Appendix T – Single Family On-Lot Volume Control

Step 2 On-Lot Volume Control

Beaufort County passed the On-Lot Volume Controls on June 13, 2011. This requires On-Lot Volume Control when constructing new homes in communities that do not meet current community-wide runoff volume control requirements. This section is applicable only for home lots of record platted but not yet developed. Worksheets are available in an online calculator format at http://stormwaterworksheet.createandsolve.com/.

Purpose

The purpose of this worksheet and web-based program is to help a homeowner or builder determine the amount of excess stormwater runoff that will come off the property after construction of the home.

It will also assist in selecting the controls necessary to control this excess runoff so that the County's water resources are not impacted. Scientists have determined that excess freshwater runoff into saltwater tidal waters can impact the area's fishery resources.

The worksheet and program will allow the user to print out a sheet that can be used to document satisfactory controls so a zoning permit can be obtained. This zoning permit is necessary for issuance of a building permit.

Step 1 – Lot Information

This information is used to compute the excess runoff after construction. If a homeowner is planning an irrigation system, (entered in Section 1), storage and reuse of stormwater from rooftop should be considered for a portion of the irrigation needs. Use of drinking water for irrigation is an expensive alternative for homeowners, and reduction of this can save money as well as reducing amount of water running off the parcel after construction. While this is recommended, storage and reuse is optional because of its initial cost.

Step 2 – Post Construction Stormwater Runoff Calculations

The amount of excess runoff in gallons can be computed using this web-based program. It will depend on whether the soil is sandy or clay (entered in Section 1). The rainfall event that is used to determine the amount of runoff to be controlled is a 1.95-inch rainfall (95^{th} percentile of average events in a year) in a 24-hour period. Before construction, on sandy soils, generally no runoff will occur with the 1.95-inch rainfall event. For clay soils, more than 0.5 inch of a 1.95 rainfall will runoff before construction. Taking this into account, the program will determine the runoff to be controlled, in gallons, after construction.

Step 3 – Application of Best Management Practices

This section takes the gallons determined in the Step above and guides the user through three steps that will reduce these gallons until they are all being controlled. The first step is an optional **storage and reuse/infiltration practice.** This practice will utilize a holding facility of some size and then the water can be utilized for reuse or infiltrated at a slow rate from the storage facility.

When storage is utilized, it will control a certain amount of rooftop impervious surface. The maximum storage allowed for credit is limited to the rooftop impervious surface (in square feet) times 1.15. Additional storage can be added but credit is limited to 1.15 gallon per square foot of rooftop surface. When storage is used, it decreases the amount of impervious surface that needs to be handled by the other practices. This is called unaddressed impervious surface.

The second practice is **disconnected impervious surface**. It can utilize the natural infiltration capacity of the lot to control water running off unaddressed impervious surfaces. It will require a determination of which way the water sheet flows across the lot. The program allows up to two directions to be selected. The user starts with an estimate of the impervious surfaces and pervious portion of the lot. If the lot flows in one direction, the estimate is easy. It would be the unaddressed impervious surface and the previous surface it flows over to the end of the lot. If the ratio of unaddressed impervious surface to pervious area is greater than 5, there will be no credit, and runoff is better controlled by the next step. Figures 5-1 and 5-2 provide examples of one- and two-direction calculations to help in determining input figures for this practice.

If after the employing the first two practices there is still excess runoff to be handled, **rain gardens and other practices** will be used to control the remaining runoff. This will be computed for the user, who will be given a square foot size of a standard rain garden.

This standard size rain garden is 3 ft deep and can have special soil or sand and rock mixture that will store runoff and allow it to infiltrate. There is some flexibility between storage and reuse and rain gardens. If less rain garden is desired, storage can be increased, and vice-versa.

There is an attached sheet at the end of this help sheet that provides examples of alternative practices under this step.

It should be remembered that impervious surface on the property causes the excess volume that needs to be controlled. The amount of controls can be reduced by decreasing the impervious surface on the property by considering pervious driveways and walks, reducing rooftop size (two story versus one story), and other practices.

