

APPENDIX A

**GENERAL GUIDANCE
FOR SMALL-AREA BMPS**

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APPENDIX A STRUCTURAL GUIDANCE FOR SMALL-AREA BMPS

A.1 Overview

The small-area BMP is meant to provide treatment for small areas with minimal design effort. The intent is to provide treatment of, and to infiltrate, rainfall events up to the water quality storm, 1.3 inches, which constitutes 90% of the average annual rainfall in central Missouri.

A.2 Rain Garden

A.2.1 Design Criteria

1. Excavation Depth = 3 feet minimum, Bottom Sand Layer = 6", Soil Depth = 27 inches, Mulch Depth = 3 inches

2. Ponding Depth depends on infiltration rate at Excavation Depth.

For infiltration rates of less than 3 inches/day, configure the basin so that runoff from the impervious area soaks into the planting area but does not pool above the mulch.

For infiltration rates of 3 inches/day or greater, build the basin so that water pools above the mulch to the same depth as the infiltration rate.

3. Bottom Surface Area = 20% of contributing impervious surface, must be flat but not required to be smooth.
4. The contributing area must be stabilized before final excavation and installation of the rain garden. A partial hole, 2 feet, deep may be dug and used as a sediment trap, with the sediment and remainder of soil dug out just before installing planting soil. Do not allow machinery on bottom surface of rain garden. If machinery must enter rain garden area, start digging at one end and work out so that machinery does not track on bottom of finished excavation. Excavation must be flat but not smooth. Do not scrape the bottom smooth since this will harm infiltration. When the bottom of the basin is approved, place 6 inches of sand then place the planting soil mix.
5. Planting Soil Mix: 80% coarse sand (concrete sand will work), 10% compost and 10% sandy loam topsoil.

6. Planting soil may be mixed inside or outside of the basin. To mix inside, place sand, compost and sandy loam in 6-inch, 1-inch and 1-inch lifts respectively. Till the compost and sandy loam into the 6 inches of sand thoroughly before placing and tilling the next lift. Alternatively, the sand, compost and sandy loam may be mixed outside the basin and placed in the basin in lifts of 8". Lightly tamp or lightly water each lift of either method to encourage settling of the fill. Avoid overtamping or overwatering (and causing ponding) before basin is finished.
7. A 3-inch layer of shredded hardwood mulch or landscaping rock (hardwood mulch is preferred) should be placed on the surface.
8. Place a berm or otherwise construct the rain garden such that a flat, 6" ponding area, the same size as the bottom of the basin (the same as the design square footage), is formed over the mulch layer to catch and temporarily hold water from the impervious area until it can soak through the planting bed into the soil below.
9. See Diagram A.2.1 for further installation guidelines.

A.2.2 Planting

1. Plants are necessary for the proper function of a rain garden. A minimum plant density must be achieved in accordance with the following table. Actual location and spacing of the plants should be determined based on aesthetics and the health of the plants as well as considerations of other infrastructure such as overhead power lines.

Plant Types	Plant Spacing	Coverage Area
Grasses/Flowers	1.5 feet	7
Small Shrubs (<10 feet tall)	6 feet	75
Large Shrubs / Small Trees (10 to 25 feet tall)	8 feet	135
*Large Trees	16 feet	540

*Large trees must be installed 3-5 feet beyond the edge of the rain garden.

