Appendix F

Revised Stormwater Prevention Pollution Plan

INSITE
ENGINEERING, SURVEYING &
LANDSCAPE ARCHITECTURE, P.C.

PRELIMINARY
STORMWATER POLLUTION PREVENTION PLAN

For

Salem Hunt
Town of North Salem, New York

April 24, 2009

NOTE: This report, in conjunction with the project plans, makes up the complete Preliminary Stormwater Pollution Prevention Plan.

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1.0 INTRODUCTION

1.1 Project Description

The subject site plan is for a 40± acre parcel located on the west side of June Road in the Town of North Salem in Westchester County. The attached Location Map (Figure 1) delineates the subject parcel and its surroundings. The subject parcel is located in the R-MF/4 (Residential – Multi-family) zoning district and is designated as Tax Map Number 5-1735-19. It is proposed to develop the site with 65 two bedroom residential units. The proposed units will gain access with a proposed access road off June Road. Water will be supplied to the site by drilled wells that will serve as a public water supply for the proposed development. Wastewater will be disposed of with a subsurface treatment system servicing the entire development.

There are no known enforcement actions, including lawsuits or administrative proceedings, commenced against the applicant, or any principle affiliate of the applicant, for any alleged violations of law related to the applicant of the site, in the five years preceding this application.

1.2 Existing Conditions

The subject parcel is located on a hillside adjacent to June Road in the Town of North Salem. The property contains a natural drainage divide (running north south) with a high point near the southern property line. There are three Town regulated wetland pockets (one is also NYSDEC regulated) located in the western portion of the site. There is an existing watercourse flowing from south to north to the east of the ridgeline near the eastern property line. The watercourse is immediately surrounded by NYSDEC Wetland L-32. There is an existing NYSEG easement on the subject property along a portion of the northern property line.

The property is characterized as a wooded hillside sloping gently from south to north. The elevations on the site range from 480 near the discharge point of the watercourse along the northern property line to 580 at the high point of the natural drainage divide on the southern property line. The stormwater runoff generally sheets off the divide to the wetlands located to the east and west of the divide. The Town regulated wetlands to the west, watercourse, and NYSDEC wetland to the east of the ridgeline ultimately drain off the site to the north. The onsite soils consist of Charlton Loam (ChB, ChD)^{B}, Leicester Loam (LcB)^{c}, Pompton Silt Loam (Pw)^{B}, Ridgebury Loam (RdB)^{C}, Sutton Loam (SuB)^{B}, Sun Loam (Sh)^{D} and Udorthrents (Ub). The soils in the area proposed to be developed are classified as deep to very deep well drained soils, whereas the soils located in the portions of the site to be left undisturbed, such as the wetlands are classified as very deep, nearly level, and poorly drained or very poorly drained. The soils boundaries are shown on Figure 2 and 3.

1.3 Proposed Conditions

The subject property is proposed to be developed with a multifamily residential use, containing 65 units. Access to the site will be gained from an access road off June Road near the intersection of June Road and Starlea Road. The stormwater runoff from the development of the western portion of the site will be collected and conveyed to a treatment train consisting of two stormwater practices in series (1.1P and 1.2P) before discharging to the Town-regulated wetland to the north at Design Line 1. The stormwater runoff from the development to the east of the natural drainage divide will be collected and conveyed to a treatment train consisting of swales and two stormwater practices (2.1P and 2.2P) located near the entrance to the site. The stormwater runoff from this treatment train as well as the area to the east of the proposed road will discharge to Design Line 2. The overall drainage patterns present in the existing condition were generally maintained in the post-development condition. The pre-development and post-development drainage areas are shown on Figures 2 and 3 respectively.

Stormwater practice 1.1P has been designed as a (W-4) pocket wetland. Stormwater practice 1.2P is designed as a (F-1) surface sand filter. Stormwater practices 2.1P and 2.2P have been designed as (P-1) micropool extended detention ponds.

