VIRGINIA ASSOCIATION OF SOIL & WATER CONSERVATION DISTRICTS

# VIRGINIA CONSERVATION ASSISTANCE PROGRAM IMPLEMENTATION AND DESIGN MANUAL THIRD EDITION, July 2016

# [VCAP BMP MANUAL]

July 2016

Virginia Conservation Assistance Program

Presented by Virginia Association of Soil & Water Conservation Districts







**The Virginia Conservation Assistance Program (VCAP) is an urban cost-share program that provides financial reimbursement to property owners installing eligible Best Management Practices (BMP's) in Virginia's Chesapeake Bay Watershed.**

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# Introduction

The VCAP Manual ("Manual") is intended to assist Soil and Water Conservation District (SWCDs) personnel as they carry out the Virginia Conservation Assistance Program (VCAP or the "Program"). The Program was pioneered by the Grant Sub-committee of the Virginia Association of Soil and Water Conservation Districts' Urban Committee and is based upon the North Carolina Community Conservation Assistance Program (NCCCAP), modified as appropriate to conform to best management practices accepted by the Virginia Department of Environmental Quality (DEQ).

The purpose of this program is to provide cost-share and technical assistance to address natural resource concerns by assisting in the voluntary installation of certain stormwater best management practices on land where there is no other cost-share program assistance available. The program also aims to assist localities with the MS4 (Municipal Separate Storm Sewer System) Permit requirements and the challenges meeting the Chesapeake Bay Total Maximum Daily Load (TMDL) goals.

This Manual is to be a resource for District staff as they provide technical assistance needed to guide the proper siting, selection, design, installation, and maintenance of stormwater best management practices, or BMPs, on eligible lands. These BMPs are intended to capture and/or infiltrate surface runoff produced immediately following a 1-inch rainfall event. These BMPs are designed to manage stormwater coming from a source on the property, such as roof, driveway or lawn. Sites with contributing offsite runoff can also be addressed with the practices in the Program, but may require more extensive planning and engineering.

Where applicable, this document references the Non-Proprietary BMPs of the Stormwater Design Specifications contained in the Virginia Stormwater BMP Clearinghouse (http://vwrrc.vt.edu/swc/NonProprietaryBMPs.html). Users will also find the *Virginia Agricultural Cost Share (VACS) BMP Manual* and technical manuals of the Natural Resources Conservation Service (NRCS) helpful for fulfilling the intentions of the Program.

The Manual is divided into three parts. Part I summarizes the background and history of the development of VCAP and its administrative framework. Part II contains background information on stormwater management and the Chesapeake Bay. Part III contains the design standards for all VCAP best management practice.

# PART I – PROGRAM DEVELOPMENT AND IMPLEMENTATION

## Section 1.1 Background and Development of the Program

The Virginia Conservation Assistance Program (VCAP or the "Program") is based upon the North Carolina Community Conservation Assistance Program (NCCCAP). The assistance and support of the staff of that program is gratefully acknowledged in the preparation of this Manual. Like VCAP, NCCCAP provides financial help to landowners in urban, suburban, and rural areas to control erosion and runoff on non-agricultural properties.

NCCCAP is designed to retrofit water quality best management practices (BMPs) onto already-developed non- agricultural land. Several districts within the state, particularly Mecklenburg County, broadened their scope of resource protection and developed local community conservation assistance programs, and thus developed model programs potentially applicable across the entire state.

Encouraged by these efforts, the North Carolina Association of Soil and Water Conservation Districts pursued the development of a statewide community conservation program. Through the strong support of district supervisors, the North Carolina Soil and Water Conservation Commission received authorizing legislation to establish the NCCCAP through Session Law 2006-08. The North Carolina Division of Soil and Water Conservation began the program using grant funds to demonstrate recognizable results across the state. In July 2007, the program received its first state appropriation. Over the succeeding five years additional financial support was used to expand the program throughout the state.

Desiring to replicate this successful program, in 2011 the Virginia Association of Soil and Water Conservation District's Urban Committee sought a Chesapeake Bay Small Watershed Project Design Grant from the National Fish and Wildlife Foundation to support the establishment of design components for this Program, focused on filling "urban" gaps identified in Virginia's Watershed Implementation Plan (WIP) for the Chesapeake Bay Total Maximum Daily Load (TMDL). The WIP noted that the "new stormwater regulations will not address sediment and nutrient loads associated with existing development, nor does the existing Chesapeake Bay Preservation Act . . . (To) fill this gap, new requirements, as well as financial incentives for stormwater BMPs are needed."

The Urban Committee's Grant Sub-Committee was primarily comprised of representatives from four Soil and Water Conservation Districts (Districts) -- Culpeper, Hanover-Caroline, Piedmont, and Thomas Jefferson -- all of which played active roles with design of the Program.

The remainder of this Manual is the result of this collaborative work, and is based on the *North Carolina CCAP Program Manual, July 2007* (as partially updated through March 2012) and the *North Carolina Division of Soil and Water Conservation Community Conservation Assistance Program Stormwater Management Practice Design Manual* (no date), and conforms with the Non-Proprietary BMPs of the DCR Design Specifications contained in the Virginia Stormwater BMP Clearinghouse (http://vwrrc.vt.edu/swc/NonProprietaryBMPs.html) where necessary for Virginia programmatic purposes, as well as to the format and content of the *Program Year 2012 Virginia Agricultural Cost Share (VACS) BMP Manual*.

## Section 1.2 Program Scope and Eligibility

A. Program Scope

Districts have a successful history of promoting the voluntary installation of water quality BMPs on agricultural lands through the Virginia Agricultural Cost-Share program. This Program expands this capacity by enabling Districts to promote efforts for corrective action on developed lands, often described as retrofitting. Installing stormwater BMPs on developed land reduces the amount of sediment, nutrients and other contaminants from reaching streams and rivers. Properly managed stormwater can help recharge groundwater and protect the land and streams from erosion. Financial incentives to help encourage the installation of stormwater BMPs will help Virginia meet its non-point source pollution reduction water quality objectives.

While VCAP is designed to encourage the installation of stormwater BMPs on developed land, it is understood that resource-based problems affecting water quality occur on all land uses. For this reason VCAP, at this time, is not limited to strictly urban settings, but includes situations where there is no other cost-share program currently offered to implement a water quality improvement BMP. Broad eligibility criteria will allow VCAP to accomplish several priorities that are not limited to the treatment of stormwater in urban settings. A ranking system is used to help prioritize the recruitment of participants and the implementation of BMPs.

B. Program Eligibility

1. Development:

   The Program is not eligible to be used to assist new development sites to meet local, state and federal stormwater mandates.

2. Flooding:

   The Program is not eligible to be used to deal with major flooding on existing development. Flooding, as defined by the Virginia Erosion and Stormwater Management Act (VESMA), is "a volume of water that is too great to be confined within the banks or walls of the stream, water body, or conveyance system and that overflows onto adjacent lands, thereby causing or threatening damage." The Program may be used to address smaller scale localized flooding as long as there is no channelization of stormwater runoff and the drainage pattern remains unchanged. Localized flooding, as defined by the Virginia Stormwater Management Regulations, means "smaller scale flooding that may occur outside of a stormwater conveyance system. This may include high water, ponding, or standing water from stormwater runoff, which is likely to cause property damage or unsafe conditions."

3. Municipal Separate Stormwater Sewer Systems (MS4):

   Per subsection C (2b) (1) of Section 1 from 9VAC25-890-40, unregulated sites within designated MS4 localities are eligible for funding. Unregulated sites include any development not previously permitted through the Virginia Erosion and Stormwater Management Program (VESMP). Funded practices may be used as credit toward any local stormwater utility fees. These practices may not be used to trade credits to regulated activities. Funded practices must meet or exceed the baseline removal requirement for the site before the MS4 locality can report the BMP for load reduction credit. Funded practices that do not meet the baseline removal requirements for the site will be reported by this Program.

## Section 1.3 Goals and Objectives of the Program

The overall Program goal is to encourage owners or managers of non-agricultural land in the Program District to install "urban" BMP retrofits that will provide nutrient and/or sediment reductions that can be credited toward accomplishing Virginia's Chesapeake Bay TMDL goals by offering cost-sharing financial incentives. The Program will accomplish the following objectives to meet the Program goal.

A. Maintain a suite of BMPs consistent with the Virginia Stormwater BMP Clearinghouse, as appropriate, and a subset of BMPs appropriate for the Program.

B. Identify environmental benefits associated with BMPs including load reductions associated with Chesapeake Bay TMDL implementation efforts.

C. Maintain BMP specifications that may be required beyond those provided by the Virginia Stormwater BMP Clearinghouse.

D. Maintain partnerships between Districts and local government to ensure local support of the Program.

E. Establish support for the Program through partnerships with community groups.

F. Continue to develop and maintain Program information and outreach materials.

G. Identify and establish contacts with other grant programs to maintain strategies to secure continued funding for the Program.

H. Develop and maintain a training curriculum for staff and contractors.

## Section 1.4 District Responsibilities

Local implementation of the Program is the responsibility of the participating Districts. The charge for the Districts is to execute the Program to satisfy a recognized nonpoint source pollution problem. Districts are to place the highest priority on water quality improvement and protection.

A. All Program-related meetings will comply with the Open Meetings Law (Va. Code § 2.2-3707 *et seq*.). Districts will ensure that the District Board meets often enough to properly execute and oversee the Program in their Districts. The Program Steering Committee recommends that District Boards meet to review their Program activities at least six times per year.

B. Each District that chooses to participate in the Program will give public notice of its planned activities preceding the start of each program year and/or when new sources of Program funds become available.

C. Districts will research and develop strategy plans that:

1. Determine what needs to be done to decrease residential, suburban, and urban nonpoint source pollution.
2. Areas most critically needing attention will be prioritized.
3. Assess outreach opportunities and determine marketing approaches.
4. Prioritize applications based on numerical rankings, using primary and secondary considerations.
5. Assess staff capability and determine technical and engineering assistance needs.
6. Follow procedures for tracking and reporting BMP installation and nutrient reduction credits as appropriate.

D. Districts will review and rank applications (Contract- VCAP form-1) for funding based on an established schedule.

E. When an application for funding has been approved, the District will approve a design, installation and maintenance plan, which will become a part of the contract with the participant (Landowner Agreement- VCAP form-3).

F. When BMPs are installed, District staff with appropriate technical authority, as applicable, will certify that the installation meets the requirements of Part III of this Manual. After certification, contingent on availability, Districts may disburse payment from the Program funds allocated to their project.

G. Districts are responsible for conducting annual spot checks of 25 percent (25%) of all active contracts executed in their District to ensure on-going maintenance. Districts are to document the number and names of all persons participating in the spot check process. Spot checks will be performed by appropriate technical staff.

H. Districts will ensure that participants adhere to the maintenance agreement. Participants found to be out of compliance are notified pursuant to the guidelines found in Part I, Section 1.8 ("Compliance & Corrective Actions") of this Manual, and documentation of the noncompliance and resolution becomes a part of the District files. Districts will also ensure that the Program Steering Committee receives notification of noncompliance and the subsequent resolution of such noncompliance.

I. Districts shall ensure that BMP maintenance is continued regardless of transfer of control of property (see Part 1, Section 1.7).

J. Districts will exercise all jurisprudence to avoid any actual or perceived conflicts of interest in implementing the Program.

## Section 1.5 Program Steering Committee Role

The role of the Program Steering Committee ("SC") is to provide programmatic guidance to ensure the Program continues to accomplish the overall goal of enabling non-agricultural landowners to install BMPs that reduce the flow of nonpoint source pollution into local waterways and ultimately the Chesapeake Bay. The SC is also responsible for providing guidance on continued funding and legislative issues related to the Program that may arise.

The Steering Committee will include the following members:

- A representative staff member of at least four, but not to exceed six, participating Districts;
- The Executive Director of the Virginia Association of Soil and Water Conservation Districts, or his or her representative; and
- The Chair of the VASWCD Urban Committee, or approved representative of the Urban Committee shall serve as an Ex-officio member. The Urban Committee member is responsible for keeping Urban Committee members informed of the progress of the Program, to encourage other Districts to adopt the Program and to determine collaborative opportunities with the larger Urban Committee based on its plan of work.

As the Program evolves, the central focus of the SC should include long-range planning and goals, manual development, and critical technical feedback and expertise. Review and approval of practices, payments, and technical assistance will fall to the SC. Day-to-day operations;

outreach; and branding of the program will fall primarily to the VCAP Coordinator. Any agreements made through an MOU with SC districts, such as technical training, funds management, and attending SC meetings will constitute the remainder of SC obligations.

Primarily, the SC members provide critical feedback and assistance to the VCAP Coordinator through their years of experience in the field, technical knowledge, and past experience with the Program. This is an absolutely crucial role for the SC and will continue to be of great value to the VCAP Coordinator.

Specifically, the Steering Committee will:

- Convene monthly SC meetings to discuss ongoing programmatic development, provide guidance to the VCAP Coordinator, and take part in long-range and strategic planning for the Program
- Review and approve cost-share applications, cost-share payments, and technical assistance payments
- Approve program level issues such as manual revisions, BMP criteria, and any changes to official Program policies
- Provide feedback on branded materials, outreach content, and other VCAP Coordinator roles in general
- Assist with District outreach and relationship building through promoting and discussing the Program
- Provide program feedback to the Virginia Association of Soil and Water Conservation Districts on program issues, challenges, or future plans based on experience and program feedback by participating Districts Bay wide
- Form and oversee a Technical Advisory Committee to continually develop and improve BMP specifications and Manual language
- Record and post minutes from monthly SC meetings and Technical Advisory Committee sessions

## Section 1.6 Program Technical Advisory Committee Role

The Program Steering Committee is responsible for creating and maintaining a Technical Advisory Committee ("TAC"). The TAC is responsible for evaluating and providing technical advice to the Steering Committee regarding BMPs in the Program. Membership should consist of a proportional representation of participating Districts and other individuals by invitation from the Program Steering Committee. Ideally about three-fourths of the TAC is composed of licensed and certified professionals, and contractors or stormwater industry representatives that are involved in landscaping and stormwater management. The remaining members are agency personnel representing the agencies that are directly involved in the Virginia Conservation Assistance Program. The TAC should meet at least once per year, and may meet at any time appropriate to conduct business for the Program.

The TAC is encouraged to solicit input by the Program Districts, other Non-Program Districts, or other specialty organizations or agencies on various issues including types of BMPs, BMP specifications, and average BMP costs. Directors, District staff, DCR personnel, and U.S. Department of Agriculture Natural Resources Conservation Service (NRCS) personnel have a standing invitation to attend TAC meetings and participate in the discussions. TAC members

are not representatives of the Program and may not lobby on its behalf.

Ad hoc technical review subcommittees will convene as needed to assist in development of new BMPs, program evaluation, and make recommendations to the full TAC. The subcommittees will assist in the evaluation of Innovative BMP Demonstration Project requests. The subcommittees will consist of appropriate DCR, DEQ, VCE, DOF, NRCS, SWCD, VASWCD, and other agency representatives and willing TAC members as needed.

## Section 1.7 Funding Allocations, Payments, and Participant Responsibilities

### A. Funding Allocations

As of January 1, 2016 the Program is funded entirely through EPA's Chesapeake Bay Implementation Grant ("CBIG"). With this grant, all districts falling within the Chesapeake Bay watershed in Virginia now qualify for the program, which is operated and managed by the Virginia Association of Soil and Water Conservation Districts ("VASWCD"). Cost-share funding is maintained at a bay-wide level on a first come, first serve basis. There are no per-district allocations and cost-share rates/caps are the same for all bay Districts.

The allocation of funds will be administered by the Steering Committee with support from the VCAP Coordinator, an employee of the VASWCD. Any District that has the technical and administrative resources necessary to support the Program can accept applications from public, private, and business non-agricultural landowners and managers and submit them to the VCAP Coordinator for review. The funds will be reimbursed to the District upon project completion.

### B. Submission

The process to apply for reimbursable cost-share funding begins by signing a VCAP form 1 (Contract), which specifies the urban best management practice requesting to be installed and the total estimated cost, and by submitting a design plan and narrative.

Districts are to review the Contract and design plan for compliance with the Program policies as described in the VCAP Manual. Districts are to rank each project using the VCAP Ranking Sheet (VCAP Form – 6) and provide this ranking sheet to the VCAP Coordinator.

The District staff submits the application to the VCAP Coordinator. The VCAP Coordinator reviews the application for completeness. Each month, applications will be presented to the Steering Committee for consideration and approval. Final approval of practice funding is the responsibility of the local District Board of Directors. All actions taken must be voted upon and the outcome recorded in the minutes of the meeting where such action is taken. Districts should be prepared to verify and document that their cost-share payments are being spent in accordance with the administrative and technical guidance published in this manual.

Once approved, the Program participant signs the Landowner Agreement (VCAP form-3) confirming the amount of cost-share approved, agreeing to allow district staff to access the property under specified terms, and specifying other terms of the agreement. As part of the Landowner Agreement, the participant works with the district technical staff to complete a Job Sheet (VCAP form-2) that describes any site-specific details, including an Operation and Maintenance Plan. The Operation and Maintenance Plan describes the participant's obligations to maintain the practice. The participant is responsible for the maintenance of the practice for the entire lifespan of the practice. In cases where changes in the control of the land occur, such as the sale of the property, or any changes in lease agreements, the participant may complete an Agreement Transferring BMP Responsibility (VCAP form-4) to relieve them of the responsibility to maintain of the practice.

### C. Verification and Payments

Once a practice has been installed, inspected, and approved by a district staff member, the district is expected to make the approved cost-share payment to the participant. An invoice is then submitted to the VCAP Coordinator for reimbursement.

If it is not possible for the district to make cost-share payments on larger projects before being reimbursed, the district must submit a formal request to the VCAP Coordinator on district letterhead for an early reimbursement payment.

Reimbursement will be made to the district for each completed contract and will include technical assistance funds at an established flat rate. Districts must submit a completed Job Sheet (VCAP Form-2), and a third-party as-built certification when necessary.

### D. Participant Responsibilities

Maintenance agreements between the involved parties are acceptable but ultimate responsibilities still rest with the participant. Districts may choose to encourage landowner participation over tenant participation in their information and promotional campaigns.

### E. Reporting Completed Practices

The VCAP Coordinator will report completed practices to the State tracking program at least annually. The reportable data will be collected on the Job Sheet (VCAP Form-2).

## Section 1.8 Compliance and Corrective Action

Failure to maintain the practice for the specified lifespan will result in the participant being required to refund all or part of the cost-share amount. The required repayment amount is based on the amount of funding provided to the participant prorated to the lifespan remaining. In the case of the death of the participant this requirement may be waived. This determination requires an official action of the District Board that must be recorded in the minutes. A Transfer of Responsibility form (VCAP form-4) should be signed if the property changes ownership during the life of the BMP.

Participants found to have practices not meeting specifications or practices destroyed during the designated life span will be contacted by the District and informed of the nature of the deficiency and repayment requirements if not corrected. This should initially be a verbal notice (with the date documented in a case file). Verbal notice should be followed with a written notice (by certified mail) within two weeks. This notice must indicate the observed nature of the problem and allow the individual the opportunity to respond within two weeks.

Participants may be given a maximum grace period of six months from the date of the written notification for practice compliance. At the end of the grace period, the practice will be re-inspected. The District will notify participants found with practices still not in compliance in writing that repayment of state or other cost-share funds is required.

Participants will have 60 days from the date of the District's notification of repayment to refund the cost-share funds. If restitution has not been made at the end of this 60-day period, the District will notify the Virginia Office of the Attorney General (OAG) for assistance to reclaim the funds. It is recommended that the OAG be apprised of the need for assistance as soon as the deadline for recovery has passed.

# PART II –STORMWATER OVERVIEW

## Section 2.1 Introduction

The specifications and application of best management practices (or BMPs) are constantly evolving with new information and more experience. The specifications and standards found in this Manual will be updated as more research and information is gathered. This document focuses on retrofit BMPs that can be installed in small scale settings, such as existing individual residences and small businesses.

**Stormwater BMPs found in this Manual:**



## Section 2.2 Stormwater Overview

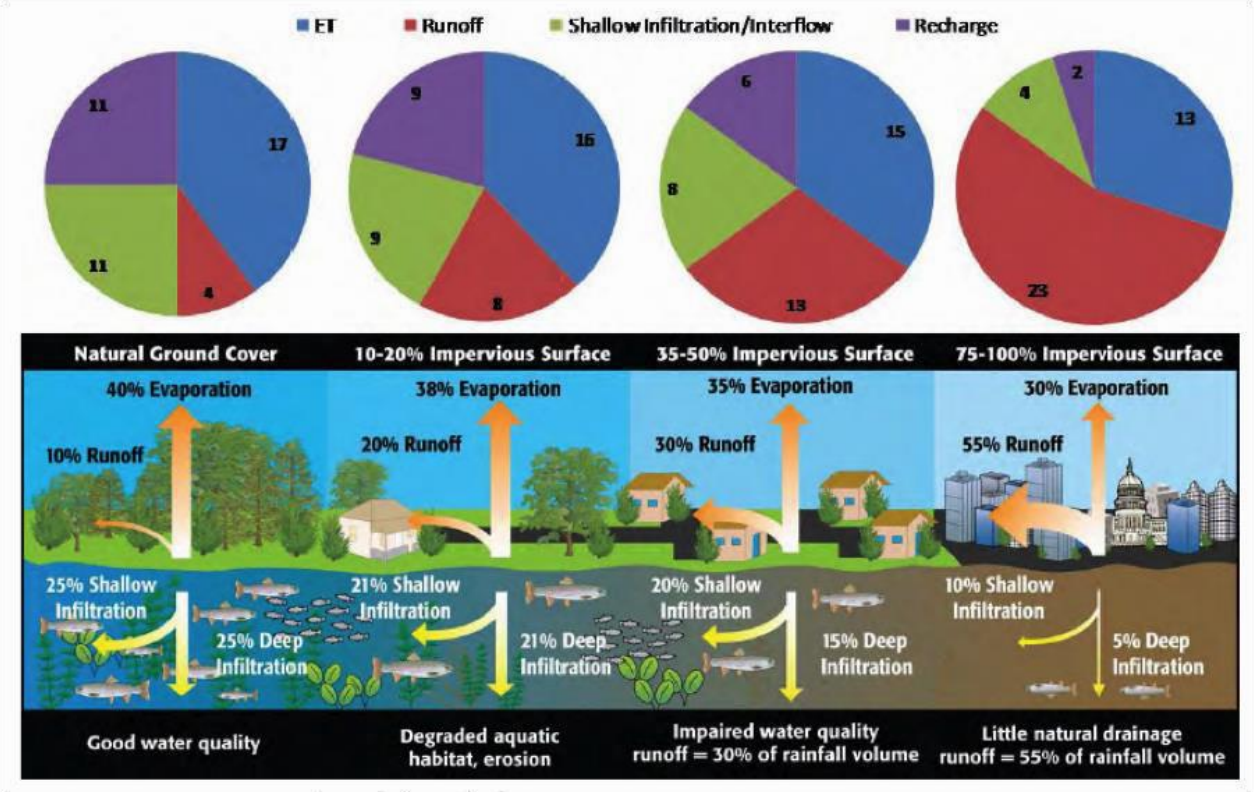
### A. Definitions of Stormwater

Stormwater describes surface runoff from disturbed and developed lands that is produced immediately following a rainfall event or as a result of snowmelt. Factors that affect stormwater include the quantity and intensity of a precipitation event, amount of impervious surfaces, the soil type and condition, vegetative cover, and slope length and steepness. The Virginia Stormwater Management Program Permit Regulations at 9VAC25-870-10 define the term as "precipitation that is discharged across the land surface or through conveyances to one or more waterways and that may include stormwater runoff, snow melt runoff, and surface runoff and drainage."

## B. Effects of Urbanization

Virginia is among the fastest growing states and the resulting urban influx affects many facets of the state's infrastructure. More cars drive our roads, more people create higher wastewater discharges, and more development necessitates stormwater runoff controls.

How does urbanization affect stormwater runoff? Roads, parking lots, sidewalks, homes, and offices replace the natural, permeable landscape. Rainfall that once soaked into vegetated ground is now available for stormwater runoff. Impermeable surfaces connect to form a "stormwater superhighway" that allows runoff to reach streams more quickly. The following diagram illustrates how stormwater runoff is a function of impervious cover.




