

Harrisonburg Conservation Assistance Program

Program Year 2019



Administered By:

Shenandoah Valley Soil & Water Conservation District



Harrisonburg Conservation Assistance Program

Introduction to this Manual

The First Edition of the Harrisonburg Conservation Assistance Program (HCAP) Implementation and Design Manual “Manual” is intended to assist Shenandoah Valley Soil and Water Conservation District “District” and City of Harrisonburg “City” staff as they implement HCAP. It is based off the statewide Virginia Conservation Assistance Program (VCAP) Manual.

The purpose of this program is to provide cost-share and technical assistance to address natural resource and stormwater concerns by assisting in the voluntary installation of certain stormwater Best Management Practices (BMPs) within city limits. HCAP also aims to assist the City with the Municipal Separate Storm Sewer System (MS4) implementation and the challenges meeting the Chesapeake Bay Total Maximum Daily Load (TMDL) goals.

This Manual is to be a resource for staff as they provide technical assistance needed to guide the proper siting, selection, design, installation, and maintenance of stormwater BMPs on eligible lands. These BMPs are intended to capture and/or infiltrate surface runoff produced immediately following a 1-inch rainfall event, on average. These BMPs are primarily designed to manage stormwater coming from a source on the property, such as a roof, driveway or lawn. Sites with contributing offsite runoff can also be addressed with the practices in HCAP 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 (<https://www.swbmp.vwrrc.vt.edu/>). 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 HCAP.

The Manual is divided into two parts. Part I summarizes the background and history of the development of HCAP and its administrative framework. Part II contains the design standards for all HCAP BMPs.

Contents

Introduction to this Manual.....	1
Part I - Program Development and Implementation	5
Section 1.1 Background and Development of HCAP.....	5
Section 1.2 Program Scope and Eligibility.....	5
Program Scope	5
Program Eligibility	5
Section 1.3 Goals and Objectives of HCAP.....	6
Section 1.4 Responsibilities.....	6
City of Harrisonburg’s Responsibilities	6
District Responsibilities.....	6
Participant Responsibilities.....	7
Section 1.5 Program Process	7
General Process	7
Approval Categories.....	8
Start and End Deadlines.....	8
Section 1.6 Application Requirements.....	8
Section 1.7 Funding Allocations, Payments, and Cost Share Caps	10
Funding Allocations and Payments	10
Guidance on Labor Rates	10
Cost-Share Rates and Caps	10
Section 1.8 Program Compliance and Corrective Action	11
Spot Checks	11
Corrective Action	11
Cost Share Repayment Hardship Process	12
Section 2.1 Introduction of BMPs	13
Practice Selection.....	13
Section 2.2 General Stormwater BMP Design Considerations	14
Compliance with Local, State, and Federal Code.....	14
Maintenance	14
Section 2.3 Policies Regarding BMP Retrofit Practices	14
Lifespan Requirements of HCAP Projects	15
Ranking Criteria for HCAP Funding	15
Engineered Practice Design Document Requirements	15
Operation and Maintenance.....	17
Technical Responsibility	17
Cost Share Guidelines	17

Planning Considerations	18
Section 2.4 Impervious Surface Removal (ISR)	19
Policies Regarding ISR	19
Criteria.....	19
Plans and Specifications.....	19
Maintenance	20
Eligible Costs	20
Helpful Technical References.....	20
Section 2.5 Conservation Landscaping (CL)	21
Policies Regarding Conservation Landscaping	21
Criteria.....	21
Plans and Specifications.....	22
Maintenance	23
Eligible Costs	23
Helpful Technical References.....	24
Section 2.6 Rain Garden (RG).....	25
Policies Regarding Rain Gardens.....	25
Criteria.....	25
Plans and Specifications.....	25
Maintenance	25
Eligible Costs	26
Helpful Technical References.....	26
Section 2.7 Vegetated Stormwater Conveyances (VSC)	27
Policies Regarding Vegetated Stormwater Conveyance.....	27
Criteria.....	27
Plans and Specifications.....	27
Maintenance	28
Eligible Costs	28
Helpful Technical References.....	28
Section 2.8 Rainwater Harvesting (RWH)	29
Policies Regarding Rain Water Harvesting.....	29
Criteria.....	29
Plans and Specifications.....	29
Maintenance	29
Eligible Costs	30
Helpful Technical Resources	30
Section 2.9 Bioretention (BR).....	31
Policies Regarding BR.....	31
Criteria.....	31
Plans and Specifications.....	31

Maintenance	32
Eligible Costs	32
Helpful Technical References.....	32
Section 2.10 Permeable Pavement (PP)	33
Policies Regarding Permeable Pavement	33
Criteria.....	33
Plans and Specifications.....	33
Maintenance	34
Eligible Costs	34
Helpful Technical References.....	34
Section 2.11 Green Roofs (GR).....	35
Policies Regarding Green Roofs	35
Criteria.....	35
Plans and Specifications.....	35
Maintenance	36
Eligible Costs	36
Helpful Technical References:.....	36

Part I - Program Development and Implementation

Section 1.1 Background and Development of HCAP

The Harrisonburg Conservation Assistance Program (HCAP) is based on the Virginia Conservation Assistance Program (VCAP). VCAP is a statewide program which is administered by local Soil and Water Conservation Districts with oversight from the City Liaison that allocates funds for projects. HCAP replicates the success of VCAP and uses local funding provided by the City of Harrisonburg Stormwater Utility Fund to assist property owners to install eligible BMPs. The City of Harrisonburg and Shenandoah Valley Soil and Water Conservation District will work in partnership to administer the program.

Section 1.2 Program Scope and Eligibility

Program Scope

Historically, the City has not had an avenue to help private property owners alleviate private drainage issues on their properties. HCAP establishes a dedicated source of funding for city residents to alleviate smaller-scale, individual drainage issues with corrective action on developed lands, hereafter described as “retrofitting.” Stormwater retrofits reduce the amount of sediment, nutrients, and other contaminants reaching streams and rivers and alleviate drainage issues. Properly managed stormwater can help recharge groundwater and protect the land and streams from erosion.

A ranking system is used to help prioritize the recruitment of participants and the implementation of BMPs, with a minimum ranking score to be determined by city and District staff based on funding. Applicants must meet all program requirements to proceed beyond the application phase.

Program Eligibility

Development

HCAP is not eligible to be used to assist new development sites to meet any local, state, or federal stormwater mandates. HCAP is intended to retrofit existing infrastructure. At the end of three years after the developed site has been completed and stabilized and an occupancy permit has been issued, an applicant is eligible to apply.

Participants

HCAP is eligible to private, non-profits, and commercial landowners within the City of Harrisonburg. State- and federally-owned land does not qualify. A practice is not eligible for HCAP funding if it meets eligibility for and corresponds to an equivalent BMP in an agricultural cost-share program (such as DCR VACS or NRCS), regardless of whether the applicant receives funding for the corresponding BMP in an agricultural cost-share program.

