Stable, Under Construction, Needing Maintenance, etc.)

Date	Initials	Depth of Floatables and Oils Removed	Sediment Depth Measured Prior to Removal	Site Activity and Comments

*Note: Sediment removal is not required unless sediment depths exceed 75% of maximum clean-out depths stated in Table 1.

Notes

Downstream Defender® Inspection Log

Site Name: ______________________________ Owner Change since last inspection? Y N

Location: ______________________________

Owner Name: ______________________________

Address: ______________________________ Phone Number: ______________

Site Status: ______________________________

Date: __________ Time: __________ Site conditions*: ______________________________
(Stable, Under Construction, Needing Maintenance, etc.)

Inspection Frequency Key: A=annual; M=monthly; S=after major storms

Inspection Items	Inspection Frequency	Inspected? (Yes/No)	Maintenance Needed? (Yes/No)	Comments/Description
Debris Removal				
Adjacent area free of debris?	M			
Inlets and Outlets free of debris?	M			
Chamber free of debris?	M			
Vegetation				
Surrounding area fully stabilized? (no evidence of eroding material in Downstream Defender®)	A			
Grass mowed?	M			
Water retention where required				
Water holding chamber(s) at normal pool?	M			
Evidence of erosion?	A			
Sediment Deposition				
Sedimentation sump not more than 50% full?	A			
Structural Components				
Any evidence of structural deterioration?	A			
Rim & cover in good condition?	A			
Spalling or cracking of structural parts?	A			
Outlet/Overflow Spillway	A			
Noticeable odors?	A			
Evidence of flow bypassing facility?	A			

Inspector Comments: ____

____

____

____

Overall Condition of Downstream Defender® : ☐ Acceptable ☐ Unacceptable

**"Acceptable" would mean properly functioning; "unacceptable" would mean damaged or required further maintenance.*

If any of the above Inspection Items are checked "Yes" for "Maintenance Needed", list Maintenance actions and their completion dates below:

Maintenance Action Needed	Due Date

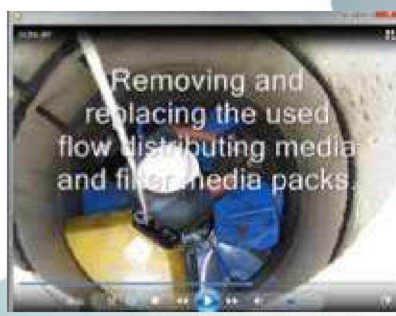
The next routine inspection is schedule for approximately: (date) ________________________

Inspected by: (signature) ____

Inspected by: (printed) ____

Hydro International Certification Program

for Stormwater BMP Maintenance Providers



The Hydro International Stormwater BMP Maintenance Certification verifies that a stormwater BMP maintenance provider has been trained on the proper inspection and maintenance procedures for Hydro International's manufactured stormwater treatment products.

Maintenance providers who complete this complimentary web-based program become a Hydro International Preferred Stormwater BMP Maintenance Partner. Become a Hydro International certified Stormwater BMP maintenance provider today.

Learn more at **http://www.hydro-int.com/us/products/service-parts**

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www.hydro-int.com

Turning Water Around...®

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

Alternative Stormwater Management
Deep-Ripping and Decompaction

Description

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

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

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

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

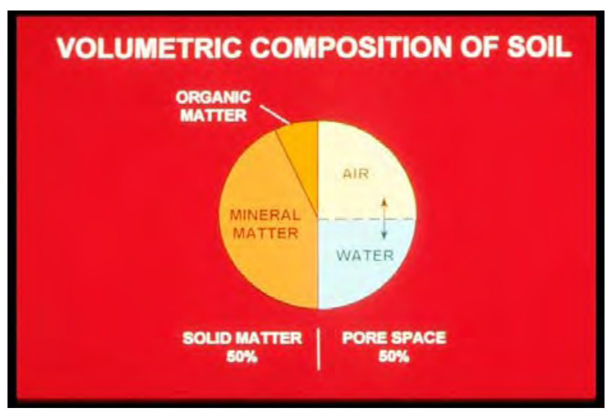

Fig. 2. About 50% of the volume of undisturbed loam surface soil is pore space, when soil is in good condition for plant growth. Brady, 2002.

Recommended Application of Practice

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

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).