**Stormwater Runoff as a Function of Impervious Cover (Potomac Conservancy 2008)**

There are many impacts from this increase in impermeable area: (1) more stormwater reaches streams because there is less opportunity for it to infiltrate into the ground; (2) peak flows increase because the "stormwater superhighway" transports runoff from large areas rapidly; (3) velocities in the stream increase, causing more erosion; and (4) base flow is lower during dry weather due to a lack of infiltration into the underlying groundwater (groundwater recharge).

Although Virginia passed legislation to manage stormwater pollution in 2004, sediment remains a major pollutant of our waters. In addition, metals and chemicals from vehicles and industries pollute stormwater runoff in increasing amounts. Likewise, nutrients are found in the urban environment in a variety of forms, such as fertilizer used on lawns and deposition from the air.

Fertilizer contains nutrients for plants to grow, but excess fertilizer, or fertilizer that is inadvertently applied to pavement, harms water quality. This manual will provide design guidance for several best management practices (BMPs) that can be installed to reduce the amount of pollution entering streams.

## Section 2.3 Stormwater Best Management Practices (BMPs)

### A. Overview of Stormwater BMPs

Stormwater management is the attempt to reduce runoff volume, control peak flow rate, and improve water quality using best management practices (BMPs). Each BMP has certain conditions under which it will function properly. Site conditions such as amount of stormwater discharge, soil-type, slope, available land, impervious surface, and proximity to waterways all influence the selection of a BMP.

The Environmental Protection Agency (EPA) has identified two distinct classifications of BMPs- "nonstructural" and "structural."

Nonstructural BMPs reduces stormwater quantity and improves water quality at the source. There are some simple non-structural practices that homeowners can implement themselves. Some examples include downspout disconnection, sheet flow to open space, grass channels, replacing managed turf with native plants, and amending soil.

Structural BMPs are engineered systems that control the peak flow, reduce runoff volume, and improve stormwater quality. Some examples of these are bioretention areas, rain gardens, rain water harvesting, green roofs, and constructed wetlands.

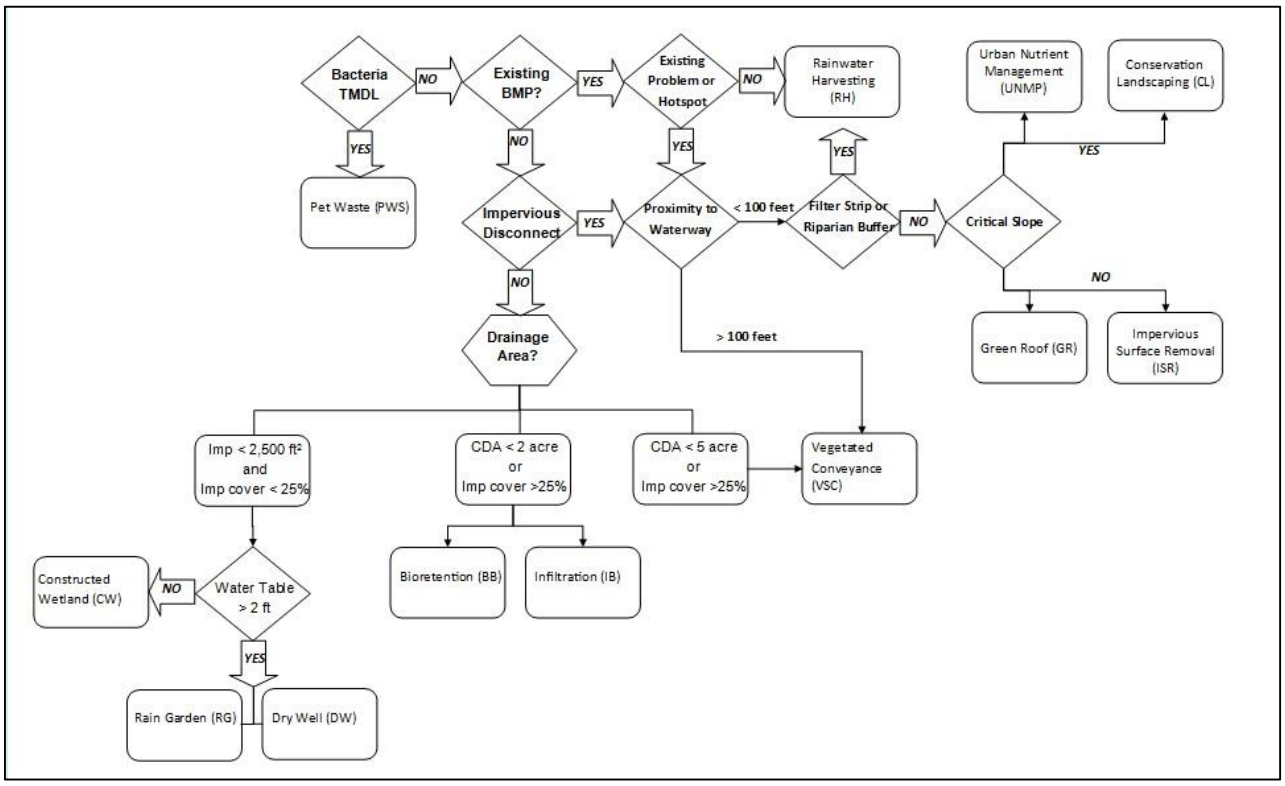
### B. Practice Selection

BMP selection will be based on site needs, conditions, or homeowner objectives, and can be very unique depending on the individual landowner's desired outcome. Sites should have an identifiable water quality issue and BMP objectives should be limited to practices that capture and reuse or treat stormwater. Typically, measures to only reduce flooding will not be eligible for cost share.

Some Examples:

- Sites with known erosion problems and poor drainage could consider improving the stormwater conveyance system.
- Sites with water volume issues and have an onsite need for water could consider rainwater harvesting to collect and reuse stormwater.
- Sites that produce high levels of pollutants could consider a conversion of land management practices that changes how the land is used to reduce pollutant generation.
- A combination of objectives can be satisfied with one or more practices, and practices can be combined to create "treatment trains" to accomplish all objectives.

The following flow chart may be helpful to determine what practice is appropriate for a particular property.




## C. Accounting for Chesapeake Bay Model Credits

Since the first Chesapeake Bay Agreement in 1983, Virginia along with the other states in the Chesapeake Bay watershed have been trying to reduce and reverse the adverse impacts of sediment and nutrient pollution to the Bay. As earlier efforts to reduce point source sediment and nutrient pollutants bore success, efforts have increasingly turned to the growing problem of nonpoint sources of sediment and nutrients. To reflect the growing concern of untreated runoff that results from agriculture and the proliferation of untreated runoff from urban and residential development, the Bay Agreement was updated in 1987, 2000 and 2014.

The insufficient progress of cleanup and the continued impairment of the Chesapeake Bay led to the insistence that Chesapeake Bay Total Maximum Daily Load (TMDL) levels be determined for nitrogen, phosphorous, and sediment. Each state within the Chesapeake Bay watershed was required to develop Watershed Implementation Plans (WIPs). The WIPs detailed the strategies each state will implement to meet TMDL allocations (*see Fact Sheet: Chesapeake Bay TMDL, 12/29/10*).

The VCAP BMPs are intended to address Virginia's Phase II WIP strategies and to be accountable for achieving a level of pollution reduction in accordance with the Urban BMPs of the Chesapeake Bay Model (see Sections 6.7 through 6.10). Pollution reduction under the Model is determined based on a BMP's pollutant removal efficiency rate, a pollutant load reduction, or a land use change (see Table 6-4 in Section 6.10 of the Model). Since most of the VCAP BMPs are derived from the Virginia Stormwater BMP Clearinghouse, there is assurance of verification of those BMPs with the Chesapeake Bay Model and accountability towards meeting Virginia's Phase II WIP strategy goals.

Appendix C contains Sheet 2 of an NPS BMP DET V10 matrix used by the Chesapeake Bay Program to evaluate BMP data elements, and Sheet 3, an example VCAP project tacking spreadsheet.

[Note: A separate VCAP guidance document entitled, "Comparison of VCAP BMPs and Chesapeake Bay Phase 5.3 Community Watershed Model Urban Practices BMPs, with additional input from the Commonwealth of Virginia Chesapeake Bay TMDL Phase II Watershed Implementation Plan (WIP)" compares the existing VCAP BMPs with the Chesapeake Bay Model's discussions of Urban Practices, Shoreline Protection, Land Use Changes, and BMP Annual Time Series (see Model Sections 6.7 through 6.10).

## Section 2.4 General Stormwater BMP Design Considerations

### 2.4.1 Water Quality Treatment

#### A. The "First Flush" Concept and Treatment Volume Approach

The term "first flush" has become common nomenclature in the stormwater management field. The concept behind this term is that pollutants that have collected on impervious surfaces will wash off during the first part of a storm event. The "first flush" contains more pollutants than stormwater runoff produced later in the storm. In theory, if the "first flush" could be captured and treated by a stormwater practice, 90% of the pollutants leaving the site could be treated by the stormwater practice (Schueler and Holland, 2000). However, it has been found that a Treatment Volume approach provides better pollutant removal performance by the BMPs than the "first flush" approach. The following is from Chapter 5 of the September 2012 Virginia Stormwater Management Handbook. Based on these findings, the Treatment Volume approach will be emphasized by future stormwater programs in Virginia:

*The Treatment Volume is a variation of the first flush concept that is based on a regional analysis of the mid-Atlantic rainfall frequency spectrum. Treatment volume (Tv) becomes the storage volume that stormwater BMPs provide water quality treatment. Treatment Volume is derived from the Simple Method for pollutant load using the 90th percentile rainfall event and the site cover coefficient. In Virginia, the 90th percentile rainfall event is defined as 1-inch of rainfall. The rationale for using the 90th percentile event is that it represents the majority of runoff volume on an annual basis.*

*The proposed Treatment Volume (Tv) has several distinct advantages when it comes to sizing BMPs for water quality treatment:*

- *Storage is a direct function of impervious cover and disturbed soils, which provides designers incentives to minimize the area of both at a site.*
- *The $T_v$ approach provides adequate storage to treat pollutants for a range of storm events. This is important since the first flush effect has been found to be modest for many pollutants (Pitt et al, 2005).*
- *The $T_v$ provides effective stormwater treatment for approximately 90% of the annual runoff volume from the site, and larger storms will be partially treated.*

*$T_v$ provides an objective measure to gage the aggregate performance of environmental site design, Runoff Reduction, and Pollutant Removal BMPs together using a common currency (runoff volume).*

### B. Disconnection

Impervious areas that immediately drain to a stormwater conveyance system, such as inlets, culverts, and open channels, are considered to be "connected impervious" areas and produce stormwater that flows untreated to surface water bodies. For example, if a rooftop drains to a gutter, which then drains directly onto a nearby street and into the street storm drainage, this would be considered an example of "connected impervious."

Disconnection occurs when impervious surfaces are redirected and dispersed into sheet flow across an expanse of turf grass or natural vegetation. Runoff from disconnected impervious areas is routed to a pervious area where it has a chance to infiltrate. As a rule of thumb, impervious surfaces must sheet flow for at least 40 feet before it reaches some kind of conveyance system, before it may be considered a disconnected impervious surface for runoff calculation.

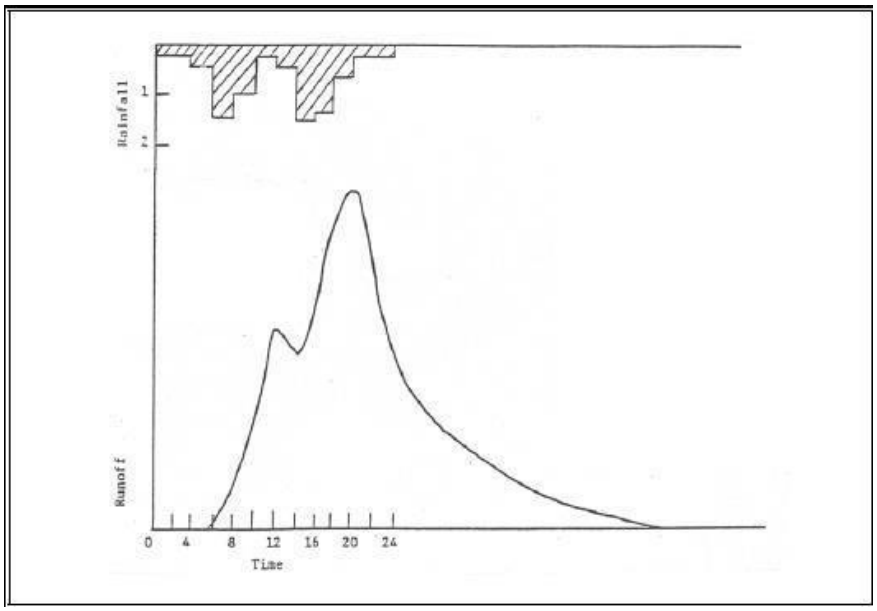
### C. Pollutant Load Treatment

The "Simple Method" is a technique that can be used to calculate the anticipated pollutant load that will leave a given residence or small business (Schueler, 1987). The information required to employ the Simple Method is: (1)the area that will be draining to the proposed BMP location in acres, (2) the percentage of the drainage area that is impervious, (3) the annual regional rainfall, and (4) pollutant concentration. The Simple Method calculates storm intensity in a two-step process using a runoff coefficient to calculate runoff depth (inches), which is then used to determine the annual pollutant load (lbs./year). Instructions on using the Simple Method can be found in Appendix A (Calculations Specific to VCAP BMPs).

## 2.4.2 **Water Quantity Control**

### A. Peak Flow

Determining the peak flow leaving a watershed during a storm is important when designing many stormwater BMPs. The peak flow is simply the period when the greatest volume of water leaves the watershed through the course of a storm event. The following graph shows a sample flow versus time relationship and its associated peak flow. The depth of rain that falls throughout the event can be observed on the right side of graph.




**Peak Flow Illustration (Figure 4-4 Virginia Stormwater Management Handbook, Volume 2, 1st edition 1999)**

The peak flow is used to determine the capacity of stormwater conveyance systems and size BMP outlet structures. See Appendix A.2 for detailed calculations.

**B. Dispersing Stormwater**

Stormwater collects and concentrates very easily in depressions, swales, natural runoff conveyances, rain gardens, and rain water cisterns. If possible, backyard stormwater BMPs should have an overflow connection to an existing stormwater drainage pathway. The current drainage path can be utilized as a way to convey water away from the BMP should a storm occur that is larger than what the BMP is designed to hold.

## 2.4.3 **BMP Components**

**A. Pretreatment and Inlet Control**

Pretreatment is a necessary component of many stormwater BMPs. Pretreatment is a process to reduce pollution in stormwater before it is introduced into a stormwater BMP. Pretreatment is usually performed to reduce constituents, such as sediment, that may interfere or substantially reduce the effectiveness of a stormwater BMP. Pretreatment requirements for stormwater BMPs covered by the Program can be found in Appendix B.

**B. Outlet Structure**

Close attention should be paid to where the water from a stormwater BMP exits a given property. During small rain events, depending on soil conditions, all the stormwater produced in a small watershed may be retained in the BMP. However, during larger rainfall events the stormwater BMP will fill to capacity and spill over into the adjoining area.

There are three types of outlets to consider: underdrains, orifices, and weirs. An underdrain is a perforated pipe that collects excess water from a filtering practice and is typically connected to a storm sewer system or 'day lighted" into a conveyance system. An orifice is a part of a control structure that includes a riser and barrel through an earthen embankment. Orifice outlets typically connect to a storm sewer system or "daylights" into a conveyance system. A weir is a notch in the earthen embankment similar to an open channel. Weirs can be a vegetated, stone or concrete and they typically discharge runoff overland as sheet flow. Selection of an outlet is dependent on the stormwater BMP and location of an adequate conveyance system.

Special care should be taken to ensure that the area into which the outlet discharges is able to convey the stormwater safely to a nearby conveyance system, such as an inlet, culvert or open channel. The procedure for determining the appropriate outlet size can be found in Appendix A.3

## 2.4.4 **Compliance with Local, State, and Federal Codes**

**A. Permits**

The type, size and location of the BMP may require compliance with local zoning ordinances and local, state and federal permitting. A joint permit application (JPA) should be submitted when impacting wetlands and streams. If the size of the BMP disturbs enough land to qualify as a land disturbing activity, then a local land disturbing permit may be needed. These BMPs must comply with the local program ordinance and the Virginia Erosion and Sediment Control Regulations (9VAC25-840 *et seq*.).

### B. Riparian Buffers

Riparian buffers help to absorb periodic flood surges; supply thermal protection, food, and cover to fish and other wildlife; stabilize stream-banks; filter runoff; and provide recreation and aesthetic values.

Riparian buffer rules in certain localities can impact the function and siting of a backyard stormwater BMP. All participants should confer with their local governments, as well as their local Soil and Water Conservation District, to determine if proposed BMPs may be impacted by local riparian buffer requirements

## 2.4.5 **Considering Soil Conditions**

### A. Soil Fertility

Stormwater BMPs are impacted significantly by the soil in which they are constructed. Therefore, it is important to know which soil types are present at a given location before designing or constructing a stormwater BMP. The presence of restricted layers such as shallow bedrock, high water table, and compacted clay may affect construction and design of stormwater BMPs. Soil properties such as hydraulic conductivity, texture, and linear extensibility affect site infiltration rates. Soil nutrient levels (N-P-K), pH and cation-exchange-capacity (CEC) affect vegetation establishment. When a site is evaluated for a practice, determining the soil type at the site can be performed first by referring to soil surveys for general soil characteristics and then, more importantly, from field investigations.

### B. **Soil Surveys**

Soil Surveys are comprehensive reports on soil resources of a given county. These publications include maps with soil boundaries, aerial photos, narrative descriptions of each soil map unit and tables explaining specific soil properties and features. District staff should become familiar with the soil survey of their particular counties. It is important to note that soil surveys may not be accurate to the site scale level.

### C. **Site Investigations**

Soil information gathered solely from a soil survey should not be used exclusively to determine which type of soil is present at a given site. A site investigation is needed to verify that the soil on site is suitable for a given BMP, especially those intended to provide infiltration. Infiltration information can be gathered in two ways, first by testing for presence of wetland soils, and secondly by testing for permeability.

To test for wetland soils dig a test hole in the location of the proposed BMP that is approximately 2-foot deep, or to the depth of the bottom of the proposed BMP, whichever is deeper. As the hole is being dug, the soil should be observed for signs that it is a wetland soil. Wetland soils are commonly grey with ribbons of brown. If wetland soils are identified within 1 foot of the surface at a given site, the site is likely poorly drained. A detailed description of wetland soils is available in Vepraskas (1999).

To test for permeability conduct a simplified soil infiltration test. This is a test to check the permeability of the soils being evaluated for BMP suitability. A hole should be dug using an auger or spade, approximately 1 foot below the expected bottom of BMP. The newly dug hole should be filled with a known amount of water. Monitor how quickly the hole drains and use this information to select the appropriate BMP. The drainage rate is particularly important for plant selection and bottom grading of the practice.

## 2.4.6 **Maintenance**

Once construction is completed, periodic inspections must be performed to ensure the BMP continues to function as designed. Maintenance is a necessary component of all BMPs. All participants must be aware of the operation and maintenance responsibilities for the proposed BMP. These responsibilities, as noted in the BMP-specific Operations and Maintenance Plan found in the Job Sheet (VCAP form-2) attached to the Landowner Agreement (VCAP form-3) (*see* Appendix D), may influence BMP selection. District Staff should discuss the following maintenance requirements with all participants:

### A. Routine Maintenance

Routine maintenance may include landscaping and aesthetic maintenance such as grass, tree and shrub care, wetland plant care, re-seeding and mulching, slope stabilization, grass mowing, pruning, filling and repair of gully erosion, repair of shoreline, animal control caused by nuisance rodents, removal of invasive vegetation and minor sediment cleaning. It also may include removal of debris, trash, sediment, vegetation and other matter that impedes or threatens to impede stormwater functioning or structural integrity.

### B. Non-Routine Maintenance

Non-routine maintenance may include the repair or replacement of structural components such as embankments, risers and outlet barrels, trash racks and anti-vortex devices, emergency spillways, pretreatment forebays, seepage controls, drains, water quality or quantity control devices, outlet protections or energy dissipaters, shoreline stabilization, and major sediment removal (excavation or dredging methods).

## 2.4.7 **Problems Regarding Multiple Property Owners**

Before a site is chosen for a backyard stormwater BMP, the property boundaries must be clearly defined by property owner and verified if possible by District staff. This is to ensure that no part of the stormwater BMP would be located on property belonging to an individual not participating in the Program. If a stormwater BMP is to be located in such a way that multiple property owners will be impacted, all property owners must be contacted and must agree upon the BMP measures in the project contract, and be noted in the Landowner Agreement VCAP form 3.

Additionally, stormwater BMPs are designed to slow and capture stormwater before it leaves a given property, thus a pool of water may form as water slows and enters the BMP. This pool of water should not extend to a neighbor's property without written consent in the project contract. It should also be noted that downstream property owners usually benefit from their upslope neighbor's installation of backyard BMPs, which bring about a potential reduction in flooding and erosion on the downstream owner's property. This benefit should be clearly communicated to the non- participating landowners as part of the development of the BMP project.

# PART III: New BMP Retrofits

## Section 3.0 General Policies

A new "retrofit" occurs when installing a BMP that creates storage to reduce nutrients from existing developed land that is not currently receiving any stormwater treatment (CBPWQGIT, 2012). These stormwater practices are built near stormwater outfalls or within existing stormwater conveyance system; adjacent to large parking lots or other impervious areas; within right-of-ways; and on individual residential properties.

The practices in this section are organized by the level of engineering required for their design. When engineering is required, the practices are further divided by scale or scope of the project. As a guideline, the following is the assigned level of engineering for the BMPs in this section:

Basic practices generally require no engineering in their installation and minimal planning. These can generally be planned and installed by a participant with minimal District assistance.

3.1 Pet Waste Station (Not Currently Funded)

3.2 Urban Nutrient Management Planning (Not Currently Funded)

3.3 Impervious Surface Removal

3.4 Conservation Landscaping

Intermediate practices require more extensive planning and in some instances some engineering and thus may require the participant to hire a skilled contractor with some engineering expertise.

3.5 Rain Garden

3.6 Dry Well

3.7 Constructed Wetland

Advanced practices require extensive planning, the hiring of a skilled contractor and engineer, and District staff certification and training.

3.8 Vegetated Stormwater Conveyance

3.9 Rainwater Harvesting

3.10 Bioretention

3.11 Infiltration Basin

3.12 Permeable Pavement

3.13 Green Roof

**Release Agreement for Advanced BMPs:**

Depending on the scale of the practice, a Release Agreement (VCAP Form – 5) may be used to waive the requirement for the design plan to be certified with a stamp from a licensed professional. The Steering Committee must be notified when a participant requests waiving this requirement. The following will be used by Districts as a guide for that determination in accordance with the scale tables below.

- Local Districts may approve the waiver for Small Scale projects.
- The Steering Committee may approve the waiver for Medium Scale projects
- Large Scale projects cannot waive the requirement for a design plan to be stamped by a licensed professional. All Level 2 designs are considered Large Scale projects.