Practices funded through this program cannot be used for Nutrient Trading.

Practices are not intended to meet regulatory requirements of the participant.

BMP Selection

Cost-share funds must be used to install the most effective BMP needed to address the resource concern. If several BMPs are installed on the site as part of a “treatment train,” they must all be necessary to address the resource concern, and the most effective BMP must be installed first. All practices necessary to solve the water quality problem should be installed regardless of whether they receive HCAP cost-share funds. For example, a buffer should not be installed in an eroding lot unless the erosion problem on the property is also addressed.

All practices detaining and/or infiltrating runoff must be sized to treat a 1" rainfall volume as per the DEQ Stormwater BMP Clearinghouse specifications.

Property Boundaries

Before a site is chosen for a stormwater BMP, the property boundaries must be clearly defined by the property owner and verified if possible by District staff. This is to ensure that no part of the proposed BMP is to be located on property belonging to an individual not participating in HCAP. No portion of the BMP should extend to a neighbor's property.

Flooding

HCAP is not eligible to address major flooding issues on existing development. Flooding, as defined by the Stormwater Management Act, 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." HCAP may be used to address smaller scale localized flooding if 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."

Section 1.3 Goals and Objectives of HCAP

The overall program goal is to encourage owners of eligible land in the City of Harrisonburg to install stormwater 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. HCAP will accomplish the following objectives to meet the program goal:

- Maintain a suite of BMPs consistent with the Virginia Stormwater BMP Clearinghouse
- Identify environmental benefits associated with BMPs including load reductions associated with Chesapeake Bay TMDL implementation efforts.
- Establish support for HCAP through outreach and education
- Continue to develop and maintain HCAP information and outreach materials.

Section 1.4 Responsibilities

Responsibilities of program implementation are outlined in the Memorandum of Agreement between the City of Harrisonburg and the Shenandoah Valley Soil and Water Conservation District.

City of Harrisonburg's Responsibilities

- The City will approve program level issues such as Manual revisions, BMP criteria, and any changes to official HCAP policies.
- The City will promote HCAP.
- The City will report completed practices to the DEQ BMP Warehouse.
- The City will provide final review and approval of applications.
- The City will review and approve engineer designs.

District Responsibilities

- The District will review applications for completeness and feasibility and will present complete, high quality applications to the City for consideration and approval.

The District is to review the Application Packet for compliance with HCAP policies as described in the HCAP Manual.

Participant Responsibilities

Participants may not begin any construction until the application is approved by the City. If participants begin construction before their application is approved, they will not be eligible to receive cost-share for that project.

It is the participant's responsibility to ensure that any contractors meet all local codes and responsibilities.

Participants are responsible to pay for work completed under this agreement prior to submission of eligible invoices for reimbursement.

The Operation and Maintenance Plan further describes the participant's obligations to maintain the BMP. The participant is responsible for the maintenance of the BMP for the entire lifespan of the practice, regardless of changes in the ownership of the land. Maintenance agreements between the involved parties are acceptable but ultimate responsibilities still rest with the participant that signs the Application and Contract Form.

In cases where a change in ownership of the land occurs, such as the sale of the property, or any changes in lease agreements, the participant shall notify the District to complete an Agreement Transferring Agreement Form to relieve them of responsibility for the practice by transferring it to the new owner. If this form is not completed, the participant continues to be the responsible party regardless of ownership of the subject property.

Section 1.5 Program Process

General Process

1. Application

- Follow procedures listed in Section 1.6 and apply by submission deadline.

2. Approval

- Wait for notification of practice approval from the District. Approval notices will be sent by letter.

3. Design Review

- For engineered practices- Following approval, the City will review the design from the engineer. The participant shall wait for the District to notify them of design approval before starting any work.
- For non-engineered practices- Following approval, the participant shall wait for the District to notify them of design approval before starting any work.

4. Construction/Installation

- Participants may not begin any construction until the application is approved by the City and the District. If participants begin construction before their application is approved, they will not be eligible to receive cost-share for that project.

5. District Inspection/Certification, As-Built, District receipt of project invoices

- For engineered practices- Following completion of installation, engineer must submit an As-Built design to the District, copies of project invoices must be submitted to the District, and the District and city staff must complete final site evaluation.
- For non-engineered practices- Following completion of installation, copies of project invoices must be submitted to the District, and the District and city staff must complete final site evaluation.

6. Reimbursement

- Following completion of all previous steps, the District will provide reimbursement.

7. Spot Check

- Following payment and during the lifespan of the practice, the District and City staff may periodically conduct a spot check of the practice (See Section 1.8).

Approval Categories

For high quality, completed applications that meet ranking criteria, the approval process will fall into the one of the two categories below:

Approval

- A non-engineered practice
- An engineered practice with a full, completed design

Conditional Approval

- An engineered practice with a feasibility package

Following conditional approval, participants shall contact their engineer to develop a full complete design plan for their project. The design plan will need to be submitted to the District for review and approval. The participant may not start construction until receipt of design approval from the District.

Start and End Deadlines

If a participant does not begin work within 90 days of application approval, the District shall follow up with the participant and request justification for failure to start the project within 90 days. An extension may be granted if the participant provides a justification deemed reasonable by city staff, such as waiting for the appropriate planting season. Hiring a contractor or purchasing materials qualifies as starting a project; obtaining a permit does not qualify.

Projects must be completed by June 1st of the calendar year following the approval of the application. The District should work with the participant to ensure project completion timely and communicate any potential problems to the City. Contracts that cannot be completed by June 1st of the calendar year following the approval will be cancelled.

Section 1.6 Application Requirements

The applicant must have a current federal tax form W-9 on file with the District to assure that correct tax information for the applicant is available for reporting purposes. A 1099 tax form will be issued to applicants based on the W-9 data on file, for payments of \$600 or greater in a calendar year.

Below is the general 3 step application process.