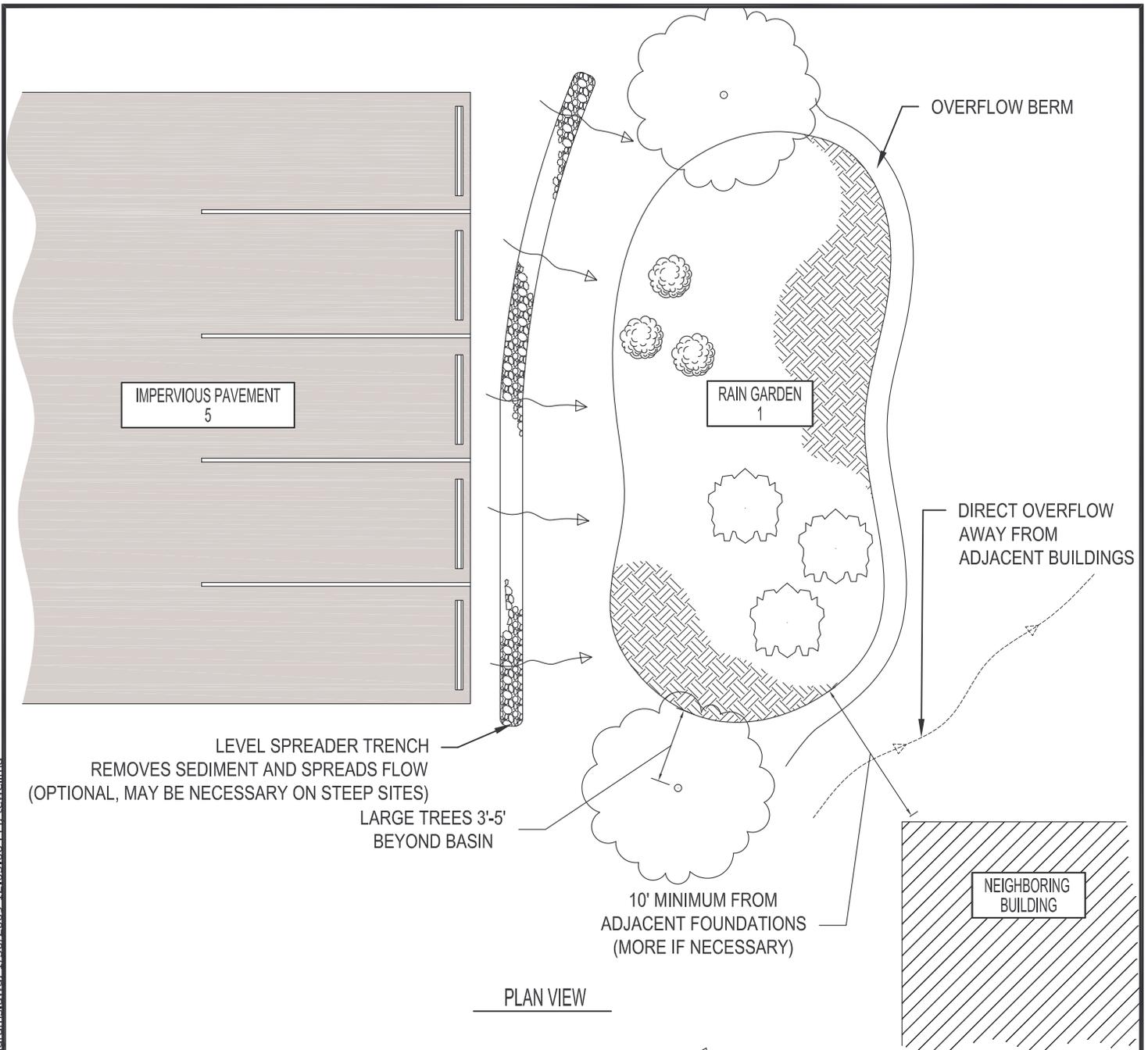
2. Generally, a mix of types is best to help the basin function optimally. Plants in a rain garden must be able to withstand very wet periods as well as hot, dry periods. Native plants that are adapted to wetland or mesic wetland sites will generally perform best. Consult Appendix A in the Kansas City BMP manual for more guidance as well as Appendix D in this manual.
3. Rain gardens which collect water from pavement should have salt tolerant plants.
4. It is strongly recommended that a landscape professional be consulted for help planning, installing and maintaining the plants.