Rainwater Harvesting (RH) Scales

| Scales | Size (gallons) | Allowable Configuration |
|---|---|---|
| Small | <650 gallons | Above Ground (Height < 6 feet) |
| Medium | <3,000 gallons | Underground (<5 feet); or Above Ground (Height< 6 feet and Height to Width < 2:1) |
| Large | >3,000 gallons | Underground (>5 feet); or Above Ground (Height > 6 feet and Height to Width > 2:1) |

Bioretention (BR), Infiltration (IF) and Vegetated Conveyance Systems (VCS) Scales

| | Bioretention | Infiltration | Vegetated Conveyance System | |
|---|---|---|---|---|
| **Scales** | **Size (square feet)** | **Size (square feet)** | **Slope Gradient (%)** | **Drainage Area (acre)** |
| Small | < 300 sq. ft. | < 300 sq. ft. and depth < 3 feet | Slope < 2% | CDA < ½ acre at maximum 25% IAT; or CDA < 10,000 sq. ft. and IAT is < 2,500 sq. ft. |
| Medium | < 1,500 sq. ft. | < 1,500 sq. ft. and depth < 5 feet | Slope <10% | CDA < 1 acre and IAT < 20,000 sq. ft. |
| Large | >1,500 sq. ft. | >1,500 sq. ft. or depth > 5 feet | Slope >10% | CDA < 2 acre and IAT > 20,000 sq. ft. |

Permeable Pavement (PP) Scales

| Scales | Size (square feet) | Drainage Area (acre) | Allowable Configuration |
|---|---|---|---|
| Small | <1,000 sq. ft. | CDA is 100% Impervious; IAT < 2,500 sq. ft. | Pervious Grid Pavers |
| Medium | <10,000 sq. ft. | CDA is same size or less than the treated area. | Pervious Grid Pavers ; Interlocking Pavers |
| Large | >10,000 sq. ft. | CDA is up to twice the size of the treated area | Pervious Grid Pavers ; Interlocking Pavers; Porous Asphalt or Porous Concrete |

Green Roof (GR) Scales

| Scales | Size (square feet) | Drainage Area (acre) | Allowable Configuration |
|---|---|---|---|
| Small | < 400 sq. ft. | No External Drainage | Sheds; Un-occupied structures |
| Medium | <1,000 sq. ft. | CDA is same size or less than the treated area. | Garages; Occupied Structures |
| Large | >1,000 sq. ft. | CDA is up to twice the size of the treated area | Publicly Buildings; Occupied Structures; Intensive Roofs |

## Policies Regarding New BMP Retrofit Practices

Detailed standards for each BMP are discussed in subsequent sections of this chapter. Where applicable, these BMP standards are based on the specifications of the Virginia Stormwater BMP Clearinghouse to be consistent with the Chesapeake Bay TMDL Watershed Implementation Plan (WIP). Below are the design standards that pertain to all practices within Section 3.

### A. Eligibility

- Practices are not intended to meet regulatory requirements.
- Practices funded through this program cannot be used for Nutrient Trading.

### B. Lifespan Requirements of VCAP Projects

- Urban Nutrient Management Plans expire after 3 years.
- Pet Waste Stations must be maintained for 3 years.
- All other practices must be maintained for 10 years.
- Once installed, projects should be considered permanent landscape features and an effort should be made to provide for continuation beyond the Program commitment.

### C. Ranking Criteria for VCAP Funding

Each application will be numerically ranked based on Site, Practice and Application criteria. The site specific criteria include the presence of an existing BMP; ownership; proximity to waterway or storm drain; and existing problem. The practice specific criteria includes BMP type; mitigating a TMDL impairment; establishing or enhancing a riparian buffer or filter strip; critical slopes over 15 percent; impervious acres treated; contributing drainage area; and opportunities to disconnect and disperse impervious areas. The application specific criteria includes creating partnerships; signage; providing educational value; initiating practices in new Districts; and rewarding participants with final plans ready for implementation.

See the VCAP Urban Practice Ranking Sheet (Form-6) in Appendix D.

### D. Plans and Specifications

- **The participant is responsible for ensuring that the proposed project construction and subsequent maintenance meets all applicable local, state and federal permits, policies and ordinances.**
- Design plan and Job Sheet (VCAP Form-2) shall include the following:
    - Sketch showing the location, specifications, contributing drainage area, impervious areas treated, and dimensions of the practice,
    - Cross section showing the depth, slope, and inlet, outlet and overflow structures where applicable,
    - Material Lists and Cost Estimate,
    - Site constraints for construction should be identified,
    - Installation requirements including construction sequence and site stabilization, and
    - Necessary computations per the practice standards.

## E. Operation and Maintenance

- All practices will be subject to spot checks by SWCD staff during the practice's lifespan.
- Participant must accept maintenance responsibilities for the practice per an approved Operation and Maintenance Plan found in the Job Sheet (VCAP form 2), attached to the Landowner Agreement VCAP form 3(see Appendix D). This agreement will include specific maintenance objectives described for each BMP.

## F. Technical Responsibility

- The participant will be responsible for submitting all project plans. Technical guidance may be provided by local SWCDs. All projects must meet local codes, ordinances, and policies, and must address any permitting requirements.
- The local SWCD is responsible for reviewing all plans, providing any necessary technical guidance, and inspecting the completed practice to ensure that all standards have been met prior to issuance of payment.
- District staff that provides assistance and approval of projects must have a basic understanding of nonpoint source pollution and pollution reduction in Virginia. Stormwater and Erosion and Sediment Control certification is preferred.
- A licensed or certified professional is responsible for certifying design plans for advanced practices. Should a program participant choose to assume the responsibility and forgo a licensed, engineered design, a Release Agreement VCAP form-5 shall be signed.

## G. Cost-Share and Incentives

- Cost Estimates are needed to determine the Cost-Share amount.
- If a practice requires a pre-treatment then the pre-treatment costs are included in the primary practice costs.
- Incentives are flat payments that do not exceed the total cost of installation.

## H. Planning Considerations

- Miss Utility notification (Call 811).
- Infiltration test (USDA NRCS Soil Quality Test Kit Guide. Soil Quality Institute. July 2001. Section I Part 3. Page 7-8. Or Appendix 8-A on the Virginia Stormwater BMP Clearinghouse)
- Soil Compaction Test (see Penn State Extension Agronomy Facts 63 or Bulk Density Test USDA NRCS. Soil Quality Test Kit Guide. Soil Quality Institute. July 2001. Section I Part 4. Page 9-13.)
- Soil Fertility Testing (see VCE PUB 425-125 and 425-129)
- Setbacks from dwellings, septic and wells shall follow guidelines per the practice standard.

## Section 3.1 Pet Waste Stations (PWS)


**Typical Pet Waste Station**

The Environmental Protection Agency estimates that the typical dog produces three-quarters of a pound of waste per day. Left alone, pet waste can pollute ground and surface water, attract flies and pests, and transmit parasites and infectious diseases. Pet waste stations are designed to encourage pet owners to pick up after their animals in parks and other public places to prevent waste from being transported off-site by stormwater runoff. As illustrated above, pet waste stations typically include a covered 10-gallon waste can and plastic or bio-degradable "pick-up" bags attached to a sign-post that identifies the station purpose, and are installed at convenient locations where pet-walking and pet exercise occurs. However, where trash receptacles are already deployed in a public area, the waste cans are not an essential component of this BMP.

### Policies Regarding PWS

Pet Waste Stations have relatively few practice constraints other than ensuring that the receptacles are located at places where pet owners are likely to have need of their services, they can be serviced and maintained by available staff, and the ultimate disposal facility will not of itself cause a water quality problem by concentrating the pet waste in or near a watercourse or in groundwater. This practice is a nonstructural BMP and is simple to implement.

**A. Criteria**

- This practice should only be installed in public areas such as parks, neighborhood common areas, apartment complexes, and similar public areas that are easily accessible and visible to pet walkers. .This practice is not designed for the individual homeowner.
- Receptacles should be safely located away from areas used for access by public utility service vehicles and must be at least 100 feet from water conveyance systems.
- Each station must have a professionally designed sign describing the use and purpose of the station. .Most commercial stations come with this type of sign.
- The waste disposal site will not of itself cause a water quality problem by its location to a watercourse or groundwater supply.

## B. Plans and Specifications

- A final design plan for the site must be submitted by the landowner and approved by the local Soil and Water Conservation District before construction is initiated. The installed practice must be in accordance with the approved design unless changes were pre-approved by the local SWCD. .Information required in the plan includes:
    - Location within the property on a site map.
    - Site preparation details.
    - Provide Manufacturer specifications for installation, such as depth of posts and foundation materials.
    - Provide a waste disposal plan, if a trash can is included in the design.

## C. Operations and Maintenance

- At least weekly service and maintenance for all stations that include a waste receptacle.
- Refill waste bags as necessary.

## D. Cost-Share Rates

- After the initial purchase of the station, VCAP will not provide assistance for waste bags.
- The Program will reimburse up to 75 percent of costs up to a maximum payment of $400.00 per station.

## E. Helpful Technical Reference

- http://www.annapolisgreen.com/pdf/PetWasteStationCommProgHowToGuide.pdf

## Section 3.2 Urban Nutrient Management Planning (UNMP)

Surveys[1] show that about 50 percent of homeowners fertilize their lawns, but fewer than 20 percent of those who fertilize consult an expert lawn professional or take a soil test to determine the optimal fertilization strategy. Nutrient export associated with turf grass fertilizer use from home, commercial and industrial lawns depends on various landscape factors, fertilizer application rates and overall lawn care practices. Having an urban nutrient management plan developed ensures an optimal fertilization strategy will be implemented and helps to reduce nutrient export from fertilized lawns.

[1]Schueler, T., Lane, C. 2013. Recommendations of the Expert Panel to Define Removal Rates for Urban Nutrient Management: CBP Approved Final Report. p34-35.

### Policies Regarding UNMP

Urban Nutrient Management plans (UNMP) have relatively few practice constraints other than: the area associated with the plan must currently be fertilized or have a critical need to be renovated because of poor or no vegetative cover, the property owner agrees to keep fertilization records regardless of who is making the applications, the property owner agrees to have a certified fertilizer applicator apply all fertilizer in accordance with the plan or the property owner demonstrates they have the necessary knowledge along with proper application and calibration equipment to apply the fertilizer themselves.

Definitions:

An **amended** Urban Nutrient Management Plan is a current UNMP that has been updated to accurately match current landscape management practices. Plans only need to be amended if changing of landscape plants or turf grass species drastically alters the optimal fertilization strategy outlined in the current plan.

A **revised** Urban Nutrient Management Plan is an expired UNMP that has been rewritten to accurately match actual landscape plants and/or lawn management practices.

**A. Ranking and Priority (high and low)**

- Proximity to stream, river, storm drain, or bay (within 300 feet = high priority).
- Very High (VH) Virginia Tech soil test phosphorus fertility rating or correlated to VH from another lab.
- Area was previously over fertilized compared to DCR guidelines.
- Newly established turf.
- Fertilized areas have slopes greater than 15% (and account for 33% or more of the landscape).
- High water table.
- Soil types: shallow soils, sandy soils or karst terrain.

## B. Criteria

- This BMP applies to fertilized turf grass landscapes and other ornamental plant landscape areas that receive nutrients at least once in a three year period.
- In order to be eligible for cost-share, urban nutrient management plans must be prepared by a private planner who holds a current Nutrient Management Planner Certificate in the Turf and Landscape Category issued by the Virginia Department of Conservation and Recreation. Urban Nutrient Management Plans must be written to comply with all requirements set forth in the Nutrient Management Training and Certification Regulations, (4 VAC 50-85-10 et seq.) and the criteria set forth in the Virginia Nutrient Management Standards and Criteria, revised July 2014.
- Plans must be developed based on soil analyses taken within a three year period prior to plan development and must be performed by soil testing laboratories approved by DCR.
- Before cost-share payment can be made the following items must be submitted:
    - A complete copy of the Urban Nutrient Management Plan, containing the planner's Virginia Nutrient Management Certificate number.
    - An invoice for planning services from the private certified planner.
    - If the participant is seeking cost-share for a plan previously written under this specification, fertilizer application records and the previous plan must be presented to SWCD staff for review.

## C. Plans and Specifications

- Urban Nutrient Management Plans will be prepared to include all necessary information as outlined in the Nutrient Management Regulations 4 VAC 50-85-10 et seq. Outlined plan content can be found at: http://www.dcr.virginia.gov/soil_and_water/documents/nmtmsc-tl_plan_checklist.pdf

## D. Operations and Maintenance

- Participant is required to keep all fertilizer records regardless of who makes the applications.
- Participant is responsible for notifying the certified planner when landscape plants or lawn care practices have changed, warranting amendment of the plan.
- Participant is responsible for maintaining adequate vegetative cover.
- All plans are subject to spot check procedures and any other quality control measures.

## E. Cost-Share Rates

- The Program will reimburse up to $100 per parcel per year. If the plan is written through a Virginia Cooperative Extension Master Gardener program, the maximum allowable reimbursement is equal to the fee associated with the Master Gardener Program.
- Participants may redirect their cost-share payment to their private certified nutrient management planner by signing a written statement to that effect. A sample statement is attached to this specification

## F. Helpful Technical References

- Chapter 13 of the Urban Nutrient Management Handbook
- Nutrient Management Standards and Criteria Revised July 2014
- Fertilizer Applicator Certification Training (FACT)
- Fertilizer calculator (Derek)

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ASSIGNMENT OF URBAN NUTRIENT MANAGEMENT PLAN WRITING COST-SHARE PAYMENT AUTHORIZATION

I_____, do hereby direct the_____Soil and Water Conservation District (SWCD) to pay any and all cost-share funds disbursed under the URBAN NUTRIENT MANAGEMENT PLAN WRITING to

_____, of
Name

_____
Business

for services provided during development of my Nutrient Management Plan.

_____
Signature

_____
Date

## Section 3.3 Impervious Surface Removal (ISR)

Surfaces covered by impenetrable materials such as asphalt, compacted gravel, concrete, brick, and stone are impermeable. These impermeable materials seal surfaces, repel water, and prevent precipitation from infiltrating into soils and groundwater. Removal of these impermeable materials, when combined with permeable pavement or vegetation establishment, is intended to reduce stormwater runoff rate and volume, as well as associated pollutants transported from the site by stormwater runoff.

The process of urbanization, characterized by increases in impermeable or impervious areas, causes a substantial increase in stormwater runoff. One obviously beneficial stormwater management practice is to reduce the amount of impervious surface area in a given urbanized area. If an area has already been urbanized, this can be accomplished by removing impervious areas that can be replaced with pervious areas and still serve the intended purpose.

### Policies Regarding ISR

Patios, walkways, parking areas, and driveways can all be converted to pervious areas that increase infiltration to groundwater. Gardens, lawns, and permeable pavers all can be used in place of the impervious area removed. In order for impervious surface removal costs to be offset by the Program, they must be accompanied by an approved stabilization plan. This practice is considered to be a nonstructural BMP.

### A. Criteria

- This BMP is not intended for impervious surface removal associated with roof removal (associated with structure removal)
- Removal must include the impervious surface and sub-grade aggregate. The materials removed must be properly disposed.
- The subsoil shall be scarified at least 2 inches below the compacted subgrade aggregate.
- The practice must include a plan for vegetation establishment or permeable pavement installation.
- When vegetation is to be established on site, the practice should be initiated as closely as possible to the optimum time for vegetation establishment. Temporary conservation cover must be established within 14 calendar days if permanent vegetation cannot be established. Vegetation establishment must include proper soil preparation, which may require a soil test. Deep tillage using a chisel plow, ripper or sub-soiler may be required to address soil compaction. Addition and incorporation of topsoil or organic matter may be necessary for proper seedbed establishment.
- Incorporate soil compost amendments if the intention is to have the newly previous act as a riparian buffer or filter strip.

### B. Plans and Specifications

- A design plan for the site must be submitted by the landowner and approved by the local Soil and Water Conservation District before construction is initiated. The installed practice must be in accordance with the approved design unless changes were pre-approved by the local SWCD. Information required in the design plan includes:

- Total impervious surface area to be removed and detailed map of the site.
- A plan for fragmenting, removal and disposal of existing impervious cover.
- A plan for soil preparation, which must be supported by a soil-test.
- A plan for final site stabilization.
- Expected timeline for completion.
- Erosion and Sediment Control Plan, if applicable

**C. Operation and Maintenance**

- Maintenance Inspection of the planted area shall be conducted annually by the landowner, or a designated sub-contracted agent of the landowner.
- Site specific maintenance items depending on final stabilization plan.
- Ensuring full vegetative cover remains intact and invasive species are controlled if vegetation is used.
- No impervious surface built over the treated area.

**D. Cost-Share Rates**

- The Program will offer incentive payments based on a rate of up to $2.50 per square foot of treated area with a maximum payment of $10,000.00 per parcel per year.

**E. Helpful Technical References**

- Conservation Landscaping BMP in this Manual (see Section 3.4 below).
- Permeable Pavement BMP in this Manual (see Section 3.11 below)
- Virginia Stormwater Clearinghouse Design Specification No. 4 Soil Amendments http://www.vwrrc.vt.edu/swc/NonProprietaryBMPs.html
- Virginia Erosion and Sediment Control Handbook Standard and Specification 3.30 – Topsoiling. http://www.dcr.virginia.gov/stormwater_management/e_and_s-ftp.shtml

## Section 3.4 Conservation Landscaping (CL)

This practice encompasses the conversion of turf grass areas or bare soils to areas planted in native herbaceous and woody species. Converting landscape into highly functioning ecosystems collectively in a community can have significant beneficial impacts on local water quality and that of the Chesapeake Bay.

Native plants are generally best adapted to local soil and climate conditions and therefore require the least amount of nutrient addition or cultivation in order to maintain the amount of ground cover best suited to minimize runoff. In contrast, turf grasses and non-native species generally require both continual maintenance and periodic fertilization in order to provide the same amount of stormwater runoff protection. Therefore, the conversion to of native plants will generally be beneficial from a nonpoint source runoff pollution prevention standpoint.

The nutrient load of a residential lawn has been estimated at between 2 and 9.7 mg/L./year of nitrogen and between 0.3 and 1.9 mg/L/yr. of phosphorus (*CSN TB 9, 2011*).

**Natural Meadow Turf to Native Plant Management**

### Policies Regarding CL

There are three conservation landscaping practices covered under this standard; Meadow, Tree Planting, and Landscaped Mulched Bed. Meadow or Tree Planting may be used for establishing a Riparian Buffer along a waterway or pond. A Meadow may be used as a Filter Strip when receiving runoff from impervious surfaces. This practice is considered to be a nonstructural BMP, unless used as a Filter Strip.

## A. Criteria

- Perennial native species that are adapted to the site conditions must be used. Therefore, selected species must have the capacity to achieve adequate density and vigor within an appropriate time frame to stabilize the site sufficiently to permit suited uses with ordinary management activities. Invasive or noxious species are prohibited. Plant species must be considered native "Flora of Virginia". See *Helpful Technical References* section for publications and websites related to native plants.
- Vegetation establishment must include proper soil preparation. Deep tillage using a chisel plow, ripper or sub-soiler may be required to address soil compaction. Addition and incorporation of topsoil or organic matter may be necessary for proper seedbed establishment.
- This practice should be initiated as closely as possible to the optimum time for vegetation establishment. Temporary conservation cover must be established within 14 calendar days if permanent vegetation cannot be established.
- Mowing of the planted area shall be limited according to the approved Operation and Maintenance Plan described in the Job Sheet VCAP form 2.
- A meadow should include a seed mix with at least two (2) native grass species and nine (9) forbs/wildflower species. Alternative Seed Mix ratio may be considered. Competition controls must be included with the final plans. Competition controls should be described in greater detail in the site specific plan submitted before installation. A temporary cover is necessary when there will be two (2) burn downs separated by a growing season.
- Tree plantings are intended to be native species. Diversity is encouraged for larger scale projects. Appropriate tree protection measures must be employed, such as tree shelters, weed barriers, tree wraps, or other methods approved by the local SWCD.
- Landscaped Mulch Beds must include suitable mulch at least 3 inches thick. Landscape edging is recommended when adjacent to invasive ground cover and impervious surfaces.
- Required density and minimum ground covers for all plantings will be based on approved site specific plans. See VDOF recommendations for tree plantings in the *Helpful Technical References* section.
- Fertilization, mulching, or other facilitating practices for plant growth must be timed and applied to accelerate establishment of selected species, and must not be a requirement for vegetation maintenance. Soil amendments will be added only as demonstrated necessary according to a soil test report.
- Measures to exclude pests that will interfere with the timely establishment of vegetation must be employed.
- If the planting area is to serve as a *Filter Strip or Riparian Buffer*, the following criteria should be followed:
  - A robust stand of vegetation should be established.
  - Slope gradient shall be less than 8% for Filter Strips.
  - Minimum width of 35 feet for slope gradients less than 4%. Minimum width of 50 feet for slope gradients 4 to 6 percent. Minimum width of 65 feet for slope gradients of 6 to 8 percent. Riparian Buffers with slope gradients over 8 percent shall have a minimum width of 100 feet.
  - Runoff onto the Filter Strip should be evenly dispersed with an adequate pretreatment measure. See appendix B

- Impervious area to Filter Strip should be less than 5,000 square feet.

**B. Plans and Specifications**

- A planting plan for the site must be submitted by the landowner and approved by the local Soil and Water Conservation District before construction is initiated. The installed practice must be in accordance with the approved design unless changes were pre-approved by the local SWCD. Information required in the planting plan includes:
  - Type of Conservation Landscaping.
  - Square footage of the area being planted.
  - Linear feet of stream being buffered (if applicable).
  - Total drainage area of the site and the amount of impervious surface draining to the project. Only applicable for Filter Strip applications.
  - Slope of the land.
  - Plan to control and/or eliminate unwanted existing vegetation.
  - Landscape planting and mulching plan including: species, rate of seeding or planting, minimum quality of planting stock and method of establishment. Only viable, high-quality seed or planting stock should be used. Soil types and any soil amendments required as a result of a soil test. Include the amounts, timing and method of application of each amendment.

**C. Operation and Maintenance**

- Maintenance of the planted area will be conducted annually by the landowner, or a designated sub-contracted agent of the landowner.
- Maintenance will include:
  - Annual survey of planted area to evaluate for invasive species and plant survival/success. For the first two years, trees must have a 75 %survival rate with an overall survival rate of 50 %. Meadows must maintain a cover of 75 % or more.
  - If invasive species are present (according to: www.dcr.virginia.gov/natural_heritage/documents/invlist.pdf), remove to reduce invasive cover ground cover to less than 5%.
  - Tree and shrub mortality will be addressed annually by replanting the species with adequate protection and support to ensure survival.
  - Trash should be removed at least annually.
  - Issues of trespass, leading to damaged vegetation, will be addressed as necessary.

**D. Cost Share Rates/Incentives**

- Meadows and Landscaped Mulch Beds will offer incentive payments based on a rate of up to $250.00 per 1000 square feet of area planted.
- Tree-planting will offer incentive payments based on a rate of up to $9.00 per tree.
- Payments will not exceed total cost of the project with a maximum payment of $3,500.00 per parcel per year.
- Only one cost-share rate can be applied per planting area.

## E. Helpful Technical References

- USDA NRCS Conservation Cover: Wildflower Meadow for Wildlife and Pollinators. Virginia Conservation Practice Job Sheet 327. 2011.
- USDA NRCS Riparian Forest Buffer. Conservation Practice Job Sheet 391. 1997.
- NRCS Virginia Plant Establishment Guide. 2011. http://www.dgif.virginia.gov/quail/nrcs-plant-establishment-guide-species-list-2011.xls
- Dorner, Jeanette. An Introduction to using native plants in restoration projects. National Park Service. 2000. www.nps.gov/plants/restore/pubs/intronatplant/index.htm
- Homeowner Guide to Make your Property Bay Friendly. Chesapeake Stormwater Network. June 19, 2013. http://chesapeakestormwater.net/be-bay-friendly/
- http://www.prairiemoon.com/growing-your-prairie/growing-your-prairie.pdf
- VDOF Tree planting recommendations: http://www.dof.virginia.gov/tree/care/index.htm
- Native Plant Resources:
  - Native Plant Center (ACB): http://www.nativeplantcenter.net/
  - Digital Atlas of the Flora of Virginia: http://vaplantatlas.org/
  - Flora of Virginia Project: http://floraofvirginia.org/
  - Native Plants for Conservation, Restoration & Landscaping http://www.dcr.virginia.gov/natural-heritage/nativeplants

## Section 3.5 Rain Garden (RG)

A Rain Garden is a shallow landscaped depression that incorporates many pollutant removal mechanisms including temporarily ponding stormwater runoff 6 to 12 inches above a mulch layer that encourages the rain water to infiltrate into the underlying native soil within 48 hours.

**A Typical Rain Garden**

### Policies Regarding RG

Rain Gardens should be designed to treat runoff from small areas, such as individual rooftops, driveways and other on-lot features in single-family detached residential developments. Inflow is typically from a downspout with energy dissipaters or can be sheet flow from a driveway/patio or lawn. This practice is intended for disconnecting impervious surfaces.

### A. Criteria

- Practice should be located within 40 feet of downspout or contributing impervious surface.
- Project drainage area will not contain more than ½ acre at 25% impervious cover, unless the total project drainage area is less than 10,000 square feet in which case impervious area will not be greater than 2,500 square feet.
- Rain Gardens shall be sized with the following method (Fairfax County, 2009), Dp is the depth of ponding in feet:

  Impervious Surface (sq. ft.) x 0.072/ Dp = _____ sq. ft.