Step 4 – Summary of Volume Reduction Practices

This section is computed for the user to show a summary. This program allows the user to print a one-page sheet that summarizes entry and practices being used. This sheet would be attached to zoning and building permits and will be checked at completion of the project.

Definitions:
Impervious surface – hard surface that allows rainfall to run off and not infiltrate the soil.
Rooftop impervious surface – horizontal surface area of rooftops including overhangs and other detached buildings/sheds.
Other impervious – generally hard surfaces on the ground like paved driveways, patios, walkways and sidewalks.
Pervious surface – surface that is not hard, such as grass, garden or forest area. This also includes gravel and dirt driveways.

Irrigated area is area that would be served by an installed irrigation system. **Unaddressed impervious surface** – term used to determine amount of impervious surface or runoff gallons that had not been controlled by a previous practice.
Standard rain garden – rain garden that has 3 ft of fill material and a 6-inch maximum ponding depth. Different sizes can be constructed but then credits must be computed from Beaufort County BMP manual.

Conversions
Rainfall to gallons of runoff
Design storm is 1.95 inches, of which 1.85 inches is available to run off impervious surface. 1.85 inch on 1 sq ft of impervious surface is equivalent to 1.15 gallons of runoff
Preconstruction runoff
Clayey soils – 0.53 inches run off for a 1.95-inch storm. 0.53 inch on 1 sq ft is equivalent to 0.33 gallon of runoff.
Sandy soils – No runoff for a 1.95-inch storm
Storage and reuse – if irrigation is used on parcel then storage must be between 0.3 gallon/sq ft of rooftop impervious surface to maximum credit of 1.15 gallon/ sq ft of rooftop impervious surface. Storage can be larger but maximum credit is 1.15g/sq ft.

Rain garden
Square foot of impervious surface per square foot of standard rain garden
Clayey soils 4 sq ft of impervious surface to 1 sq ft of standard rain garden
Sandy soils 7 sq ft of impervious surface to 1 sq ft of standard rain garden
Disconnected imperviousness – is the practice of running uncontrolled stormwater flow from impervious surfaces over pervious surfaces to take advantage of natural infiltration of the soil. Credit is given in Table 5-8 based on ratio of impervious surface over pervious surface to compute a ratio.

Table 5-8 Credit Table for Disconnected Impervious Area

Disconnected Impervious Ratio	Runoff reduction (Gal/sq. ft-impervious area)	Runoff reduction (Gal/sq. ft-impervious area)
	Clayey	Sandy
0.1	.40	1.15
0.2	.40	1.12
0.4	.38	1.08
0.8	.33	1.01
1.0	.31	.98
2.0	.24	.84
3.0	.19	.74
4.0	.16	.67
5.0	.14	.60

