NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD

STORMWATER RUNOFF CONTROL
(No. and acre)
CODE 570

DEFINITION

Controlling the quantity and quality of stormwater runoff.

PURPOSE

To control stormwater runoff to achieve one or more of the following:

- Minimize erosion and sedimentation during and following construction activities.
- Reduce the quantity of stormwater leaving developing or developed sites.
- Improve the quality of stormwater leaving developing or developed sites.
- Enhance stormwater infiltration and/or filtration.

CONDITIONS WHERE PRACTICE APPLIES

This practice applies to sites where stormwater runoff causes or may cause undesirable downstream flooding, sedimentation or channel degradation and/or degradation of surface or ground water quality if left untreated. This practice may apply both to sites undergoing development as well as remedial work on already developed sites.

CRITERIA

General Criteria Applicable To All Purposes

Plan, design and construct stormwater runoff controls to comply with applicable federal, state, and local laws and regulations.

Develop a plan to reduce the impacts of stormwater runoff from the site based on an assessment of the downstream area. As applicable include in the plan practices or management activities that will:

- Reduce onsite erosion.
- Reduce offsite impacts from sedimentation.
- Reduce the quantity of stormwater leaving the site to levels that will not adversely affect downstream receiving channels.
- Improve the quality of runoff leaving the site.
- Leave the site in a stable condition after construction.

Vegetative Measures. Where appropriate, stabilize all areas disturbed by construction with vegetation as soon as possible after construction. Refer to Conservation Practice Standard Critical Area Planting (342) for the establishment of vegetation. If vegetation is not appropriate for the site, use other measures to stabilize the area.

Safety. Detention ponds and other areas where water is detained or flows swiftly, can present hazards to the public. Where necessary, include appropriate safety features to warn of potential dangers or deter entry to hazardous areas such as fences, gates and warning signs.

Additional Criteria for the Reduction of Water Quantity. Design stormwater control systems to control flow from the area of concern to rates and volumes that will not cause degradation of downstream areas due to erosion or sedimentation. Acceptable peak rates are dependent upon the capacity and stability of the receiving channel. Local regulations may specify acceptable discharge rates for different storm frequencies.

Runoff is controlled by slowing the release of runoff from the site. This can be accomplished by onsite storage, increasing infiltration onsite, lengthening the flow path of runoff or a combination of these methods.

All runoff control methods must include provisions to safely bypass runoff in excess of the design storm.

Additional Criteria for the Improvement of Water Quality. Runoff from developing areas can be contaminated with a variety of substances

including sediment, oils, chemicals and trash. Runoff control systems must include provisions to reduce contaminates in the runoff leaving the site. This can include vegetated filtration areas and other biofilters, trash guards and settling areas that are readily accessible for cleanout. For runoff that is known to be contaminated with substances that may be particularly harmful to the water supply or fish and wildlife, additional measures may be necessary.

Additional Criteria for Erosion and Sediment Control. Control erosion on the site by limiting the amount and length of time that bare soil is exposed to precipitation. This can be accomplished by staging construction and only removing vegetation from a portion of the site at a time, revegetating areas incrementally during construction or using temporary seeding and mulching to stabilize areas until permanent vegetation can be established. Structural erosion control practices can also be installed to reduce the flow length and velocity of runoff to limit erosion.

When erosion cannot be stopped at the source, sediment laden runoff must be filtered or detained to allow sediment particles to settle out to acceptable levels before runoff is released from the site. This can be accomplished by sediment traps, sediment basins and other structures designed to detain or filter runoff. Refer to Conservation Practice Standard Sediment Basin (350) for design requirements for sediment basins.

Additional Criteria for Stormwater Infiltration and/or Filtration. If the design infiltration rate of the native soil is determined to be at least 0.8 inches per hour, which is considered minimal design risk, an underdrain is not required. A perforated underdrain pipe is required for soils with an infiltration rate slower than 0.8 inches per hour unless no suitable outlet for the pipe exists. The minimum diameter of the underdrain pipe is 4 inches.

Pretreatment is mandatory when the runoff is from parking lots and streets, or other areas expected to contribute sediment and other pollutants.

A storage layer is required when the design infiltration rate of the native soil is less than 0.3 inches per hour.

A bioretention basin shall be located a minimum of 50 feet from any private onsite wastewater treatment system and shall not be hydraulically connected to the treatment system's dispersal system or cause negative impacts such as cross contamination.

A bioretention basin shall not be hydraulically connected to any building or pavement foundation or cause negative impacts to structures.