  Pervious Surface (sq. ft.) x 0.028/ Dp = _____ sq. ft.

  Total Surface Area Size Required = _____ sq. ft.

- Alternative sizing methods may be considered on a case-by-case basis. Multiple rain

gardens for a large drainage area are encouraged to keep the maximum size to no more than 300 sq. ft. per cell (excavated ponding area).

- The site must have soils capable of infiltrating stormwater runoff. If the need for soil replacement or underdrain is identified the participant should consider a bioretention practice.
- The subsoil of the ponding area will be amended with compost to achieve 5 percent organic matter content. Typically, compost is applied at a 4:1 ratio (soil to compost) usually 1 inch of compost incorporated 4 inches. A compost amendment rate calculator similar to the SoilsforSalmon.org may be used.
- Rain Gardens will not be placed in wetland soil or within the 100-year flood plain.
- Rain Gardens should retain water for less than 48 hours after a storm event.
- Depth to water table and bedrock shall be greater than 2 feet.
- Impact from location of proposed Rain Garden on septic drain fields and foundations should be evaluated prior to application approval.
- A stable stormwater overflow route must be available or provided.
- When concentrated stormwater is routed into a Rain Garden, an energy dissipater must be provided that will prevent scour of the Rain Garden. Alternative pretreatment may be considered. See Appendix B.
- All vegetated areas that drain to the Rain Garden must be maintained in full vegetative cover with no scour areas.
- Planting and mulching and all other site stabilization measures must occur immediately after constructing the Rain Garden. Seasonal exceptions can be made

**B. Plans and Specifications**

- A design plan for the site must be submitted by the landowner and approved by the local Soil and Water Conservation District before construction is initiated. The installed practice must be in accordance with the approved design unless changes were pre-approved by the local SWCD. Information required in the design plan includes:
    - Results of an infiltration test (see Section 3.0 for infiltration test details)
    - Landscape plan including: species, rate of seeding or planting, minimum quality of planting stock and method of establishment. Only viable, high-quality seed or planting stock should be used.
    - Soil types and any required soil amendments as a result of a soil fertility test or compaction test, such as compost to add organic matter and improve soil structure and water holding capacity, or application of lime to increase pH of acid soils with the amounts, timing and method of application of each amendment.
    - A statement regarding compliance with any permitting requirements.
    - Other information as requested by the local SWCD
- It is the program participant's responsibility to ensure any contractors meet all local codes and requirements.

## C. Operation and Maintenance

- Maintenance inspection shall be conducted annually by the landowner, or a designated sub-contracted agent of the landowner.
- First year Maintenance will include:
  - Weekly watering during the growing season;
  - Repair of erosion, as necessary
- Maintenance will include:
  - Annual survey of planted area to evaluate for:
    - invasive species
    - plant survival/success
    - ensure all vegetation stabilization measures remain intact
    - runoff flow routes functioning
  - If invasive species are present (according to: www.dcr.virginia.gov/natural_heritage/documents/invlist.pdf), remove to reduce invasive cover ground cover to less than 5%.
  - Tree and shrub mortality will be addressed annually by replanting the species with adequate protection and support to ensure survival.
  - Reapply wood mulch as needed.
  - Trash should be removed at least annually.

## D. Cost-Share Rates/Incentives

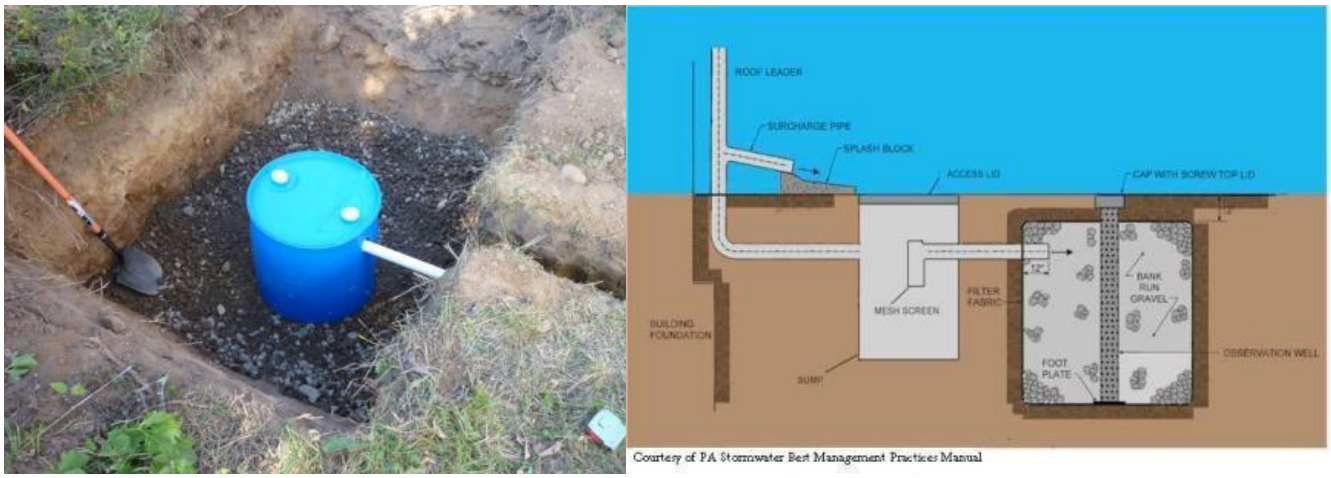
- The Program will reimburse up to 75 percent of costs with a maximum payment of $2,000.00 per parcel per year.
- When pre-treatment is required, the pre-treatment costs are included in the cost of the practice.

## E. Helpful Technical References

- Rain Garden Design and Construction: A Northern Virginia Homeowner Guide. Fairfax County, Va. 4/2009. http://www.fairfaxcounty.gov/nvswcd/raingardenbk.pdf
- Virginia Stormwater BMP Clearinghouse Design Specification No. 1 and No. 9 http://www.vwrrc.vt.edu/swc/NonProprietaryBMPs.html
- Rain Garden Landscape Templates for the Mid-Atlantic http://www.lowimpactdevelopment.org/raingarden_design/
- Virginia Cooperative Extension Urban Water Quality Management Rain Garden Plants. Pub 426-043 https://pubs.ext.vt.edu/426/426-043/426-043_pdf.pdf
- Cogger, Craig. Compost Amendment Rate Calculator. Washington State University. Accessed 2016 at: http://www.soilsforsalmon.org/resources.htm

## Section 3.6 Dry Well (DW)

A Dry Well is a subsurface storage facility that receives and temporarily stores stormwater runoff from roofs of structures. Discharge of this stored runoff from a dry well occurs through infiltration into the surrounding soils. A Dry Well may be either a structural chamber and/or an excavated pit filled with gravel.




**A Typical Dry Well**

### Policies Regarding DW

This practice is designed to treat runoff from small areas, such as individual rooftops, driveways and other on-lot features in single-family detached residential developments. Inflow is typically from a downspout but could be sheet flow from a driveway/patio or lawn.

### A. Criteria

- Practice should be located within 40 feet of downspout or impervious surface.
- Project drainage area will not contain more than ½ acre at 25% impervious cover, unless the total project drainage area is less than 10,000 square feet in which case impervious area will not be greater than 2,500 square feet.
- Dry Well shall be sized according to the following, where D is the depth of the reservoir (ft.) and Vr is Void Ratio of reservoir (typical 0.4 to 1.0):

  Impervious Surface (sq. ft.) x 0.95/ (12*Vr*D) =_____ sq. ft.

  Pervious Surface (sq. ft.) x 0.25/ (12*Vr*D) = _____ sq. ft.

  Total Surface Area Size Required = _____ sq. ft.
- The footprint of the Dry Well may be reduced based on soil attributes and other site conditions, as approved by the District or certified by a licensed professional.
- The site must have soils capable of infiltrating stormwater runoff. Should retain water for less than 48 hours after a storm event. If the need for an underdrain is identified the participant should consider a Bioretention practice (3.10).

- Depth to Water Table and Bedrock shall be greater than 2 feet from bottom of excavation.
- Shall not be placed in wetland soil or within the 100-year flood plain.
- Shall not be appropriate where high pollutant or sediment loading is anticipated due to potential groundwater contamination and clogging.
- Shall not be appropriate where there is a significant risk for basement seepage or flooding, cause surficial flooding of groundwater, or interfere with the operation of drain fields or other subsurface structures.
- Dry Well depth is typically between 1 and 5 feet, with at least 12 inches of soil and sod cover.
- Gravel reservoir shall be wrapped in non-woven geotextile meeting NRCS specification Va-795.
- Where necessary, leaf screens or debris sump shall be used as pretreatment to prevent clogging.
- Not intended to provide storage for large storms; therefore, a stable stormwater overflow or bypass route must be provided when connected to a downspout or drain pipe.
- All vegetated areas that drain to the practice must be maintained in full vegetative cover.
- Sodding must occur immediately after construction. Seasonal exceptions can be made
- Dry Well shall include observation ports with maintenance access.

**B. Plans and Specifications**

- A design plan for the site must be submitted by the landowner and approved by the local Soil and Water Conservation District before construction is initiated. The installed practice must be in accordance with the approved design unless changes were pre-approved by the local SWCD. Information required in the planting/design plan includes:
    - Results of a infiltration test (see Section 3.0 for infiltration test details)
    - A statement regarding compliance with any permitting requirements or local codes.
    - Other information as requested by the local SWCD.

**C. Operation and Maintenance**

- Maintenance inspections shall be conducted annually by the landowner, or a designated sub-contracted agent of the landowner.
- Maintenance will include:
    - Inspection of pretreatment devices.
    - Inspection of observation ports for signs of prolonged standing water.
    - Routine maintenance of sod to ensure vegetative cover survives.

## D. Cost-Share Rates/Incentives

- The Program will reimburse up to 75 percent of costs with a maximum payment of $2,000.00 per parcel per year.
- When pre-treatment is required, the pre-treatment costs are included in the cost of the practice.

## E. Helpful Technical References

- USDA NRCS Engineering Field Handbook Part 650 Chapter 14 Water Management (Drainage) subsection C Subsurface Drainage. 2001.
- Virginia Erosion and Sediment Control Handbook (VESCH) Specification 3.28 Subsurface Drains. http://www.deq.virginia.gov/Programs/Water/StormwaterManagement/Publications/ESCHandbook.aspx
- Virginia Stormwater BMP Clearinghouse Design Specification No. 1 Disconnection and No. 8 Infiltration Practices http://www.vwrrc.vt.edu/swc/NonProprietaryBMPs.html

## Section 3.7 Constructed Wetlands (CW)

**Constructed Wetland Receiving a Roof Drain**

A constructed wetland can temporarily store, filter, and clean runoff from driveways, roofs and lawns and thereby improve water quality. To properly function in this regard, the wetland should be designed and constructed to retain water or remain saturated for two to three weeks.

Constructed wetlands are typically less than 1 foot deep (although they have greater depths at the forebay and in micro pools) and possess variable micro topography to promote dense and diverse wetland cover. The wetland environment provides an ideal environment for gravitational settling, biological uptake, and microbial activity. Constructed wetlands are the final element in a roof-to- stream runoff reduction sequence. They should only be considered for use after all other upland runoff reduction opportunities have been exhausted and there is still a remaining water quality or channel protection volume to manage.

### Policies Regarding CW

Constructed Wetlands are intended to meet the Level 1 baseline design criteria. Enhancements to a Level 2 design may be considered in accordance with the Clearinghouse guidelines. These are ideal for sites that cannot meet the Rain Garden or Dry Well practice standards. Consultation with the U.S. Army Corp of Engineers for the determination of jurisdictional wetlands is needed for poorly drained sites.

### A. Criteria

- Project drainage area will not contain more than ½ acre at 25% impervious cover, unless the total project drainage area is less than 10,000 sq. ft. in which case impervious area will not be greater than 2,500 sq. ft.
- Constructed wetlands must be excavated to the water table elevation to maintain a permanent base flow. Deep pools must be 24-48 inches deep. Micro-pools must be 12 inches deep or less. High marsh areas must be 6 inches deep or less.
- Constructed wetlands must have at least three cells. Fifteen (15%) to Twenty-five (25%) percent of the surface area must be deep pools (DP); fifty (50%) to seventy (70%) percent of the surface area must be high marsh (HM); and the remaining area may be micro pools (MP). Surface area may be calculated as follows:

$D_{mean} = D_{DP}$ x (% deep pool) + $D_{MP}$ x (% micro-pool) + $D_{HM}$ x (% high-marsh)

Impervious Surface (sq. ft.) x 0.95/ ($12D_{mean}$) = _____sq. ft.

Pervious Surface (sq. ft.) x 0.25/ ($12D_{mean}$) = _____ sq. ft.

Total Wetland Area Required = _____ sq. ft.

- Variable width aquatic bench should be provided around any deep pools for safety. Width should be between 2 and 6 feet at a depth of 12 inches.
- A sediment forebay must be located at every concentrated inlet that receives 10 %or more of the drainage area to provide energy dissipation and pretreatment. Forebays should be at least 15 %of the surface area. Forebays are considered deep pools.
- The designer should provide for overland relief from the storm event specified by local authority or for the 25-year storm event, whichever is the most stringent. However, the maximum depth shall not exceed a foot above the high marsh during this storm event.
- Refer to the BMP Clearinghouse, Appendix E Landscaping for planting zones. A short list of plants which thrive in wetland planting zones are shown in Tables 13.3 and 13.4 of Virginia Stormwater BMP Clearinghouse Design Specification No. 13. Consult a professional horticulture specialist for additional plant choices.
- All material specification and construction details shall be in accordance with the Virginia Stormwater BMP Clearinghouse Specification No. 13.

**B. Plans and Specifications**

- A design plan for the site must be submitted by the landowner and approved by the local Soil and Water Conservation District before construction is initiated. The installed practice must be in accordance with the approved design unless changes were pre-approved by the local SWCD. Information required in the plan includes:
  - Soil types and any required soil amendments as a result of a soil test, such as compost to add organic matter and improve soil structure and water holding capacity, or application of lime to increase pH of acid soils with the amounts, timing and method of application of each amendment.
  - An Erosion and Sediment Control Plan detailing full site stabilization.
  - A statement regarding compliance with any permitting requirements or local codes.
  - Other information as requested by the local SWCD.

**C. Operation and Maintenance**

- Maintenance inspections shall be conducted annually by the participant, or a designated sub-contracted agent.
- Maintenance will follow guidelines on the Virginia Stormwater BMP Clearinghouse Design Specification No. 13.
- Sediment removal in the pools and forebays may be necessary every 3 to 5 years.
- Maintenance to include pretreatments, inlets/outlet, and vegetation.

## D. Cost-Share Rates/Incentives

- The Program will reimburse up to 75 percent of costs with a maximum payment of $5,000.00 per application per parcel per year.
- When pre-treatment is required, the pre-treatment costs are included in the cost of the practice.

## E. Helpful Technical Resources

- Virginia Stormwater BMP Clearinghouse, Design Specification No. 13 Constructed Wetlands, Design Specification Appendix D, Design Specification Appendix E http://www.vwrrc.vt.edu/swc/NonProprietaryBMPs.html
- Hunt, William F. and Bill Lord. 2006. Urban Waterways, Maintenance of Stormwater Wetlands and Wet Ponds. North Carolina Cooperative Extension Service. (Hunt and Lord, 2006). Accessed 2016. http://www.bae.ncsu.edu/stormwater/PublicationFiles/WetlandMaintenance2006.pdf

## Section 3.8 Vegetated Stormwater Conveyances (VSC)

**Typical Channel**

Vegetated Stormwater Conveyances serve to prevent scour and erosion and provide water quality treatment while conveying stormwater. They are constructed trapezoidal channels lined with vegetation that inhibits erosion. From a water quality perspective, they are preferable to pipes because they allow more soil/water contact and more opportunity for infiltration. There are three types of vegetated conveyances: Dry Swales, Step Pool Conveyance, and Wet Swales.

Dry swales (DS) are shallow channels with a series of check dams to provide temporary storage and to allow infiltration of the desired Treatment Volume (Tv). Dry Swales use an engineered soil media as the channel bed unless existing soils are permeable enough to infiltrate runoff into underlying soils. In most cases, however, the runoff treated by the soil media flows into an underdrain, which conveys treated runoff to a conveyance system downstream. The underdrain system consists of a perforated pipe within a gravel layer on the bottom of the swale, beneath the filter media. Dry swales can be planted with turf grass, tall meadow grasses, decorative herbaceous cover, or trees.

Wet Swales (WS) are shallow channels with check dams that create permanent pools that intercept groundwater and provide enhanced pollutant removal within the conveyance. The saturated soil and wetland vegetation provide an ideal environment for gravitational settling, biological uptake, and microbial activity. On-line or off-line cells are formed within the channel to create saturated soil or shallow standing water conditions.

Step Pool Conveyance Swales (SPCS) are defined channels that convert surface runoff to shallow groundwater through attenuation pools and sand seepage filters. These safely convey, attenuate, and treat stormwater with a series of constructed pools and riffles using engineered soil media.

SPCS can be designed to provide energy dissipation and extreme flood control, best suited to natural ravines with slopes of 10 % or less.

**Policies Regarding VSC**

Vegetated Stormwater Conveyances shall not be used to modify or channelize existing drainage. All of these practices shall meet the Level 1 baseline design criteria. Dry and Wet Swales may be enhanced to a Level 2 design in accordance with the Clearinghouse guidelines. Step Pool Conveyance Swales shall only be considered after all other measures have been evaluated.

**A. Criteria**

- Maximum contributing drainage area should be 5 acres or less.
- Riprap lining and concrete hardening are not eligible activities.
- The practice shall not convey flows from an intermittent or perennial stream.
- The practice shall not discharge directly into a natural stream channel, and must be dispersed into a stable riparian buffer or vegetated filter strip. Design must ensure a stable, adequate outfall condition will exist. See Appendix A3.
- Should be designed with enough capacity to convey runoff from the 10-year design storm event within the channel banks and be non-erosive during the 10-year design storm events. See Appendix A1 and A3 for calculation procedures.
- Design must include at least 3 inches of freeboard at the top of the channel during the 10-year storm for conveyance draining a single lot. Conveyances draining more than one (1) lot or more than 1 acre shall provide a minimum of 6 inches of freeboard above the 10-year storm elevation to the foundation of adjacent structures.
- If turf reinforcement matting is used, it should be installed according to the manufacturer's recommendations. Manufactured products should have maximum permissible velocity specifications available.
- It must be verified that temporary and permanent channel linings are adequate for design flows. It is good practice to design conservatively by multiplying the calculated velocity by a safety factor of 1.3.
- Channels should be designed with a trapezoidal or parabolic cross section. The bottom width of the channel shall be between 4-8 feet wide. A wider channel should incorporate benches, or a gravel diaphragm to prevent braiding and erosion.
- Each DS &WS must provide the required treatment volume within the temporary or permanent pool areas. See appendix A4 for calculation procedures.
- At least one Check Dam is required at the outfall of DS and WS and spaced according to the slope. Compacted earthen berm check dams are preferred. Pre-fabricated check dams, such as, timber, metal or concrete may be used where slope or length limitations exist.
- Adequate conveyance of stormwater into and out of the practice shall be in accordance with procedures outlined in Appendix A3 of this Manual.
- Dry Swale:
  - Sites must have soils capable of infiltrating. Ponded water should be retained no longer than 48 hours. Ensure that there are appropriate numbers of underdrain pipes

and that are adequately sized to meet this criterion.

- Depth to water table or bedrock shall be greater than 2 feet.
- The longitudinal slope of the channel should be less than 4%.
- Temporary pool depth for the Treatment Volume shall be no more than 9 inches
- The side slopes should be no steeper than 3H:1V, flatter slopes are encouraged where adequate space is available.
- All material specification and construction details shall be in accordance with the Virginia Stormwater BMP Clearinghouse Specification No. 10.

- Wet Swale:
  - The longitudinal slope of the channel should be less than 2%.
  - Permanent pool depth for the Treatment Volume shall be no more than 6 inches.
  - Temporary ponding depth for the 10-year design storm shall not exceed 12 inches above the permanent pool elevation.
  - Works best in impermeable Hydrologic Soil Group C or D.
  - A landscaping plan is required for WS. See Constructed Wetland (CW) plant reference.
  - The side slopes should be no steeper than 4H:1V to enable wetland plant growth. Flatter slopes are encouraged where adequate space is available, to enhance pre-treatment of sheet flows entering the channel.
  - All material specification and construction details shall be in accordance with the Virginia Stormwater BMP Clearinghouse Design Specification No. 11.

- Step-Pool Conveyance Swale:
  - The longitudinal slope of the channel should be less than 10 %. Steeper slopes may be considered when a substantial benefit can be quantified.
  - Riffles and pools shall not be more than 10 feet long.
  - Riffles shall have a depth of less than 12 inches. Pools should have a depth of 18 inches.
  - Boulder cascade shall have an elevation drop of 5 feet or less. Three pools separated by cobble riffles shall be used below a boulder cascade.
  - The width to depth ration (W/D) shall be greater than 2.
  - For other design specifications refer Anne Arundel County, Md. Step Pool Storm Conveyance Systems Design Guidelines and Calculator.

**B. Plans and Specifications**

- A design plan for the site must be submitted by the landowner with a professional seal; or a waiver of liability may be accepted on a case-by-case basis (See Appendix D VCAP form-5). The installed practice must be in accordance with the approved design unless changes were pre-approved by the local SWCD. Information required in the design plan includes:
  - Results of Soil Assessment including infiltration test as necessary.
  - Adequate conveyance calculations
  - Computations for Treatment Volume (Tv) in accordance with the applicable

standards from the BMP Clearinghouse.

  - Landscape Plan including type of grasses, herbaceous plants or trees to be planted.
  - A suitable Erosion and Sediment Control Plan to stabilize the flow area.
  - A statement regarding compliance with any permitting requirements or local codes.
  - Other information as requested by the local District.

- Certification by a Licensed Professional may be required by the District to verify practice installation.

### C. Operation and Maintenance

- Maintenance inspection shall be conducted annually by the landowner, or a designated sub-contracted agent of the landowner.
- Maintenance will follow guidelines on the Virginia Stormwater BMP Clearinghouse Design Specifications No. 10 and 11.
- Maintenance to include pretreatment, inlet/outlet, and check dams or grade control structures.

### D. Cost-Share Rates/Incentives

- Dry Swale and Step Pool Conveyance reimbursement payments will be made for up to 75 percent of costs with a maximum payment of $5,000.00 per parcel per year.
- Wet Swale reimbursement payments will be made for up to 75 percent of costs with a maximum payment of $3,000.00 per parcel per year.
- When pre-treatment is required, the pre-treatment costs are included in the cost of the practice.

### H. Helpful Technical References

- Virginia Stormwater BMP Clearinghouse Design Specification No. 10 and 11 http://www.vwrrc.vt.edu/swc/NonProprietaryBMPs.html
- Virginia Erosion and Sediment Control Handbook, 3rd Edition http://www.deq.virginia.gov/Programs/Water/StormwaterManagement/Publications/ESCHandbook.aspx
- Regenerative Step Pool Storm Conveyance (SPSC) Design Guidelines. Anne Arundel County Maryland. December 2012. Accessed May 2016 http://www.aacounty.org/departments/public-works/wprp/watershed-assessment-and-planning/step-pool-conveyance-systems/

## Section 3.9 Rainwater Harvesting (RWH)

**A Cistern Structure Employed in RWH**

Rainwater harvesting systems intercept, divert, store, and release rainfall for future use. Rainwater Harvesting includes the collection and conveyance into an above- or below-ground storage tank where it can later be used or directed to on-site stormwater practice for disposal/infiltration. Uses may include flushing of toilets and urinals inside buildings, landscape irrigation, exterior washing (e.g. car washes, building facades, sidewalks, street sweepers, fire trucks, etc.), fire suppression (sprinkler) systems, supply for chilled water cooling towers, replenishing and operation of water features and water fountains, and laundry, if approved by the local authority. Replenishing of pools may be acceptable if special measures are taken, as approved by the appropriate regulatory authority.

### Policies Regarding RWH

In many instances, Rainwater Harvesting can be combined with a secondary (down-gradient) runoff reduction practice to enhance runoff volume reduction rates and/or provide treatment of overflow from the Rainwater Harvesting system. A water use plan that provides a year round demand will be given additional consideration.