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

Benefits

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

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

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

- Decreases runoff volume generated and provides hydrologic source control

- May be planned for application in feasible open locations either alone or in conjunction with plans for structural practices (e.g., subsurface drain line or infiltration basin) serving the same or contiguous areas

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

Feasibility / Limitations

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

Soil

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

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

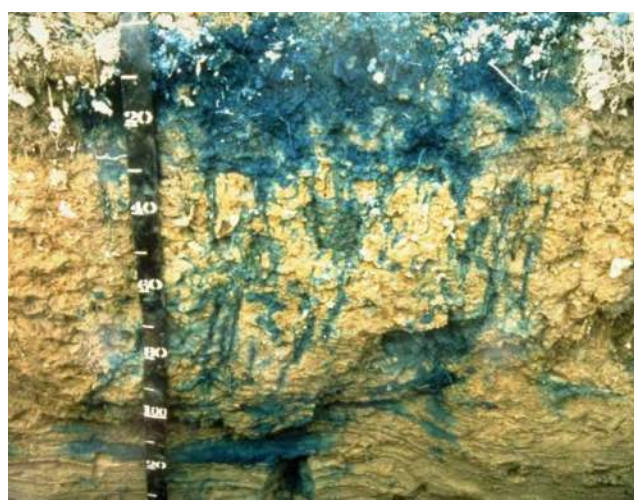

Fig. 4. Profile (in centimeters) displaying the infiltration test result of the natural undisturbed horizons of a soil in Hydrologic Soil Group C.

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

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

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

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

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

Slope

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

Local Weather/Timing/Soil Moisture

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

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.

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.

Design Guidance

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

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

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

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

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

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

Implements

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

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

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

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

Pulling-Power of Equipment

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

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

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

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

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

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

Depth and Patterns of Movement

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Maintenance and Cost

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

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

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

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

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

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

Resources

Publications:

- American Society of Agricultural Engineers. 1971. *Compaction of Agricultural Soils.* ASAE.

- Brady, N.C., and R.R. Weil. 2002. *The Nature and Properties of Soils. 13th ed.* Pearson Education, Inc.

- Baver, L.D. 1948. *Soil Physics.* John Wiley & Sons.

- Carpachi, N. 1987 (1995 fifth printing). *Excavation and Grading Handbook, Revised. 2nd ed.* Craftsman Book Company
- Ellis, B. (Editor). 1997. Safe & Easy Lawn Care: The Complete Guide to Organic Low Maintenance Lawn. Houghton Mifflin.

- Harpstead, M.I., T.J. Sauer, and W.F. Bennett. 2001. *Soil Science Simplified. 4th ed.* Iowa State University Press.

- Magdoff, F., and H. van Es. 2000. *Building Soils for Better Crops. 2nd ed.* Sustainable Agricultural Networks

- McCarthy, D.F. 1993. *Essentials of Soil Mechanics and Foundations, Basic Geotechnics 4th ed.* Regents/Prentice Hall.

- Plaster, E.J. 1992. *Soil Science & Management. 3rd ed.* Delmar Publishers.

- Union Gas Limited, Ontario, Canada. 1984. *Rehabilitation of Agricultural Lands, Dawn-Kerwood Loop Pipeline; Technical Report*. Ecological Services for Planning, Ltd.; Robinson, Merritt & Devries, Ltd. and Smith, Hoffman Associates, Ltd.

- US Department of Agriculture in cooperation with Cornell University Agricultural Experiment Station. Various years. *Soil Survey of (various names) County, New York.* USDA.

Internet Access:

- Examples of implements:

V-Rippers. Access by internet search of *John Deere Ag -New Equipment for 915* (larger-frame model) *V-Rippe*; and, *for 913* (smaller-frame model) *V-Ripper*. Deep, angled-leg subsoiler. Access by internet search of: 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 J
Notice of Intent (NOI) and
SPDES GP-0-15-002

0806372691

NOTICE OF INTENT

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

NYR (for DEC use only)

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

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

-IMPORTANT-
RETURN THIS FORM TO THE ADDRESS ABOVE
OWNER/OPERATOR MUST SIGN FORM

Owner/Operator Information

Owner/Operator (Company Name/Private Owner Name/Municipality Name)
Hudson Valley Community College

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

Owner/Operator Contact Person First Name
Richard

Owner/Operator Mailing Address
80 Vandenburgh Avenue

City
Troy

State
NY

Zip
12180 -

Phone (Owner/Operator)
518 - 629 - 7356

Fax (Owner/Operator)
- -

Email (Owner/Operator)
r.edwards@hvcc.edu

FED TAX ID
- (not required for individuals)

1443372699

Project Site Information

Project/Site Name

HVCC Gene Haas Center Adv. Manuf. Bldg.