Soil testing was conducted in the areas of the proposed stormwater basins and the results are shown on Figure 4. The testing identified a groundwater source for the (W-4) pocket wetland in accordance with the NYSDEC requirements. It is proposed to line the two proposed (P-1) micropool extended detention ponds with clay to promote the permanent pool. The contributing area to pond 2.1P is slightly less than the recommended 10 acres (contributing area is 9.3 acres). The addition of the clay liner and imperviousness (29%) of the

contributing area will help maintain the permanent pool. The NYSDEC has accepted this on several other projects with as little as 4 acres. The soil testing indicated adequate soil depth and the required two foot separation distance to groundwater for the proposed (F-1) surface sand filter.

2.0 STORMWATER MANAGEMENT

The stormwater management for the subject project has been designed in accordance with the New York State Department of Environmental Conservation (NYSDEC) requirements and the latest version of the New York State Stormwater Management Design Manual (NYSSMDM) including Chapter 10. The project is located in a TMDL phosphorus watershed so the requirements of Chapter 10 apply. Stormwater practices 1.1P, 1.2P, 2.1P and 2.2P have been designed per the NYSSMDM to meet the water quality treatment requirements. To meet the NYSDEC Stream Channel Protection (Cp_v) requirement, 24-hour, center-of-mass detention has been provided for the 1-year, 24-hour storm through each of the two treatment trains prior to discharge at the respective design lines. Attenuation of the 10-year and 100-year, 24-hour design storms has been provided to meet the NYSDEC requirements for Overbank Flood Control (Q_r) and Extreme Flood Control (Q_f), respectively.

The stormwater management for the subject project has also been designed in compliance with the New York City Department of Environmental Protection (NYCDEP) requirements. Water quality for this project has been addressed to meet the NYCDEP standards with two stormwater basins in series. Additionally, 24-hour plug-flow detention of the 2-year, 24-hour storm, and attenuation for the 10-, 25-, 50-, and 100-year, 24-hour design storms has been provided to meet the requirements of the NYCDEP and the Town of North Salem.

Two design lines were chosen to analyze the pre-development and post-development stormwater runoff. Design lines were chosen rather than design points due to stormwater runoff discharging to onsite wetlands in both the pre-development and post-development conditions. In the pre-development condition, the stormwater discharges as sheet and shallow concentrated flows. In the proposed condition, it will discharge to an enhanced velocity dissipater near the edge of the wetland. Design Line 1 is located to the west of the drainage divide. This line was chosen to assess the stormwater runoff from the site that drains to the town-regulated wetlands on the northwest portion of the property for both the pre- and post-development conditions. Design Line 2 is along the northern and eastern borders of the proposed development. This design line was chosen to assess the stormwater runoff from the site that drains to June Road and the NYSDEC regulated wetlands to the east of the development. It is noted that portions of the stormwater runoff contributory to Design Line 2 does not reach the NYSDEC wetland to the east in the pre-development condition. In the pre-development condition approximately 5 acres of woodland discharges to the developed property to the north. In the proposed condition this area is directed to the onsite wetlands. This is proposed because there is no practical method of discharging basins 2.1P and 2.2P to the northern property line due to the existing development on the adjacent property. To address the increased volume of stormwater runoff to the wetland, Better Site Design (BSD) methods have been incorporated to the greatest extent practical to limit the increase in volume of runoff reaching the wetland. For a discussion of the BSD practices incorporated into the design see Section 2.1. As shown in Section 2.3 the peak discharge from the property to Design Line 2 in the post-development condition has been attenuated to below the peak discharge in the pre-development condition.

NYSDEC wetland L-32 (Design Line 2 discharge) has a overall contributing area of approximately 279 acres. Approximately 19 acres of the proposed development will contribute to the wetland making up 7% of the contributing area. As the project represents a small portion of the wetland contributing area, the increase in volume of stormwater runoff from the project is seen as having negligible consequences. To ensure that the increase in volume does not change the function of the box culvert under June Road that drains the wetland, a downstream assessment was performed. The results can be found in Appendix I.

