ALTERNATIVES TO CONSIDER WHEN DISCONNECTING ROOF DOWNSPOUTS FROM CURBS AND STORM SEWER SYSTEM

FACT SHEET: Downspout Disconnection

DESCRIPTION

In urban areas, roof runoff flows through gutters and downspouts and out to the storm or combined sewer. Disconnecting downspouts is the process of separating roof downspouts from the sewer system and redirecting roof runoff onto pervious surfaces. This reduces the amount of directly connected impervious area in a drainage area.

For disconnection to be safe and effective, each downspout must discharge into a suitable receiving area. Roof runoff can be redirected to a garden, yard, planter, or a rain barrel or cistern for eventual reuse. Runoff must not flow toward building foundations or onto adjacent property.

A plan for downspout disconnection will work with the existing downspouts on a building assuming there is an adequate receiving area; however, for buildings with internal drainage, disconnecting internal downspouts may be difficult or impractical.

BENEFITS

- Provides supplemental water supply when used in conjunction with capture/reuse systems
- Wide applicability
- Reduces potable water use and water supply costs when used in conjunction with capture/reuse systems
- Related cost savings and environmental benefits
- Reduced runoff volume, CSOs Peak

MAINTENANCE

- Check materials for leaks and defects
- Remove accumulated debris, especially from gutters

COST

- Inexpensive; materials are readily available at hardware store

POTENTIAL LIMITATIONS

- Internal drainage more difficult to disconnect
- Do not disconnect onto adjacent property owner
- Need adequate receiving area

POTENTIAL APPLICATIONS	
Residential	Yes
Commercial	Yes
Ultra Urban	Limited
Industrial	Yes
Retrofit	Limited
Highway/Road	No
Recreational	Yes
Public/Private	N/A

Residential downspout disconnect in Portland Oregon (Source: Portland Stormwater Website)

Residential downspout disconnection in Lancaster, PA

VARIATIONS

- Scuppers
- Drip chains
- Decorative gargoyles

KEY DESIGN FEATURES

- Install splashblock at the end of the extension to prevent erosion
- Roof runoff must be discharged at least 5 feet away from property lines including basements and porches

SITE FACTORS

- Water table to bedrock depth – N/A
- Soils – N/A
- Slope – N/A
- Potential hotspots – Yes (with treatment)
- Maximum drainage area – N/A

STORMWATER QUANTITY FUNCTIONS		STORMWATER QUALITY FUNCTIONS		ADDITIONAL CONSIDERATIONS	
Volume	Medium	TSS	Medium	Capital Cost	Low
Groundwater Recharge	Medium/High	TP	N/A	Maintenance	Low
Peak Rate	Medium	TN	N/A	Winter Performance	High
Erosion Reduction	Medium	Temperature	Medium/High	Fast Track Potential	Low/Medium
Flood Protection	Low			Aesthetics	High

FACT SHEET: Cistern/Rain Barrel

BENEFITS

- Provides supplemental water supply
- Wide applicability
- Reduces potable water use
- Related cost savings and environmental benefits
- Reduced stormwater runoff impacts

POTENTIAL APPLICATIONS	
Residential	Yes
Commercial	Yes
Ultra Urban	Yes
Industrial	Yes
Retrofit	Yes
Highway/Road	No
Recreational	Yes
Public/Private	Yes/Yes

DESCRIPTION

Cisterns and Rain Barrels are structures designed to intercept and store runoff from rooftops to allow for its reuse, reducing volume and overall water quality impairment. Stormwater is contained in the cistern or rain barrel structure and typically reused for irrigation or other water needs. This GI technology reduces potable water needs while also reducing stormwater discharges.

Rain Barrel – rooftop downspouts are directed to an above-ground (typically) structure that collects rainwater and stores it until needed for a specific use, such as landscape irrigation.

Cistern – Underground (typically) container or tank with a larger storage capacity than a rain barrel, and typically used to supplement greywater needs (i.e. toilet flushing) in a building, as well as irrigation.

Cisterns and rain barrels can be used in urbanized areas where the need for supplemental onsite irrigation or other high water uses is especially

MAINTENANCE

- Discharge before next storm event
- Clean annually and check for loose valves, etc.
- May require flow bypass valves during the winter

COST

- Rain Barrels range from $100 to $300
- Cisterns typically range from $500 to $5000

POTENTIAL LIMITATIONS

- Manages only relatively small storm events which requires additional management and use for the stored water.
- Typically requires additional management of runoff
- Requires a use for the stored water (immigration, gray water, etc.

VARIATIONS

- Rain barrels
- Cistems, both underground and above ground
- Tanks
- Storage beneath a surface using manufactured products
- Various sizes, materials, shapes, etc.

