Vegetated Swale

Alternative Names: Bioretention Swale, Dry Water Quality Swale

High Point Swale – Seattle Public Utilities
http://www.ci.seattle.wa.us/util/About_SPU/Drainage_&_Sewer_System/Natural_Drainage_Systems
Accessed 05/13/2008

DESCRIPTION

Vegetated swales are shallow, vegetated channels which treat and convey stormwater runoff. Unlike typical stormwater conveyance structures, such as pipes, concrete channels or drainage channels, vegetated swales slow runoff velocity, filter out stormwater pollutants, reduce runoff temperatures and, under certain conditions, infiltrate runoff into the ground as groundwater. Vegetated swales require engineered soils which stormwater can permeate through and a dense vegetative cover to reduce erosion. Check dams placed periodically along the length of the swale slow runoff and promote filtration and infiltration. Swales are underlain with a layer of gravel to temporarily store runoff after it permeates through the soil layer and an underdrain, if necessary, to convey runoff to a stormwater pipe or additional stormwater facility. Conveyance channels that do not employ specially designed soil mediums will not remove pollutants as efficiently as vegetated swales and are not appropriate for use in areas where phosphorus is a pollutant of concern.[4]

BENEFITS

Overall

- Reduces stormwater runoff volume, flow rate and temperature
- Filters stormwater runoff
- Improves quality of local surface waterways
- Provides local flood control
- Enhances aesthetic appeal of streets, neighborhoods and commercial or industrial sites
- Provides wildlife habitat
- Reduces soil erosion
- Provides a location for snow storage
- Provides a cost-effective way of managing stormwater

Pollutant Removal

Pollutant removal can be affected by many factors, such as soil and vegetation types; removal efficiencies will also vary seasonably. Properly designed vegetated swales can be effective at eliminating many pollutants of concern in the Charles River watershed:

- Total Suspended Solids: 60% - 85%[4,5,6]
- Total Phosphorus: 15% - 90%[1,3,4,6,8]
- Total Nitrogen: 10% - 90%[4]
- Total Zinc: 68% - 88%[1,8]
- Total Copper: 45% - 80%[1]

Volume Attenuation/Flow Reduction

Vegetation and check dams placed throughout a swale are designed to slow stormwater runoff and reduce peak flows in smaller storms. If infiltration is possible, swales can also reduce overall stormwater runoff.

MAINTENANCE

Needs and Frequency

- Maintain vegetation, replace plants as needed, requires more attention during the establishment period
- For manicured channels, mow grass periodically and remove grass clippings (grass should be 3-6” in length)
- Inspect inlet and outlet structures periodically
- Inspect check dams periodically, repair as needed
- Inspect swale during and after rain events to ensure that water is draining according to design specifications
- Repair eroded areas as needed
- Remove and properly dispose of accumulated sediment and other trash

Cost

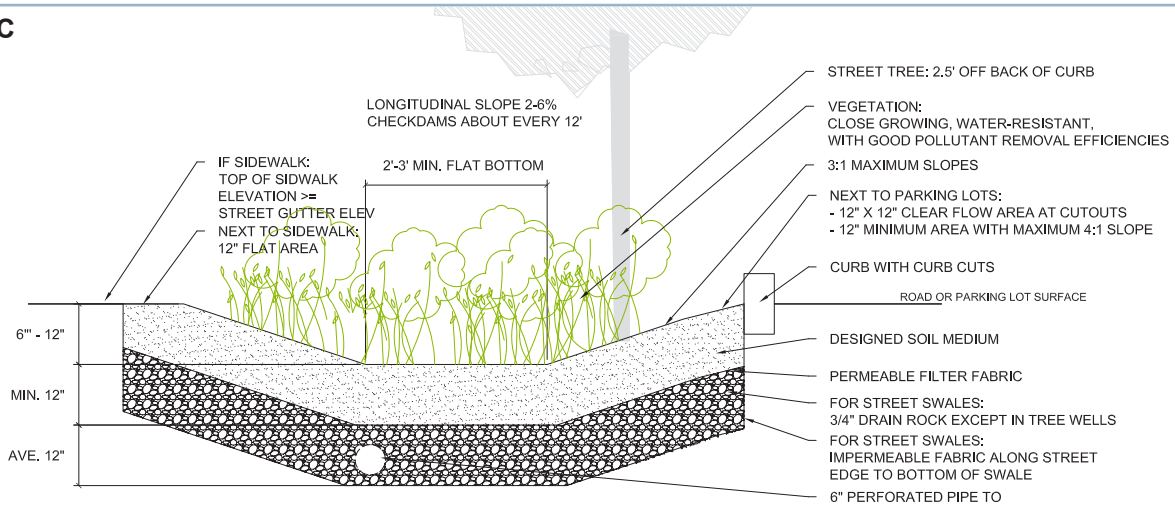
Approximately $200/year for a 900 sq. ft. vegetated swale[3]

