

Project ID: Out_01

Total Treated Drainage Area: 34.6 acres

Total Treated Impervious Area: 15.1 acres

Total Water Quality Volume (WQv):

~55,471 cubic feet; 1.27 acre-feet

Rainfall Depth Treated (Pe): 1 inch

Annual Nutrient Removal:

- TN: 230.9 lbs
- TP: 15.5 lbs
- TSS: 4.4 tons

Existing Site Description

The existing outfall pipes include a 36-inch vitrified clay pipe extra strength (VCPX) and 12-inch RCP located north of Edgewood Road. Stormwater runoff from Annapolis Water Reclamation facility and from Edgewood Road is collected by the stormdrain system and discharged from the outfalls directly to Back Creek. There are no existing stormwater management facilities within this drainage area. Stormwater runoff from the outfalls confluence approximately 20 feet north of the outfalls and flows approximately 230 feet before entering Back Creek. The outfalls are located in the existing FEMA 100-year floodplain. Several trees are located along the stream banks, and there is a foot bridge approximately 50 feet from the outfalls. A water utility line was identified 25 feet upstream of the outfalls. The soils in the drainage area and downstream of the outfall area are hydrologic soil groups B/D, C, and D. The outfall area is on a parcel owned by the City. Figure 43 shows the existing conditions map with drainage area.

Proposed Project Description

The proposed project would convert the existing outfall to a SPSC. The SPSC would be designed using the Anne Arundel County *Regenerative Step Pool Storm Conveyance Design Guidelines* (Revised December 2012) and MDE's *Stormwater Design Manual*. In accordance with the design guidance, the existing slope of 1.5 percent is suitable to implement the SPSC system. A SPSC of approximately 150 feet is recommended. Approximately three pools with a sand filter surface area of approximately 3,000 square feet will be required to capture and treat the entire water quality volume from the drainage area. The pools would have a maximum depth of 3 feet with 3 to 1 side slopes.

Implementation of the SPSC would reduce pollutants such as TN, TP, and TSS. This project will help the City of Annapolis achieve approximately 15.1 acres of impervious area credits toward its upcoming NPDES MS4 requirements. Figure 44 provides the schematic of the proposed SPSC system, and Figure 45 provides a typical profile.

Feasibility Assessment

Property Ownership	The property is owned by the City; therefore, no ownership issues are anticipated for the implementation of this project.
Construction Access	The site can be access from Edgewood Road. Open area is available to stage construction activities. Existing slopes are navigable by construction equipment.
Utility Conflicts	There is an existing water pipe 20 feet upstream from the outfall, but this project will not cause any impacts to it. Though there were no indicators of underground electric utilities at the project site (i.e., no light poles or utility boxes), confirmation should be obtained during final design.
Environmental Impacts	Potential tree impacts are anticipated to be a challenge for this project. Several mature trees along the banks would be affected during project implementation.
Design/Construction	Geotechnical investigation will be required to determine the infiltration rates of the soils in the project area during final design.

Plans and Permits

The following plans and permits may be required for the implementation of this project:

- Site/Schematic Development Application
- Stormwater Management Plan
- Natural Resources and Forest Stand Delineation
- Forest Conservation Plan/Buffer Management Plan
- Grading and Erosion Sediment Control Plan
- Temporary Traffic Control Plan
- MDSPGP for activities in US waters
- General Permit for Stormwater Discharge Associated with Construction Activity (if the area disturbed is greater than 1 acre)

Back Creek Sub-Watershed: Outfall 01-Retrofit

Cost Estimate

Table 27: Cost Estimate for Outfall 01 Retrofit

Item	Quantity	Units	Unit Cost	Total
Clear and Grub	1250	SY	\$2.00	\$2,500.00
Excavation and Hauling	800	CY	\$50.00	\$40,000.00
Grading	800	SY	\$3.50	\$2,800.00
Sand	590	CY	\$70.00	\$41,300.00
Filter Fabric	50	SY	\$4.00	\$200.00
Tree Removal	20	EA	\$800.00	\$16,000.00
Plantings	600	SY	\$10.00	\$6,000.00
Sand Stone Boulders	40	CY	\$240.00	\$9,600.00
Cobble Weir	30	CY	\$90.00	\$2,700.00
Wood Chips	180	CY	\$25.00	\$4,500.00
Rip-Rap	300	CY	\$130.00	\$39,000.00
Clear Water Diversion Pipe	150	LF	\$30.00	\$4,500.00
Stabilized Construction Entrance	1	EA	\$2,000	\$2,000.00
CY - Cubic Yards				
SY - Square Yards				
EA - Each				Initial Project Costs
LF - Linear Feet				\$171,100
			Contingency	20% \$34,220
			Erosion and Sediment Control	15% \$25,665
				Base Construction Costs
				\$230,985
			Mobilization	10% \$23,099
				Total Construction Cost²⁷
				\$254,084
				20 Years Life Cycle Maintenance Cost ²⁸
				(Average Annual Maintenance Cost of \$891)
				\$17,820

²⁷ Additional cost of approximately \$100,000 for design, environmental services, geotechnical investigation, survey, and permitting is assumed.