KEY DESIGN FEATURES

- Small storm events are captured with most structures
- Provide overflow for large storms events
- Discharge water before next storm event
- Consider site topography, placing structure upgradient of planting (if applicable) in order to eliminate pumping needs

SITE FACTORS

- Water table to bedrock depth – N/A (although must be considered for subsurface systems)
- Soils – N/A
- Slope – N/A
- Potential hotspots – yes with treatment
- Maximum drainage area – N/A

Top-left and bottom-left photos: Rain barrels in use in the City of Lancaster (Source: LiveGREEN)

Bottom-right photo: Rain barrel prototype example

STORMWATER QUANTITY FUNCTIONS		STORMWATER QUALITY FUNCTIONS		ADDITIONAL CONSIDERATIONS	
Volume	Low/Medium	TSS	Medium	Capital Cost	Low/Medium
Groundwater Recharge	Low	TP	Medium	Maintenance	Medium
Peak Rate	Low	TN	Medium	Winter Performance	Medium
Erosion Reduction	Low	Temperature	Medium	Fast Track Potential	Medium/High
Flood Protection	Low/Medium			Aesthetics	Low/Medium

FACT SHEET: Bioretention (Rain Gardens)

Residential rain garden at the Village at Springbrook Farm in Lebanon, PA

Rain garden at Woodlawn Library in Wilmington, DE

DESCRIPTION

Bioretention Areas (often called Rain Gardens) are shallow surface depressions planted with specially selected native vegetation to treat and capture runoff and are sometimes underlain by sand or gravel storage/infiltration bed. Bioretention is a method of managing stormwater by pooling water within a planting area and then allowing the water to infiltrate the garden. In addition to managing runoff volume and mitigating peak discharge rates, this process filters suspended solids and related pollutants from stormwater runoff. Bioretention can be designed into a landscape as a garden feature that helps to improve water quality while reducing runoff quantity. Rain Gardens can be integrated into a site with a high degree of flexibility and can balance nicely with other structural management systems including porous pavement parking lots, infiltration trenches, and other non-structural stormwater BMPs. Bioretention areas typically require little maintenance once established and often replace areas that were intensively landscaped and require high maintenance.

BENEFITS

- Volume control & GW recharge, moderate peak rate control
- Versatile w/ broad applicability
- Enhance site aesthetics and habitat
- Potential air quality & climate benefits

POTENTIAL APPLICATIONS	
Residential	Yes
Commercial	Yes
Ultra Urban	Limited
Industrial	Yes
Retrofit	Yes
Recreational	Yes
Public/Private	Yes
Residential	Yes

MAINTENANCE

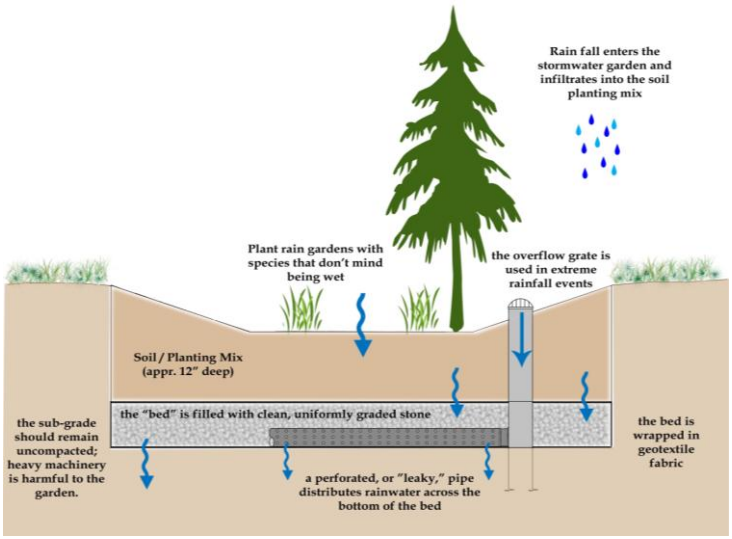
- Watering: 1 time / 2-3 days for first 1-2 months, then as needed
- Spot weeding, pruning, erosion repair, trash removal, and mulch raking: twice during growing season
- As needed, add reinforcement planting to maintain desired density (remove dead plants), remove invasive plants, and stabilize contributing drainage area
- Annual: spring inspection and cleanup, supplement mulch to maintain a 3 inch layer, and prune trees and shrubs
- At least once every 3 years: remove sediment in pre-treatment cells/inflow points and replace the mulch layer
- Maintenance cost is similar to traditional landscaping

COST

- Cost will vary depending on the garden size and the types of vegetation used; typical costs are $10-17 per sq. foot

POTENTIAL LIMITATIONS

- Higher maintenance until vegetation is established
- Limited impervious drainage area to each BMP
- Requires careful selection & establishment of plants



Conceptual diagram showing process of bioretention

Linear bioretention area along roadway
Source: Low Impact Development Center, Inc.

VARIATIONS

- Subsurface storage/infiltration bed
- Use of underdrain
- Use of impervious liner

KEY DESIGN FEATURES

- Flexible in size and configuration
- Ponding depths 6 to 18 inches for drawdown within 48 hours
- Plant selection (native vegetation that is tolerant of hydrologic variability, salts, and environmental stress)
- Amend soil as needed
- Provide positive overflow for extreme storm events
- Stable inflow/outflow conditions

SITE FACTORS

- Water Table/ Bedrock Separation: 2-foot minimum, 4-foot recommended
- Soils: HSG A and B preferred; C & D may require an underdrain
- Feasibility on steeper slopes: medium
- Potential Hotspots: yes with pretreatment and/or impervious liner
- Maximum drainage area: 5:1; not more than 1 acre to one rain garden

STORMWATER QUANTITY FUNCTIONS		STORMWATER QUALITY FUNCTIONS		ADDITIONAL CONSIDERATIONS	
Volume	Medium/High	TSS	High (70-90%)	Capital Cost	Medium
Groundwater Recharge	Medium/High	TP	Medium (60%)	Maintenance	Medium
Peak Rate	Medium	TN	Medium (40-50%)	Winter Performance	Medium
Erosion Reduction	Medium	Temperature	High	Fast Track Potential	Medium
Flood Protection	Low/Medium			Aesthetics	High