INSTALLATION COST

Approximately $10/linear foot[7]
Cost will vary depending on extent of grading and infrastructure required and vegetation utilized.

High Point Swale – Seattle, WA
CRWA May 2008

SCHEMATIC



Adapted from:
Portland: Stormwater Management Manual (Adopted July 1, 1999, Revised September 1, 2004)
http://www.portlandonline.com/bes/index.cfm?c=dfbbh Accessed 01/29/2008

EXAMPLE PROJECTS

Lily Pond Watershed
Cohasset, MA
The town installed vegetated swales and rain gardens in neighborhoods surrounding Lily Pond, which provides drinking water to the majority of the town's residents. Swales capture and treat runoff before it enters the pond.[2]

Kingston Intermediate School
Kingston, MA
This proposed retrofit includes a vegetated swale which will capture, treat and partially infiltrate runoff from the school's athletic fields.[9]

ADDITIONAL CONCERNS OR UNKNOWNS

- In Massachusetts, swales may require a pre-treatment forebay and/or under lining, depending on surrounding land use.
- Vegetated swales are vulnerable to severe rain events as a large amount of fast moving runoff can erode the vegetative cover.
- Swales are not recommended in areas with steep slopes and/or highly erosive soils.
- Pollutant removal relies on thick, well-established vegetation, therefore water quality benefits will not be realized for a few months following construction.
- Swales require more space than typical curb and gutter systems, however, they double as a landscaping feature.
- Existence of underground utility lines, especially next to sidewalks, may impact design.

SOURCES

[1]Center for Watershed Protection. (2007, August). Urban Stormwater Retrofit Practices Appendices. Urban Subwatershed Restoration Manual Series.

[2]Cohasset Board of Water Commissioners and Cohasset Water Department. (2008). 2007 Water Quality Report. Available at: www.cohassetwater.org/pdf/2007CCR.pdf?PHPSESSID=e34521253f66c1e19d979a59a481f984.

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[4]Massachusetts Department of Environmental Protection (MA DEP). (2008, February). Massachusetts Stormwater Handbook. Available at: http://www.mass.gov/dep/water/laws/policies.htm#storm.

[5]Metropolitain Area Planning Council. Fact Sheet #9 Vegetated Swales. Massachusetts Low Impact Development Toolkit. Available at: http://www.mapc.org/regional_planning/LID/swales.html.

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[7]Roy, S. (2007). Employee GeoSyntec. Personal Communication.

[8]University of New Hampshire Stormwater Center (UNHSC). (2007). UNHSC 2007 Annual Report. Available at: http://www.unh.edu/erg/cstev/2007_stormwater_annual_report.pdf.

[9]UNHSC-NEMO. Innovative Stormwater Management Inventory. Accessed May 28, 2008. www.erg.unh.edu/lid/index.asp.

[10]US EPA. (1999, September) Storm Water Technology Fact Sheet Vegetated Swale. Available at: epa.gov/owm/mtb/vegswale.pdf.