Hunter Foundation

Stormwater Retrofit Project

Town of Hunter, Greene County, New York

March 10, 2008

Project Partners and Contacts

Catskill Watershed Corporation
P.O. Box 569 Main Street
Margaretville, NY 12455
845.586.1400 Phone
www.cwconline.org
Contact: Nate Hendricks
mailto:nhendricks@cwconline.org

US Army Corps of Engineers-New York District
26 Federal Plaza
New York,, NY 10278-0090
Room # 2127
914.790.8215 Phone
212.264.2924
Contact: Rifat Salim
mailto:rifat.salim@usce.army.mil

New York City Department of Environmental Protection
71 Smith Avenue
Kingston, NY 12401
845.340.7832Phone
845.338.1260 Fax
www.nyc.gov/html/dep/html/watershed_protection/
Contact: Joe Damrath
mailto:RSwenson@dep.nyc.goc
Contact: Dave Burns
mailto:DBurns@dep.nyc.goc

Project Partners and Contacts

Hunter Foundation
PO Box 563, (6004 Main Street)
Tannersville, NY 12485
518.589.5050 Phone
www.hunterfoundation.org
Contact: Charlene Holdridge
mailto:charlene@hunterfoundation.org

Greene County Soil and Water Conservation District
907 County Office Building
Cairo, NY 12413
518.622.3620 Phone
518.622.0344 Fax
www.gcswcd.com
Contact: James Buchanan
mailto:jake@gcswcd.com

Kaaterskill Associates
PO BOX 1020
Cairo, New York 12473
518.622.9667Phone
518.622.9047Fax
www.keaeng.com
Contact: Darrin Elsom PE
mailto:D.Elsom@Keaeng.com

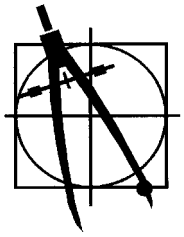

TABLE OF CONTENTS

LIST OF TABLES

APPENDICES

1.0 Introduction

The Greene County Soil and Water Conservation District (GCSWCD) will work with the Hunter Foundation to implement a number of stormwater management practices (SMP's) in association with the Foundation's redevelopment of a series of commercial buildings and impervious parking areas in the Village of Tannersville in the Town of Hunter. Project partners include New York State Department of Environmental Conservation (NYSDEC) New York City Department of Environmental Protection (NYCDEP), with funding provided through the Catskill Watershed Corporation (CWC) Stormwater Retrofit Program, and the New York Sate District of Army Corp of Engineers (ACOE) through its New York City Watershed Assistance Program.

Both structural and non-structural SMP's are proposed to measurably improve water quality and reduce and attenuate stormwater quantity from the 1.2-acre drainage. Other components of the project will include improved public access to the site in the form of a Creek Walk, the construction of an educational kiosk and interpretive signage. The kiosk and signage will educate visitors on the impact of development on water quality and quantity, the use of integrated SMP's, and stream corridor management. Short and long term effectiveness will be incorporated into the design of SMP's and evaluated through field inspection and collection of monitoring data specific to the goals and objectives of the installed practices. Field inspections and monitoring needs will be documented within an Operation and Maintenance manual developed for the proposed project and performed by GCSWCD for a term of 10 years.

1.1 Purpose and Problem Definition

The project serves approximately 1.2 acres of high-density commercial buildings and parking facilities in the Village of Tannersville. Existing stormwater from the area is conveyed as sheet and shallow flow without any treatment, discharging directly to the Sawmill Brook. The brook is a tributary of the Schoharie Creek, which is listed on the 1996 WI/PWI as “stressed” with the primary pollutant being “silt (sediment)”. Furthermore, the Schoharie Reservoir is listed on the NYS-DEC 2002 303(d) List as high priority for TMDL development with the Cause/Pollutant being Silt/Sediment. Existing site cover and topography can be seen on the attached **Sheet SP-2**.

1.2 Project Goals and Objectives

The fundamental project goal is to have an overall increase in water quality by providing point and non-point source mitigation from the impacts of pollutants associated with stormwater runoff from the site. Other project goals and objectives include:

- A measurable reduction in most pollutant categories identified by the Nationwide Urban Runoff Program (NURP) including Total Suspended Solids, Phosphorus, Nitrogen, Heavy Metals, and Petroleum Products.

- An increase in storm flow attenuation and reduction provided through implementation of SMPs.

- Provide valuable information as to the individual effectiveness of treatment practices implemented on site.

- Provide a valuable data set for future land use planning and stormwater management.