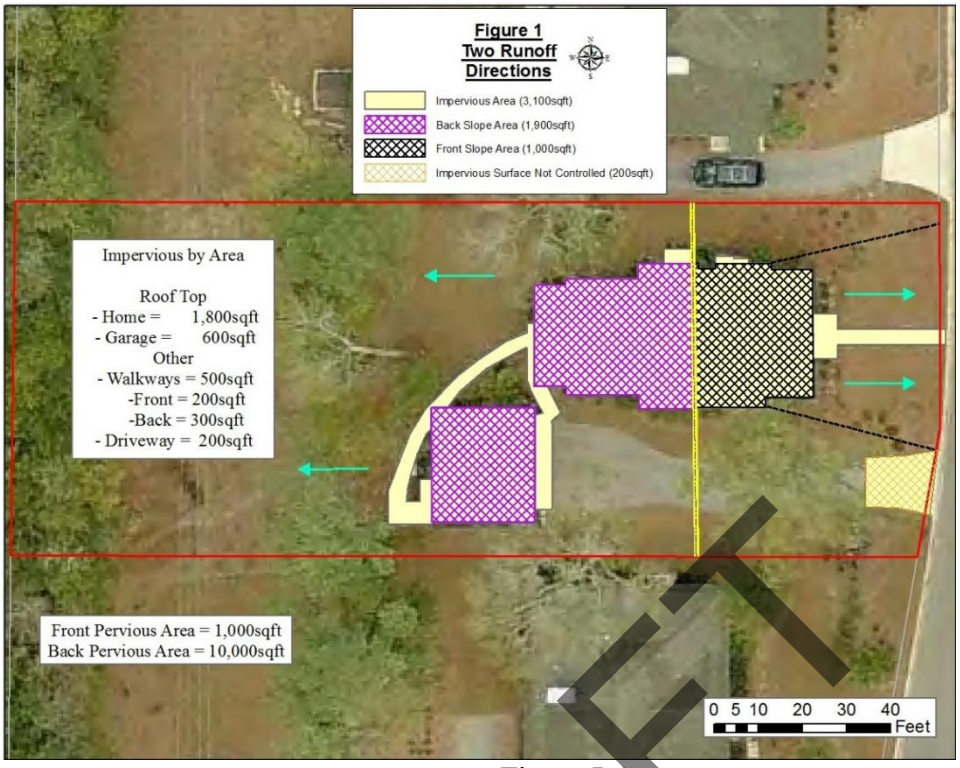


Figure 5-1
Example of a One-Direction Calculation for Disconnected Impervious Surface

This is a home on a 16,000 sq ft lot with about 2,500 sq ft of living space.

In this example, runoff from 1,000 sq ft of impervious surface flows towards the front of the house. It can be made to sheet flow over 1,000 sq ft of lawn (pervious surface). Therefore, on the worksheet or web program, enter 1,000 in impervious area and 1,000 in pervious area of the first direction.

The second direction is to the back of the home, and this 1,900 sq ft of rooftop and other impervious surface flow over 10,000 sq ft of lawn and forest area.

Therefore, enter in the second direction 1,900 sq ft in impervious area and 10,000 in pervious area.

In this example, there is 200 sq ft (paved portion of driveway) that cannot sheet flow over enough pervious area to receive a credit and would not be included in calculations

If storage and reuse/infiltration was used in the first step (say two 500 cisterns/tanks in front of house) then the unaddressed impervious surface would be computed by reducing the first direction impervious surface.

Therefore, the in first direction, enter 130 in impervious surface (reduced by 870 sq ft = 1000 gal/1.15 gal/sq ft) and still 1,000 in pervious surface. See program printout for this example (with storage) in Appendix E.3