### A. Criteria

- Cisterns must be at least250 gallons.
- The storage volume must at a minimum be sized to collect one inch of rainfall. Variances may be considered.

  Square footage of roof captured x 0.62 x 0.95 = _____ minimum gallons needed

  *0.62 is one inch of rainfall multiplied by a conversion factor.

  *0.95 is a runoff coefficient
- Water use plans shall outline the anticipated year-round water demand. Indoor usage shall include the flow rate of each fixtures and appliances connected to the system and its anticipated weekly use in gallons. Irrigation rates vary by crops, typically 0.67 gallons should be applied per square foot per week. See Virginia Cooperative Extension Publications or local VCE agent.

- Cisterns must be placed in accordance with manufacturing instructions. Below ground cisterns must be installed below the frost depth (typically 2 feet). Above ground cisterns must have a stable foundation. Unless otherwise noted in the manufacturer's instructions, all cisterns shall be placed on a gravel bed or pad at least 6 inches thick. Concrete foundations may be necessary according to the Engineer.
- Above ground cisterns should have a height to width ratio of less than 2:1 whenever possible. An engineered design is required for cisterns over the 2:1 ratio.
- Local Building officials and Health Department officials should be consulted prior to installation of Rainwater Harvesting systems. All internal water uses and foundation designs must meet the applicable Health and Building Codes.
- Generally, winterization shall include disconnection of the downspout or following manufacturer guidelines for insulating spigots and pipes.
- Cistern overflow must be to a stable location. Adequate conveyance of stormwater overflow shall be in accordance with procedures outlined in Appendix A3 of this Manual.
- All material specification and construction details shall be in accordance with Virginia Stormwater BMP Clearinghouse Design Specification No. 6.

**B. Plans and Specifications**

- A design plan for the site must be submitted by the landowner with a professional seal; or a waiver of liability may be accepted on a case-by-case basis (See Appendix D VCAP form-5). The installed practice must be in accordance with the approved design unless changes were pre-approved by the local SWCD. Information required in the plan includes:
    - Water use plan.
    - Foundation Design.
    - Winterization plan.
    - Cistern storage volume.
    - A statement regarding compliance with any permitting requirements or local codes.
    - Other information as requested by the local SWCD
- Certification by a Licensed Professional may be required by the District to verify practice installation.

**C. Operation and Maintenance**

- Maintenance inspections shall be conducted annually by the landowner, or a designated sub-contracted agent of the landowner.
- Maintenance will follow guidelines of the Virginia Stormwater BMP Clearinghouse Design Specification No. 6
- Maintenance shall include gutters, downspouts, pretreatment, inlets and outlets.

## D. Cost-Share Rates/Incentives

- The Program will offer incentive payments based on a rate of up to $2.00 per gallon with a maximum payment of $10,000.00 per parcel per year.
- When pre-treatment is required, the pre-treatment costs are included in the cost of the practice.

## E. Helpful Technical References

- Virginia Rainwater Harvesting Manual. Cabell Brand Center. 2009. http://www.rainwatermanagement.com/News/RWH_Manual2009.pdf
- Virginia Stormwater Clearinghouse, Design Specification No. 6 http://www.vwrrc.vt.edu/swc/NonProprietaryBMPs.html
- Virginia Stormwater BMP Clearinghouse, Cistern Design MS-Excel Spreadsheet, v. 1.6. March 1, 2011. http://www.vwrrc.vt.edu/swc/NonProprietaryBMPs.html (see Excel Spreadsheet; Note: Long download time, in excess of 10 minutes, is possible due to file size of 215MB.)
- Virginia Department of Health. Virginia Rainwater Harvesting & Use Guidelines. 2011. http://www.vdh.state.va.us/EnvironmentalHealth/ONSITE/gmp/documents/2011/pdf/GMP_154.pdf
- Virginia Cooperative Extension. Summer Lawn Management: Watering the Lawn. Pub 430-010. http://pubs.ext.vt.edu/430/430-010/430-010.html
- Virginia Cooperative Extension. Irrigating the Home Garden. Pub 426-322 http://pubs.ext.vt.edu/426/426-322/426-322.html

## Section 3.10 Bioretention (BR)

**A Typical Bioretention Practice Treating a Commercial Rooftop**

Bioretention as a practice is a shallow landscaped depression that temporarily ponds runoff 6 to 12 inches above the mulch layer and then filters through an engineered soil media prior to discharging to an underdrain or infiltrating into the underlying native soils. Bioretention practices typically treat parking lots, multiple lots and/or commercial rooftops. Inflow can be either sheet flow or concentrated flow. Bioretention should be located in common areas or within drainage easements, to treat a combination of roadway and lot runoff. Bioretention used on individual residential lots is commonly referred to as a *Rain Garden* and is covered in Section 3.4 above.

The primary component of the bioretention practice is the engineered soil media, which has a mixture of sand, soil, and organic material as the filtering media and includes a surface layer of mulch. The underdrain consists of a perforated pipe in a gravel layer installed along the bottom of a filter bed.

### Policies Regarding BR

Bioretention must have engineered soil media and an under drain. A Level 1 Bioretention is considered a baseline design. This practice may be enhanced to a Level 2 design in accordance with Clearinghouse guidelines.

### A. Criteria

- This BMP is intended to treat impervious surface areas greater than 2,500 square feet, and with a contributing drainage area of less than 2 acres.
- Shall not be placed on wetland soils or in the 100 year flood plain.
- Depth to Water Table and Bedrock shall be greater than 2 feet from bottom of excavation.
- Sites must have soils capable of infiltrating. Ponded water should be retained no longer than 48 hours. Ensure that there are appropriate numbers of underdrain pipes and that they are adequately sized to meet this criterion.
- Only when the soil infiltration rate has been confirmed to be adequate and the Level 2 design criteria are met can underdrains be removed.

- Appropriate pretreatment practices for each inlet shall be provided. See appendix B.
- The designer should provide for relief from the storm event specified by local ordinance or for the 25-year storm event, whichever is the most stringent.
- Adequate conveyance of stormwater into and out of the practice shall be in accordance with procedures outlined in Appendix A3 of this Manual.
- All material specifications and construction details shall be in accordance with Virginia Stormwater BMP Clearinghouse Design Specification No. 9.
- Landscaping shall include one (1) tree per 250 square feet of ponding area with a shrub to tree ratio of 3 to 1. Appropriate density of perennials shall be planted as in-fill.

**B. Plans and Specifications**

- A design plan for the site must be submitted by the landowner with a professional seal; or a waiver of liability may be accepted on a case-by-case basis (see Appendix D, VCAP form-5). The installed practice must be in accordance with the approved design unless changes were pre-approved by the local SWCD. Information required in the planting/design plan includes:
    - Results of Soil Assessment, including an infiltration test as necessary (see Section 3.0 for infiltration test details).
    - Landscape planting and mulching plan including: species, rate of seeding or planting, minimum quality of planting stock and method of establishment. Only viable, high-quality seed or planting stock should be used.
    - An Erosion and Sediment Control Plan detailing full site stabilization.
    - A statement regarding compliance with any permitting requirements or local codes.
    - Other information as requested by the local SWCD.
- Certification by a Licensed Professional may be required by the District to verify practice installation.
- It is the program participant's responsibility to ensure that any contractors meet all local codes and responsibilities.

**C. Operation and Maintenance**

- Maintenance will follow guidelines on the Virginia BMP Stormwater Clearinghouse, Design Specification No. 9.
- Maintenance inspections shall be conducted annually by the landowner, or a designated sub-contracted agent of the landowner.
- First year Maintenance will include:
    - Weekly watering during the growing season;
    - Repair of erosion, as necessary
- Sediment removal in the ponding and pretreatment areas may be necessary every 3-5 years.
- Maintenance shall include all components of the practice including inlets, pretreatments, outlets and vegetative cover.

## D. Cost-Share Rates/Incentives

- The Program will reimburse up to 75 percent of costs with a maximum payment of $10,000.00 per parcel per year.
- When pre-treatment is required, the pre-treatment costs are included in the cost of the practice.

## E. Helpful Technical References

- Virginia BMP Stormwater Clearinghouse, Design Specification No. 9 Bioretention & Appendix 9A Urban Bioretention http://www.vwrrc.vt.edu/swc/NonProprietaryBMPs.html
- Virginia Cooperative Extension. Urban Water-Quality Management: Rain Garden Plants. 2015. 426-043. http://pubs.ext.vt.edu/426/426-043/426-043.html
- Rain Garden Landscape Templates for the Mid-Atlantic http://www.lowimpactdevelopment.org/raingarden_design/

## Section 3.11 Infiltration (IF)

**A Typical Infiltration Surface Practice**

Infiltration is a practice that provides temporary surface and/or subsurface storage of stormwater runoff. Examples include gravel trenches or sodded area over an underground gravel bed or storage chambers with or without an underdrain. Infiltration practices typically treat larger drainage areas such as parking lots, multiple lots and/or commercial rooftops. Inflow can be either sheet flow or concentrated flow. Infiltration should be located in common area or within drainage easements, to treat a combination of roadway and lot runoff. Infiltration used on individual residential lots is commonly referred to as a *Dry Well* and is covered in Section 3.6.

The primary component of the Infiltration practice is a high void media with either a gravel or reinforced storage chamber. The underdrain consists of a perforated pipe in a gravel layer installed along the bottom.

### Policies Regarding IF

An Infiltration must have an under drain and may have surface ponding. A Level 1 Infiltration is considered a baseline design. This practice may be enhanced to a Level 2 design in accordance with Clearinghouse guidelines.

**A. Criteria**

- This BMP is intended to treat impervious surface areas greater than 2,500 square feet, and with a contributing drainage area of less than 2 acres.
- Shall not be placed on wetland soils or in the 100 year flood plain.
- Shall not be appropriate where high pollutant or sediment loading is anticipated due to potential groundwater contamination and clogging.
- Shall not be appropriate where there is a significant risk for basement seepage or flooding, cause surficial flooding of groundwater, or interfere with the operation of drain fields or other subsurface structures.

- Depth to Water Table and Bedrock shall be greater than 2 feet from bottom of excavation.
- Sites must have soils capable of infiltrating. Ponded water should be retained for 36 to 48 hours.
- Observation wells are required for infiltration trenches and maintenance ports are required for underground chamber systems.
- Underground bottomless or perforated chamber systems shall be designed to support the appropriate structural loads.
- Underdrains should only be included when the infiltration rates are less than ½ inch per hour or the drawdown time is greater than 48 hours. Ensure that there are appropriate numbers of underdrain pipes and that are adequately sized to meet this criterion.
- Appropriate pretreatment practices for each inlet shall be provided. See appendix B.
- The designer should provide for relief from the storm event specified by local ordinance or for the 25-year storm event, whichever is the most stringent.
- Adequate conveyance of stormwater into and out of the practice shall be in accordance with procedures outlined in Appendix A3 of this Manual.
- All material specifications and construction details shall be in accordance with Virginia Stormwater BMP Clearinghouse Design Specification No. 8.

**B. Plans and Specifications**

- A design plan for the site must be submitted by the landowner with a professional seal or a waiver of liability may be accepted on a case-by-case basis (see Appendix D, VCAP form-5). The installed practice must be in accordance with the approved design unless changes were pre-approved by the local SWCD. Information required in the design plan includes:
    - Results of Soils Assessment including an infiltration test (see Section 3.0 for infiltration test details).
    - An Erosion and Sediment Control Plan detailing full site stabilization, if necessary.
    - A statement regarding compliance with any permitting requirements or local codes.
    - Other information as requested by the local SWCD.
- Certification by a Licensed Professional may be required by the District to verify practice installation.
- It is the participant's responsibility to ensure that any contractors meet all local codes and responsibilities.

**C. Operation and Maintenance**

- Maintenance will follow guidelines on the Virginia BMP Stormwater Clearinghouse, Design Specification No. 8.
- Maintenance inspections shall be conducted annually by the landowner, or a designated sub-contracted agent of the landowner.
- Maintenance shall include all components of the practice including inlets, pretreatments, and outlets.

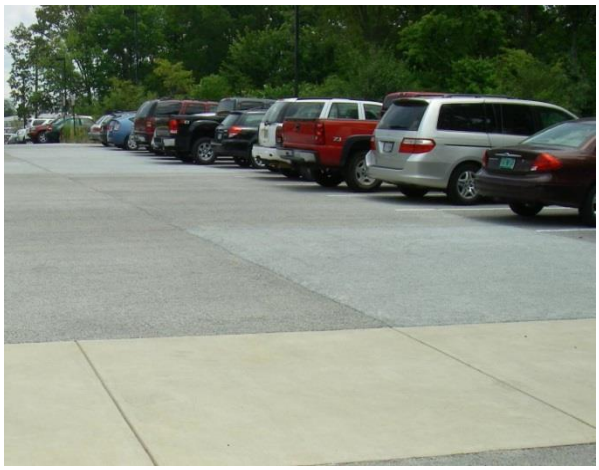
## D. Cost-Share Rates/Incentives

- The Program will reimburse up to 75 percent of costs with a maximum payment of $10,000.00 per parcel per year.
- When pre-treatment is required, the pre-treatment costs are included in the cost of the practice.

## E. Helpful Technical References

- Virginia BMP Stormwater Clearinghouse, Design Specification No. 8 Infiltration Practices http://www.vwrrc.vt.edu/swc/NonProprietaryBMPs.html
- Virginia Erosion and Sediment Control Handbook, Standard and Specification 3.28 http://www.deq.virginia.gov/Programs/Water/StormwaterManagement/Publications/ESCHandbook.aspx

## Section 3.12 Permeable Pavement (PP)



**Typical Porous Concrete** **Typical Interlocking Concrete Pavers**

**Typical Previous Pavers (Grassy Pavers$^{TM}$)**

Permeable pavements are alternative paving surfaces that allow stormwater runoff to filter through voids in the pavement surface into an underlying stone reservoir, where it is temporarily stored and/or infiltrated. Traditionally paved surfaces are impermeable, converting rainfall to runoff. Permeable pavement slows and captures rainwater, allowing it to infiltrate, promoting a high degree of runoff volume reduction and nutrient removal, and reducing the amount of impervious cover of a developed site. A variety of permeable pavement surfaces are available, including *pervious gird pavers, porous asphalt/concrete***,** and permeable *interlocking pavers*. While the specific design may vary, all permeable pavement systems have a similar structure, consisting of a surface permeable pavement layer, an underlying stone aggregate reservoir layer, and a filter

layer or fabric installed underneath.

Previous Grid Pavers typically consist of a plastic or wire mesh grid filled with amended soil or sandy gravel on top of a 4-12 inch clean stone aggregate. These are typically used for low traffic areas.

Porous Asphalt and Concrete consist of a pavement mix with few fines that create pores in the surface. The Asphalt/Concrete is placed on top of a filter layer of clean pea gravel above a 12-24 inch clean stone aggregate reservoir.

Permeable Interlocking Pavers have previous seams around the paver filled with sandy gravel or pea gravel. The pavers are placed on top of a filter layer of clean pea gravel above a 12-24 inch clean stone aggregate reservoir.

**Policies Regarding PP**

Permeable pavement is typically designed with an underdrain and treats stormwater that falls on the actual pavement surface area, but it may also be used to accept run-off from small adjacent impervious areas, such as driving lanes or rooftops. This practice may be enhanced to a Level 2 design in accordance with Clearinghouse guidelines.

**A. Criteria**

- The Project area will not have a contributing drainage area greater than ½ acre. The contributing drainage area must be stabilized and ideally be as close to 100 percent impervious as possible.
- Depth to water table and bedrock shall be greater than 2 feet from bottom of excavation.
- Only when the soil infiltration rate has been confirmed to be adequate and the Level 2 design criteria have been met can underdrains be removed.
- Shall not be appropriate where high pollutant or sediment loading is anticipated due to potential groundwater contamination and clogging.
- Shall not be appropriate where there is a significant risk for basement seepage or flooding, cause surficial flooding of groundwater, or interfere with the operation of drain fields or other subsurface structures.
- Shall not be installed on wetland soils or in the 100 year flood plain.
- The impact of freeze/thaw on the project must be evaluated. The reservoir layer and underdrain must be below the frost depth.
- The reservoir layer should not be hydraulically connected to the foundation of any structure.
- All material specification and construction details shall be in accordance with the manufacturers' recommendations and Virginia Stormwater BMP Clearinghouse Design Specification No. 7.

**B. Plans and Specifications**

- A design plan for the site must be submitted by the landowner with a professional seal; or a waiver of liability may be accepted on a case-by-case basis (see Appendix D, VCAP form-5). The installed practice must be in accordance with the approved design unless

changes were pre-approved by the local SWCD. Information required in the plan includes:

- Results of an infiltration test (see Section 3.0 for infiltration test details).
- An Erosion and Sediment Control Plan detailing full site stabilization.
- A statement regarding compliance with any permitting requirements or local codes.
- Other information as requested by the local SWCD.

- Certification by a Licensed Professional may be required by the District to verify practice installation.

**C. Operation and Maintenance**

- All operation and maintenance must follow manufacturers' recommendations.
- Maintenance inspections shall be conducted annually by the landowner, or a designated sub-contracted agent of the landowner.
- Maintenance will follow guidelines per the Clearinghouse Design Specification No. 7.
- Some Permeable Pavement products require substantially more on-going maintenance, such as sweeping and vacuum cleaning.

**D. Cost-Share Rates/Incentives**

- The Program will offer incentive payments based on a rate of up to $3.00 per square foot with a maximum payment of $10,000.00 per parcel per year.
- The incentive payment may be combined with Impervious Surface Removal (ISR), but may not be higher than the cost of installation.

**E. Helpful Technical References**


- Virginia Stormwater BMP Clearinghouse, Design Specification No. 7 Permeable Pavement http://www.vwrrc.vt.edu/swc/NonProprietaryBMPs.html
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- Smith, D.R. 2000. Permeable Interlocking Concrete Pavements: Selection, Construction, Maintenance, second edition. Washington, DC, Interlocking Concrete Pavement Institute
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## Section 3.13 Green Roofs (GR)

**Typical Green Roof Installation**

Green Roofs or vegetated roofs are alternative roof surfaces that typically consist of waterproofing and drainage materials and an engineered growth media that is designed to support plant growth. Vegetated roofs capture and temporarily store stormwater runoff in the growth media. A portion of the captured stormwater evaporates or is taken up by plants, which helps reduce runoff volumes, peak runoff rates, and pollutant loads on development sites.

This standard is intended for situations where the primary design objective of the vegetated roof is stormwater management. Green roof installations provide many other environmental benefits such as energy efficiency, air quality improvements, and habitat. There are two different types of vegetated roof systems: *intensive* vegetated roofs and *extensive* vegetated roofs. Intensive systems have a deeper growth media layer that ranges from 6 inches to 4 feet thick, which is planted with a wider variety of plants, including trees. By contrast, extensive systems typically have much shallower growing media (2 to 6 inches), which is planted with carefully selected drought tolerant vegetation.

### Policies Regarding GR

This standard was developed for the installation of extensive green roof systems. Intensive systems in accordance with the Clearinghouse guidelines are eligible to apply but the incentive payment rate remains the same.

### A. Criteria

- Roofs must be 200 square feet or larger.
- Plant establishment may be plugs/container; cuttings; seeding; vegetated mats; or modular/tray systems. Native species or mixes that are adapted to the site conditions and intended uses are encouraged. Selected species must have the capacity to achieve adequate density and vigor within an appropriate time frame. Establishment of vegetation generally takes 1-2 years. Invasive or noxious species, as identified by DCR invasive species list (http://www.dcr.virginia.gov/natural_heritage/invspinfo.shtml), are prohibited.
- Species, density/rate of seeding or planting, minimum quality of planting stock and

method of establishment shall be specified as part of the application. Only viable, high-quality seed or planting stock that is shallow-rooted, self-sustaining, and tolerant of direct sunlight, drought, wind, and frost should be used. Seeding or planting must be done at a time and in a manner that best ensures survival and growth of the selected species. The planting window extends from the spring to early fall, allowing plants to root thoroughly before the first killing frost. Green roofs should not be planted in the winter. Temporary irrigation is often necessary during dry months as the roof is established.

- North and east aspects are preferred for survivability of vegetation and reduction of irrigation.
- Green roof designs shall include the following components:
  - deck layer with adequate structural support
  - insulation layer
  - waterproofing layer
  - drainage layer and system
  - root barrier (nonwoven geotextile fabric or similar)
  - growth media
  - plant cover
  - Slope Stabilizer (if applicable)
- Roof pitch shall be a minimum of ¼":12" (2%) and no more than 4":12" (33%).
- Longest flow path from top of roof to gutter shall be less than 75 feet.
- Drainage layer shall be a minimum of 1 inches of pea gravel or a mat system.
- Growth media shall have less than 15% organic matter. Compost amendments must be free of detectable levels of pesticides and other hazardous chemicals.
- The participant is responsible for ensuring that the proposed installation and maintenance plan meets all applicable local policies and ordinances.
- Site constraints for construction and design should be identified (HVAC, Electrical, Roofing materials, Pitch/Slope, Access and Process for getting materials on the roof).
- Green Roof structural loads shall comply with Chapter 16 of the latest edition of the International Building Code.
- All material specification and construction details shall be in accordance with the manufacturers' recommendations and Virginia Stormwater BMP Clearinghouse Design Specification No. 5.

**B. Plans and Specifications**

- A design plan must be submitted by the property owner, with a professional seal; or a waiver of liability may be accepted on a case-by-case basis (see Appendix D, VCAP form-5), and approval by the local Building Office if applicable. The installed practice must be in accordance with the approved design unless changes were pre- approved by the local SWCD. Information required in the plan includes:
  - waterproofing specifications
  - structural design specifications

  - nonwoven geotextile fabric specifications
  - proposed growth medium depth and composition
  - proposed vegetation and seeding/planting rate
  - drainage system specifications
  - drainage and overflow system details
  - irrigation considerations (permanent or temporary watering systems, hose bib connections, etc.)
  - a statement regarding compliance with any permitting requirements or local codes
  - other information as requested by the local SWCD
- Certification by a Licensed Professional may be required by the District to verify practice installation.

**C. Operation and Maintenance**

- Maintenance inspections shall be conducted a minimum of twice annually by the landowner, or a designated sub-contracted agent of the landowner.
- Maintenance will follow guidelines on the Virginia Stormwater BMP Clearinghouse Design Specification No. 5.
- Maintenance will include all components of the practice including vegetation, soil media, drainage system and structural integrity.

**I. Cost Share Rates/Incentives**

- The Program will offer incentive payments based on a rate of up to $10 per square foot with a maximum payment of $10,000.00 per parcel per year.

**J. Helpful Technical References:**

- Virginia Stormwater BMP Clearinghouse, Design Specification No. 5 Vegetated Roof http://www.vwrrc.vt.edu/swc/NonProprietaryBMPs.html
- Dunnett, N. and N. Kingsbury. 2004. *Planting Green Roofs and Living Walls*. Timber Press. Portland, Oregon.
- Weiler, S. and K. Scholz-Barth 2009. *Green Roof Systems: A Guide to the Planning, Design, and Construction of Landscapes over Structure.* Wiley Press. New York, NY. http://www.slideshare.net/Sotirakou964/pomegranate-center-green-roof-manual
- 2015 International Building Code. July 2015. International Code Council, INC.
- http://www.greenroofs.com/Greenroofs101/index.html
  http://www.portlandoregon.gov/bes/article/331490
  http://www.portlandoregon.gov/bes/article/259381
  http://www.wbdg.org/resources/greenroofs.php
- Modular Roof: http://www.thisoldhouse.com/toh/how-to/step/0,,20473692,00.html
- The Green Roof Manual: A Professional Guide to Design, Installation, and Maintenance. By Edmund C. Snodgrass and Linda McIntyre. 2010.