- Provide public outreach and education on stormwater impacts and the various practices and techniques available to mitigate existing and future impacts, and management of the proposed measures.

- Develop cooperative partnerships on many levels including private enterprises, local municipalities, County, State and Federal governments, NYC DEP, and residents of the watershed.

- Demonstrate good housekeeping/pollution prevention.

2.0 Hydrologic and Pollutant Load Characterization

The drainage area was delineated into four catchments to assess potential SMP suitability and effectiveness in reducing runoff rates and pollutant loading (see attached **Sheet SP-13)**. The following sections describe the techniques used and findings.

2.1 Existing Condition Hydrology

In order to evaluate the site's hydrology, an Intensity Duration Frequency (IDF) Curve was developed using Hydro-35, Type II rainfall distribution and site-specific rainfall data. Rainfall amounts were referenced from Section 10 of the New York Guidelines for Urban Erosion and Sediment Control, April 1997. The 24-hour rainfall amounts for the 2-, 10-, 25- and 100-year design storms in Greene County are 3.0", 5.0", 6.0" and 8.0", respectively.

The Rational Method was used to generate peak flows for the existing condition. This method was chosen because of its effectiveness of predicting discharge rates for locations with small drainage areas and impervious ground cover, such as high density commercial buildings and parking lots.

The peak discharge rate predicted is a function of a runoff coefficient, rainfall intensity and drainage area. The Rational Method is expressed mathematically by the following equation:

$$\mathbf{Q = C \times I \times A}$$

Where:
Q = Peak discharge (cfs)
C = Runoff coefficient
I = Rainfall intensity (in/hr)
A = Drainage area (acres)

Conservative estimates for time of concentration (Tc) and runoff coefficient (C) were utilized, using a five minute Tc and C equaling one. The results of the existing condition analysis are summarized in the table below.

Table 1. Existing Condition Discharge Estimates (cfs)

Catchment	Area (sq. ft)	2-Year	10-Year	100-Year
1	4647	0.55	0.70	0.96
2	3322	0.39	0.50	0.69
3	7683	0.91	1.16	1.59
4	35133	4.16	5.32	7.26

2.2 Existing Condition Pollutant Load

Annual pollutant load estimates were calculated using the "The Simple Method", as described in The NYS Stormwater Management Design Manual (NYSDEC 2001). Input data consisted of the effective annual rainfall of 42.4” for Greene County and existing land use and cover characteristics. The table below displays annual estimates in pounds of Total Suspended Solids (TSS), Total Phosphorous (TP), and Total Nitrogen (TN) discharge from the four catchments.

Table 2. Existing Condition Pollutant Loading (lbs/yr)

Catchment	Area (sq. ft)	TSS	TP	TN
1	4647	114	0.3	2.1
2	3322	33	0.1	1.3
3	7683	86	0.4	3.3
4	35133	668	2.0	12.6

3.0 Proposed Stormwater Management

Several SMP's are proposed to treat the water quality volume from the drainage. Individual components were selected based on existing and proposed land uses, physical feasibility, cost, and treatment capability and performance. Ease of maintenance, and educational benefits were also considered. Preference was given to infiltration and filtering practices with multiple treatments in series. The stormwater management plan and treatment details can be seen on attached **Sheets SP-9-12** and described below in relation to the catchment area served.

3.1 Catchment 1-Improved Conveyance System and TSS Separator

The treatment for Catchment 1 will collect runoff from the impervious surface associated with NY State Route 23A and the existing paved entrance leading to the parking areas. Stormwater will be collected by two catch basins in series located in the sag of the driveway entrance. Each catch basin will have a sump with a minimum depth of three feet to serve as the primary capture area for sediment. Both catch basins will be directed to inlet to the TSS separator and outlet to the Sawmill Brook.

Design criteria for the separator-included performance during peak flows, headloss coefficients, storage capacity, cost, ease of maintenance, and an H-20 dead load rating. Hydro-International's Downstream Defender was chosen for its treatment of suspended particles, low headloss and flow through capacity, and its ability to treat the 1 and 5-year storm events to better than 60% TSS removal of a 120-micron particle. Using a 70% reduction figure for TSS as accepted by NYSDEC and the manufacturer, the pounds of sediment removed from the catch basins and hydrodynamic device is expected to be 90 pounds per year. In order to confirm this, sediment removed from the structures will be weighed and tallied during each cleaning. Additionally any oil, grease, and floatables collected should also be tallied at this time.