No formal treatment for stormwater runoff from the SSTS area is proposed. The existing woods in the area of the proposed SSTS area have minimal under brush. This classifies the woods by TR-55 as woods-hydraulic condition-fair. This equates to a runoff curve number (CN) of 60 for B-soils and 73 for C-soils. The SSTS area in the proposed condition will be cleared and planted with a conservation seed mix. The SSTS will be mowed only twice a year to prevent establishment of woody vegetation. The seed mixture and limited mowing will create a meadow in accordance with TR-55. The CN for meadow from TR-55 is 58 for B-soils and 71 for C-soils. As demonstrated above the CN for the post development condition will be lower then the pre development

condition meaning a reduction in stormwater runoff. With the reduction in the volume of runoff, the potential for pollutant runoff is also reduced. As this is the case no treatment for the SSTS area is required.

2.1 NYSDEC WQv

NYSDEC SPDES General Permit GP-0-08-001 requires that the Water Quality Volume (WQv) be treated in order to provide pollutant removal. The project is located in a TMDL (Phosphorus) watershed and is subject to the higher standards of Chapter 10 "Enhanced Phosphorus Removal Standards" of the NYSSMDM. Chapter 10 sets four goals to be achieved by the stormwater management practices implemented in TMDL phosphorus watersheds. These four goals are; reduced runoff volumes, less than 15% effective treatment bypass, median concentration of particulate phosphorus less than or equal to 0.1 mg/L and median concentration of dissolved phosphorus less than or equal to 0.06 mg/L.

Goal 1 of reducing runoff volumes is achieved through source control. Source controls are implemented by Better Site Design (BSD) practices that are used to reduce the volume of runoff and thereby reduce pollutant loads to receiving waters. Chapter 10 sets a percentage goal of impervious surface to be routed through a BSD based on soil type. The majority of the soils in the proposed development area are B soils, and a small percentage of C soils. Chapter 10 sets the goal for B-soils that stormwater runoff from 20% of impervious areas be routed through a BSD (rain garden, grass swale). Approximately 22% of the proposed impervious surfaces are routed through a BSD. For details of areas reaching BSD practices, see Figure 7. BSD practices incorporated into the proposed project include reduction of impervious surfaces, rain gardens, grass channels, disconnecting impervious surfaces, and reduced disturbance. The width of the proposed road has been reduced from 24' to 20' decreasing the proposed impervious by 10,400 square feet. All proposed driveways and parking areas are to be constructed with pervious pavement reducing impervious cover by 34,800 S.F. The reductions in impervious surfaces will reduce runoff volumes and thereby potential pollutants to receiving waters. Several rain gardens are proposed to collect stormwater runoff from the roofs of the proposed dwellings. The rain gardens will capture the runoff and filter it through a soil media, reducing runoff through infiltration and evapotranspiration. Each rain garden can capture 260 cubic feet of runoff allowing for a reduction in WQv of 5,200 cubic feet. To further increase pollutant removal, the plants in the rain gardens will be selected to enhance nutrient removal. Low gradient grass swales with check dams (to provide storage and infiltration of stormwater runoff) will also contribute to a reduction in WQv and pollutants to receiving waters. The rain gardens and grass swales serve to break up the impervious cover that would otherwise be collected and piped directly to the stormwater treatment practices. The disconnect allows for an increase in time to concentration there by increasing the volume of infiltration as the soil has a longer period to absorb runoff. The longer TC will also increase the stormwater treatment practices potential for pollutant removal as peak discharges to the practices will be reduced allowing for longer detention times.

Goal 2 of achieving less than 15% effective treatment bypass is achieved by increasing the WQv above the requirements set forth in Chapter 4 of the NYSSMDM. As stated in the NYSSMDM, this goal is achieved by capture and treatment of runoff from the 1-Year 24 hour storm. The chart below is a summary of the WQv required for each practice based on the runoff calculated in Appendix B for the 1-Year, 24 hour storm. By providing source controls to meet Goal 1, the NYSSMDM allows the reduction in runoff achieved to be used to reduce the WQv. This is reflected in the last column of Table 2.1A. Tables 2.1B and 2.1C below demonstrate that the stormwater practices have been sized in accordance with the WQv as summarized in Table 2.1A to achieve Goal 2 of Chapter 10. The following table summarizes the WQv's for the subject project.