Street Address (NOT P.O. BOX)

80 Vandenburgh Avenue

Side of Street

○ North ○ South ● East ○ West

City/Town/Village (THAT ISSUES BUILDING PERMIT)

Troy

State: NY Zip: 12180 -

County: Rensselaer

DEC Region: 4

Name of Nearest Cross Street

South Drive

Distance to Nearest Cross Street (Feet)

10

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): 607525

Y Coordinates (Northing): 4727944

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
- ○ 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

Number of Lots

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

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

Total Site Area	**Total Area To Be Disturbed**	**Existing Impervious Area To Be Disturbed**	**Future Impervious Area Within Disturbed Area**
134.5	1.6	1.1	1.2

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

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

A	**B**	**C**	**D**
%	%	100 %	%

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

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

Start Date / / - **End Date** / /

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

Name

Unnamed Tributary of the Hudson River

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?

NYSDOT

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

4277372697

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
CHA

Contact Name (Last, Space, First)
Hollowood, Michael E.

Mailing Address
III Winners Circle, PO Box 5269

City
Albany

State: NY Zip: 12205-0269

Phone: 518-453-3930 Fax: 518-453-4522

Email
mhollowood@chacompanies.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 Michael **MI** E

Last Name Hollowood

Signature

Date __ / __ / ____

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

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

Temporary Structural

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

Biotechnical

- ○ **Brush Matting**
- ○ **Wattling**

Vegetative Measures

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

Permanent Structural

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

Other

Post-construction Stormwater Management Practice (SMP) Requirements

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

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

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

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

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

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

Total WQv Required

0.077 **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	0.03
○ Disconnection of Rooftop Runoff (RR-4)..	.	and/or	.
RR Techniques (Volume Reduction)			
○ Vegetated Swale (RR-5)			.
○ Rain Garden (RR-6)			.
○ Stormwater Planter (RR-7)			.
○ Rain Barrel/Cistern (RR-8)			.
○ Porous Pavement (RR-9)			.
○ Green Roof (RR-10)			.
Standard SMPs with RRv Capacity			
○ Infiltration Trench (I-1)			.
○ Infiltration Basin (I-2)			.
○ Dry Well (I-3)			.
○ Underground Infiltration System (I-4)			.
○ Bioretention (F-5)			.
○ Dry Swale (O-1)			.
Standard SMPs			
○ Micropool Extended Detention (P-1)			.
○ Wet Pond (P-2)			.
○ Wet Extended Detention (P-3)			.
○ Multiple Pond System (P-4)			.
○ Pocket Pond (P-5)			.
○ Surface Sand Filter (F-1)			.
○ Underground Sand Filter (F-2)			.
○ Perimeter Sand Filter (F-3)			.
○ Organic Filter (F-4)			.
○ Shallow Wetland (W-1)			.
○ Extended Detention Wetland (W-2)			.
○ Pond/Wetland System (W-3)			.
○ Pocket Wetland (W-4)			.
○ Wet Swale (O-2)			.

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

Alternative SMP	Total Contributing Impervious Area(acres)
● Hydrodynamic	1.21
○ 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: Downstream Defender

Manufacturer: Hydro International

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

0.003 **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

0.002 **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

0.074 **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). 0.077

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**
0.020 **acre-feet**	0.020 **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**
7.23 **CFS**	6.82 **CFS**

Total Extreme Flood Control Criteria (Qf)

Pre-Development	**Post-development**
12.55 **CFS**	10.87 **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

Hudson Valley Community College

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.

Since this project proposes a total of 1.21 acre of impervious area to be constructed on site, the replacement of 1.14 acres of existing impervious area is considered redevelopment, and the remaining 0.07 acres of impervious area is considered to new development. Subsequently, the minimum RRv criteria is applied to the new developed impervious area only. The minimum RRv required for the entire project is 0.002 acre feet. Total runoff reduction is to be provided through the seven (7) trees proposed to be planted on site and the seven (7) existing trees being preserved on site is equal to 0.003 acre feet. The remaining WQv to be treated is through the use of the existing hydrodynamic unit Downstream Defender.

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

8741372697

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 __ / __ / ____

SPDES GP-0-15-002

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

From

CONSTRUCTION ACTIVITY

Permit No. GP-0-15-002

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

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

John J. Ferguson
Chief Permit Administrator

1 / 12 / 15

Authorized Signature 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
<u>FROM CONSTRUCTION ACTIVITIES</u>

Part I. PERMIT COVERAGE AND LIMITATIONS

A. Permit Application

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

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

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

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

B. Effluent Limitations Applicable to Discharges from Construction Activities

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

e. **Prohibited *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***

(Part I.C.2.c.i)

(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 **<u>not</u>** 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.