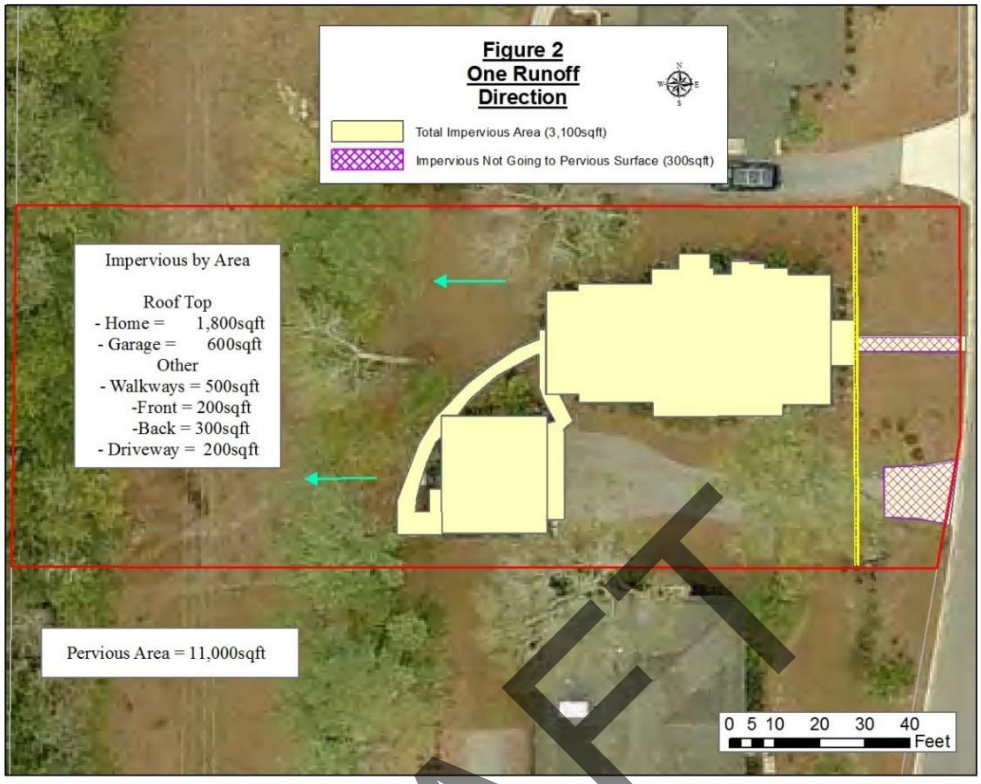


Figure 5-2
Example of a Two-Direction Calculation for Disconnected Impervious Surface

In this example, there would be 2,800 (3,100 to 300) sq ft of impervious surface sheet flowing over 11,000 sq ft of pervious surface out the back yard.

Therefore, enter 2,800 in the first impervious area and 11,000 in the pervious area. The second direction would have zero entered in both categories.

Again, if storage and reuse/infiltration was used, the impervious surface that included in the worksheet or web program would need to be reduced.

If, for example, two 500-gallon storage devices were used, the impervious surface needs to be reduced by 870 sq ft (1000 gal/1.15 gal/sq ft).

Therefore, enter 1,930 in first impervious area and 11,000 in pervious area. The second direction would have zero in both categories.

BEAUFORT COUNTY

-STORMWATER PERMIT APPLICATION-

DATE ACCEPTED	RECEIVED BY	FILING FEE	RECEIPT#	PERMIT#	PIN#

PROJECT NAME:	PROJECT TYPE:
PROJECT LOCATION:	

APPLICANT/DEVELOPER NAME, ADDRESS, PHONE#	PROPERTY OWNER NAME, ADDRESS, PHONE#
EMAIL	EMAIL
SWPPP PREPARER NAME, ADDRESS, PHONE#	CONTRACTOR NAME, ADDRESS, PHONE#
EMAIL	EMAIL
QUALIFIED INSPECTOR NAME, ADDRESS, PHONE#	ADDITIONAL INFORMATION:
EMAIL	

SW01 (Single Family Home)

- ☐ COPY OF TIER I STORMWATER POLLUTION PREVENTION PLAN (SWPPP) – (See Appendix D)
- ☐ PLOT PLAN SHOWING, VICINITY MAP, NORTH ARROW, GRAPHIC SCALE, PROPOSED IMPROVEMENTS
- ☐ SITE PLAN SHOWING EXISTING GRADES/CONTOURS/ELEVATIONS AND PROPOSED GRADES/CONTOURS/ELEVATIONS, WITH OFFSITE DISCHARGE POINTS IDENTIFIED
- ☐ NATURAL RESOURCE INVENTORY SHOWING TREES, WETLANDS, DRAINAGE COURSES, AND BUFFERS
- ☐ GRADING AND DRAINAGE CERTIFICATION
- ☐ STEP II VOLUME CONTROL (See Section 5.3) (http://stormwaterworksheet.createandsolve.com)
- ☐ APPLICATION FEE

SW02 (Non Residential and Attached Residential)

- ☐ COPY OF TIER II STORMWATER POLLUTION PREVENTION PLAN (SWPPP)
- ☐ POST CONSTRUCTION STORMWATER PLAN CHECKLIST WITH LOCATION OF ALL ITEMS INDICATED.
- ☐ SITE PLAN: VICINITY MAP, PROJECT LOCATION, NORTH ARROW, GRAPHIC SCALE, PROPOSED IMPROVEMENTS
- ☐ CONSTRUCTION PLANS