Step 1: Determine if your project will require engineering

HCAP Practice	Engineered Practice?
Impervious Surface Removal (ISR)	No- See 2A Non-Engineering Application Process
Conservation Landscaping-Meadow (CL-M)	No- See 2A Non-Engineering Application Process
Conservation Landscaping-Trees (CL-T)	No- See 2A Non-Engineering Application Process
Rain Garden (RG)	Yes- See 2B Engineering Application Process
Vegetated Stormwater Conveyance (VSC)	Yes- See 2B Engineering Application Process
Rainwater Harvesting (RH)	Yes- See 2B Engineering Application Process
Bioretention (BR)	Yes- See 2B Engineering Application Process
Permeable Pavement (PP)	Yes- See 2B Engineering Application Process
Green Roof (GR)	Yes- See 2B Engineering Application Process

Step 2: Start and submit application

2A. Non-Engineering Application Process

- Contact the District to set up an appointment to: review your project, get an application packet and project planning worksheet, and set up a site visit.
- Complete application includes:
 - Completed Application Forms
 - Application and Contract Form
 - W9 Form
 - Three (3) quotes with itemized estimated cost for project. If project includes multiple BMPs, separate estimates for each BMP should be provided. If the applicant will be constructing the project themselves, the applicant will need to submit the estimated volunteer labor hours and cost using the federal volunteer labor rate
 - Completed Project Planning Worksheet
 - Completed Site Visit (to be done by the District)

2B. Engineering Application Process

- Contact the District, to set up an appointment to: review your project, get an application packet and design package requirements, and set up a site visit.
- Complete application includes:
 - Signed and Completed Application Forms
 - Application and Contract Form
 - W9 Form
 - Three (3) quotes with itemized estimated cost for project. If project includes multiple BMPs, separate estimates for each BMP should be provided. If the applicant will be constructing the project themselves, the applicant will need to submit the estimated volunteer labor hours and cost using the federal volunteer labor rate
 - Engineer's Design Package or Feasibility Package (See Section 2.3)
 - Completed Site Visit (to be done by the District)
- Select an engineer to design your project in accordance with required specifications
- Engineer to complete required components of Feasibility Package or Design Package and submit to the District (See Section 2.3)

Step 3: Submit your completed application by the deadline

Section 1.7 Funding Allocations, Payments, and Cost Share Caps

Funding Allocations and Payments

HCAP is funded by the City of Harrisonburg Stormwater Utility Fee. Funding will be allocated based on ranking criteria. The ranking criteria will be consistently administered when considering any application for approval.

All projects approved by the City during a given calendar year must begin work within 90 days of approval to qualify for cost-share payment and must be completed by June 1st. The District should contact the City if they foresee obstacles in completing projects before the deadline.

Occasionally there may be costs that are incurred during construction that exceed the cost-share amount originally approved. In these cases, the District may request an increased cost-share payment by submitting the Adjustment Calculation Worksheet to the City prior to final payment. The increased costs must be unavoidable and must be necessary for the proper functioning of the BMP. The costs must also be within the scope of the design plan that was approved by the City prior to the beginning of construction. The decision to award the increased cost-share payment is at the discretion of the City.

Please note that any applicant may pair HCAP cost-share funding with other grant sources or cost share programs to fund a project. Please note that HCAP funds, partnered with other such resources or not, may never exceed one hundred percent (100%) of the total cost for completing the project.

Guidance on Labor Rates

This guidance provides clarification for allowing volunteer hours that have value in the calculations to determine cost-share payment amounts. HCAP does not restrict the source of the labor that a participant may utilize and submit as a cost associated with the implementation of approved BMPs. Applicants choosing to utilize volunteer labor, to include the participant, their family members, and other unpaid help, must submit such labor as part of the cost estimate in the application packet. Labor rates should be estimated at the current federal volunteer rate. The application packet shall outline the anticipated number of volunteer hours needed to install the BMP. Volunteer labor eligible to receive cost-share is restricted to the labor required for installation of the BMP, and the maximum number of volunteer hours eligible to receive cost-share is 15 hours. Exceptions may be granted on a case by case basis if the participant provides written justification and documentation that additional volunteer hours are needed. The decision to award the additional hours is at the discretion of the District and the City.

It is important that the number of hours and value of those hours is appropriate to accomplish the BMP installation. The practice participant must provide documentation to support the labor component of the installed practice, meaning the quantity of labor hours and the labor performed. The most pertinent questions to answer when calculating the cost share payment is whether the labor submitted is appropriate for the labor required to implement the practice and is reasonable for the amount of work accomplished.

Cost-Share Rates and Caps

Assigned cost-share rates and caps will apply to all applications during a given program year. Rates for each practice are described in further detail below. All applicants will be limited to \$30,000.00 in total cost-share received per calendar year, per entity, based on date of application approval. One contiguous BMP cannot have more than one application from the same property owner(s) regardless of property boundaries nor will the HCAP program accept multiple applications from adjacent property owners for the same contiguous project.

Permit fees are not an eligible component cost for any practice and therefore cannot receive cost-share. Contractor design fees are an eligible component cost under HCAP. As with all eligible costs, design fees will be subject to review by the City to determine if costs are reasonable in comparison to project scope. Contractor fees for completing HCAP Forms or meeting HCAP specifications will not be allowed. This is the responsibility of the property owner.

HCAP Practice	Cost Share Rate	Cost Share Cap
Impervious Surface Removal (ISR)	75%	\$7,500
Conservation Landscaping-Meadow (CL-M)	75%	\$3,500
Conservation Landscaping-Trees (CL-T)	75%	\$3,500
Rain Garden (RG)	75%	\$3,500
Vegetated Stormwater Conveyance (VSC)	75%	\$10,000
Rainwater Harvesting (RH)	75%	\$10,000
Bioretention (BR)	75%	\$15,000
Permeable Pavement (PP)	75%	\$15,000
Green Roof (GR)	75%	\$15,000

Section 1.8 Program Compliance and Corrective Action

Spot Checks

Spot checks are verification inspections meant to determine practice existence and viability during the lifespan of the practice and are not intended as a technical inspection. Technical accuracy is determined by a city staff member at the time of completion.

1. Random practice verification inspections will be conducted by city staff to determine that the individual practice is still viable. The City should keep all inspection forms and photo documentation on file for at least the lifespan of the practice.
2. For vegetative practices, spot checks should be conducted at a time of active growth.
3. A random 25% selection of all active projects will be checked by the City annually.
4. Copies of each spot check form shall be maintained in the city files.
5. Spot check reports on practices receiving cost-share from other sources should be copied to the appropriate agency.
6. The City will consolidate all spot check information into a table indicating how many inspections were conducted, how many practices were in compliance, and how many practices require additional District follow up. A copy of this report should be provided to the City. The report will be used by the City to assure that practices needing additional District attention receive the appropriate follow-up and that all issues are resolved, or the appropriate amount of cost-share funds are repaid to the District.

Corrective Action

City staff shall maintain written and photo documentation of practices failing to meet specifications. Failure to maintain the practice for the specified lifespan (10 years for all practices) 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 Agreement Form 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 City's notification of repayment to refund the cost-share funds.

Cost Share Repayment Hardship Process

This process may be utilized when a participant requests that the requirement for the repayment of cost-share funds due to the failure of a BMP be forgiven due to unusual circumstances beyond the participant's control. The circumstance(s) must be of a severity such as a life-threatening illness, bankruptcy, or some other situation out of the participant's control, including but not limited to natural disasters. This process may not be used to provide relief associated with practice specifications or operation and maintenance agreements, such as requirements for maintaining a percentage of vegetative cover. All requests for hardship shall be submitted in writing to the City and the decision to grant the cost-share repayment hardship exemption is at the discretion of the City.