Table 2.1A

Subcatchment(s)	Stormwater Practice Providing Treatment	WQv See Appendix B (CF)	WQv Reduction by Source Control (CF)	WQv Required (CF)
1.1S	1.1P	15,812	0	15,812
1.1S & 1.2S	1.2P	16,814	0	16,814
2.1S	2.1P	34,587	5,200	29,387
2.1S & 2.2S	2.2P	39,857	5,200	34,657

Goal 3 of achieving a median concentration of particulate phosphorus at or below 0.1 mg/L and Goal 4 of achieving a median concentration of dissolved phosphorus at or below 0.06 mg/L is accomplished by sizing the stormwater practices in accordance with Section 10.4 of the NYSSMDM. For stormwater practices 1.1P (W-4 pocket wetland), 2.1P, and 2.2P (P-1 micropool extended detention pond) the following are required; 4' to 6' deep forebay, 4' to 8' deep permanent pool, length to width ratio of 2:1, minimum surface to drainage area ratio of 1:100, and 50% of WQv in the permanent pool. The following tables summarize the required elements.

Table 2.1B

Stormwater Practice	Forebay Depth Required (Ft)	Forebay Depth Provided (Ft)	Permanent Pool Depth Required (Ft)	Permanent Pool Depth Provided (Ft)	Length to Width Ratio Required	Length to Width Ratio Provided
1.1P	4-6	5	4-8	5	2:1	2.3:1
2.1P	4-6	4	4-8	5	2:1	6.6:1
2.2P	4-6	5	4-8	5	2:1	2.7:1

Stormwater Practice	Ratio of Surface Area to Drainage Area Required	Ratio of Surface Area to Drainage Area Provided	% WQv Required in Forebay	Volume Required in Forebay (CF)	Volume Provided in Forebay (CF)
1.1P	1:100	1:16	10%	1,581	11,000
2.1P	1:100	1:30	10%	2,939	9,600
2.2P	1:100	1:46	10%	3,466	9,000

Stormwater Practice	% WQv in Permanent Pool Required	Volume Required in Permanent Pool	Volume Provided in Permanent Pool	% WQv in Permanent Pool Provided
1.1P	50%	7,906	26,250	166%
2.1P	50%	14,694	28,450	97%
2.2P	50%	17,329	18,700	54%

To meet the requirements of Section 10.4 of the NYSSMDM stormwater practice 1.2P must be sized with the appropriate storage and filter surface area for the WQv based on the 1-year, 24-hour design storm. The sandfilter must provide a storage volume equal to 75% of the WQv. See Appendix G for detailed calculations.

Table 2.1C

Stormwater Practice	Storage Volume Required (CF)	Storage Volume Provided (CF)	Filter Surface Area Required (SF)	Filter Surface Area Provided (SF)
1.2P	12,611	14,700	1,233	1,600

The treatment for the WQ_v for post development subcatchment 2.4S (first 250 feet of access road) will be accomplished using a Stormfilter by Contech. The Stormfilter is on the New York State Verified Proprietary Stormwater Management Practices list released May 2007 and found at http://www.dec.ny.gov/chemical/29089.html. Per the list the Stormfilter with ZPG media is verified for new development. The peak flow for the water quality rainfall for subcatchment 2.4S for the 1-year, 24-hour design storm is 0.37 cfs from Appendix B. The specified Stormfilter with 23 cartridges is capable of filtering 0.38 cfs. Stormfilter sizing calculations can be found in appendix H. Deep sump catch basins are proposed as pretreatment for the unit.

It is concluded that by providing source controls, WQv treatment of the 1-year, 24-hour design storm, and sizing the stormwater practices in accordance with Section 10.4 of the NYSSMDM the four goals of Chapter 10 "Enhanced Phosphorus Removal Standards" are met.