²⁸ University of Maryland. October 2011. Cost of Stormwater Management Practices in Maryland Counties.

Computations

Table 28: Water Quality Volume (WQ_v) Calculations

Design Parameters	Site Value
Treated Drainage Area (ac), A	34.6
Percent Impervious Cover, I	44%
Rainfall Depth (inches), P	1
Volumetric Runoff Coefficient, R _v	0.44
Water Quality Volume (acre-feet), WQ_v	1.27
Water Quality Volume (cubic-feet), WQ_v	55,471



Figure 43: Existing Conditions and Drainage Area



Figure 44: Proposed Retrofit Concept Design

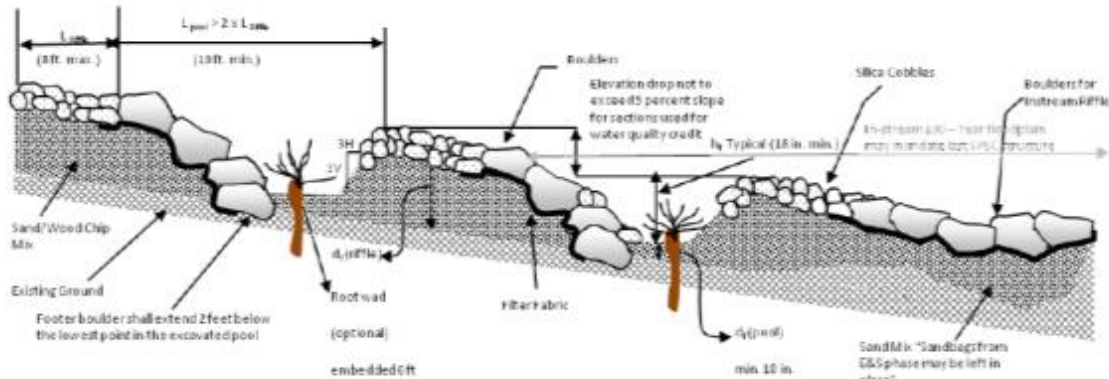
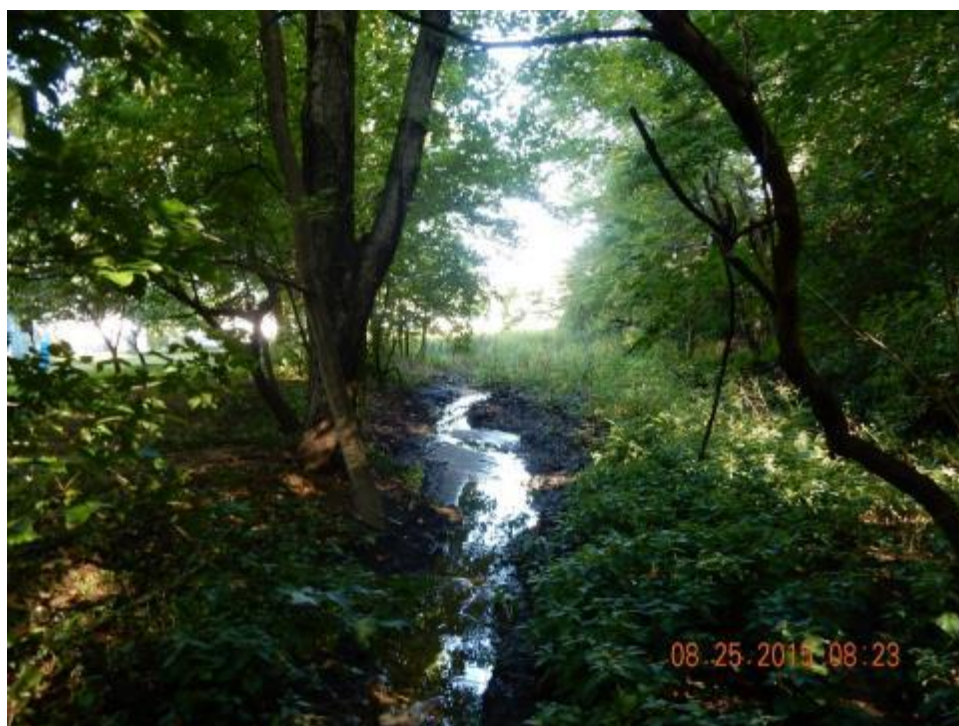


Figure 45: Typical Profile of SPSC (Anne Arundel County’s *Regenerative Step Pool Storm Conveyance Design Guidelines* (Revised December 2012))

Site Photographs



Existing Outfalls



Downstream of Outfalls