PART II - BMP RETROFITS

Section 2.1 Introduction of BMPs

A “retrofit” occurs when a BMP is installed 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 systems; adjacent to parking lots or other impervious areas; within right-of-ways; and on individual residential properties.

The specifications and application of 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 are 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:

- Impervious Surface Removal (ISR)
- Conservation Landscaping (CL)
- Rain Gardens (RG)
- Vegetated Stormwater Conveyances (VSC)
- Rainwater Harvesting (RWH)
- Bioretention (BR)
- Permeable Pavement (PP)
- Green Roofs (GR)

Practice Selection

BMP selection will be based on resource concerns and site conditions and will include applicant objectives. Sites should have an identifiable water quality issue, and BMP objectives must address the identified resource concern(s) and shall be limited to practices that capture and reuse or treat stormwater. Measures to only reduce flooding will not be eligible for cost share. The HCAP Site Assessment Tool can be used to assess the site conditions and help determine the best practice to address the water quality issue.

The selection of the most effective stormwater practice depends on the nature of the terrain, the intensity of development, and the sensitivity of the receiving water. The DEQ Stormwater BMP Clearinghouse provides a matrix to help determine which practices are recommended, acceptable, restricted or prohibited based on areas of karst, trout watersheds, ultra-urban watersheds and stormwater hotspots.

Cost-share funds must be used to install the most effective BMP needed to address the resource concern. If several BMPs are installed on the site as part of a “treatment train,” they must all be necessary to address the resource concern, and the most effective BMP must be installed first. All practices necessary to solve the water quality problem should be installed regardless of whether they receive HCAP cost-share funds. For example, a buffer should not be installed in an eroding lot unless the erosion problem on the property is also addressed.

The selection of the most effective stormwater practice depends on the nature of the terrain, the intensity of development, and the sensitivity of the receiving water. Districts may refer to the DEQ Stormwater BMP Clearinghouse, which provides a matrix to help determine which practices are recommended, acceptable, restricted or prohibited based on areas of karst, coastal plain, trout watersheds, ultra-urban watersheds and stormwater hotspots.

Examples:

- Sites which have water volume issues and an onsite need for water could consider Rainwater Harvesting (RWH) to collect and reuse stormwater.
- Sites with known erosion problems and poor drainage could consider improving the stormwater conveyance system.
- 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.

Section 2.2 General Stormwater BMP Design Considerations

BMPs must be designed to the specifications listed in the DEQ BMP Clearinghouse.

Compliance with Local, State, and Federal Code

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.

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, may influence BMP selection. District staff should discuss the following maintenance requirements with all participants:

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, 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.

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).

Section 2.3 Policies Regarding BMP Retrofit Practices

A brief description of each BMP is discussed in the subsequent sections of this chapter. Detailed BMP specifications are found on the Virginia Stormwater BMP Clearinghouse. HCAP BMPs must follow

specifications outlined by the Virginia Stormwater BMP Clearinghouse, or other standards as outlined in this manual. Below are the design standards that pertain to all practices within Part 2.

Section	HCAP Practice Name	Code	Engineered Practice?
2.4	Impervious Surface Removal	ISR	No
2.5	Conservation Landscaping-Meadow	CL-M	No
2.5	Conservation Landscaping-Trees	CL-T	No
2.6	Rain Garden	RG	Yes
2.7	Vegetated Stormwater Conveyance	VSC	Yes
2.8	Rainwater Harvesting	RH	Yes
2.9	Bioretention	BR	Yes
2.10	Permeable Pavement	PP	Yes
2.11	Green Roof	GR	Yes

Lifespan Requirements of HCAP Projects

- Once installed, projects should be considered permanent landscape features and an effort should be made to provide for continuation beyond HCAP commitment.
- All practices must be maintained for 10 years.

Ranking Criteria for HCAP Funding

Each application will receive a numeric ranking score based on water quality improvement parameters. Applications with higher ranking scores will receive priority for funding allocations.

Engineered Practice Design Document Requirements

Use the following guidelines for engineered practices.

HCAP Engineered Practices & Associated Virginia Stormwater Design Specifications		
HCAP Practice Name	HCAP Practice Code	Applicable Virginia Stormwater BMP Clearinghouse Design Specification Number*
Rain Garden	RG	No. 1 & No. 9
Vegetated Stormwater Conveyance	VSC	No. 10, No. 11 & No. 13
Rainwater Harvesting	RH	No. 6
Bioretention	BR	No. 9
Infiltration	IF	No. 8
Permeable Pavement	PP	No. 7
Green Roof	GR	No. 5

*Applicable Design Specifications can be found at: <https://www.swbmp.vwrrc.vt.edu/>

General Requirements

All documents should be on engineer's letterhead or design sheets and shall include:

- Participant name and address
- Engineer's/Designer's name, business address and contact information

- For Professional Engineers-Designs should include: Professional seal, signature and date
- For Pre-Approved Project Designers-Designs should include: Business Name, signature and date
- Identify address of proposed project location
- Map of area of proposed project area
- Detailed material lists

Feasibility Statement Package Requirements

- Identify address of proposed project location
- Map of area of proposed project area
- Identify proposed project dimensions (sqft and depth) /treatment area and contributing drainage area
- Detailed material lists
- Infiltration Test Results in inches/hr (if applicable)
- Minimum depth to water table from bottom of planned reservoir depth
- Statement describing the feasibility of project
 - “To the best of my professional knowledge, judgement and belief that the identified project location is adequate to support the requested (practice name) practice. Upon approval, I will perform the design and associated installation plan to meet applicable standards and specifications in the Harrisonburg Conservation Assistance Program (HCAP) manual as well as any referenced Virginia Stormwater BMP Clearinghouse Design Specifications.”

Design Package Requirements

- Identify project dimensions/treatment area and contributing drainage area
- Detailed drawing of practice to include all specifications for individual components
 - Identify project location and adjacent areas
 - Include specifications and drawings of specialized components to include size, quantity, and type/brand name
 - Identify where water enters and leaves the practice
 - Cross section showing depth, slope, and inlet, outlet and overflow structures (where applicable)
 - Include appropriate erosion and sediment control measures (if needed)
- Detailed construction/installation sequence instructions with references identifying key stages that the engineer needs to be on-site to inspect progress/installation. The engineer will be responsible for final certification of this practice, thus identifying and inspecting the key stages of construction and installation is critical.
- Site constraints for construction should be identified
- Calculations performed/required as well as the results of any required infiltration/percolation tests; clear calculations for storage volume are needed.
- Minimum depth to water table from bottom of planned reservoir depth
- Infiltration Test Results in inches/hr (if applicable)
- Maintenance recommendations/requirements
- The following statements:
 - Modification/Substitution Statement that specifies any substitutions or modifications must receive pre-approval from engineer
 - Design Standards Certification Statement: “To the best of my professional knowledge, judgement, and belief, this design, including drawings, calculations, and specifications,

meet the applicable standards and specifications in the Harrisonburg Conservation Assistance Program (HCAP) manual as well as any referenced Virginia Stormwater BMP Clearinghouse Design Specifications.”