2.2 NYCDEP Qualitative Analysis

Pollutant runoff amounts were analyzed in the pre and post-development conditions (as required by the NYCDEP) at the same design points and design lines used for the quantitative analysis. The Pollutant Loading Coefficient Method was utilized to calculate the annual export of Biological Oxygen Demand (BOD), Total Phosphorus (TP), Total Nitrogen (TN), and Total Suspended Solids (TSS). The Pollutant Loading Coefficient Method is utilized by the NYCDEP for Stormwater Pollution Prevention Plan permitting. The publication *Fundamentals of Urban Runoff Management: Technical and Institutional Issues* produced by the Terrene Institute was referenced to determine the appropriate loading rates for TP, TN, and TSS. The New York State Department of Environmental Conservation (NYSDEC) publication *Reducing the Impacts of Stormwater Runoff from New Development* (*Impacts*) was referenced to determine appropriate loading rates for BOD. The appropriate loading rates were then utilized to calculate the annual pollutant export values. Variables involved with this calculation include soil type and land use/ground cover characteristics. The following table summarizes the pollutant loading rates utilized for the subject project.

SUMMARY OF POLLUTANT LOADING RATES (LBS/ACRE/YEAR)

Land Use/Ground Cover	BOD	TP	TN	TSS
Forest	6.0	0.10	1.8	77.0
Grass	7.0	0.12	3.7	308.0
Road/Impervious	111.0	1.00	2.1	447.0
Multifamily Residential	50.0	0.63	5.0	395.0

Stormwater basins and a grass swale will be used to treat stormwater runoff from the proposed project. A low flow outlet and broad crested weir have been sized to provide 24-hour plug-flow detention of the 2-year, 24-hour storm as required by the NYCDEP. The following pollutant removal efficiencies for the Extended Detention Basin and Grass Swale, trip are referenced from the publication *Reducing the Impacts of Stormwater Runoff from New Development*, prepared by the NYSDEC. The removal efficiencies for the StormFilter are based on discussions with the manufacturer and review of the NYSDEC *Stormwater Management Design Manual*, the Stormfilter unit meets NYSDEC criteria for an organic filter stormwater treatment practice. The following table summarizes the pollutant removal efficiencies of each device.

LONG TERM POLLUTANT REMOVAL EFFICIENCIES

Treatment Method	BOD	TP	TN	TSS
Design 2 Extended Detention Basins	40%-60%	40%-60%	20%-40%	80%-100%
Design 3 Extended Detention Basins	40%-60%	60%-80%	40%-60%	80%-100%
Grass Swale	20%-40%	20%-40%	20%-40%	20%-40%
StormFilter	*40%*	*40%**	*40%*	*80%**

*Pollutant removal efficiencies are based on those of the F-4 organic filter in the NYSDEC Stormwater Management Design Manual

The following table summarizes the estimated pre-development and post-development annual pollutant loads (calculated in Appendix C) calculated for the subject project.

ANNUAL POLLUTANT SUMMARY FOR DESIGN LINE 1

	Annual Loads (lb/yr)			
	BOD	**TP**	**TN**	**TSS**
Design Line 1 Pre-Development	39.6	0.66	11.9	508.2
Design Line 1 Post-Development	39.2 to 21.1	0.41 to 0.21	10.0 to 6.3	184.4 to 123.2

ANNUAL POLLUTANT SUMMARY FOR DESIGN LINE 2

	Annual Loads (lb/yr)			
	BOD	**TP**	**TN**	**TSS**
Design Line 2 Pre-Development	107.4	1.79	32.2	1378.3
Design Line 2 Post-Development	172.9 to 91.4	1.76 to 1.33	44.1 to 32.1	2564.8 to 2394.4

The previous summaries were prepared in order to address the NYCDEP permitting requirements. For additional pollutant analysis see Appendix J.

With respect to phosphorous, which is the pollutant of concern in the subject TMDL watersheds, the SWPPP for the project is expected to achieve better than the calculated mean removal efficiencies due to adjunct stormwater treatment practices that have been incorporated into the project design, but not considered in the stormwater treatment calculations. These adjuncts include catch basin/drain inlet sumps, turf filter strips, rain gardens, forested filter strips, and the addition of permanent pools in the stormwater basins. The stormwater basin permanent pools will include landscaping capable of removing dissolved phosphorous. Based on the proposed SWPPP the applicant believes the project will not impact the Town of North Salem's ability to achieve the established TMDL, and the SWPPP does propose stormwater measures to reduce phosphorous loading to the maximum extent practicable**.**