II. 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 all 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 August 2005.

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

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

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

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

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

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

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

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

E. Change of *Owner or Operator*

2. When property ownership changes or when there is a change in operational control over the construction plans and specifications, the original *owner or operator* must notify the new *owner or operator*, <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*.

III. Part III. STORMWATER POLLUTION PREVENTION PLAN (SWPPP)

A. General SWPPP Requirements

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

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

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

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

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

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

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

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

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

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

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

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

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

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

B. Required SWPPP Contents

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

   c. A Stormwater Modeling and Analysis Report that includes:

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

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

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

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

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

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

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

e. Infiltration test results, when required; and

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

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

C. Required SWPPP Components by Project Type

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

IV. Part IV. INSPECTION AND MAINTENANCE REQUIREMENTS

A. General Construction Site Inspection and Maintenance Requirements

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

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

B. Contractor Maintenance Inspection Requirements

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

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

3. For construction sites where soil disturbance activities have been shut down with partial project completion, the *trained contractor* can stop conducting the maintenance inspections if all areas disturbed as of the project shutdown date have achieved *final stabilization* <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;

(Part IV.C.4.i)

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

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

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

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

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

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

V. Part V. TERMINATION OF PERMIT COVERAGE

A. Termination of Permit Coverage

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

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

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

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

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

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

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

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

(Part V.A.5)

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.

VI. 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.

VII. **Part VII. STANDARD PERMIT CONDITIONS**

A. Duty to Comply

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

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

B. Continuation of the Expired General Permit

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

C. Enforcement

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

D. Need to Halt or Reduce Activity Not a Defense

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

E. Duty to Mitigate

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

F. Duty to Provide Information

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

G. Other Information

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

H. Signatory Requirements

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

I. Property Rights

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

J. Severability

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

K. Requirement to Obtain Coverage Under an Alternative Permit

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

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

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

L. Proper Operation and Maintenance

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

M. Inspection and Entry

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

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

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

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

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

N. Permit Actions

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

O. Definitions

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

P. Re-Opener Clause

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

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

Q. Penalties for Falsification of Forms and Reports

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

R. Other Permits

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

VIII. **APPENDIX A**

Definitions

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Municipal Separate Storm Sewer (MS4) - a conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters,

ditches, man-made
channels, or storm drains):

(i) Owned or operated by a State, city, town, borough, county, parish, district, association, or other public body (created by or pursuant to State law) having jurisdiction over disposal of sewage, industrial wastes, stormwater, or other wastes, including special districts under State law such as a sewer district, flood control district or drainage district, or similar entity, or an Indian tribe or an authorized Indian tribal organization, or a designated and approved management agency under section 208 of the CWA that discharges to surface waters of the State*;*

(ii) Designed or used for collecting or conveying stormwater;

(iii) Which is not a *combined sewer*; and

(iv) Which is not part of a Publicly Owned Treatment Works (POTW) as defined at 40 CFR 122.2.

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

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

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

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

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

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

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

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

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

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

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

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.

IX. **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* <u>or</u> *alter the hydrology from pre to post development* conditions, <u>and</u> are not listed in Table 1