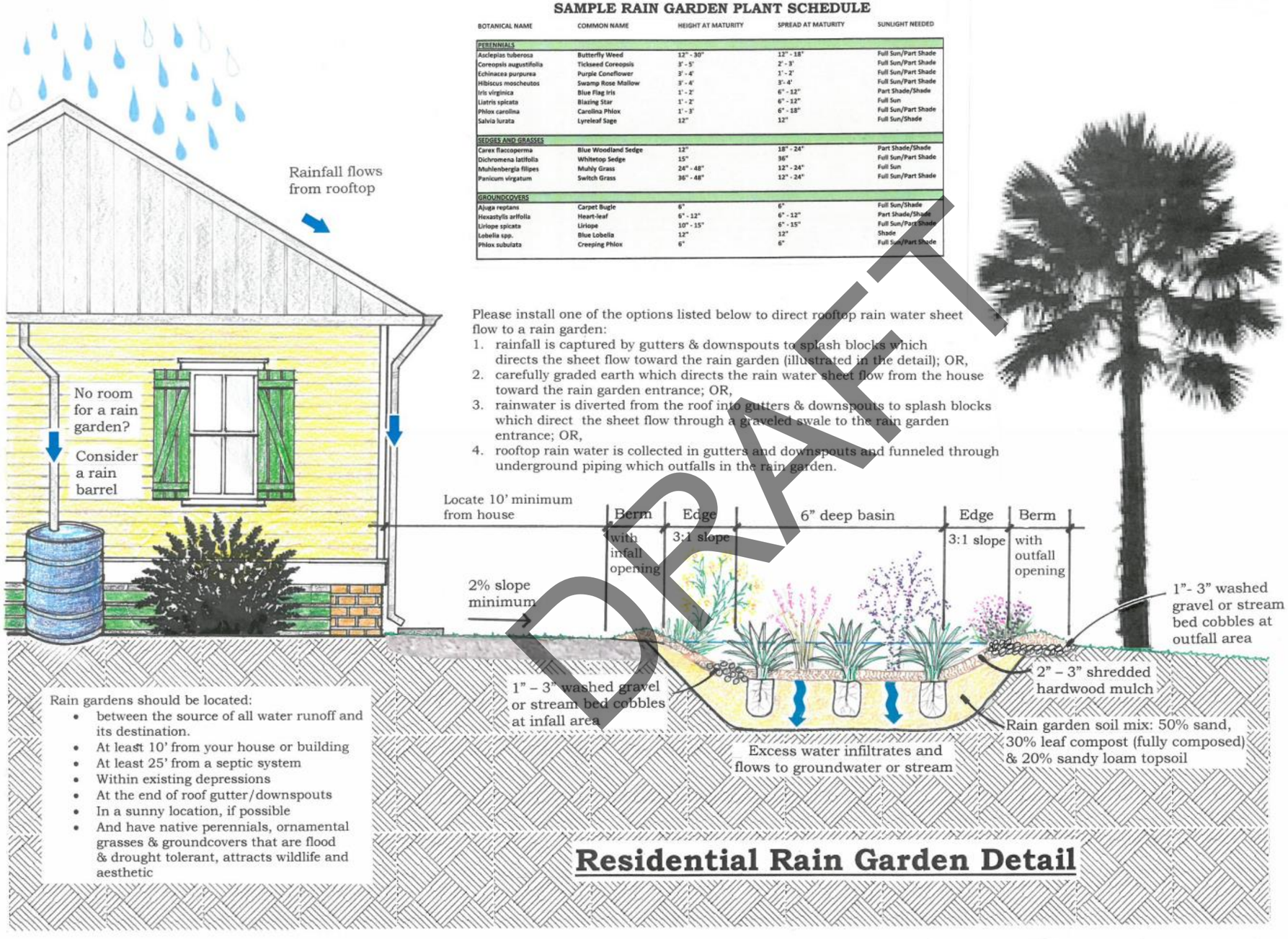
☐ DRAINAGE CALCULATIONS (See Section 5.3) ☐ APPLICATION FEE
Application Affidavit
The applicant acknowledges that application and issuance of the local Beaufort County Stormwater Permit does not preclude the need to obtain a NPDES permit from SC-DHEC per the South Carolina Erosion and Sediment Reduction act of 1983 as promulgated via 72-300, Standards for Stormwater Management and Sediment Reduction. Any change to the SWPPP associated with this permit as a result of permitting by DHEC renders this permit void until revised by the applicant to match the DHEC approved plan. The applicant further acknowledges the County may refuse to conduct inspections and may issue Notices of Violation, Stop Work Orders, and/or Civil Penalties for failure to comply with DHEC requirements.
Signature_____ Date_____