### *National Standards*

ASTM International. *Standard Test Method for Maximum Media Density for Dead Load Analysis of Vegetative (Green) Roof Systems. Standard E2399-05*www.astm.org/Standards/E2399.htm

ASTM International. *Standard Test Method for Saturated Water Permeability of Granular Drainage Media [Falling-Head Method] for Vegetative (Green) Roof Systems. Standard E2396-05*www.astm.org/Standards/E2399.htm

ASTM International. *Standard Test Method for Water Capture and Media Retention of Geocomposite Drain Layers for Vegetative (Green) Roof Systems. Standard E2398-05*www.astm.org/Standards/E2398.htm

ASTM International. *Standard Practice for Determination of Dead Loads and Live Loads Associated with Vegetative (Green) Roof Systems. Standard E2397-05*www.astm.org/Standards/E2397.htm

ASTM International. *Standard Guide for Selection, Installation, and Maintenance of Plants for Green Roof Systems. Standard E2400-06*www.astm.org/Standards/E2400.htm

# General References


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Laws and Regulations Pertaining to Stormwater Management in the Commonwealth of Virginia:

- Commonwealth of Virginia Erosion and Sediment Control Act. Code of Virginia Title 62.1 Chapter 3.1 Article 2.3 Section 44.15:51 seq.
- Virginia Erosion and Sediment Control Regulations. Virginia Administrative Code Title 9 Agency 25 Chapter 840
- Commonwealth of Virginia Stormwater Management Act. Code of Virginia Title 62.1 Chapter 3.1 Article 2.3 Section 44.15:24 seq.
- Virginia Stormwater Management Program Regulations. Virginia Administrative Code Title 9 Agency 25 Chapter 870
- General VPDES Permit for Discharges of Stormwater from Small Municipal Separate Storm Sewer Systems (MS4s). Virginia Administrative Code Title 9 Agency 25 Chapter 890.

# Appendix A – Calculations

## A.1 Determining Peak Flow

The peak flow is used to determine the proper size of stormwater conveyance systems such as inlets, culvert and open channels and is also used to determine the proper size of outlet devices. Peak flow can be calculated easily using the "Rational Method" (Bedient and Huber, 1992) for small impervious drainage areas. Larger drainage areas with a variety of vegetative cover and soil types should use the NRCS curve number method. For details on the Curve Number method see section 4 - 4.3 of the Virginia Stormwater Management Handbook Volume 2 first edition 1999.

**Rational Method:**

The rational method is a simple model used to estimate the peak flow from a given watershed using a simple formula. For applications such as backyard stormwater BMPs, where small, highly impervious watersheds will be treated, the rational method offers a somewhat coarse, but adequate, estimate of peak flow. The rational formula estimates the peak rate of runoff at any location in a drainage area as a function of the runoff coefficient, rainfall intensity and drainage area. Runoff coefficient, C, represents the condition of the land within the drainage area and is based on land use, soil type and slope (See Table 4.5 of the 1999 VSWMH). Rainfall intensity, I, is the average rainfall rate (inches per hour) for a storm duration equal to the time of concentration (Tc) for a selected design storm event (2-year, 10-year, etc.). The drainage area, A, is the contributing area that is being treated by the BMP.

The rational method formula is as follows:

Where: $Q = Rv\ I\ A$

$Q$ = Peak flow ($ft^3/s$)

$Rv$ = Runoff Coefficient (dimensionless), see table A4.2 of this manual

$A$ = Watershed area being treated (acres)

$I$ = Rainfall Intensity of Storm Event (inches/hour)

$I = B / (Tc + D)^E$

$Tc$ = Time of Concentration (minutes), see page V-5 of the 1992 VESCH (Typ. 5 minutes)

B, D and E are constants; see App. 6C-2 of the VDOT Drainage Manual.

(Note: There are 43,560 square feet in 1 acre)

Limitations of Rational Method:

- The given watershed has a time of concentration, $t_c$, less than 20 minutes;
- The drainage area is less than 20 acres.

## A.2 **Outlet Sizing**

Sizing Underdrains:

1. Determine drawdown rate

   Use Darcy's Equation: $Q = 2.3x10^{-5} K (SA) (H/L)$

   Where Q = drawdown rate (cubic feet per second)

   K = hydraulic conductivity of media (inches/hour) (typ. Loamy Sand = 2 iph)

   SA = surface area of media (square feet)

   H = height of water above the underdrain (feet) (typ. treatment volume elevation)

   L = thickness of media (feet)

2. Size the underdrain pipe to carry 10 times drawdown rate

   $Q' = 10 (Q)$ Where Q' is design flow rate and Q is drawdown rate.

3. Calculate pipe capacity (N x D)

   $N \times D = 16 (Q' n / S^{0.5})^{3/8}$

   Where N = number of pipes

   D = Diameter of pipe (inches) (Min. 3 inches)

   Q' = design flow rate (cubic feet per second)

   n = Manning Roughness Coefficient (use 0.011 for smooth and 0.015 for corrugated)

   S = pipe slope (Typ. Assumed 0.5%)

4. Find the number of underdrain pipes and diameter size combination (N x D) that will carry the flow rate.

5. Space the underdrains according to the following equation from VESCH 3.28.

   $S = \sqrt{(4 K (M^2 + 2 A M)/Q')}$

   M = Vertical distance after drawdown (typ. ½ pipe diameter)

   A = Vertical distance to bottom of excavation (typ. ½ pipe diameter plus bedding). This should be no more than 2 feet.

Installation Note:

- Install underdrains in a gravel bed with at least 2 inches of cover over the top of the pipes. The minimum gravel thickness is determined by the diameter of the pipe.
- Install outlet protection where underdrain daylights.
- Discharge to adequate outfall

Principal Outlet Orifice:

Particular BMPs may have a hydraulic depth (i.e. head) of ponding sufficient to allow a pipe outlet. These BMPs will be designing a barrel outlet based on the orifice equation.

$Q = C\ a\ \sqrt{(2gh)}$

Where Q = design flow rate (cfs)

C = orifice coefficient (typ. 0.6)

a = area of orifice (sq. ft.)

g = gravitational acceleration, 32.2 ft./ $sec^2$

h = head or depth of dry storage (ft.)

To size the barrel orifice, rearrange the equation and solve the area of orifice. Then use the following equation: $d = \sqrt{(4\ a\ /\ \prod)}$

Overflow Weirs:

Weir outlets should be sized so that the berm is not overtopped during a 10-year storm event. This means that the weir notch must be long enough to allow the peak flow associated with the 10-year storm to pass without the water rising high enough that the top of the berm is reached. To determine the appropriate length of weir notch to pass the 10-year storm, the weir equation can be applied.

$Q = C_w\ L\ H^{1.5}$

Where:

Q = Flow ($ft^3/s$)

$C_w$ = Weir Coefficient (dimensionless)

L = Length of Weir (feet)

H = Height of Water over Top of Weir (feet)

The peak flow rate passed by the weir is the flow associated with the 10-year event (see appendix A2). The weir coefficient is set to 2.7 for a vegetated broad weir or 3.3 for a drop inlet. The 10-year depth, H should be no higher than 2 inches (0.17 feet) for a vegetated weir so the water will not flow over the containment berm. Thus, the only unknown in the equation is the length of the weir. This equation can be rearranged to solve for the weir length, as follows:

$L = Q \div (C_w\ H^{1.5})$

Weir Installation Note:

- All rigid weir structures should be tied into the underlying soils.
- Soils filled around structures should be compacted and protected.
- Vegetated weirs should have sod or stabilization matting installed immediately.

## A.3 **Adequate Conveyance of Stormwater**

The Manning's Equation and the Continuity equation below are used to calculate the velocity and flow rate capacity of downstream channel or pipe system. All structural practices are expected to discharge stormwater into an adequate stormwater conveyance system. After the peak flows are computed and the outlets sized, the designer should check that the practice discharges at an adequate velocity that is less than the permissible velocity of the channel materials and to verify that the conveyance has adequate capacity to handle the overflow.

The receiving stormwater conveyance system shall have adequate capacity to handle the 10-year peak flow and resist erosion during the 10-year peak flow.

Overland relief may be sheet flow, if the 10-year peak flow depth is less than half the height of the receiving vegetation and the 10-year flow velocity should be less than 1 foot per second.

Manning's Equation:

$V = 1.49 / n\ S^{1/2}\ R^{2/3}$

Where: V = Velocity, ft./sec

n = Mannings Roughness Coefficient

S = Slope, ft./ft.

R, Hydraulic Radius (ft.) = CSA / $P_w$

CSA = Cross Section Area, sq. ft.

$P_w$ = wetted perimeter of channel, ft.

Continuity Equation:

Q = V (CSA)

Where: Q = Flow Rate, cfs

See Table 5-7 in the 1992 VESCH for roughness coefficients for sheet flow.

Use the roughness coefficient modifying tables for Chanel roughness. See table 5-16 to 5-21 in the 1992 VESCH.

Use Table 5-14 and 5-22 with Plate 5-39 in the 1992 VESCH for permissible velocities.

## A.4 **Determining Pollutant Load**

The state of Virginia has accepted the Simple Method procedure for determining pollutant loads from developed sites. A more detailed discussion and derivation of the Simple Method (Schueler, 1987). The Simple Method uses impervious cover as the key variable in calculating the levels of pollutant transported. The Simple Method is an easy technique that is used to calculate the Treatment Volume for a given stormwater treatment practice. The technique requires a modest amount of information including: (1) area that will be draining to the proposed BMP location in acres, (2) the percentage of the drainage area that is impervious, (3) annual regional rainfall, and (4) pollutant concentration.

Simple Method General Pollutant Load Equation for chemical constituents:

$L = 0.226 \times R \times C \times A$

L = relative total pollutant load (lbs/year) R = Annual Runoff (inches)

C = Pollutant Concentration (see table A1)

A = drainage area treated by stormwater treatment practice (acres) Note: 0.226 is a conversion factor

Simple Method General Pollutant Load Equation for Bacteria:

$L = 103 \times R \times C \times A$

L = relative annual load of bacteria (billions of colonies) R = Annual Runoff (inches)

C = Pollutant Concentration (see table A1)

A = drainage area treated by stormwater treatment practice (acres) Note: 103 is a conversion factor

Calculate Annual Runoff

$R = P \times P_j \times Rv$

P = average annual rainfall (inches), usually 43 inches*

$P_j$ = unit less correction factor for storms with no runoff = 0.9 Rv = unit less Runoff coefficient

Note: * indicates the annual rainfall may vary across the state of Virginia based on locally collected rainfall data.

Calculate Runoff Coefficient

$Rv = 0.05 + (0.009 * I)$

Rv = Runoff Coefficient (fraction of rainfall that will produce runoff) I = Connected impervious percentage in watershed (%)

**Table A4.1: National Median Concentrations for Chemical Constituents in Stormwater**

| Constituent | Units | Urban Runoff |
|---|---|---|
| TSS | mg / l | 54.5[1] |
| TP | mg / l | 0.26[1] |
| TN | mg / l | 2.00[1] |
| Cu | ug / l | 11.1[1] |
| Pb | ug / l | 50.7[1] |
| Zn | ug / l | 129[1] |
| *E. Coli* | 1,000 col / ml | 1.5[2] |

Source: [1]Pooled NURP/USGS (Smullen and Cave, 1998), [2] Schueler (1999)

Pollutant Load Removed by Stormwater BMP

$L_{removed} = L \times EFF$

$L_{removed}$ = relative pollutant load removed from stormwater (lbs/year) L = pollutant load treated by stormwater BMP

EFF = pollutant removal efficiency of stormwater BMP

Treatment Volume is used to meet the performance criteria for selected types of stormwater BMPs such as runoff reduction and pollutant removal practices. These stormwater BMPs must have adequate treatment volume for the removal of pollutant loads as defined by the Virginia BMP clearinghouse.

Calculate Treatment Volume

$Tv = Rv * A * (P/12)$

Tv = Volume of runoff ($ft^3$)

Rv = Runoff Coefficient (fraction of rainfall that will produce runoff)

A = Area that drains to BMP ($ft^2$)

P = Depth of rainfall treated (inches) (determined by the BMP level of design)

**Table A4.2: Rv Coefficients (use this table as an alternative to percent impervious)**

| Land Cover | HSG A Soils | HSG B Soils | HSG C Soils | HSG D Soils |
|---|---|---|---|---|
| Forest/Unmanaged Lands | 0.02 | 0.03 | 0.04 | 0.05 |
| Managed Turf | 0.15 | 0.20 | 0.22 | 0.25 |
| Impervious Cover | 0.95 | 0.95 | 0.95 | 0.95 |

# Appendix B – Pretreatment Requirements for VCAP BMPs

**General Guidance:**

Pretreatment is a necessary component of many stormwater BMPs. Pretreatment techniques protect a BMP from the buildup of trash, sediments and particulate matter; and dissipate erosive velocities entering the practice (MPCA, 2008). If a particular stormwater BMP is sensitive to heavy loadings of fine sediments; or if there is a "hotspot" site which will produce high sediment and pollutant loads, then pretreatment is required.

**Table B.1: Acceptable Pretreatment Measures**

| Sheet Flow | Concentrated Flow | Inlets |
|---|---|---|
| Gravel Diaphragm | Gravel Diaphragm | Leaf Screens |
| Grass Filter Strips | Grass Channel | Sump Basins |
| Other Proprietary Systems | Engineered Level Spreader | Vortex Filters |
| | Sediment Forebay | Street Sweeping |
| | Proprietary Systems | Propriety Systems |

**Specific Pretreatment Requirements:**

1. For stormwater BMPs requiring pretreatment, the selected pretreatment measures must be provided above and outside of the treatment area. Pretreatment may store up to 10 percent of the Treatment Volume per inlet.
2. Pet Waste Stations (PWS), Conservation Landscaping (CL) and Impervious Surface Removal (ISR) require no pretreatment.
3. Rain Gardens (RG), Dry Well (DW), Bioretention (BR), Infiltration (IF), Constructed Wetlands (CW), and Vegetated Stormwater Conveyances (VSC) require one or more pretreatment measures per the Virginia BMP Clearinghouse.
4. Rainwater Harvesting (RH) and Permeable Pavement (PP) require unique pretreatment devices per the Virginia BMP Clearinghouse and Manufacturer's specifications.
    a. Rainwater Harvesting (RH) is sensitive to roof debris and must have pretreatment of the gutter and downspout system that filters, captures or divert the "first flush" volume.
    b. Permeable Pavement (PP) is sensitive to debris from pervious surfaces and application of snow removal material; therefore, pretreatment must provide filtering layer or routine maintenance such as vacuuming.

The following technical guidance for pretreatment measures can also be found in the Virginia Stormwater Management Handbook, first edition and Virginia Stormwater BMP Clearinghouse.

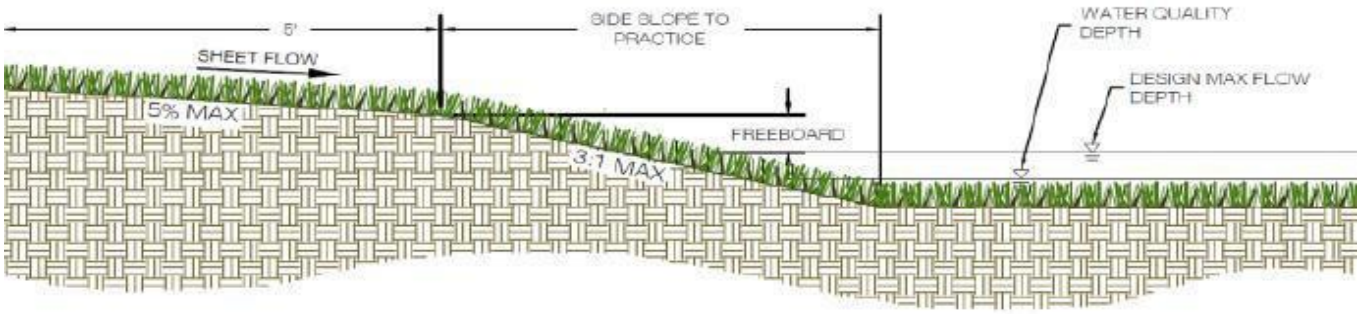
**Grass Filter**

When runoff is sheet flow from such areas as parking lots, residential yards, etc., is involved, a grass filter strip, often enhanced with a gravel diaphragm, is usually employed. Table B.2 provides sizing guidelines as a function of inflow approach length, land use, and slope.

- The first 10 feet of the filter strip must be 2% or less.
- The minimum filter strip length should be 10 feet.
- The contributing drainage area should not have more than 5,000 square feet of impervious surface.
- Use a gravel diaphragm when impervious surface exceeds this limit or when the minimum filter length cannot be met.

**Table B.2: Pretreatment Filter Strip Sizing Guidance (Source: Claytor and Schueler, 1996)**

| Parameter | Impervious Parking Lot* | | | | Residential Lawns | | | | Notes |
|---|---|---|---|---|---|---|---|---|---|
| Maximum Inflow Approach Length (Feet) | 35 | | 75 | | 75 | | 150 | | |
| Filter Strip Slope | < 2 % | >2% | <2% | >2% | <2% | >2% | <2% | >2% | Max = 6% |
| Minimum Length | 10ft. | 15ft. | 20ft. | 25ft. | 10ft. | 12ft. | 15ft. | 18ft. | *GD as necessary |



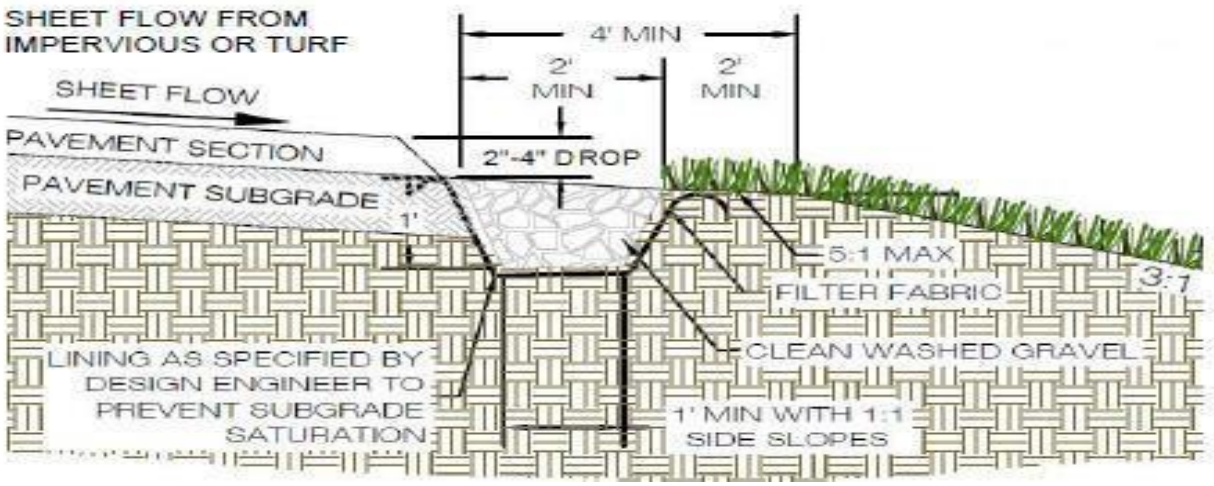

**Grass Filter for Sheet Flow Pretreatment**

**(Va. Stormwater Clearinghouse Specification No. 9: Bioretention)**

**Gravel Diaphragm**

A gravel diaphragm at the top of the slope is created by excavating a 2-foot wide and 1-foot deep trench that runs on the same contour at the top of the filter strip or grass channel. The diaphragm serves two purposes. First, it acts as a pretreatment device, settling out sediment particles before they reach the practice. Second, it acts as a level spreader, maintaining sheet flow.

- Maximum flow length from previous surfaces shall be 150 feet.
- Maximum flow length from impervious surfaces shall be 75 feet.
- The flow should travel over the impervious area and to the practice as sheet flow and then drop at least 3 inches onto the gravel diaphragm. The drop helps to prevent runoff from running laterally along the pavement edge, where grit and debris tend to build up.
- A layer of nonwoven filter fabric should be placed between the gravel and the underlying soil trench.
- If the contributing drainage area is steep (4% slope or greater), then larger stone (clean gravel that meets VDOT #57 grade) should be used in the diaphragm.
- If the contributing drainage area is solely turf (e.g., lawn), then the gravel diaphragm may be eliminated.




**Gravel Diaphragm for Sheet flow Pretreatment**

**(Va. Stormwater Clearinghouse Specification No. 2: Sheet flow to Filter or Open Space)**

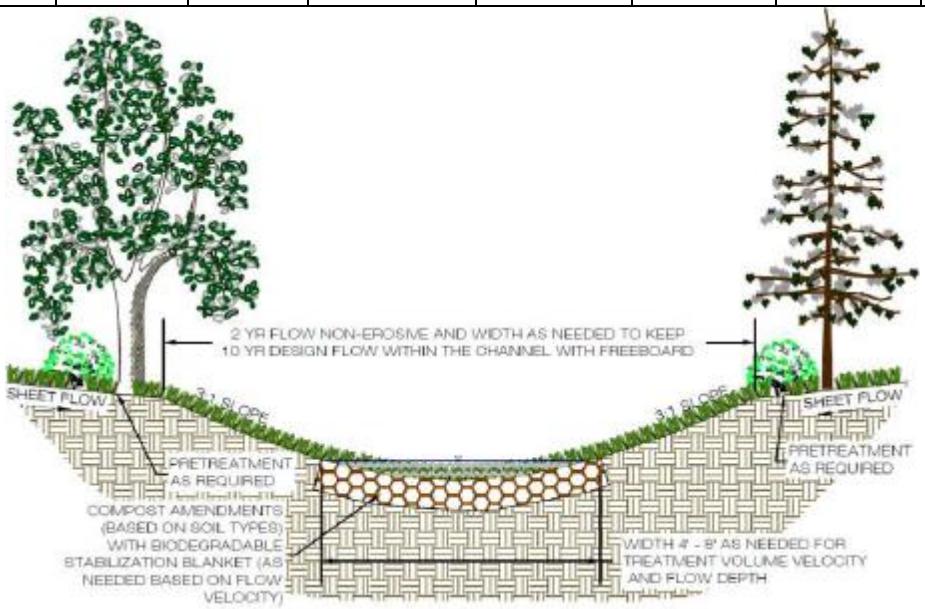
**Grass Channel**

For applications where concentrated runoff enters the practice by surface flow, such as through a slotted curb opening, a grassed channel, often equipped with a gravel diaphragm to slow the velocity and spread out the flow entering the basin, is the usual pretreatment method. The length of the grassed channel depends on the drainage area, land use, and channel slope. Table B.3 provides recommendations on sizing for grass channels leading into a practice for a one acre drainage area.

- The minimum grassed channel length should be 20 feet.
- Dimensions of the grass channel shall ensure that the velocity during the 1 inch per hour storm is 1 foot per second or less.
- Use a gravel diaphragm when the minimum length cannot be met or channel bottom width exceeds 6 feet.
- Use Check Dams when channel slope exceed 2 percent or erosive flows occur for the 10-year storm.

**Table B.3: Pretreatment Grass Channel Sizing Guidance for a 1.0 Acre Drainage Area (Source: Claytor and Schueler, 1996)**

| Parameter | < 33 % Impervious | | Between 34 % and 66 % Impervious | | >66 % Impervious | | Notes |
|---|---|---|---|---|---|---|---|
| Slope | <2% | >2% | <2% | >2% | <2% | >2% | Max. = 4% |
| Minimum Length (feet) | 25 | 40 | 30 | 45 | 35 | 50 | Multiple by CDA acreage |




**Grass Channel for Concentrated Flow Pretreatment**

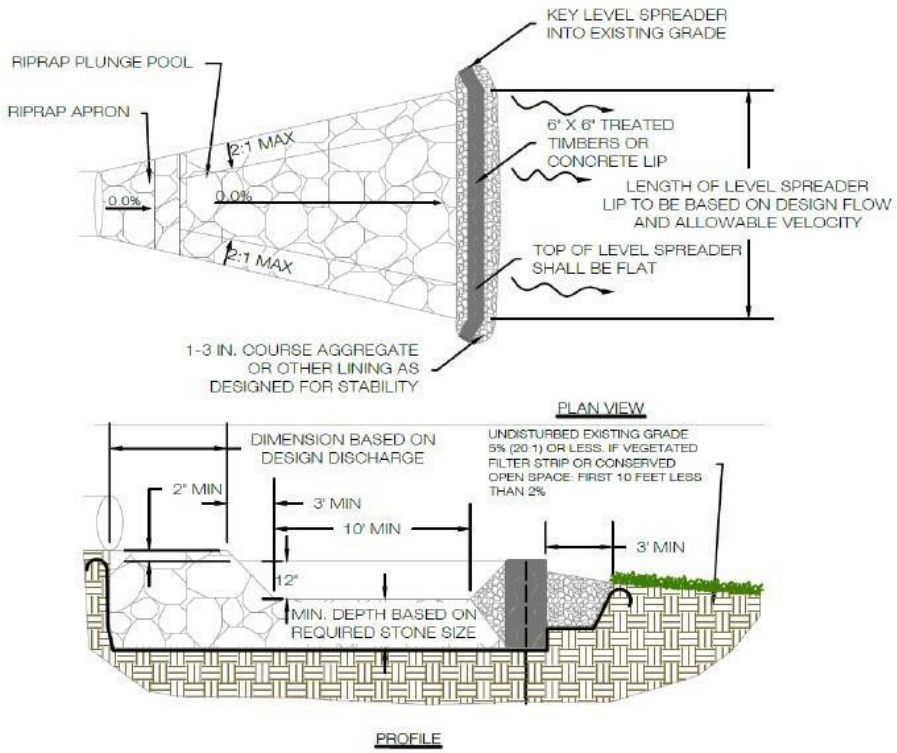
**(Va. Stormwater Clearinghouse Specification No. 3: Grass Channel).**

**Engineered Level Spreader with Forebay**

An engineered level spreader is an energy dissipater device that is used to convert concentrated stormwater runoff to sheet flow. A forebay is constructed to allow sediment to settle from the incoming stormwater runoff before it is delivered to the treatment or control practice. The engineered level spreader should be located at each point of concentrated incoming flow of the stormwater BMP. Storm drain piping or other conveyances may be aligned to discharge into one forebay or several, as appropriate for the particular site. Engineered level spreaders should be installed in a location which is accessible by maintenance equipment.