X. **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

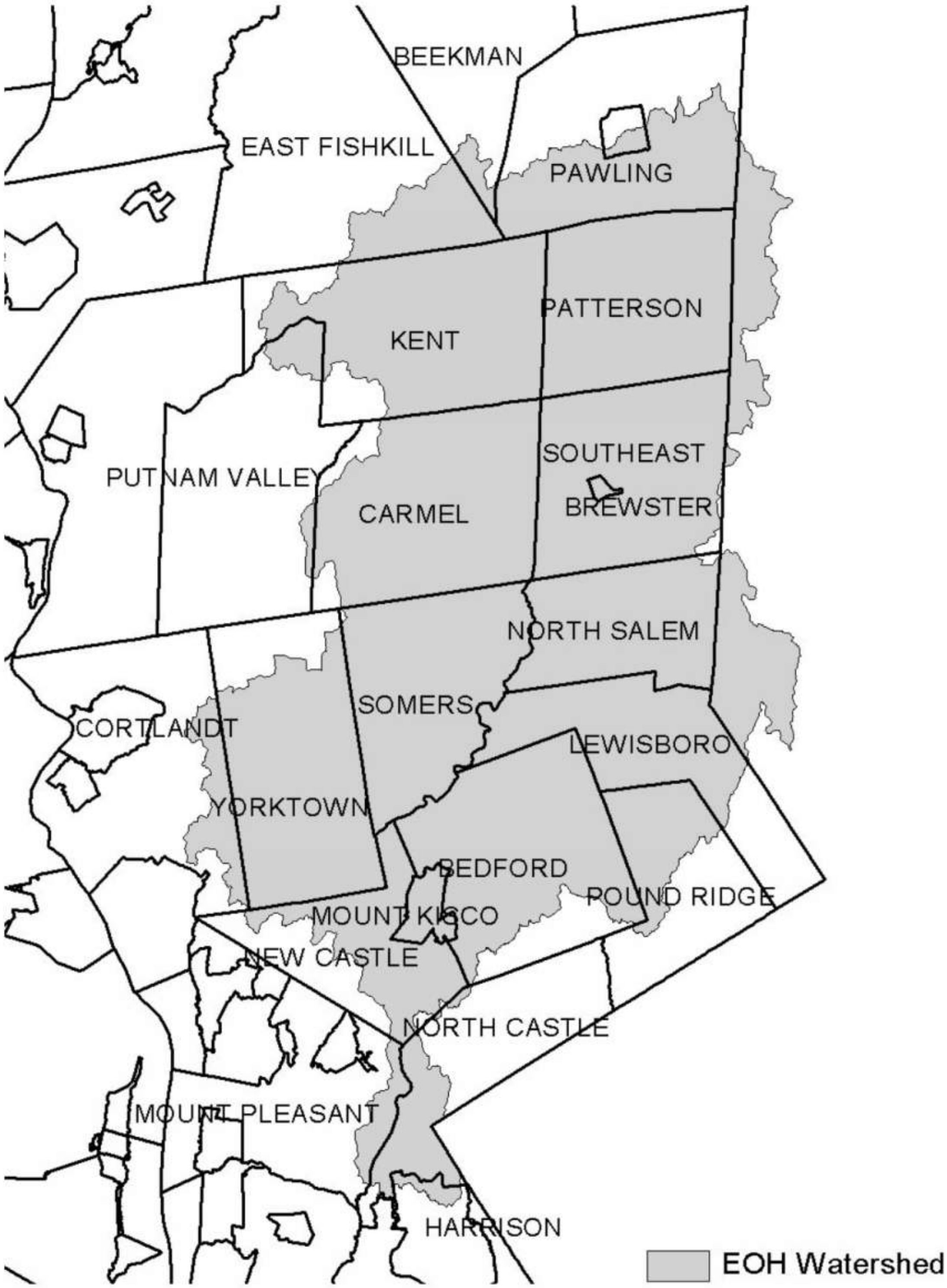