- Permitting Compliance Statement that specifies the design and installation details are in compliance of all local permitting requirements and local codes.
- Locate Public Utilities Statement that specifies to contact Miss Utility prior to work.

Note that the design package must include sufficient detail to allow the District to verify that the design is in accordance with the Harrisonburg Conservation Assistance Program manual as well as any referenced Virginia Stormwater BMP Clearinghouse Design Specifications.

As-Built Package Requirements

- Detailed drawing of final practice to include:
 - Noting any changes from the original approved design plan
 - Identify project location and adjacent areas
 - Include specifications and drawings of specialized components used to include size, quantity, and type/name brand.
 - Identifies where water enters and leaves the practice
- The following statements:
 - As-Built Certification Statement: “To the best of my professional knowledge, judgement, and belief, this practice is installed in accordance with the construction drawings (as shown on these As-Built drawings) and meet the applicable standards and specifications in the Harrisonburg Conservation Assistance Program manual as well as any referenced Virginia Stormwater BMP Clearinghouse Design Specifications.”
 - Permitting Compliance Statement that specifies the practice and installation details are in compliance with all local permitting requirements and local codes.

Operation and Maintenance

- All practices will be subject to spot checks by city staff during the practice’s lifespan.
- Participant is responsible for all maintenance responsibilities for the practice per an approved Operation and Maintenance Plan. This agreement will include specific maintenance objectives described for each BMP.

Technical Responsibility

- The participant will be responsible for submitting all project plans. Technical guidance may be provided by the District. All projects must meet local codes, ordinances, and policies, and must address any permitting requirements.
- The District and City are 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.
- A licensed or certified professional is responsible for certifying design plans for engineered practices.

Cost Share Guidelines

- Itemized cost estimates are required to determine the maximum cost-share amount.
- Cost share payment shall not exceed the total cost of installation.
- The District is required to issue a Form 1099- (IRS) for any individual it issued a payment over \$600.00

- HCAP Cost Share funds may be combined with other grant or cost-share resources, but may not exceed one hundred percent (100%) of total practice costs. If receiving additional funding for this project, the applicant is required to fully disclose to the SWCD funding source(s) and amount(s).
- For engineered practices, up to \$750 will be eligible for feasibility statement work.

Planning Considerations

- Setbacks from dwellings/buildings, septic systems, and wells shall follow guidelines per the practice standard.
- 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)

Section 2.4 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. Removing impervious areas and replacing the area with pervious materials also serves the intended purpose.

Policies Regarding ISR

Patios, walkways, parking areas, driveways, and other impervious surfaces can be converted to pervious areas that increase infiltration to groundwater. Gravel driveways and walkways more than three years old are considered an impervious surface. For example gardens, lawns, and permeable pavers can be used in place of the impervious area removed. For impervious surface removal costs to be offset by HCAP, they must be accompanied by an approved stabilization plan.

- ISR can be a standalone practice when not followed by the installation of a HCAP BMP, e.g. the site beneath the removed surface is stabilized with vegetation.
- When ISR is followed by the installation of another HCAP practice, ISR will become a component of that practice, and the cost-share of that practice will increase to account for the cost-share rate for ISR (except for permeable pavement). In these situations, the applicant would submit one application for the primary BMP with ISR as a component.
- When ISR is followed by permeable pavement, ISR will become a component of that practice, but the applicant will not receive additional cost-share for ISR. In these situations, the applicant would submit one application for PP with ISR as a component.

Criteria

- This BMP is not intended for impervious surface removal associated structure (roof) 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 permanent 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. Tillage may be required to address soil compaction. Addition and incorporation of topsoil or organic matter may be necessary for proper seedbed establishment.

Plans and Specifications

This practice does not require adherence to specific technical specifications other than what is outlined below.

A design plan for the site must be submitted by the applicant and approved by the City before construction is initiated. The installed practice must be in accordance with the approved design unless changes were pre-approved by the City. Information required in the design plan includes (see HCAP Submission Checklist for a comprehensive list):

- Project Planning Worksheet
 - Total impervious surface area to be removed
 - Detailed sketch/aerial map of the site
 - Photos of the site, including the resource concern(s)
 - A plan for fragmenting, removal and disposal of existing impervious cover.
 - A plan for soil preparation
 - Competition controls
 - A plan for final site stabilization
 - Expected timeline for completion
- Erosion and Sediment Control Plan, if applicable
- Site constraints for construction should be identified

Maintenance

- If using vegetative cover:
 - Maintenance inspection of the planted area shall be conducted annually by the landowner, or a designated sub-contracted agent of the landowner.
 - Weeding
 - Remove any dead or diseased plants
 - Dead-head flowers
 - Remove trash
 - Ensuring full vegetative cover remains intact and invasive species are controlled if vegetation is used.
- No impervious surface built over the treated area.
- Stabilize any eroded or bare areas
- Site specific maintenance items depending on final stabilization plan.
- If installing permeable pavement, adhere to the Permeable Pavement (PP) O&M plan

Eligible Costs

- Eligible costs may include: demolition (removal and disposal of surface material and aggregate), soil testing, seedbed preparation (harrowing/raking/tillage/amending soil), herbicide application, permanent seed, mulch, sod, erosion and sediment controls when needed.

Helpful Technical References

- Conservation Landscaping BMP in this Manual (see Section 2.5 below).
- Permeable Pavement BMP in this Manual (see Section 2.11 below)
- VA Stormwater Clearinghouse Design Specification No. 4 Soil Amendments.
- VA Erosion and Sediment Control Handbook Standard and Specification 3.30 – Top soiling.

Section 2.5 Conservation Landscaping (CL)

This practice encompasses the conversion of managed turf grass areas or bare soils to areas planted in native herbaceous and woody species. Managed turf is defined as grassed soil that no longer functions in its natural hydrologic state due to disturbance, compaction, or excessive management (West Virginia Department of Environmental Protection). Converting managed turf or bare soils into highly functioning ecosystems collectively in a community can have 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 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 to provide the same amount of stormwater runoff protection. Therefore, the conversion of managed turf or bare soils to native plants will generally be beneficial from a non-point 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/year of phosphorus (Chesapeake Stormwater Network Technical Bulletin No. 9, 2011).

Policies Regarding Conservation Landscaping

There are two conservation landscaping practices covered under this standard: Meadow and Tree Planting. Tree planting may be used for establishing a Riparian Buffer along a water feature, addressing an erosion problem, or to convert from turf. Meadows may be used to address an erosion problem or convert from turf. This practice is a nonstructural BMP.

Photo documentation and District verification of the resource concern(s) must be provided in the application.