A.2.3 Maintenance

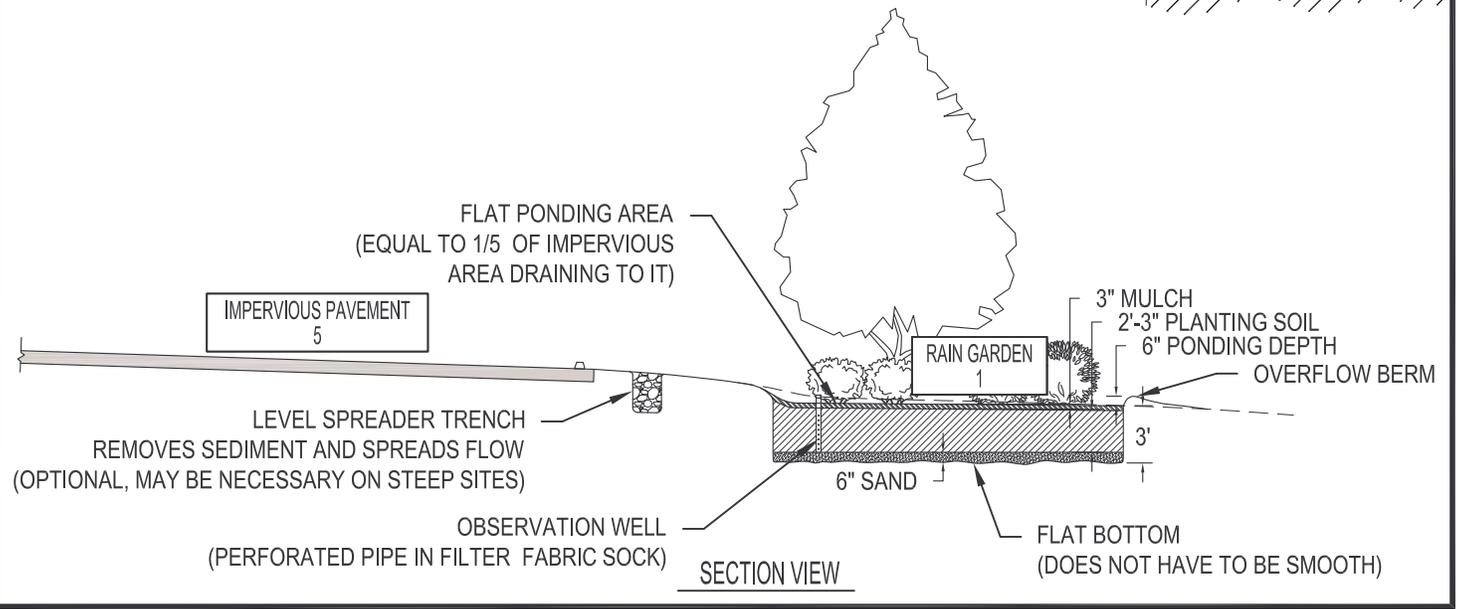
1. Rain gardens should be weeded weekly until native plants are established. And, per City Ordinance they must be kept free of weeds (plants that are in the garden by design will not be considered weeds.)
2. Water plants as needed during the first year of establishment and as needed during dry periods thereafter.
3. Avoid using fertilizer in and around the rain garden.
4. After the garden is established dead grasses and flower stems and leaves should be removed each spring by mowing or burning. (Allowing the stems, leaves and seeds to remain through the winter is not necessary, but it can provide food and cover to birds and other animals.)

Typical Maintenance Activities for Rain Gardens	
Activity	Frequency
Water Plants	As needed during first growing season and as needed during dry periods thereafter
Re-mulch bare spots	As needed
Treat diseased trees and shrubs	As needed
Inspect soil and repair eroded areas	Monthly
Remove litter and debris	Weekly
Add additional mulch	Once per year

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PLAN VIEW



SECTION VIEW