Figure 2 - Onondaga Lake Watershed

Figure 3 - Greenwood Lake Watershed

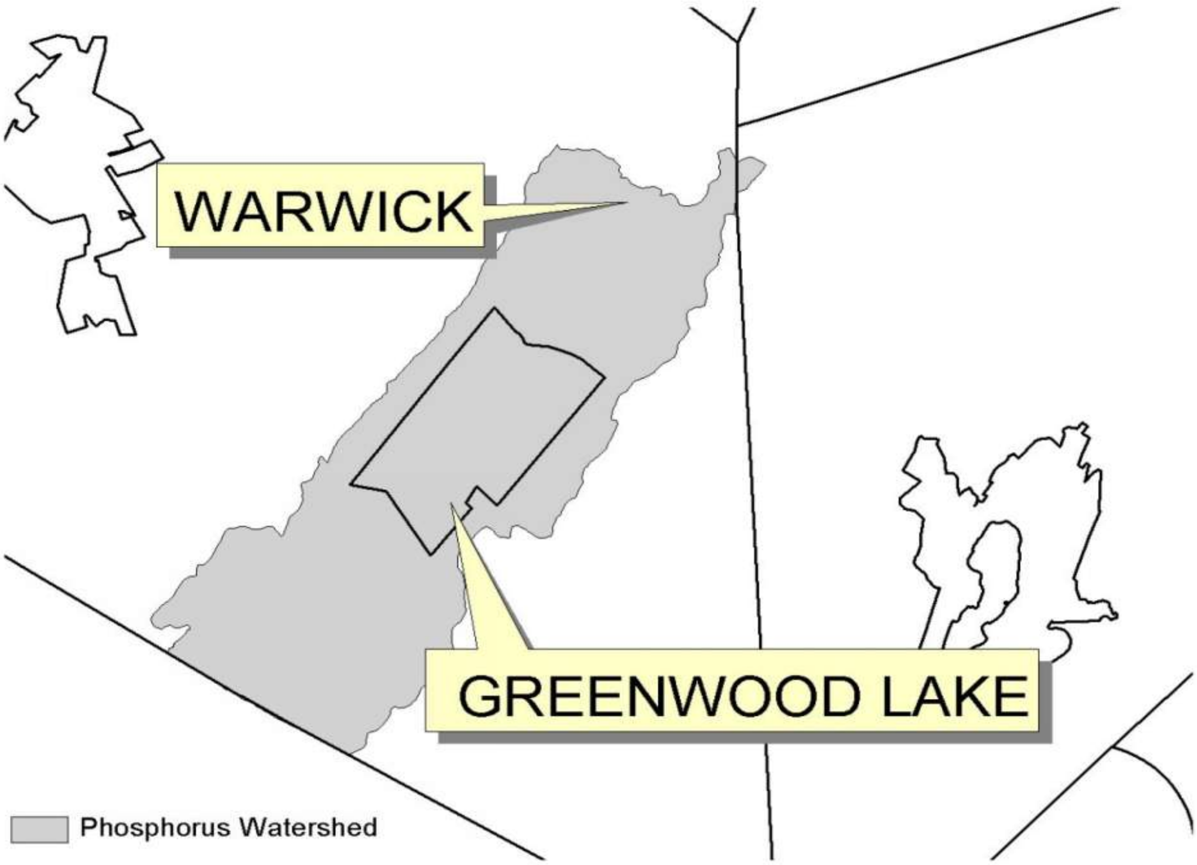