3.2 Catchment 2-Raingarden A

Raingarden A will serve to filter runoff from the rooftop associated with the Slopes building. New roof gutters will collect rainfall and outlet to a raised double cell filtering system. Filtered runoff will discharge to the underground pipe network proposed for Catchment 1 allowing for secondary treatment through the TSS separator. Runoff from large storm events will bypass through a riser outlet and extreme events will pass through weir outlet and be collected by the drop inlet of the underground system. Both beds will be planted with native vegetation suitable for bioretention treatment systems.

3.3 Catchment 3-Raingarden B

Raingarden B will serve to filter runoff from multiple existing rooftops and the proposed pedestrian entrance and creek walk from State Route 23A. New roof gutters and outlet will collect runoff to a one-foot deep forebay sized to store 25% of the water quality volume. Stormwater will outlet though a grassed control section to the adjacent filtering bed. Large storms will outlet through a riser outlet to the underground system. Both beds will be planted with native vegetation suitable for bioretention treatment systems.

3.4 Catchment 4- Porous Pavement and Bio swale

A porous pavement system is proposed to retrofit existing gravel parking areas to provide storage and infiltration of stormwater. Excavation and removal of the existing gravel and asphalt surfaces to suitable native material will be required. The system will consist of a layered sub grade, meeting load and porosity for storage and infiltration requirements. A six-inch layer of well graded gravel reinforced with a geosynthethic matrix will act as the system pavement. Alcoa's cellular confinement system known as Geoweb was selected due to its capability of reducing the compaction of gravels from use, improved strength, reduction in sub grade, and expected lifespan.

Figure 1. Existing parking area condition.

A bioswale with a forebay is proposed as a secondary stormwater control. The SMP will filter sheet flow from the porous pavement system during excessive rainfall events and also provide a snow storage area with treatment capacity. Stormwater will outlet though a grassed control section to the adjacent filtering bed. Large storms will outlet through a riser outlet directly to protected outlet along the bank of the Sawmill Brook. Both beds will be planted with native vegetation suitable for bioretention treatment systems

3.5 Proposed Condition Pollutant Removal

SMP removal efficiencies for total suspended solids (TSS), total phosphorous (TP) and total nitrogen (TN) were applied to the existing condition data from data obtained from Appendix A of The NYS Stormwater Management Design Manual (NYSDEC 2001). Table 3 displays these findings including pounds removed, the proposed condition representing pollutant loads with treatments implemented.

Table 3. Proposed Condition Pollutant Removal

TSS Removal					
Catchment	Existing (lbs/Yr)	Treatment	Removed (lbs/Yr)	Proposed (lbs/Yr)	% Reduction Achieved
1	114	TSS Separator	91	23	80%
2	33	Filtering-TSS Separator	32	2	96%
3	86	Filtering-TSS Separator	82	4	96%
4	668	Infiltration-Filtering	658	10	99%
Total	901		863	38	96%
TP Removal					
Catchment	Existing (lbs/Yr)	Treatment	Removed (lbs/Yr)	Proposed (lbs/Yr)	% Reduction Achieved
1	0.3	TSS Separator	0.0	0.3	0%
2	0.1	Filtering-TSS Separator	0.1	0.1	60%

3	0.4	Filtering-TSS Separator	0.2	0.1	60%
4	2.0	Infiltration-Filtering	1.8	0.2	88%
Total	2.9		2.1	0.8	72%
TN Removal					
Catchment	Existing (lbs/Yr)	Treatment	Removed (lbs/Yr)	Proposed (lbs/Yr)	% Reduction Achieved
1	2.1	TSS Separator	0.0	2.1	0%
2	1.3	Filtering-TSS Separator	0.5	0.8	40%
3	3.3	Filtering-TSS Separator	1.3	2.0	40%
4	12.6	Infiltration-Filtering	8.8	3.8	70%
Total	19.3		10.6	8.7	55%

3.6 Riparian Buffer Establishment

Figure 2. Existing riparian buffer.

A combination of dormant plant materials, native riparian seed mixtures, and plantings of live trees and shrubs will be employed to initiate the development of a functioning riparian community. Native willow and dogwood stakes will be planted along approximately 250 feet of the streambank. All other areas of disturbance will be treated with seed mixtures and mulched to minimize soil losses. Various species of woody trees and shrubs, appropriate for the riparian zone, shall be planted in the disturbed upland areas. Stormwater components installed along the stream will be planted with native vegetation appropriate for proposed hydrologic conditions and treatment requirements. **Sheet #** displays the landscaping plan for the site.