2.3 Quantitative Analysis

"HydroCAD" by HydroCAD Software Solutions LLC of Tamworth, New Hampshire was used to model and assess the stormwater flows for the subject project. HydroCAD is a computer-aided design program for modeling the hydrology and hydraulics of stormwater runoff. It is based primarily on hydrology techniques developed by the United States Department of Agriculture, Soil Conservation Service (USDA, SCS) TR-20 method combined with standard hydraulic calculations. The program was used to analyze the 1-year, 2-year, 10-year, 25-year, 50-year and 100-year, 24-hour design storms. Peak flows were calculated for both the pre-development condition and the post-development condition. The input requirements for the HydroCAD computer program are as follows:

Subcatchments (contributing watershed/sub-watersheds)

- Design storm rainfall in inches
- CN (runoff curve number) values which are based on soil type and land use/ground cover
- Tc (time of concentration) flow path information

Stormwater Basins

- Surface area at appropriate elevations
- Flood elevation
- Outlet structure information

For detailed information for each subcatchment and pond, see Appendices A & B.

The precipitation values for the various design storms analyzed were obtained from the local County Soil and Water Conservation District office and the North East Regional Climate Center. The values provided are for 24-hour design storms.

Design Storm	**24-Hour Rainfall**
1-Year	3.2”
2-Year	3.5”
10-Year	5.5”
25-Year	6.0”
50-Year	7.0”
100-Year	10.0”

The CN (runoff curve number) values utilized in this report were referenced from the USDA, SCS publication *Urban Hydrology for Small Watersheds*. The following is a summary of the various land uses/ground covers and their associated CN values utilized in this report.

Land Use/Ground Cover	**CN Value**
Paved parking and roofs	98
Woods, Fair, B Soil	60
Woods, Good, B Soil	55
Woods, Fair, C Soil	73
Woods, Good, C Soil	70
Woods, Good, D Soil	77
Grass, B Soil	61
Grass, C Soil	74
Meadow, B Soil	58
Meadow, C Soil	71
Flexipave, B Soil	65
Flexipave, C Soil	76

2.4 NYSDEC Channel Protection Volume

To meet the Stream Channel Protection (Cp_v) requirements of the NYSDEC, 24 hours of center of mass detention for the 1-Year, 24-hour design storm has been provided in each of the proposed treatment trains. The following table summarizes the center of mass detention times of each treatment train prior to discharging out of the stormwater management system.

CENTER OF MASS DETENTION TIME (MIN) FOR 1-YEAR, 24 HOUR DESIGN STORM

Treatment Train	Center of Mass Time IN to Treatment Train (Min)	Center of Mass Time OUT of Treatment Train (Min)	Total Center of Mass Detention (Min)	Total Center of Mass Detention (Hrs)
1.1P – 1.2P	872.2	3,154.3	2,282.1	38.0
2.1P – 2.2P	885.1	2,961.3	2,076.2	34.6

The data for the table above was taken from Appendix B of this SWPPP. As shown in the table above a minimum of 24 hours or 1,440 minutes has been provided within each treatment train prior to discharge from the site. By providing 24 hours of detention of the center of mass for the 1-Year, 24-hour design storm the NYSDEC requirements for Stream Channel Protection (Cp_v) have been met.

2.5 NYSDEC Overbank Flood Control (Q_p) and Extreme Flood Control (Q_f)

The quantitative analysis performed for the subject project involves the assessment of two design lines. Design Line 1 is located along the rock wall west of the natural drainage divide south of the Town-regulated wetland. Design Line 2 is located along the northern property line from the natural drainage divide to the east and along the NYSDEC wetland buffer adjacent to the watercourse. The following table summarizes the calculated pre-development and post-development peak stormwater runoff flows:

PEAK FLOW SUMMARY (C.F.S.)