Figure 4 - Oscawana Lake Watershed

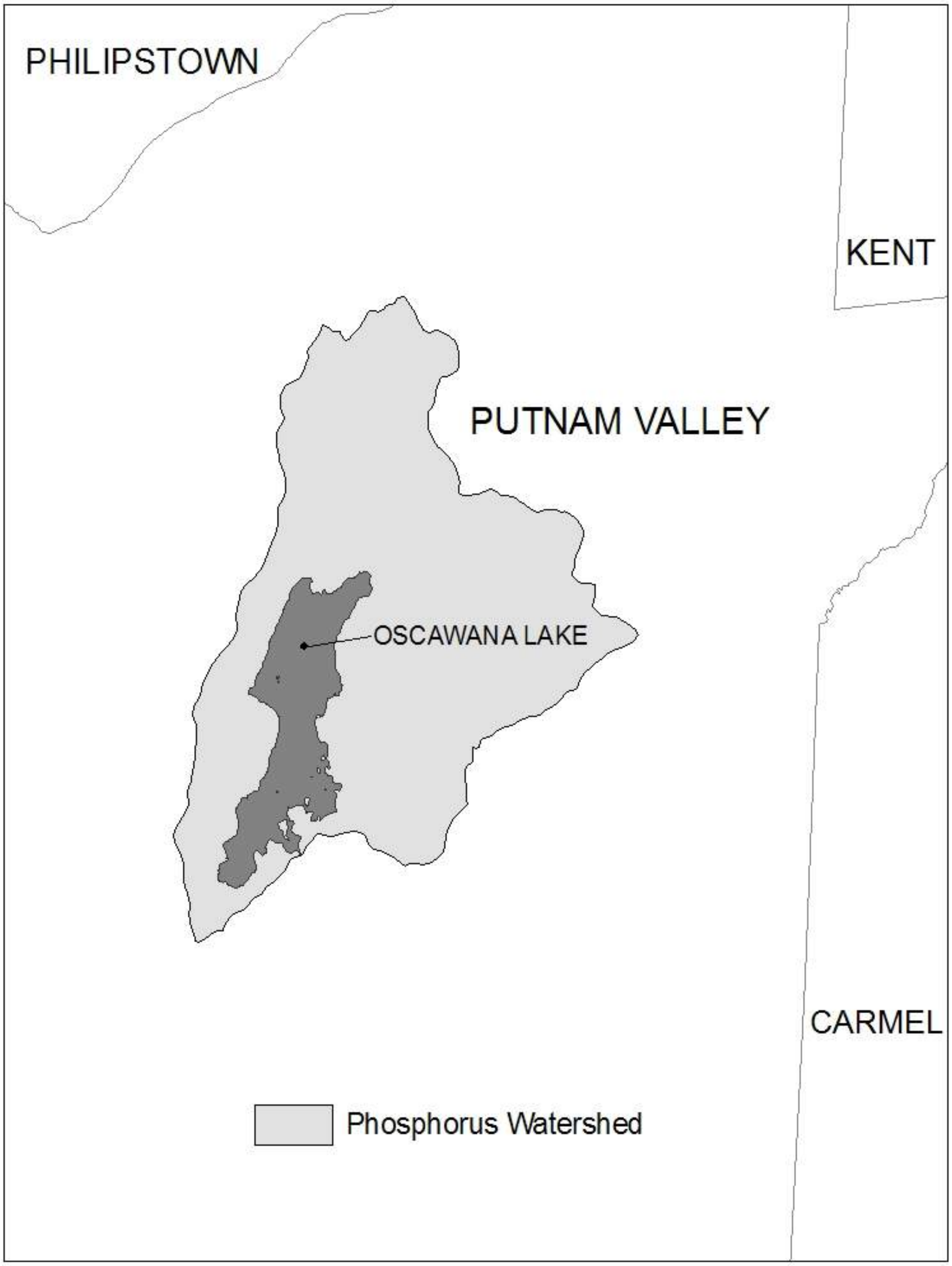
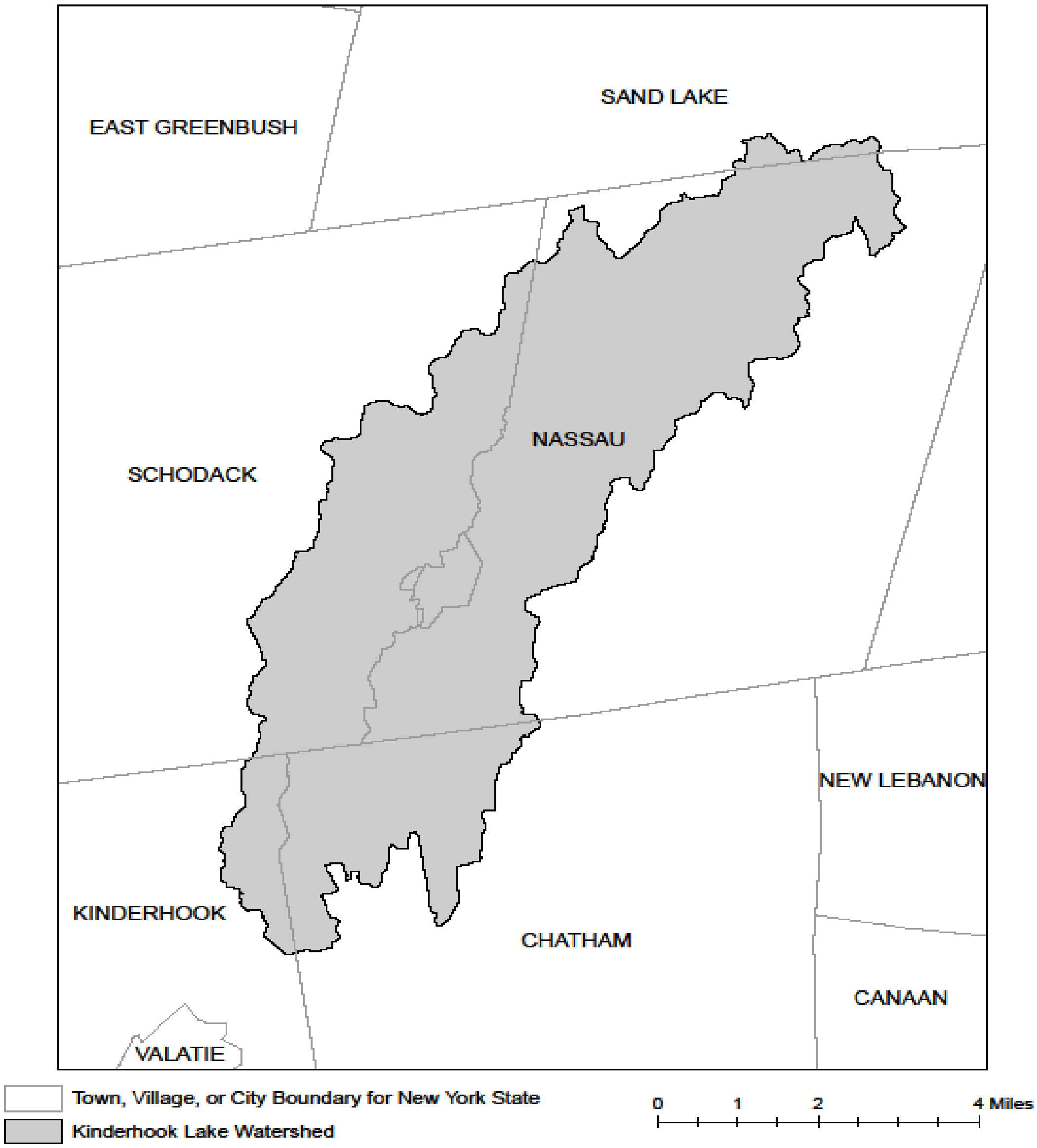