Criteria

Perennial native species that are adapted to the site conditions must be used. 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. Plant species must be considered native "Flora of Virginia." Only native plants will be allowed in a conservation landscaping plant list or planting plan. See Helpful Technical References section for publications and websites related to native plants. Invasive or noxious species, as identified by the DCR invasive species list, and/or the USDA noxious weed list are prohibited. Additionally, annual plants, vegetables, and herbs are not allowed. The City reserves the right to deny applications and/or withhold cost-share payments from any projects that install invasive or noxious species.

Vegetation establishment must include proper soil preparation. Tillage 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 shall be limited according to the approved Operation and Maintenance Plan. Mowing of grass under tree plantings shall be limited to four times per year.

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.

Tree plantings are required 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 City. Obtaining a Department of Forestry (DOF) plan is recommended for tree plantings.

Wet areas not suitable for Rain Gardens or pocket wetland practices may be converted to a wet meadow under Conservation Landscaping. This should be used in areas where standing water or saturated soil limits vegetative cover to less than 90% and contributes to a water quality concern downstream.

Required density and minimum ground covers for all plantings will be based on mature size of approved species within the approved site-specific plans.

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. Only the minimum amount of fertilizer necessary to establish vegetation growth shall be utilized (according to soil test report).

Measures to exclude pests that will interfere with the timely establishment of vegetation must be employed.

Plans and Specifications

This practice does not require adherence to specific technical specifications other than what is outlined below.

A planting plan for the site must be submitted by the applicant and approved by the City before construction is initiated. The installed practice must be in accordance with the approved design unless changes were pre-approved by the City. Information required in the planting plan includes (see HCAP Submission Checklist for a comprehensive list):

- Project Planning Worksheet
 - Type of Conservation Landscaping.
 - Square footage of the area being planted.
 - Linear feet of stream being buffered (if applicable).
 - Slope of the land.
 - Plan to control and/or eliminate unwanted existing vegetation.
 - Landscape planting and mulching plan to include:
 - Species (plant list can include the common plant name but must include the scientific name)
 - 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.
 - Vegetables, herbs, and annual plants are not allowed in the landscape plan.
- Material list and itemized cost estimates.

- Include the amounts, timing and method of application of each amendment.
- If working with Virginia Department of Forestry (VDOF), attach VDOF site plan.
- Site constraints for construction should be identified
- Sketch and aerial photo showing the location, specifications, contributing drainage area, impervious area(s) treated, dimensions of the practice, and project layout
- Photos of the site, including the resource concern(s)

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:

- Water plants as needed
- Control undesirable weeds (mowing, hand cutting, weed eating) It is recommended to mow only one third of the project area. Mowing only a portion of the area will allow beneficial insects to have suitable habitat nearby. Spot treat invasive species, as needed.
- Stabilize eroded or bare areas.
- Mowing:
 - In the first growing year, if undesirable weeds become an issue, may need to mow three times, about once a month in summer (June, July, and August). Do not mow area lower than 6-8 inches. Never mow when soils or plants are wet.
 - In subsequent years, if needed, mow high (6-10 inches) no more than twice a year, either before or after nesting season (typically early March or mid-August). Never mow when soils or plants are wet.
 - Weeds should be mowed at a height of about one foot in the second growing season. Biennial weeds should be mowed when in full bloom, but before setting seed, usually around mid-June.
- Applying fertilizer after the first growing season (vegetation establishment) is prohibited as one of the purposes of HCAP is to reduce sources of nutrient pollution.
- Pesticide use should be limited and applied only when needed and in accordance with product label
- Annual survey of planted area to evaluate for invasive species and plant survival/success. Vegetation must achieve an overall survival rate of 75% throughout the ten-year maintenance agreement period. Remove dead or diseased plant. Replant vegetation, as needed, to ensure required stand/survivability.
- Trash should be removed at least annually.
- Issues of trespassing, leading to damaged vegetation, should be addressed.

Eligible Costs

Eligible costs may include: soil testing, site preparation (herbicide, sod removal, harrowing, raking, tillage), installation (broadcast, drill, or planting), temporary and permanent seed, plants, mulch, soil amendments (compost and lime), tree shelter, weed barriers, erosion and sediment controls when necessary.

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.
- Dorner, Jeanette. An Introduction to using native plants in restoration projects. National Park Service. 2000.
- Homeowner Guide to Make your Property Bay Friendly. Chesapeake Stormwater Network. June 19, 2013.
- Native Plant Resources:
 - Native Plant Center (ACB)
 - Digital Atlas of the Flora of Virginia
 - Flora of Virginia Project
 - Native Plants for Conservation, Restoration & Landscaping
 - Virginia Native Plant Society

Section 2.6 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.

Policies Regarding Rain Gardens

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.

Criteria

This practice requires adherence to the technical specifications outlined by the Virginia DEQ Stormwater Design Specification No. 9 on the Virginia Stormwater BMP Clearinghouse.

Plans and Specifications

A design plan for the site must be submitted by the applicant and approved by the City before construction is initiated. The installed practice must be in accordance with the approved design unless changes were pre-approved by the City. Information required in the design plan includes (see HCAP Submission Checklist for a comprehensive list):

- An infiltration test should be conducted to a minimum depth of 12", and the infiltration test results must be submitted with the application.
- Provide calculations verifying sizing and outlet capacity.
- 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. Plant list can include the common plant name but must include the scientific name. Vegetables, herbs, and annual plants are not allowed in the landscape plan
- A statement regarding compliance with any permitting requirements.
- Design should meet Engineered Practice Design Document Requirements (see section 2.3)

It is the HCAP participant's responsibility to ensure any contractors meet all local codes and requirements.

Maintenance

Maintenance inspection shall be conducted annually by the landowner or a designated sub-contracted agent of the landowner.

Maintenance requirements are outlined in the technical specifications for this practice.

Maintenance will also include:

- Water plants during dry periods
- Control and remove invasive species through the use of mechanical (weeding) methods.
- Remove and replace dead or diseased plants- replant if survival rate is poor (<50%)

- Ensure runoff flow routes function as designed
- Remove accumulated sediment
- Stabilize any eroded or bare areas, especially overflow route
- Reapply mulch, as needed
- Remove trash accumulation, especially from inlet area
- Remove excess leaves

Eligible Costs

Eligible costs may include: soil testing, excavation, grading/amending soil, plants, seed, installation costs (planting/seeing), compost, mulch, pre-treatment costs, engineered soil, and underdrain components (pipe, stone) when necessary. A maximum of \$750 will be eligible for feasibility statement work.

Helpful Technical References

- Virginia Stormwater BMP Clearinghouse Design Specification No. 1 and No. 9.
- Rain Garden Design and Construction: A Northern Virginia Homeowner Guide. Fairfax County, Va. 4/2009.
- Virginia Cooperative Extension Urban Water Quality Management Rain Garden Plants. Pub 426-043.
- Cogger, Craig. Compost Amendment Rate Calculator. Washington State University. Rain Garden Landscape Templates for the Mid-Atlantic.