4.0 Project Details

4.1 Project Schedule

Table 4 below displays anticipated completion dates of the major project milestones through August 2008. Some of the proposed vegetation requires plant dormancy expected to extend project completion through fall of 2008.

Table 4. Proposed Stormwater Project Schedule.

	March-08	April-08	May-08	June-08	July-08	August-08
Design	**X**	**X**				
Permit and Approval	**X**	**X**				
Funding Approval				**X**		
Project Bidding				**X**		
Construction						**X**
O&M Manual		**X**				

4.2 Landowner Agreements

Implementation of the project will require formal approval in the form of Landowner Project Agreements. These agreements contain a 10 year easement for GCSWCD and project partners for project maintenance as specified in the Operation and Maintenance Manual described in ensuing sections.

4.3 Project Permitting

Construction of the project requires ACOE, NYSDEC and NYCDEP permits and approval. NYSDEC Article 15 Title 5 Stream Disturbance Permit and Section 401 Clean Water Act Water Quality Certification Permit, and ACOE Nationwide 27 Permit 7 for the construction of a new stormwater outlet structure are required before construction commences. The approval of a stormwater pollution prevention plan outlining erosion and sediment control during construction will be required by NYCDEP.

4.4 Project Bidding

Construction components of the project will be bid out as per New York State General Municipal Law through a public sealed bid process. Bidders will be required to attend a mandatory pre-bid site meeting prior to submission of a sealed bid. Bidders will be asked to prepare bids on the basis of several unit bid items and awarded on the basis of the aggregate costs of all of the bid items.

4.5 Construction Estimate

Construction cost estimates were determined by published 2007 construction means data and cost of similar projects in the area. Table 5 below represents material and construction estimates per unit items. Project administration, management, engineering and construction survey and oversight are not included in these estimates.

Table 5. Estimated Unit Material and Construction Cost.

Unit Item	Estimated Cost
Improved Conveyance System TSS Separator	$23,710
Rain Garden A	$7,136
Rain Garden B	$6,902
Bioswale	$17,391
Porous Gravel Pavement	$42,009
Stormwater Landscaping	$13,548
Creek walk	$2,772
Education- Outreach	$4,100
Erosion and Sediment Control	$2,475
Mobilization / Demobilization	$1,824
Total Cost	$121,867

4.6 Project Construction

A construction plan will be developed by the selected contractor, and require authorization and approval by GCSWCD, and Kaaterskill Engineering. It is estimated construction should not exceed one month in time, and should be implemented during dry periods. Some of the bioengineering components of the project can be installed anytime during the dormant period of the specific plant species, but it is recommended to install the plant material expeditiously after harvesting in order to reduce the probability of damage to the plant material

Erosion and sediment control measures will be implemented in such a way as to reduce the risk of soil loss from disturbed areas and protect the Sawmill Brook. Measures taken during all phases of construction will be in accordance with the guidelines provided by the New York Standards and Specifications for Erosion and Sediment Control.

4.7 Operation and Maintenance

As proposed, GCSWCD will operate and maintain stormwater systems for a period of ten years. An Operation and Maintenance Manual (O&M) will be developed once the final project is designed. The O&M Manual will include a schedule for regular inspections of the all installed SMP's as outlined in The NYS Stormwater Management Design Manual (NYSDEC 2003) including documentation of signed landowner agreements and responsibilities and terms. The manual will minimally address the following:

- Periodic inspections of catch basins and cleaning as needed.
- For the TSS separator, follow the manufacturer's recommended maintenance procedures at the specified frequencies or as needed.

- As part of the O&M procedure, regular monitoring of the treated effluent is recommended to ensure the systems are operating properly.

- Solids and other materials removed from any of the systems should be disposed at a location and a manner that does not cause pollution of any of the local waterways. Disposal in a sanitary landfill after approval of the landfill operator is a practical option.

- A log of all maintenance activities should be kept at the site and made available to GCSWCD or local authorities when requested. The log should include the type of activity, name of person responsible for the activity, and time and date of the activity.

Vegetation Management

Vegetative establishment in the project area is a critical component to the project's long-term stability. General site constraints and gravelly soil conditions limit the success and establishment of the designated vegetative elements of the project. Careful planning, monitoring, and maintenance are required for all of installed vegetation. Increased browsing pressure from mammals, potential for disease, and extreme weather conditions can reduce the success of the plant materials. Inspection and monitoring of the plant materials throughout the initial stage of development will assist in ensuring plant viability. Supplemental installation of plant material, as needed, in the form of bioengineering and riparian planting will ensure effective riparian establishment. Plantings will require maintenance to ensure proper moisture at critical times.