24-HOUR DESIGN STORM										
	2-YEAR		10-YEAR (Overbank Flood Control)		25-YEAR		50-YEAR		100-YEAR (Extreme Flood Control)	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
Design Line 1	1.03	0.20	5.39	2.35	6.79	3.75	9.84	7.04	20.35	18.32
Design Line 2	5.98	3.98	19.76	13.13	23.78	15.79	32.32	21.41	60.14	56.22

As seen by the above summary, the post-development peak flows for the 2-, 10-, 25-, 50-, and 100-year design storms have been attenuated to rates less than or equal to the pre-development peak flows.

The NYSDEC SPDES General Permit GP-0-08-001 requires Overbank Flood Control ($Q_{p)}$ and Extreme Flood Control (Q_f) to be considered in the design of the proposed stormwater management practices. Overbank Flood Control was considered in the design of the proposed stormwater basins to prevent an increase in the frequency and magnitude of out-of-bank flooding generated by the development. Overbank Flood Control requires the attenuation of the peak post-development 10-year, 24-hour storm event to the pre-development rates. The proposed stormwater basins were also designed to provide Extreme Flood Control. The intent of the extreme flood criteria is to prevent the increased risk of flood damage from large storm events and protect the physical integrity of the stormwater management practices. Extreme Flood Control was provided by attenuating the post-development peak discharge from the 100-year storm to near or below the pre-development rates. The Town has requested an assessment of the impacts to the downstream receiving waterbodies in addition to the State requirements. For large projects which propose stormwater management basins with contributing areas of 50 acres or more (subject projects < 10 acres) the New York State Stormwater Design Manual recommends a downstream analysis be performed. The manual states that this analysis can be performed utilizing the 10% rule. This method was utilized to address the Towns concerns, see Appendix I for additional detail. In summary there will be no adverse impacts to the downstream properties due to the subject project.

2.6 NYCDEP Quantity Requirements

As required per the NYCDEP, the attenuation of peak flows from the 10, 25, and 100-year storms to pre-development levels is accomplished with stormwater practices 1.1P, 1.2P, 2.1P, and 2.2P. The table in Section 2.5 summarizes the pre and post development peak flows expected for the proposed project. As shown in this table the peak flows discharging to the design lines in the post-development condition have been mitigated to below the existing condition levels.

3.0 STORMWATER CONVEYANCE SYSTEM

The stormwater collection and conveyance systems for the project will consist of drain inlets, catch basins, and HDPE pipe. The systems will be sized to collect and convey at minimum the 10-year, 1-hour design storm using the Rational Method. The calculations will be provided prior to site plan approval. The Rational Method is a standard method used by engineers to develop flow rates for sizing collection systems. The Rational Method calculates flows based on a one-hour design storm. Critical areas of collection system will be sized to convey the 100-Year, 1-hour design storm or conveyance of the 100-Year storm to the stormwater practices will be provided by over land flow if the pipe system capacity is exceeded. Where overland flow is used to convey stormwater no structures shall be impacted.

4.0 EROSION AND SEDIMENT CONTROL

Erosion and sediment control should be accomplished by four basic principles: diversion of clean water, containment of sediment, treatment of dirty water, and stabilization of disturbed areas. Sediment should be contained with the use of silt fence at the toe of disturbed slopes and excavation of temporary sediment basins. Disturbed areas should be permanently stabilized within 14 days of final grading to limit the required length of time that the temporary facilities must be utilized.

4.1 Temporary Erosion and Sediment Control Facilities

Temporary erosion and sediment control facilities should be installed and maintained as required to reduce the impacts to off-site properties. The owner will be required to provide maintenance for the temporary erosion and sediment control facilities. In general, the following temporary methods and materials should be used to control erosion and sedimentation from the project site:

- Stabilized Construction Entrance
- Silt Fence Barriers
- Storm Drain Inlet Protection
- Sediment Basins

A stabilized construction entrance should be installed at the entrance to the site as shown on the plan. The design drawings will include details to guide the contractor in the construction of this entrance. The intent of the stabilized construction entrance is to prevent the “tracking” of soil from the site. Dust control should be accomplished with water sprinkling trucks if required. During dry periods, sprinkler trucks should wet all exposed earth surfaces as required to prevent the transport of air-borne particles to adjoining areas.