Sloped areas immediately adjacent to a bioretention basin shall be less than 20% (excluding berms constructed as part of the bioretention basin) but greater than 0.5% for pavement and greater than 1% for vegetated areas to ensure positive flow toward the basin.

The minimum depth to bedrock or seasonally high ground water table shall be 3 feet.

A bioretention basin should be placed such that it is visible to encourage routine maintenance.

The design ponding depth shall not exceed 18 inches. The maximum drawdown time for each basin is 48 hours. The optimal design pond depth for overall system function is 6 to 9 inches.

The side slopes of the berm that form the ponding area shall be between 0.5H:1V and 3:H:1V. The outer slopes are recommended to be 5H:1V or flatter. The surface slope of the basin shall not exceed 1%.

CONSIDERATIONS

Research has shown that the first runoff from a site is often the most contaminated. After this initial flush, fewer pollutants are available for removal and dilution lessens the impact. Consequently treatment of this "first flush" of runoff is often sufficient to address the water quality concern. The exact amount of runoff to treat varies depending upon the surface and level of contamination. Determine the amount of runoff to treat based on appropriate research or experience.

Stormwater control practices can affect downstream hydrology. While this is the point of most stormwater control systems, the effect of changing the peak rate and volume of runoff should be considered on downstream areas. The effect of a single project should also be considered in context with other projects in the watershed to determine the cumulative effect. Generally peak rates of runoff should be kept at or below pre-development rates of runoff from the site for the 2-year, 24-hour storm. For already developed areas consider reducing the peak flow from the current developed condition.

Design stormwater control practices to fit into the visual landscape as well as to function for runoff control. Since stormwater control practices are generally installed in public spaces, consider how the space will be used and the visual impact the practices will have.

If properly designed, stormwater control practices can be beneficial to wildlife. When possible use native vegetation to provide food and habitat for wildlife and pollinators. Since most stormwater control practices are in aquatic environments, they can inhibit the movements of aquatic organisms. When designing these structures include provisions for the safe passage of aquatic organisms that may inhabit the site.

To be most effective, stormwater control should include a system of practices working together. This might include detention along with infiltration areas and the maintenance of natural, undisturbed areas. However, it could also include managing the development of the site to limit the disturbed area, ensuring that revegetation occurs in a timely manner and controlling where heavy equipment is allowed to travel on a site.

Large storms can quickly fill stormwater runoff practices with sediment that must be removed in order for the practices to function correctly. Consequently these practices should be designed for easy access and maintenance.

Since stormwater control practices are often installed in urban and public spaces, vandalism may be a problem. Consider using practices that cannot be easily vandalized such as grouting rock in place and installing barriers and locks where appropriate.

PLANS AND SPECIFICATIONS

Prepare plans and specifications for stormwater runoff control systems that describe the requirements for applying the practice according to this standard. As a minimum the plans and specifications shall include:

1. A plan view showing the extent of the practice.
2. Where appropriate, cross-sections and/or profiles showing elevations and distances.
3. Where appropriate, plans for structural details.
4. Where appropriate, seeding requirements.
5. Construction specifications that describe in writing site specific installation requirements for the stormwater runoff control systems.

OPERATION AND MAINTENANCE

Prepare an operation and maintenance plan for the operator. The minimum requirements to be addressed in the operation and maintenance plan are:

1. Periodic inspections, especially immediately following significant rainfall events.
2. Prompt repair or replacement of damaged components especially surfaces that are subjected to wear or erosion.
3. Regular inspection of settling basins, trash guards and other practices to collect and remove accumulated sediment and debris.
4. Where vegetation is specified, periodic mowing, fertilization and control of vegetation.

REFERENCES

Bannerman, R., and E. Considine. 2003. "Rain Gardens: A How-to Manual for Homeowners." University of Wisconsin Extension Publication GWQ037 or Wisconsin Department of Natural Resources Publication PUB-WT-776 2003. Madison, WI

U. S. Environmental Protection Agency. 2007. Developing Your Stormwater Pollution Prevention Plan. Washington, DC

United States Environmental Protection Agency. 1999. Stormwater Technology Fact Sheet: Bioretention. Publ. EPA-832-F-99-012. Office of Water, Washington, D.C.

Schmidt, R., D. Shaw, and D. Dods. 2007. "The Blue Thumb Guide to Raingardens: Design and Installation for Homeowners in the Upper Midwest." Waterdrop Innovations, LLC.