Figure 5: Kinderhook Lake Watershed



XI. 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

XII. 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
Onondaga	Onondaga Creek, Middle and tribs
Onondaga	Onondaga Creek, Upp, and minor tribs
Onondaga	Harbor Brook, Lower, and tribs
Onondaga	Ninemile Creek, Lower, and tribs
Onondaga	Minor tribs to Onondaga Lake
Onondaga	Onondaga Creek, Lower, and tribs
Ontario	Honeoye Lake
Ontario	Hemlock Lake Outlet and minor tribs
Ontario	Great Brook and minor tribs
Orange	Monhagen Brook and tribs
Orange	Orange Lake
Orleans	Lake Ontario Shoreline, Western
Oswego	Pleasant Lake
Oswego	Lake Neatahwanta
Putnam	Oscawana Lake
Putnam	Palmer Lake
Putnam	Lake Carmel
Queens	Jamaica Bay, Eastern, and tribs (Queens)
Queens	Bergen Basin
Queens	Shellbank Basin
Rensselaer	Nassau Lake
Rensselaer	Snyders Lake
Richmond	Grasmere, Arbutus and Wolfes Lakes
Rockland	Congers Lake, Swartout Lake
Rockland	Rockland Lake
Saratoga	Ballston Lake
Saratoga	Round Lake
Saratoga	Dwaas Kill and tribs
Saratoga	Tribs to Lake Lonely
Saratoga	Lake Lonely
Schenectady	Collins Lake
Schenectady	Duane Lake
Schenectady	Mariaville Lake
Schoharie	Engleville Pond
Schoharie	Summit Lake
Schuyler	Cayuta Lake
St. Lawrence	Fish Creek and minor tribs
St. Lawrence	Black Lake Outlet/Black Lake
Steuben	Lake Salubria
Steuben	Smith Pond
Suffolk	Millers Pond
Suffolk	Mattituck (Marratooka) Pond
Suffolk	Tidal tribs to West Moriches Bay
Suffolk	Canaan Lake
Suffolk	Lake Ronkonkoma
Suffolk	Beaverdam Creek and tribs
Suffolk	Big/Little Fresh Ponds
Suffolk	Fresh Pond
Suffolk	Great South Bay, East
Suffolk	Great South Bay, Middle
Suffolk	Great South Bay, West
Suffolk	Mill and Seven Ponds
Suffolk	Moriches Bay, East
Suffolk	Moriches Bay, West
Suffolk	Quantuck Bay
Suffolk	Shinnecock Bay (and Inlet)
Sullivan	Bodine, Montgomery Lakes
Sullivan	Davies Lake
Sullivan	Pleasure Lake
Sullivan	Swan Lake
Tompkins	Cayuga Lake, Southern End
Tompkins	Owasco Inlet, Upper, and tribs
Ulster	Ashokan Reservoir
Ulster	Esopus Creek, Upper, and minor tribs
Ulster	Esopus Creek, Lower, Main Stem
Ulster	Esopus Creek, Middle, and minor tribs
Warren	Lake George
Warren	Tribs to L.George, Village of L George
Warren	Huddle/Finkle Brooks and tribs
Warren	Indian Brook and tribs
Warren	Hague Brook and tribs
Washington	Tribs to L.George, East Shr Lk George
Washington	Cossayuna Lake
Washington	Wood Cr/Champlain Canal, minor tribs
Wayne	Port Bay
Wayne	Marbletown Creek and tribs
Westchester	Lake Katonah
Westchester	Lake Mohegan
Westchester	Lake Shenorock
Westchester	Reservoir No.1 (Lake Isle)
Westchester	Saw Mill River, Middle, and tribs
Westchester	Silver Lake
Westchester	Teatown Lake
Westchester	Truesdale Lake
Westchester	Wallace Pond
Westchester	Peach Lake
Westchester	Mamaroneck River, Lower
Westchester	Mamaroneck River, Upp, and tribs
Westchester	Sheldrake River and tribs
Westchester	Blind Brook, Lower
Westchester	Blind Brook, Upper, and tribs
Westchester	Lake Lincolndale
Westchester	Lake Meahaugh
Wyoming	Java Lake
Wyoming	Silver Lake

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

XIII. APPENDIX F

LIST OF NYS DEC REGIONAL OFFICES

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