SAMPLE RAIN GARDEN PLANT SCHEDULE

BOTANICAL NAME	COMMON NAME	HEIGHT AT MATURITY	SPREAD AT MATURITY	SUNLIGHT NEEDED
PERENNIALS				
Asclepias tuberosa	Butterfly Weed	12" - 30"	12" - 18"	Full Sun/Part Shade
Coreopsis augustifolia	Tickseed Coreopsis	3' - 5'	2' - 3'	Full Sun/Part Shade
Echinacea purpurea	Purple Coneflower	3' - 4'	1' - 2'	Full Sun/Part Shade
Hibiscus moscheutos	Swamp Rose Mallow	3' - 4'	3'- 4'	Full Sun/Part Shade
Iris virginica	Blue Flag Iris	1' - 2'	6" - 12"	Part Shade/Shade
Liatris spicata	Blazing Star	1' - 2'	6" - 12"	Full Sun
Phlox carolina	Carolina Phlox	1' - 3'	6" - 18"	Full Sun/Part Shade
Salvia lurata	Lyreleaf Sage	12"	12"	Full Sun/Shade
SEDGES AND GRASSES				
Carex flaccoperma	Blue Woodland Sedge	12"	18" - 24"	Part Shade/Shade
Dichromena latifolia	Whitetop Sedge	15"	36"	Full Sun/Part Shade
Muhlenbergia filipes	Muhly Grass	24" - 48"	12" - 24"	Full Sun
Panicum virgatum	Switch Grass	36" - 48"	12" - 24"	Full Sun/Part Shade
GROUNDCOVERS				
Ajuga reptans	Carpet Bugle	6"	6"	Full Sun/Shade
Hexastylis arifolia	Heart-leaf	6" - 12"	6" - 12"	Part Shade/Shade
Liriope spicata	Liriope	10" - 15"	6" - 15"	Full Sun/Part Shade
Lobelia spp.	Blue Lobelia	12"	12"	Shade
Phlox subulata	Creeping Phlox	6"	6"	Full Sun/Part Shade

Please install one of the options listed below to direct rooftop rain water sheet flow to a rain garden:

1. rainfall is captured by gutters & downspouts to splash blocks which directs the sheet flow toward the rain garden (illustrated in the detail); OR,
2. carefully graded earth which directs the rain water sheet flow from the house toward the rain garden entrance; OR,
3. rainwater is diverted from the roof into gutters & downspouts to splash blocks which direct the sheet flow through a graveled swale to the rain garden entrance; OR,
4. rooftop rain water is collected in gutters and downspouts and funneled through underground piping which outfalls in the rain garden.



Rain gardens should be located:

- between the source of all water runoff and its destination.
- At least 10' from your house or building
- At least 25' from a septic system
- Within existing depressions
- At the end of roof gutter/downspouts
- In a sunny location, if possible
- And have native perennials, ornamental grasses & groundcovers that are flood & drought tolerant, attracts wildlife and aesthetic

Residential Rain Garden Detail

BEAUFORT COUNTY SOUTH CAROLINA 1769

Residential Rain Garden Detail

DATE: 10/01/18
SCALE: Not to Scale
DRAWN BY: NRM
REVISIONS: 10/10/18
11/08/18
11/26/18

RAIN GARDEN DETAIL