The following are design guidelines for using an engineered level spreader with forebay:

- The length of the level spreader lip shall be sized to disperse the 10- year peak flow as sheet flow with a flow depth less than ½ the height of the receiving vegetation, typically 0.1 to 0.17 feet.
- The width of the level spreader channel on the up-stream side of the level lip should be three times the diameter of the inflow pipe, and the depth should be 9 inches or one-half the culvert diameter, whichever is greater.
- The level spreader lip may be set at the treatment volume elevation if no other pretreatment is provided and velocities are non-erosive.
- The forebay section of the level spreader shall be excavated as shown below.
- The forebay should be sized to hold 0.25 inches of runoff per impervious acre of contributing drainage area. Each individual forebay should hold a minimum of 0.1 inches per impervious acre.




**Level Spreader for Pipe or Channel Pretreatment**

**(Va. Stormwater Clearinghouse Specification No. 2: Sheet Flow to Filter or Open Space).**

# Appendix C – Reportable Measures for Crediting Urban BMPs for Chesapeake Bay Recovery Efforts

Overview:

This appendix provides guidance on the necessary data collection for BMP reporting to the Chesapeake Bay Program.

Sheets 1 provides more specific information on all of the urban BMPs approved for Chesapeake Bay recovery efforts, including practice name, practice codes, specific spatial and temporal requirements, BMP definitions/descriptions, and web sources of Virginia-specific specifications for these urban BMPs. Sheet 2 catalogues land use code information. Sheet 3 is the Project Tracking Document for the Program.

## Sheet 1 – Measures

| Type | BMP Name | Practice Code | Practice Area Measure | Practice Length Measure | Practice Width Measure | Count Measure | Service Years | BMP Definition | VA Specifications |
|---|---|---|---|---|---|---|---|---|---|
| Urban | Bioretention Filter | 912 | Drainage Area | | | | 10 | An excavated pit backfilled with engineered media, topsoil, mulch, and vegetation. These are planting areas installed in shallow basins in which the storm water runoff is temporarily ponded and then treated by filtering through the bed components, and through biological and b iochemical reactions within the soil matrix and around the root zones of the plants. Underdrain existence and hydrologic soil group are unknown for this BMP, which reduces its pollution reduction credits. Some of the characteristics of this standard form include a required filter media depth of only 24 inches and at least 75% planting coverage within 2 years. | Virginia Stormwater BMP Clearinghouse Specification #9 Bioretention (Level 1)<br><br>VCAP Standard 3.10 Bioretention (Level 1) |
| Urban | Bioretention Filter — Enhanced | 912E | Drainage Area | | | | 10 | An excavated pit backfilled with engineered media, topsoil, mulch, and vegetation. These are planting areas installed in shallow basins in which the storm water runoff is temporarily ponded and then treated by filtering through the bed components, and through biological and biochemical reactions within the soil matrix and around the root zones of the plants. Underdrain existence and hydrologic soil group are unknown in this BMP, which reduces its pollution reduction credits. Some of the characteristics of this enhanced form include a required filter media depth of at least 36 inches, sub-soil testing, and at least 90% planting coverage within 2 years. | Virginia Stormwater BMP Clearinghouse Specification #9 Bioretention (Level 2)<br><br>VCAP Standard 3.10 Bioretention (Level 2) |

| Type | BMP Name | Practice Code | Practice Area Measure | Practice Length Measure | Practice Width Measure | Count Measure | Service Years | BMP Definition | VA Specifications |
|---|---|---|---|---|---|---|---|---|---|
| Urban | Conserved Open Space | UR-3 | Drainage Area | Length Treated | Avg. Width | | | Maintaining natural vegetation areas to act as filter strips by accepting sheet flow from adjacent hardened surfaces. | Virginia Stormwater BMP Clearinghouse Specification #2 Conserved Open Space<br><br>VCAP Standard 3.4 Conservation Landscaping (Landscape beds used as Filter Strip) |
| Urban | Constructed Wetland | 911 | Drainage Area | | | | 35 | Creation of a wetland for intercepting stormwater runoff then releasing it to an open water system at a specified flow rate. These structures retain a permanent pool and usually have retention times sufficient to allow settlement of some portion of the intercepted sediments and attached nutrients/toxics. There is little or no vegetation living within the pooled area nor are outfalls directed through vegetated areas prior to open water release. Some characteristics that differ from the enhanced form include a single cell, possible extended detention, a mean wetland depth greater than 1 foot, comprises in area less than 3% of the contributing drainage area, and is an emergent wetland design. | Virginia Stormwater BMP Clearinghouse Specification #13 Constructed Wetlands (Level 1)<br><br>VCAP Standard 3.7 Constructed Wetland (Level 1) |
| Urban | Constructed Wetland — Enhanced | 911E | Drainage Area | | | | 35 | Creation of a wetland for intercepting stormwater runoff then releasing it to an open water system at a specified flow rate. These structures retain a permanent pool and usually have retention times sufficient to allow settlement of some portion of the intercepted sediments and attached nutrients/toxics. There is little or no vegetation living within the pooled area nor are outfalls directed through vegetated areas prior to open water release. This enhanced form is multi-cell and allows only limited water surface fluctuations, has a mean wetland depth less than 1 foot, comprises in area greater than 3% of the contributing drainage area, and is a mixed wetland design. | Virginia Stormwater BMP Clearinghouse Specification #13 Constructed Wetlands (Level 2)<br><br>VCAP Standard 3.7 Constructed Wetland (Level 2) |
| Urban | Dry Swale | 907 | Drainage Area | Length Treated | | | 10 | Dry swales are bioretention cells that are shallower, configured as linear channels, and covered with turf or other surface material (other than mulch and ornamental plants). They operate as a soil filter system that temporarily stores and then filters stormwater. Unlike the enhanced form, this BMP can have a swale slope of up to 2%, as little as 18 in. of media depth, and a turf cover. It must have an underdrain. | Virginia Stormwater BMP Clearinghouse Specification #10 Dry Swale (Level 1)<br><br>VCAP Standard 3.8 Vegetated Conveyance System (Dry Swale Level 1) |
| Urban | Dry Swale - Enhanced | 907E | Drainage Area | Length Treated | | | 10 | Dry swales are bioretention cells that are shallower, configured as linear channels, and covered with turf or other surface material (other than mulch and ornamental plants). They operate as a soil filter system that temporarily stores and then filters stormwater. This enhanced form must have a swale slope of 1% or less, up to 24 in. of media depth, and trees and shrubs along with the turf cover. Options exist that do not require an underdrain. | Virginia Stormwater BMP Clearinghouse Specification #10 Dry Swale (Level 2)<br><br>VCAP Standard 3.8 Vegetated Conveyance System (Dry Swale Level 2) |

| Type | BMP Name | Practice Code | Practice Area Measure | Practice Length Measure | Practice Width Measure | Count Measure | Service Years | BMP Definition | VA Specifications |
|---|---|---|---|---|---|---|---|---|---|
| Urban | Dry Well | UR-9 | Drainage Area | | | No. Installed | 15 | On-lot infiltration systems for infiltration at the individual lot level, controlling runoff at its source. These systems generally receive sheet flow runoff. | Virginia Stormwater BMP Clearinghouse Specification #1 Disconnection and #8 Infiltration<br><br>VCAP Standard 3.6 Dry Well |
| Urban | Filter Strip | 393 | Drainage Area | | | | 10 | Practices that capture and temporarily store runoff and pass it through a filter bed of either sand or an organic media. This BMP is an above ground structure. An organic media filter uses another medium besides sand to enhance pollutant removal for many compounds due to the increased cation exchange capacity achieved by increasing the organic matter.<br>These systems require yearly inspection and maintenance to receive pollutant reduction credit. | Virginia Stormwater BMP Clearinghouse Specification #2 Conserved Open Space<br><br>VCAP Standard 3.4 Conservation Landscaping (Meadow used as Filter Strip) |
| Urban | Green Roof System — Extensive | 011EX | Treated Roof Area | | | | - | A vegetated roof surface that typically consist of waterproofing and drainage materials and an engineered growing media that is designed to support plant growth. Vegetated roofs capture and temporarily store stormwater runoff in the growing media before it is conveyed into the storm drain system. A portion of the captured stormwater evaporates or is taken up by plants, which helps reduce runoff volumes, peak runoff rates, and pollutant loads on development sites. An extensive vegetated roof typically has shallower growing media (2 to 6 inches thick), which is planted with carefully selected drought tolerant vegetation. | Virginia Stormwater BMP Clearinghouse Specification #5 Vegetated Roof (Level 1)<br><br>VCAP Standard 3.13 Green Roof (Level 1) |
| Urban | Green Roof System — Intensive | 011IN | Treated Roof Area | | | | - | A vegetated roof surface that typically consist of waterproofing and drainage materials and an engineered growing media that is designed to support plant growth. Vegetated roofs capture and temporarily store stormwater runoff in the growing media before it is conveyed into the storm drain system. A portion of the captured stormwater evaporates or is taken up by plants, which helps reduce runoff volumes, peak runoff rates, and pollutant loads on development sites. An intensive vegetated roof has a deep growing media layer (6 inches to 4 feet thick), which is planted with a wider variety of plants, including trees. | Virginia Stormwater BMP Clearinghouse Specification #5 Vegetated Roof (Level 2)<br><br>VCAP Standard 3.13 Green Roof (Level 2) |

| Type | BMP Name | Practice Code | Practice Area Measure | Practice Length Measure | Practice Width Measure | Count Measure | Service Years | BMP Definition | VA Specifications |
|---|---|---|---|---|---|---|---|---|---|
| Urban | Infiltration Basin | 908 | Drainage Area | | | | 5 | A depression to form an infiltration basin where sediment is trapped and water infiltrates the soil. No underdrains are associated with infiltration basins, because by definition they provide complete infiltration. Unlike the enhanced form, this BMP requires at least two forms of pre-treatment and a soil infiltration rate between 1/2 to 1 in./hr. | Virginia Stormwater BMP Clearinghouse Specification #8 Infiltration (Level 1)<br><br>VCAP Standard 3.11 Infiltration (Underground Chambers – Level 1) |
| Urban | Infiltration Basin — Enhanced | 908E | Drainage Area | | | | 5 | A depression to form an infiltration basin where sediment is trapped and water infiltrates the soil. No underdrains are associated with infiltration basins, because by definition they provide complete infiltration. This enhanced form requires at least three forms of pre-treatment and a soil infiltration rate of 1.0 to 4.0 in/hr. | Virginia Stormwater BMP Clearinghouse Specification #8 Infiltration (Level 2)<br><br>VCAP Standard 3.11 Infiltration (Underground Chambers – Level 2) |
| Urban | Infiltration Trench | 909 | Drainage Area | | | | 10 | A constructed trench where sediment is trapped and water infiltrates the soil. No underdrains are associated with infiltration trenches, because by definition they provide complete infiltration. Unlike the enhanced form, this BMP requires at least two forms of pre-treatment and a soil infiltration rate between 1/2 to 1 in./hr. | Virginia Stormwater BMP Clearinghouse Specification #8 Infiltration (Level 1)<br><br>VCAP Standard 3.11 Infiltration (Surface – Level 1) |
| Urban | Infiltration Trench — Enhanced | 909E | Drainage Area | | | | 10 | A constructed trench where sediment is trapped and water infiltrates the soil. No underdrains are associated with infiltration trenches, because by definition they provide complete infiltration. This enhanced form requires at least three forms of pre- treatment and a soil infiltration rate of 1.0 to 4.0 in/hr. | Virginia Stormwater BMP Clearinghouse Specification #8 Infiltration (Level 2)<br><br>VCAP Standard 3.11 Infiltration (Surface – Level 2) |
| Urban | Lined Waterway or Outlet | 468 | Drainage Area | Length Treated | | | 15 | A waterway or outlet having an erosion-resistant lining of concrete, stone, synthetic turf reinforcement fabrics, or other permanent material | Virginia Erosion and Sediment Control Handbook Specification 3.17 Stormwater Conveyance Channels<br><br>VCAP Standard 3.8 Vegetated Conveyance System (Step Pool Conveyance system) |

| Type | BMP Name | Practice Code | Practice Area Measure | Practice Length Measure | Practice Width Measure | Count Measure | Service Years | BMP Definition | VA Specifications |
|---|---|---|---|---|---|---|---|---|---|
| Urban | Nutrient Management (Urban/Residential) | UR-7 | Area Implemented | | | | 1 | Urban nutrient management involves the reduction of fertilizer to grass lawns and other urban areas. The implementation of urban nutrient management is based on public education and awareness, targeting suburban residences and businesses, with emphasis on reducing excessive fertilizer use. | VCAP Standard 3.2 Urban Nutrient Management Planning |
| Urban | Permeable Pavers — Enhanced | 910E | Area Treated | | | | 25 | Pavement or pavers that reduce runoff volume and treat water quality through both infiltration and filtration mechanisms. Water filters through open voids in the pavement surface to a washed gravel subsurface storage reservoir, where it is then slowly infiltrated into the underlying soils or exits via an underdrain. Underdrain, sand, and vegetation existence and hydrologic soil group are unknown for this BMP, which reduces its pollution reduction credits. The enhanced form of this BMP requires soil infiltration rates to exceed 0.5 in./hr., has a contributing drainage area equal to the permeable pavement area, and has options to not require an underdrain. | Virginia Stormwater BMP Clearinghouse Specification #7 Permeable Pavement (Level 2)<br><br>VCAP Standard 3.12 Permeable Pavement (Concrete Pavers –Level 2) |
| Urban | Permeable Pavers - w/ Sand, Veg, on A/B Soils | 910A2 | Area Treated | | | | 25 | Pavement or pavers that reduce runoff volume and treat water quality through both infiltration and filtration mechanisms. Water filters through open voids in the pavement surface to a washed gravel subsurface storage reservoir, where it is then slowly infiltrated into the underlying soils or exits via an underdrain. This BMP has no underdrain, has sand and/or vegetation and is in A or B soil. | Virginia Stormwater BMP Clearinghouse Specification #7 Permeable Pavement (Level 1)<br><br>VCAP Standard 3.12 Permeable Pavement (Pervious Gird Pavers) |
| Urban | Permeable Pavers - w/ Underdrain on A/B Soils | 910A1 | Area Treated | | | | 25 | Pavement or pavers that reduce runoff volume and treat water quality through both infiltration and filtration mechanisms. Water filters through open voids in the pavement surface to a washed gravel subsurface storage reservoir, where it is then slowly infiltrated into the underlying soils or exits via an underdrain. This BMP has an underdrain, no sand or vegetation and is in A or B soil. | Virginia Stormwater BMP Clearinghouse Specification #7 Permeable Pavement (Level 1)<br><br>VCAP Standard 3.12 Permeable Pavement (Concrete Pavers on A/B Soils – Level 1) |
| Urban | Permeable Pavers - w/ Underdrain on C/D Soils | 910C1 | Area Treated | | | | 25 | Pavement or pavers that reduce runoff volume and treat water quality through both infiltration and filtration mechanisms. Water filters through open voids in the pavement surface to a washed gravel subsurface storage reservoir, where it is then slowly infiltrated into the underlying soils or exits via an underdrain. This BMP has an underdrain, no sand or vegetation and is in C or D soil. | Virginia Stormwater BMP Clearinghouse Specification #7 Permeable Pavement (Level 1)<br><br>VCAP Standard 3.12 Permeable Pavement (Concrete Pavers on C/D Soils – Level 1) |

| Type | BMP Name | Practice Code | Practice Area Measure | Practice Length Measure | Practice Width Measure | Count Measure | Service Years | BMP Definition | VA Specifications |
|---|---|---|---|---|---|---|---|---|---|
| Urban | Pet Waste Management | 1005 | | | | Lbs Waste Managed | 1 | | VCAP Standard 3.1 Pet Waste Stations |
| Urban | Planter Boxes | 071 | Contributing Impervious Surface Area | | | No. Structures | 10 | Small landscaped stormwater treatment devices that can be placed above or below ground and can be designed as infiltration or filtering practices. Stormwater planters use soil infiltration and biogeochemical processes to decrease stormwater quantity and improve water quality, similar to rain gardens and green roofs but smaller in size. | Virginia Stormwater BMP Clearinghouse Specification #9 Bioretention (Level 1)<br><br>VCAP Standard 3.5 Rain Gardens (Raised Planters) |
| Urban | Porous Pavement | 910 | Area Treated | | | | 30 | A variety of permeable pavement surfaces including pervious concrete, porous asphalt and permeable interlocking concrete pavers. All permeable pavements have a similar structure, consisting of a surface pavement layer, an underlying stone aggregate reservoir layer and a filter layer or fabric installed on the bottom. Unlike the enhanced form, this BMP only requires soil infiltration rates less than 0.5 in./hr., an external contributing area to permeable pavement ratio not exceeding 2:1, and does not require an underdrain. | Virginia Stormwater BMP Clearinghouse Specification #7 Permeable Pavement (Level 1)<br><br>VCAP Standard 3.12 Permeable Pavement (Porous Asphalt or Concrete – Level 1) |
| Urban | Porous Pavement — Enhanced | 910E | Area Treated | | | | 30 | A variety of permeable pavement surfaces including pervious concrete, porous asphalt and permeable interlocking concrete pavers. All permeable pavements have a similar structure, consisting of a surface pavement layer, an underlying stone aggregate reservoir layer and a filter layer or fabric installed on the bottom. The enhanced form of this BMP requires soil infiltration rates to exceed 0.5 in./hr., has a contributing drainage area equal to the permeable pavement area, and has options to not require an underdrain. | Virginia Stormwater BMP Clearinghouse Specification #7 Permeable Pavement (Level 2)<br><br>VCAP Standard 3.12 Permeable Pavement (Porous Asphalt or Concrete – Level 2) |

| Type | BMP Name | Practice Code | Practice Area Measure | Practice Length Measure | Practice Width Measure | Count Measure | Service Years | BMP Definition | VA Specifications |
|---|---|---|---|---|---|---|---|---|---|
| Urban | Rain garden/ Bioretention Basin | 0009 | Drainage Area | | | No. Systems | 8 | An excavated pit backfilled with engineered media, topsoil, mulch, and vegetation. These are planting areas installed in shallow basins in which the storm water runoff is temporarily ponded and then treated by filtering through the bed components, and through biological and biochemical reactions within the soil matrix and around the root zones of the plants.<br>Underdrain existence and hydrologic soil group are unknown for this BMP, which reduces its pollution reduction credits. | Virginia Stormwater BMP Clearinghouse Specification #1 Disconnection<br><br>Virginia Stormwater BMP Clearinghouse Specification #9 Bioretention (Level 1)<br><br>VCAP Standard 3.5 Rain Gardens |
| Urban | Rainwater Harvesting — Cistern | 708 | Contributing Impervious Surface Area | | | No. Installed | 15 | Cisterns harvest rainwater for reuse in significantly larger volumes than rain barrels. They use manufactured tanks or underground storage areas. Rainwater collected in cisterns may be used for lawn and garden watering and also in non-potable water applications such as toilet flushing. Cisterns can be implemented without the use of pumping devices by relying on gravity flow instead. | Virginia Stormwater BMP Clearinghouse Specification #6 Rainwater Harvesting<br><br>VCAP Standard 3.9 Rainwater Harvesting |
| Urban | Riparian Forest Buffer | 391U | Buffer Area | Length Treated | Avg. Buffer Width | | 15 | An area of trees at least 35 feet wide on one side of a stream, usually accompanied by trees, shrubs and other vegetation that is adjacent to a body of water. The riparian area is managed to maintain the integrity of stream channels and shorelines, to reduce the impacts of upland sources of pollution by trapping, filtering, and converting sediments, nutrients, and other chemicals. | Virginia Stormwater BMP Clearinghouse Specification #2 Conserved Open Space<br><br>VCAP Standard 3.4 Conservation Landscaping (Tree Planting as Riparian Buffer) |
| Urban | Seeding (Re-vegetation) | 042 | Area Treated or Planted | | | | | Seeding of bare land and subsequent revegetation of that land to reduce erosion from it. | Virginia Erosion and Sediment Control Handbook Specification 3.32 Permanent Seeding and 3.35 Mulching<br><br>VCAP Standard 3.4 Conservation Landscaping (Meadow and Landscape Beds) |

| Type | BMP Name | Practice Code | Practice Area Measure | Practice Length Measure | Practice Width Measure | Count Measure | Service Years | BMP Definition | VA Specifications |
|---|---|---|---|---|---|---|---|---|---|
| Urban | Tree/Shrub Establishment | 612 | Area Planted | | | | 15 | Urban tree planting is planting trees on urban pervious areas at a rate that would produce a forest-like condition over time. The intent of the planting is to eventually convert the urban area to forest. If the trees are planted as part of the urban landscape, with no intention to covert the area to forest, then this would not count as urban tree planting | Virginia Erosion and Sediment Control Handbook Specification 3.37 Trees/Shrubs<br><br>Virginia Stormwater BMP Clearinghouse Specification #4 Soil Amendments (Appendix 4A)<br><br>VCAP Standard 3.4 Conservation Landscaping (Tree Planting) |
| Urban | Wet Swale | 066 | Drainage Area | | | | 10 | Vegetated open channels that convey stormwater runoff and provide treatment as the water is conveyed. Runoff passes through either vegetation in the channel, subsoil matrix, and/or is infiltrated into the underlying soils. This BMP has no underdrain and is in A or B soil. Unlike the enhanced form, this BMP slopes less than 2%, is an on-line design, and has only a turf cover. | Virginia Stormwater BMP Clearinghouse Specification #11 Wet Swales (Level 1)<br><br>VCAP Standard 3.8 Vegetated Conveyance System (Wet Swales – Level 1) |
| Urban | Wet Swale - Enhanced | 066E | Drainage Area | | | | 10 | Vegetated open channels that convey stormwater runoff and provide treatment as the water is conveyed. Runoff passes through either vegetation in the channel, subsoil matrix, and/or is infiltrated into the underlying soils. This BMP has no underdrain and is in A or B soil. This enhanced form has swale slopes less than 1%, off-line swale cells, with wetland planting and trees within swale cells. | Virginia Stormwater BMP Clearinghouse Specification #11 Wet Swales (Level 2)<br><br>VCAP Standard 3.8 Vegetated Conveyance System (Wet Swales – Level 2) |