Siltation barriers constructed of geosynthetic filter cloth should be installed liberally at the toe of all disturbed slopes. The intent of these barriers is to contain silt and sediment at the source and inhibit its transport by stormwater runoff. The siltation barriers will also help reduce the rate of runoff by creating filters through which the stormwater must pass. Siltation barriers should also be installed around catch basins and drain inlets. The intent of these barriers is to prevent silt and sedimentation from entering the stormwater collection system.

The proposed stormwater basins will also act an as temporary sediment basins during construction of the proposed road and utilities. Most stormwater runoff from disturbed areas will be directed to the sediment basins. These basins will be sized in accordance with the publication, *New York State Standards and Specification for Erosion and Sediment Control*, printed by the Empire State Chapter Soil and Water Conservation Society.

4.2 Permanent Erosion and Sediment Control Facilities

Permanent erosion and sediment control will be accomplished by diverting stormwater runoff from steep slopes, controlling/reducing stormwater runoff velocities and volumes, and vegetative and structural surface stabilization. All of the permanent facilities are relatively maintenance free and only require periodic inspections.

The temporary sediment basins will be cleaned of all sediment and debris, excavated to its final elevation and dimension, and stabilized with the vegetation as indicated on the plans. Riprap aprons will be used at the discharge end of all piped drainage systems. Runoff velocities will be reduced to levels that are non-erosive to the receiving waterbodies through use of these aprons.

Other than the buildings and paved surfaces, the primary method for permanently stabilizing disturbed surfaces at the subject site is with vegetation. The vegetation will control stormwater runoff by preventing soil erosion, reducing runoff volume and velocities, and providing a filter medium. Permanent seeding should optimally be undertaken in the spring from March 21st through May 20thand in late summer from August 15th to October 15th. The stormwater basins will allow for settlement of suspended sediment that is generated by stormwater runoff from the site. These facilities provide a central collection area for sediment deposition and eventual disposal.

5.0 IMPLEMENTATION AND MAINTENANCE

5.1 Construction Phase

Details associated with the implementation and maintenance of the proposed stormwater facilities and erosion control measures during construction are shown on the project plans. A construction sequence will be provided to guide the contractor in the installation of the erosion control measures as well as the site plan features. The erosion control plan and detail sheets include associated details and notes to aid the contractor in implementing the plan.

During construction, a Site Log Book, Appendix E, is required to be kept per NYSDEC SPDES General Permit GP-0-08-001. Erosion and sediment control inspections are required to be conducted as necessary under coverage of the permit (minimum once a week) and an updated logbook is required to be kept on site for the duration of the construction activities. The Construction Site Log Book is an appendix taken from the *New York State Standards and Specifications for Erosion and Sediment Control* (Blue Book).

The stormwater basins have limited routine maintenance requirements. Initially the basins will require regular maintenance until the permanent vegetation is established. Vegetation should be inspected every 30 days and after every major storm event until established, after which inspections should take place on a quarterly basis and after every large storm event. Damaged areas should be immediately re-seeded and re-mulched. The floor of the basins shall be planted with a seed mixture that contains plants that are tolerant of occasional flooding. The seed mixtures contain several plant species that vary slightly in their needs for survival. It is expected that not all of the species will survive within each basin due to variations within each basin such as water, nutrients, and light. During the initial year of planting, the plants may require watering to germinate and become established. Note that several seedings may be required during the first year to completely establish vegetation within the basins. After the initial year of establishment, the basins don't need to be fertilized or watered. A natural selection process will occur over the first few years, such that the species within the seed mixture most suitable to the conditions will survive.

The proposed rain gardens should not be constructed until the contributing area has been stabilized. Initially, the rain gardens will require regular maintenance. The vegetation should be inspected every 30 days and after major storm events until established. Once established the rain gardens should be inspected twice a year and after major storms. Damaged areas should be replanted and mulched.

The proposed grass swales should not be constructed until the discharge point has been properly stabilized. Swale construction should be started at the discharge point and proceed towards the top. Seeding and mulching as well as check dam construction should coincide with swale construction. Initially, the vegetation should be inspected every 30 days and after major storm events until established. After the vegetation is established the swales should be inspected twice a year and after major storms.