Section 2.7 Vegetated Stormwater Conveyances (VSC)

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 or other suitable ground cover.

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 Vegetated Stormwater Conveyance

Vegetated Stormwater Conveyances shall not be used to modify or channelize existing drainage. Step Pool Conveyance Swales shall only be considered after all other measures have been evaluated.

Criteria

This practice requires adherence to the technical specifications outlined by the Virginia DEQ Stormwater Design Specification No. 10 (Dry Swales) or No. 11 (Wet Swales) on the Virginia Stormwater BMP Clearinghouse.

Plans and Specifications

A design plan, with a professional seal, must be submitted by the applicant. The installed practice must be in accordance with the approved design unless changes were pre-approved by the City. Information required in the design plan includes (see HCAP Submission Checklist for a comprehensive list):

- An infiltration test should be conducted to a minimum depth of 12 inches, and the infiltration test results must be submitted with the application.
- Provide results of a soil assessment.
- Provide adequate conveyance calculations.
- Computations for Treatment Volume (Tv) in accordance with the applicable standards from the BMP Clearinghouse.

- Landscape plan. Plant list can include the common plant name but must include the scientific name. Vegetables, herbs, and annual plants are not allowed in the landscape plan.
- A suitable Erosion and Sediment Control Plan to stabilize the flow area.
- A statement regarding compliance with any permitting requirements or local codes.
- Certification by a Licensed Professional may be required by the District to verify practice installation.
- Design should meet Engineered Practice Design Document Requirements (see section 2.3)

Maintenance

Maintenance inspection shall be conducted annually by the landowner or a designated sub-contracted agent of the landowner.

Maintenance requirements are outlined in the technical specifications for this practice.

Eligible Costs

Eligible costs may include: excavation, grading, soil amendments, installation costs (planting/seeding), engineered soil, plant material (including live stakes and fascine cuttings), geotextile fabric, check dams, erosion and sediment controls (matting), riffle substrate, riprap/boulders, underdrain components, pretreatment costs. A maximum of \$750 will be eligible for feasibility statement work.

Helpful Technical References

- Virginia Stormwater BMP Clearinghouse Design Specification No. 10 and 11.
- Virginia Erosion and Sediment Control Handbook, 3rd Edition.
- Regenerative Step Pool Storm Conveyance (SPSC) Design Guidelines. Anne Arundel County Maryland. December 2012.

Section 2.8 Rainwater Harvesting (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. Non-potable 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, and replenishing and operation of landscaping water features and water fountains. Replenishing of pools may be acceptable if special measures are taken, as approved by the appropriate regulatory authority. Applicants should contact their local health department or other regulatory authority for required gray water permits.

Policies Regarding Rain Water Harvesting

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.

Criteria

This practice requires adherence to the technical specifications outlined by the Virginia DEQ Stormwater Design Specification No. 6 on the Virginia Stormwater BMP Clearinghouse.

Plans and Specifications

A design plan, with a professional seal, must be submitted by the applicant. The installed practice must be in accordance with the approved design unless changes were pre-approved by the City. Information required in the plan includes (see HCAP Submission Checklist for a comprehensive list):

- A basic Water Use Plan describing how and when water will be dispersed.
- Foundation Design.
- Winterization plan.
- Cistern sizing calculations.
- A statement regarding compliance with any permitting requirements or local codes.
- Certification by a Licensed Professional may be required by the District to verify practice installation.
- Design should meet Engineered Practice Design Document Requirements (see section 2.3)

Maintenance

Maintenance inspection shall be conducted annually by the landowner or a designated sub-contracted agent of the landowner.

Maintenance requirements are outlined in the technical specifications for this practice.

Maintenance will also include:

- Inspect and clean pre-screening devices and first flush diverters
- Remove debris and leaves out of gutters and downspouts

- Inspect tank for and remove sediment buildup. Inspect and clean storage tank lids, paying special attention to vents and screens on inflow and outflow spigots.
- Check mosquito nets and patch holes
- Check condition of overflow pipes, overflow filter path and/or secondary runoff reduction practices
- Replace damage or defective parts
- Repair any erosion downstream of overflow outlet
- Remember to keep tank volume lower during colder weather to prevent freezing water from cracking the tank

Eligible Costs

Eligible costs may include: excavation, grading of pad, installation (placement, connection and stabilization), collection system (reasonable gutters/downspouts), pretreatment devices, cistern, stone/concrete for pad/bedding, overflow piping, elevated platform. A maximum of \$750 will be eligible for feasibility statement work.

Helpful Technical Resources

- Virginia Rainwater Harvesting Manual. Cabell Brand Center. 2009.
- Virginia Stormwater Clearinghouse, Design Specification No. 6.
- Virginia Stormwater BMP Clearinghouse, Cistern Design MS-Excel Spreadsheet, v. 1.6. March 1, 2011.
- Virginia Department of Health. Virginia Rainwater Harvesting & Use Guidelines. 2011.
- Virginia Cooperative Extension. Summer Lawn Management: Watering the Lawn. Pub 430-010.
- Virginia Cooperative Extension. Irrigating the Home Garden. Pub 426-322.

Section 2.9 Bioretention (BR)

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 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 2.6 above. In areas with space restrictions, Urban Bioretention may be utilized in the form of stormwater planters, expanded tree pits, or stormwater curb extensions, for example (Virginia Stormwater BMP Clearinghouse Design Specification No. 9, Appendix 9-A).

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

This practice requires adherence to the technical specifications outlined by the Virginia DEQ Stormwater Design Specification No. 9 on the Virginia Stormwater BMP Clearinghouse.

Criteria

This practice requires adherence to the technical specifications outlined by the Virginia DEQ Stormwater Design Specification No. 9 on the Virginia Stormwater BMP Clearinghouse.

Plans and Specifications

A design plan with a professional seal must be submitted by the applicant. The installed practice must be in accordance with the approved design unless changes were pre-approved by the City.

Information required in the planting/design plan includes (see HCAP Submission Checklist for a comprehensive list):

- An infiltration test should be conducted to a minimum depth of 12 inches, and the infiltration test results must be submitted with the application.
- Provide results of a soil test.
- Provide sizing calculations.
- 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. Plant list can include the common plant name but must include the scientific name. Vegetables, herbs, and annual plants are not allowed in the landscape plan.
 - Plant selection for the project site must include some native Virginia species, but is not strictly limited to them. However, only native plants will be eligible to receive cost-share funds. Invasive or noxious species, as identified by the DCR invasive species list, and/or the USDA noxious weed list are prohibited. Vegetables, herbs, and annual plants are not allowed in the landscape plan.
 - The City reserves the right to deny applications and/or withhold cost-share payments from any projects that install invasive or noxious species.