# Sheet 2 – Land Use

| **Existing Land Use Code Info** | | |
|---|---|---|
| **Existing Land Use** | **LU Code** | **Definition** |
| Ag (unspecific) | Agric | Farmettes, mixed uses, indiscernible |
| Urban (unspecific) | Urban | mixed uses, undiscernible |
| Urban - Low Intensity Residential | 21 | Areas of mixed constructed materials (30-80% of cover) and vegetation (20-70% of cover). These areas commonly include single-family housing units in areas of lower population densities. |
| Urban - High Intensity Residential | 22 | Highly developed areas where people reside in high numbers. Examples include apartment complexes and row houses. Vegetation accounts for less than 20 percent of the cover. Constructed materials account for 80 to100 percent of the cover. |
| Urban - Commercial/Industrial/Transportation | 23 | Includes infrastructure (e.g. roads, railroads, etc.) and all highly developed areas not classified as High Intensity Residential. |
| Urban/Recreational Grasses | 85 | Vegetation (primarily grasses) planted in developed settings for recreation, erosion control, or aesthetic purposes. Examples include parks, lawns, golf courses, airport grasses, and industrial site grasses. |
| Forest - Deciduous | 41 | Areas dominated by trees where 75 percent or more of the tree species shed foliage simultaneously in response to seasonal change. |
| Forest - Evergreen | 42 | Areas dominated by trees where more than 75% of the tree species maintain their leaves all year. Canopy is never without green foliage. |
| Forest — Mixed | 43 | Areas dominated by trees where neither deciduous nor evergreen species are greater than 75% of total tree cover. |
| Bare Rock/Sand/Clay | 31 | Perennially barren areas of bedrock, desert pavement, scarps, talus, slides, volcanic material, glacial debris, beaches, and other accumulations of earthen material. |
| Quarries/Strip Mines/Gravel Pits | 32 | Areas of extractive mining activities with significant surface expression. |
| Transitional | 33 | Areas of sparse vegetative cover (< 25 percent) that are dynamically changing from one land cover to another, often because of land use activities such as forest clear cuts, a forest-ag transition, the temporary clearing of vegetation, and changes due to natural causes (e.g. fire, flood, etc.). |

# Sheet 3 – VCAP Project Tracking Document

| **Data Reporting Fields** | | | | |
|---|---|---|---|---|
| **Field** | **Required?** | **Description, purpose, and rules associated with the field** | **Example 1** | **Example 2** |
| Date Installed | Yes | Report the **year** the practice was installed. | 3/15/2015 | 5/30/2014 |
| BMP Name | Yes | Report the **practice name** either using Chesapeake Bay Program practice names, state practice names or facility-specific practice names. | TCN – Tree planting | RG |
| Practice Description | Yes | Report a description of what the BMP does or a definition. | An area of trees at least 35 feet wide on one side of a stream, usually accompanied by trees, shrubs and other vegetation that is adjacent to a body of water… | Small-Scale Bioretention implanted at the end of a downspout with no underdrain and using native soils. Landscaping is native plants… |
| Contributing Drainage Area | Yes, if 'Amount Applied' is not supplied | Report total site acres treated by the practice; includes the Impervious Acres. | N/A | 0.1 |
| Impervious Acres Treated | Optional | Report the number of impervious acres treated by the practice. If unknown or left blank, DEQ will assume the Total Acres Treated are 100% pervious urban. | N/A | 0.057 |
| Runoff Captured | Optional | If the BMP meets Virginia's performance-based water quality criteria, calculate the runoff captured in acre-feet. | | 0.0054 |
| Amount Applied | Yes, if 'Contributing Drainage Area' is not supplied | Report the number of units implemented for each practice at the location. | 0.5 | N/A |
| Measurement Unit | Yes, if 'Amount Applied' is supplied | Report the unit of measurement for the value entered under "Amount Applied." Most common measurement units will be acres, linear feet, or pounds. | Acres | N/A |

| **Data Reporting Fields** | | | | |
|---|---|---|---|---|
| **Field** | **Required?** | **Description, purpose, and rules associated with the field** | **Example 1** | **Example 2** |
| County Name | Yes | Report the name of the country in which the practice was implemented. | Culpeper | Farmville |
| State FIPS | Optional | Report State FIPs code where the practice was installed. | 51047 | 51087 |
| HUC12 | Yes | Report HUC12 where the practice was installed, if available. | 020802060105 | 020802070206 |
| Latitude | Yes | Report latitude of practice, if applicable or available. If latitude and longitude are provided HUC12 and State FIPs are unnecessary. | DDD MM' SS.S" | DDD MM' SS.S" |
| Longitude | Yes | Report longitude of practice, if applicable or available. If latitude and longitude are provided HUC12 and State FIPs are unnecessary. | DDD MM' SS.S" | DDD MM' SS.S" |
| Inspect Date | Yes | Report each inspection date (i.e. Spot Check date) for the practice. If more than 5 inspections have been performed for a given practice, insert additional columns to accommodate. | None | 7/1/2015 |
| District Approval Date | Yes | Report the date the allocation was approved by the District Boards. | 1/1/2015 | 5/15/2014 |
| Grant Source | Yes | Report the grant source providing funding. If multiple grants, insert additional columns to accommodate. | NFWF | WQIF |
| Contract Number | Yes | Report the unique District identification number. | VCAP 07-15-001 | VCAP 05-14-005 |

# **Appendix D – VCAP Forms**

VCAP Form-1: Contract

VCAP Form-2: Job Sheet

VCAP Form-3: Landowner Agreement

VCAP Form-4: Transfer of Responsibility

VCAP Form-5 Release Agreement

VCAP Form-6 Ranking Sheet

# Virginia Conservation Assistance Program (VCAP)

**Contract Number:**_____

## CONTRACT

## VCAP Form – 1

**Part A.** Application

I, _____ (PRINT) hereby make application to_____Soil & Water Conservation District for cost-share assistance to purchase and install a best management practice as described in part B below.

I /We agree that all best management practice(s) approved will be installed, operated, and maintained in accordance with the practice(s) standard(s) and the Landowner Agreement (VCAP Form – 3). I/We agree not to use the BMP for purposes of Nutrient Trading or regulatory compliance. I/We shall indemnify and save the District harmless from any and all claims for damages to persons or property arising from the installation, maintenance, repair, operation or use of the BMP(s).

I/We understand that it is my/our responsibility to pay in full all bills for work completed under this agreement prior to submission of eligible bills for reimbursement.

| | |
|---|---|
| Mailing Address: | Phone: |
| | Email: |
| Participant Signature: | Circle one: Landowner or Manager |
| SSN / Tax ID: | Submit Design Plan: |

The local Soil and Water Conservation District (SWCD) is required to issue a 1099-form to the Internal Revenue Service (IRS) for any individual to whom it issues a check for over $600.00. Because the IRS uses the Social Security number or Federal Tax ID number as an unique identifier, the SWCD must collect that information from any individual to whom it issues a check. The SWCD does not use the Social Security number or Federal Tax ID number for any purpose other than that stated above.

**Part B.** Technical Determination and District Approval **(To be completed by District Staff)**

| Practice Title | Quantity | Total Estimated Cost | Approved Estimated Cost-Share | Required Completion |
|---|---|---|---|---|
| | | | | |

**I have reviewed this application and all supporting documentation, and have indicated the quantity authorized based on technical need. This practice must be installed and certified by the completion date.**

X_____

District Employee Signature Date

**Application Approval:** X_____

District Director Signature Date

Carryover of this practice is granted to be completed by date: _____ x_____

District Director Signature Date

**Part C.** Practice Verification and Payment **(To be completed by District Staff)**

**I verify that the above practice was installed according to the practice standards and specifications.**

X_____

District / Technical Representative Date

Payment Amount _____ Date of Payment _____Check Number _____

Funding Source _____

District Soil and Water Conservation programs, activities and employment opportunities are available to all people regardless of race, color, religion, gender, age, national origin or political affiliation.

## Virginia Conservation Assistance Program (VCAP)

**Contract Number:**_____

JOB SHEET

VCAP Form – 2

**This Job sheet is to be filled out by district technical staff together with program participant. Please document any information that helps to describe any unique aspects of the project from design to completion. The Job Sheet will document the installed practice and must be submitted to the Program Coordinator at project completion.**

**Tracking and Reporting:**

Property Owner: _____ Address: _____

Manager (if applicable):_____ Contact: _____

Hydrologic Unit Code: _____ GPS Coordinate: _____

Grant Source: _____ Installation Date: _____

Practice Description: _____

Dominant Land Use Treated: _____

Contributing Drainage Area: _____ Impervious Area Treated: _____

Acres Treated or Quantity, if applicable: _____

**Ranking:** Circle or check all that apply.

| | | |
|---|---|---|
| Existing BMP Treatment: | YES | NO |
| Property Ownership: | PUBLIC | HOA or PRIVATE |
| Proximity to Waterway: | > 100 ft. | < 100 ft. |
| Type of Existing Problem: | Erosion Impact Area | Poor Vegetative Cover |
| Site located in TMDL Watershed: | YES | NO |
| BMP Type: | Structural | Nonstructural |
| Practice Addresses TMDL Pollutant: | YES | NO |
| Practice Create or Enhance a Riparian Area: | Forest Buffer | Meadow Buffer or Filter Strip |
| Practice Treats Critical Slope (>15%): | YES | NO |
| Practice Disperses Runoff on Slope: | YES | NO |
| Practice Create Disconnection: | YES | NO |
| Partnership Opportunity: | YES | NO |
| Participant will Display a Sign | YES | NO |
| Education Opportunity: | Public Visibility | Educational Program |

**Sketch Layout:** **Attach an aerial of site and practice layout.**

# Virginia Conservation Assistance Program (VCAP)

**Contract Number:**_____

## Site-Specific Details:

**Design Details:** i.e. Dimensions, Sizing, Planting Plan (Describe or Attach)

**Construction and Installation Details:** i.e. Materials and Specifications (Describe or Attach)

**Signage Requirement:** i.e. NO MOW/WILDLIFE/EDUCATIONAL (Describe)

**Permits:** Confirm local policies, such as Land Disturbance, grass heights, etc. (Describe)

**Operation and Maintenance Plan:** (Describe)

# Virginia Conservation Assistance Program (VCAP)

**Contract Number:**_____

## LANDOWNER AGREEMENT

### VCAP Form – 3

The_____Soil and Water Conservation District (District) has agreed to provide funding through a grant from the_____(*Grant Agreement #*_____) to _____*(Landowner)* for the purpose of construction of a _____*(BMP Description)* located at _____*(Landowner Address or BMP Location)*.

A total amount of $_____in cost share funding has been approved for this practice. The landowner agrees that access to the landowner's property will be allowed for the District to:

- Evaluate site and design options, and to observe construction and operation of the BMP.
- Conduct Spot Checks during the____year life span of the practice.

Such access to the site shall be secured through consultation with the landowner to determine a mutually agreeable date and time for access.

The landowner accepts responsibility for the maintenance of the BMP for the duration of its project lifespan. The landowner shall be responsible for maintaining the practice in accordance with the attached ***Job Sheet (VCAP Form-2).***

The Landowner may not use the approved BMP for purposes of Nutrient Trading or regulatory compliance.

The Landowner shall indemnify and save the District harmless from any and all claims for damages to persons or property arising from the installation, maintenance, repair, operation or use of the BMP(s).

Any breach of the above terms of this agreement shall lead to the immediate revocation of this agreement. All or part of funding assistance may be required to be refunded, on a straight line pro-rata basis based on the BMP lifespan, if the BMP is removed or not properly maintained during the life of the practice. Should the property change ownership during the life span of the practice, the landowner will work with the District to ensure that an ***Agreement Transferring BMP Responsibility (VCAP Form-4)*** form is completed. If the VCAP Form-4 is not completed, the participant remains responsible for the BMP during the project lifespan.

_____ _____

Landowner Date

_____ _____

District Representative Date

# Virginia Conservation Assistance Program (VCAP)

**Contract Number:**_____

## Agreement Transferring BMP Responsibility

## VCAP Form – 4

### Commonwealth of Virginia

### AGREEMENT TRANSFERRING RESPONSIBILITY FOR BEST MANAGEMENT PRACTICE

This agreement is intended to designate the transfer of maintenance responsibility for a Best Management Practice that received cost-share. The present participant of the property has received funding from the Commonwealth of Virginia to implement a Best Management Practice on the below-referenced land unit. In return he/she has agreed to maintain the practice until _____. Completion of this agreement acknowledges assumption of responsibility by the new participant, including the requirement to repay cost-share funds received by the present participant if the BMP is not maintained according to state specifications or in accordance with the Operations and Maintenance Plan described in the Job Sheet (VCAP Form-2).

Contract No.:_____Name of Soil and Water Conservation District: _____

Latitude:_____Longitude: _____

BMP description (if applicable): _____

Extent Installed: _____

| PRESENT PARTICIPANT-NAME & ADDRESS | NEW PARTICIPANT-NAME & ADDRESS |
|---|---|
| _____ | _____ |
| _____ | _____ |
| _____ | _____ |
| Phone No.: _____ | Phone No.: _____ |

The undersigned hereby certifies that the present participant has transferred to the new participant his or her right and interest in the land unit described above. In consideration of this transfer of ownership or leasehold, it is hereby agreed:

1. The new participant hereby assumes the duties and obligations of the present participant under Contract No.: _____ to maintain the above BMP for its lifespan in accordance with state specifications or the assigned Operation and Maintenance Plan described in the Job Sheet, and to refund all or part of the cost-share assistance or other provided funding if the practice is found not to meet state specifications, or if the practice is removed or not properly maintained during its lifespan. The new participant agrees to allow District personnel access to his/her property for the purpose of verifying maintenance of BMP.
2. The District acknowledges the transfer of the maintenance responsibility. Any cost-sharing or assistance provided under this transfer agreement shall be in accordance with applicable program rules and regulations.

| | |
|---|---|
| _____ | _____ |
| (SIGNATURE OF PRESENT PARTICIPANT) | (SIGNATURE OF NEW PARTICIPANT) |
| _____ | _____ |
| DATE | DATE |
| _____ | _____ |
| SSN or Federal Tax ID# | SSN or Federal Tax ID# |

District Board APPROVED BY: _____ DATE: _____

Release Agreement for Eligible Practices

VCAP Form -5

## PLEASE READ CAREFULLY BEFORE SIGNING

I,_____(*the Participant*), wish to forgo a licensed engineered design as required by the Virginia Conservation Assistance Program Manual for the proposed _____ (BMP Description), located at _____ (Address), funded by the _____ Soil and Water Conservation District (the District).

I agree to the following:

- I verify that the design plan submitted is in accordance with the technical criteria in the applicable program standard and specifications.
- I will insure that the Practice will be built to the design plan which was submitted and in accordance with any manufacturing instructions.
- I hereby release from all liability and hold harmless the District, any of its employees representing or related to the District, any VCAP personnel, and any volunteers or other representatives, for any personal injuries, including death, property loss, or damage in connection with any activity related to the Engineered Practice located at the location stated above.
- I hereby acknowledge that it is my responsibility to abide by any and all local code requirements, state regulations, safety regulations, and manufacturer requirements.

This contract shall be governed by the Commonwealth of Virginia in the County of_____and any applicable Federal law.

_____ _____

Signature of Participant Date Signature of District Representative Date

_____ _____

Print Name Print Name

# Instructions

## VCAP Ranking Form-6

The VCAP Ranking form is to be filled out by District staff for each application submitted for funding approval to the VCAP Steering Committee. The Contract Number, Practice Code, Estimated Cost and Cost Share Request shall be included in the Heading Section. Unless there are special instructions, input ONE for YES and ZERO for NO. Please note the Spreadsheet will compute the ranking score automatically.

**Site Specific Criteria are those elements found on the project site that may affect BMP performance.**

- Existing BMPs include any stormwater management facilities installed to provide water quantity and/or water quality treatment in accordance with applicable stormwater management regulations at the time of construction. Ideally, the proposed BMP retrofit will occur on a site devoid of any water quality treatment. Sites without an existing facility or if the facility only provides detention receive 10 points. Treatment trains or a series of BMP treatments are allowed as long as type of treatment (Infiltration/Filtering/Biological Uptake/Sedimentation) is not duplicated (i.e. a Rain Garden draining to an existing Bioretention or Dry Swale practice should be discouraged). No additional points can be given for treatment trains.
- Ownership includes Public (lands or buildings owned by Governmental agency) for 10 points; HOA (lands or buildings owned by Homeowners Associations or nonprofit) for 7 points; or Private (Residential or Business) for 5 points. Apartment Complexes will be considered under a HOA. Areas on private property but within public right-of-ways require permission and are still considered Private.
- Proximity to Waterway or Storm Drain will be determined for the area needing treatment or the point of discharge for each downspout. A distance of less than 100 feet receives 10 points.
- Problem Area may include erosion and/or poor vegetative cover. Erosion impact occurs from an area of land not being disturbed but subject to persistent soil erosion resulting in the delivery of sediments onto neighboring areas or waterways; visible signs include rills, gullies and sediment deposition. Poor Vegetative Cover occurs when the vegetation is not able to maintain a uniform density to inhibit erosion or sedimentation; visible signs include bare spots, stressed, diseased and dead vegetation resulting in a vegetative density of less than 75 percent. For planning considerations a soil map with erodibility factors should be gathered for erosion impact areas and a soil nutrient test should be performed for poor vegetative cover. Each qualifying problem receives 10 points, both may occur on a site.
- TMDL Watershed includes any site located within a watershed with an approved TMDL implementation plan for a locally impaired waterway. The type of impairment does not matter, 5 points are given.

**BMP Specific Criteria are those elements affected by the BMP selected for implementation.**

- BMP Type includes structural practices that have defined inlets and outlet and provides a quantifiable storage of stormwater runoff; Rain Gardens, Dry Wells, Constructed Wetlands, Vegetative Stormwater Conveyances, Rainwater Harvesting, Bioretention, Infiltration, Permeable Pavement and Green Roofs are examples of Structural BMPs. Nonstructural practices do not provide storage of stormwater runoff, these practices convert land cover and/or improves land management through changing behaviors; Pet Waste Stations, Urban Nutrient Management, Impervious Surface Removal, and Conservation Landscaping are examples of nonstructural BMPs. Structural BMPs are preferred and receive 10 points, nonstructural BMPs receive 0 points.

- TMDL Considerations include whether the selected BMP provides the necessary treatment mechanism for the pollutant of concern in the approved local implementation plan. See your local Implementation plan for approved practices to receive 5 points.
- Buffers refer to BMPs that create or enhance riparian areas where not required by regulation or law. Generally this is for Conservation Landscaping practices that are installed along a stream or waterway or configured to treat impervious runoff in a Filter Strip. Resource Protection Areas (RPAs), Resource Management Area (RMAs) and regulated buffer areas are not eligible for additional points. Practices that establish a Forested Riparian Buffer receive 10 points, Meadow Riparian Buffers and Filter Strips receive 5 points.
- Slopes that are critical, greater than 15%, can be treated or protected by the proposed BMP. Practices that treat erosion impact areas or poor vegetative cover on critical slopes receive 10 points; includes Conservation Landscaping and Vegetative Stormwater Conveyances. Practices that protect critical slopes by dispersing flow non-erosively receive 5 points; includes Rain Garden, Bioretention, Infiltration, and may include Dry Well, Rainwater Harvesting, or Constructed Wetland on case by case.
- Impervious Area Treated (IAT) is intended for BMPs that treat hardscapes. Square Footage divided by 1,000 is used to compute a score not to exceed 10 points. Contributing Drainage Area (CDA) is used to determine percent Impervious Cover. The square footage of the CDA is divided by the IAT and multiplied by 10, with a score not to exceed 10 point, if CDA is less than IAT than an error will occur.
- Disconnection Created occurs when the proposed BMP disconnects impervious surface. Impervious surface is disconnected when the receiving area is well vegetated and the slope is less than 5% with a minimum flow path of 40 feet. When any of these conditions are not met, then a BMP can be used to create disconnection for 10 points; includes Conservation Landscaping – Filter Strips, Rain Gardens, Dry Wells, Rainwater Harvesting, Bioretention, Infiltration, and may include Constructed Wetlands or Impervious Surface Removal on case by case. Underground downspouts do not always mean impervious connection, verify outlet location.

**Application Specific Criteria are those elements based on the quality of the application packet and agreements made that promote the program.**

- Partnership implies that the participant is a group or agency working on lands not within their ownership and there is a memorandum of agreement with the owner. This includes Master Gardner or Master Naturalists working on public lands or nonprofits working with a private residence for 5 points.
- Signage implies that the participant will place a permanent sign for the promotion of the program for 5 points. Signs must meet all local ordinances. The program will provide the sign.
- Educational Value is given when the practice is publicly visible and accessible for 10 points or the practice is part of an education program such as an outdoor classroom or demonstration site for 10 points. Only one category may be selected. Signage is preferred for educational sites.
- Initial Practice is given for District participation and for Districts that diversify the types of BMPs being implemented. First time Districts receive a one-time 10 point bonus. Each practice that is the first of its kind within the District receives an additional 10 point bonus. A maximum of 20 points may be given one-time.
- Design Plans that are complete and detailed will receive 10 points. Engineered Practices should always include a completed design plan with the Application.

## VCAP Urban Practice Ranking Sheet (VCAP Form - 6)

***This form is to be filled out by District Staff for each application submitted for funding approval to the VCAP Steering Committee. Include the Contract Number (District#-FY-###), Practice Code (abreviation), Estimated Cost (If applicable) and Cost Share Requested***

| | |
|---|---|
| **Contract #** | |
| **Practice** | |
| **Estimated Cost** | |
| **Cost Share Requested** | |

| RANKING CRITERIA<br>Site Specific Criteria | Input (1/0) | POINT VALUE | TOTAL POINTS EARNED | NOTE |
|---|---|---|---|---|
| **Existing BMPs** | | | | |
| There are no existing BMPs to treat the contributing drainage area of the practice. | 0 | 10 | 0 | |
| **Ownership** | | | | |
| Public (The practice is for a public owned space or building); or | 0 | 10 | 0 | |
| HOA (The practice is for private community owned or managed land); or | 0 | 7 | 0 | |
| Private (The practice is for an individual owner) | 0 | 5 | 0 | |
| **Proximity to Waterway or Storm Drain** | | | | |
| Less than 100 feet | 0 | 10 | 0 | |
| **Problem Area** | | | | |
| Erosion Impact Area (visible erosion and/or deposition); and/or | 0 | 10 | 0 | |
| Poor Vegetative Cover (Density <=75%) | 0 | 10 | 0 | |
| **TMDL Watershed** | | | | |
| Is the Site located within a Local TMDL Watershed with an approved Implementation Plan | 0 | 5 | 0 | |
| **BMP Specific Criteria** | | | | |
| **BMP Type** | | | | |
| Is the proposed BMP structural (e.g. RG, DW, CW, VSC, RH, BR, IF, PP, GR)? | 0 | 10 | 0 | |
| Is the proposed BMP Nonstructural (e.g. PWS, UNMP, ISR, CL)? | 0 | 0 | 0 | |
| **TMDL Considerations** | | | | |
| Practice addresses a local TMDL impairment (see instructions) | 0 | 5 | 0 | |
| **Buffer** | | | | |
| ***Practice will result in the creation or enhancement of a riparian area through:*** | | | | |
| Forested Riparian Buffer establishment (planting); or | 0 | 10 | 0 | |
| Meadow Riparian Buffer (seeded and mowed 4 times a year or less); or | 0 | 5 | 0 | |
| Filter Strip (Meadow or Mulch Bed) | 0 | 5 | 0 | |
| ***Slope*** | | | | |
| BMP Treats a slope equal to or greater than 15 percent (>=15%); and/or | 0 | 10 | 0 | |
| BMP disperses runoff nonerosively | 0 | 5 | 0 | |
| **Impervious Area Treated (IAT)** | | | | |
| Impervious Area in square feet (point value = IAT Sq. Ft. / 1,000) | **0** | **0** | 0 | |
| Total Contributing Drainage Area in square feet (point value = IAT/CDA*10) | **0** | **#DIV/0!** | #DIV/0! | |
| **Disconnection Created** | | | | |
| BMP proposes to disconnect imperivous surfaces (see instructions) | 0 | 10 | 0 | |
| **Application Specific Criteria** | | | | |
| **Partnership** | | | | |
| Practice is in conjunction with partner agency project (VCE, Master Gardeners, etc.) | 0 | 5 | 0 | |
| **Signage** | | | | |
| Applicant is willing to provide promotional signage | 0 | 5 | 0 | |
| **Educational Value** | | | | |
| Practice is located in a public or highly visible area (school, shopping center, roadway, etc.); or | 0 | 10 | 0 | |
| Practice is a component of an education site (outdoor classroom, demonstration site, etc.) | 0 | 10 | 0 | |
| **Initial Practice** | | | | |
| Application is the first for the Sponsoring District; and/or | 0 | 10 | 0 | |
| Practice is first of its kind for the Sponsoring District | 0 | 10 | 0 | |
| **Design Plan** | | | | |
| The application includes a Final Design Plan | 0 | 10 | 0 | |
| | | **TOTAL RANKING POINTS** | **#DIV/0!** | |