- Required density and minimum ground covers for all plantings will be based on mature size of approved species within the approved site-specific plans. See VDOF recommendations for tree saplings in the Helpful Technical References section.
- Only the minimum amount of fertilizer necessary to establish vegetation growth shall be utilized (according to soil test report).
- A statement regarding compliance with any permitting requirements or local codes.
- Certification by a Licensed Professional may be required by the District to verify practice installation.
- Design should meet Engineered Practice Design Document Requirements (see section 2.3)

Maintenance

Maintenance inspection shall be conducted annually by the landowner or a designated sub-contracted agent of the landowner.

Maintenance requirements are outlined in the technical specifications for this practice.

Maintenance will also include:

- Ensure adequate plant survival. Evaluate and eliminate invasive species. Remove any dead or diseased plants. Dead-head flowers. Replant vegetation as needed.
- Ensure runoff flow routes function as designed
- Remove accumulated sediment
- Remove excess leaves. Remove trash, especially from inlet area
- Stabilize any eroded or bare areas, especially overflow route. Fix scoured areas
- Water plants
- Reapply mulch

Eligible Costs

Eligible costs may include: excavation, grading, installation costs (backfill, planting/seeding), plant material, engineered soil media, stone, geotextile fabric, erosion and sediment control when necessary, mulch, pre-treatment costs, underdrain costs, outlet/overflow structure. A maximum of \$750 will be eligible for feasibility statement work.

Helpful Technical References

- Virginia BMP Stormwater Clearinghouse, Design Specification No. 9 Bioretention & Appendix 9A Urban Bioretention.
- Virginia Cooperative Extension. Urban Water-Quality Management: Rain Garden Plants.2015. 426-043.
- Rain Garden Landscape Templates for the Mid-Atlantic.

Section 2.10 Permeable Pavement (PP)

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 grid 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.

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

Porous Asphalt and Porous 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 to 24-inch clean stone aggregate reservoir.

Permeable Interlocking Pavers have pervious 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 to 24-inch clean stone aggregate reservoir.

Policies Regarding Permeable Pavement

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.

Permeable Pavement shall only be installed when it is either replacing impervious surface or treating additional impervious surface and when it is the most appropriate and cost-effective Best Management Practice to treat the resource concern.

Criteria

This practice requires adherence to the technical specifications outlined by the Virginia DEQ Stormwater Design Specification No. 7 on the Virginia Stormwater BMP Clearinghouse.

Plans and Specifications

A design plan with a professional seal must be submitted by the applicant. The installed practice must be in accordance with the manufacturer's specifications and approved design, unless changes were pre-approved by the City. Information required in the plan includes (see HCAP Submission Checklist for a comprehensive list):

- An infiltration test should be conducted to a minimum depth of 12 inches, and the infiltration test results must be submitted with the application.
- Manufacturer's operation and maintenance manual or guidelines.

- A statement regarding compliance with any permitting requirements or local codes.
- Certification by a Licensed Professional may be required by the District to verify practice installation.
- Design should meet Engineered Practice Design Document Requirements (see section 2.3)

Maintenance

Maintenance inspection shall be conducted annually by the landowner or a designated sub-contracted agent of the landowner.

Maintenance requirements are outlined in the technical specifications for this practice.

Maintenance will also include:

- For the first 6 months following construction, the practice and contributing drainage area should be inspected at least twice after storm events that exceed 1/2 inch of rainfall. Conduct any needed repairs or stabilization.
- Remove trash and debris. Remove accumulated debris from downspouts and channels leading to the permeable pavement. Remove any soil or sediment deposited on pavement
- Conduct maintenance using a regenerative street sweeper
- Replace any necessary joint material

The following tasks **must be avoided** on all permeable pavements:

- storage of snow piles containing sand
- re-sealing
- re-surfacing
- storage of mulch or soil materials
- power washing
- sanding
- installing impervious surfaces over the area

Eligible Costs

Eligible costs may include: excavation, grading, installation (backfilling, leveling), stone aggregate, pavers, grids, pervious concrete/asphalt, geotextile fabric, underdrain components, pretreatment when necessary, erosion and sediment controls when necessary. A maximum of \$750 will be eligible for feasibility statement work.

Helpful Technical References

- Virginia Stormwater BMP Clearinghouse, Design Specification No. 7 Permeable Pavement.
- Ferguson, B.K., editor. 2005. Porous Pavements. Boca Raton, FL, CRC Press LLC.
- Smith, D.R. 2000. Permeable Interlocking Concrete Pavements: Selection, Construction, Maintenance, second edition. Washington, DC, Interlocking Concrete Pavement Institute.
- Smith, David R. 2006. Permeable Interlocking Concrete Pavement-Selection Design, Construction and Maintenance. Third Edition. Interlocking Concrete Pavement Institute.

Section 2.11 Green Roofs (GR)

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 Green Roofs

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.

Criteria

This practice requires adherence to the technical specifications outlined by the Virginia DEQ Stormwater Design Specification No. 5 on the Virginia Stormwater BMP Clearinghouse.

Plans and Specifications

A design plan with a professional seal must be submitted by applicant 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 City. Information required in the plan includes (see HCAP Submission Checklist for a comprehensive list):

- Waterproofing specifications
- Structural design specifications
- Non-woven geotextile fabric specifications
- Proposed growth medium depth and composition
- Proposed vegetation and seeding/planting rate. Plant list can include the common plant name but must include the scientific name. Vegetables, herbs, and annual plants are not allowed in the landscape plan.
- 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
- Certification by a Licensed Professional may be required by the District to verify practice installation.
- Design should meet Engineered Practice Design Document Requirements (see section 2.3)

Maintenance

Maintenance inspection shall be conducted annually by the landowner or a designated sub-contracted agent of the landowner.

Maintenance requirements are outlined in the technical specifications for this practice.

Maintenance will also include:

- Maintain vegetative cover, including utilization of proper irrigation and fertilization rates. Remove and replace dead or diseased plants. Remove invasive species (must be done by hand so as not to damage membrane). Dead-head flowers. Weeding is best performed when soil is moist
- Check and maintain drainage system to ensure no clogs, obstructions, or other damage impact proper drainage flow; replace washed-out rocks or missing pavers from vegetation free edge strip; repair/replace soil media if it has been washed out; remove debris from downspout scupper
- Maintain structural integrity of building - assess for leaks, erosion, or structural concerns
- Stabilize any eroded or bare areas- by replacing with plugs or cuttings from other plants
- Remove trash and debris

Eligible Costs

Eligible costs may include: installation (placement of layers and planting), plant material, soil media, drainage system, additional structural support, root barrier material, waterproofing, insulation. A maximum of \$750 will be eligible for feasibility statement work.

Helpful Technical References:

- Virginia Stormwater BMP Clearinghouse, Design Specification No. 5 Vegetated Roof.
- 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.
- 2015 International Building Code. July 2015. International Code Council, INC.
- The Green Roof Manual: A Professional Guide to Design, Installation, and Maintenance. By Edmund C. Snodgrass and Linda McIntyre. 2010.