

Downspout Disconnection

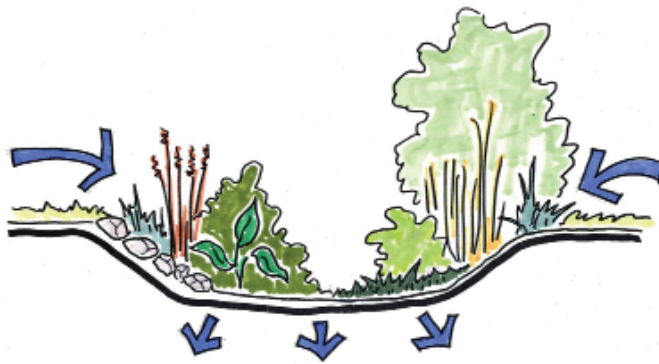
PURPOSE

Establishing a municipal downspout disconnection program provides support for a simple, low cost and low maintenance green infrastructure practice to reduce the amount of runoff entering the municipal storm or combined sewer system, thus reducing the occurrence of combined sewer overflows and associated water pollution.

The purpose of a municipal downspout disconnection program is to identify and disconnect those downspouts (also called roof leaders) that discharge into the sanitary sewer system, thereby reducing peak storm flows and associated combined sewer overflows (CSO). Sometimes, downspouts may not be directly plumbed into the sewer, but flow onto contiguously connected impervious areas such as driveways and parking lots, which drain to storm drains in the street. Under both circumstances (direct connection or overflow), redirecting downspouts to vegetated areas such as lawns or rain gardens is a recommended best practice.

In a 2011 study conducted by the Center for Watershed Protection, researchers evaluated runoff reduction at downspout disconnections to six urban residential lawns in the City of Baltimore, Maryland with C-type soils (less cohesive granular soils). On average, runoff reduction was high with an average reduction of 95% for the 1-inch rainfall event, and an average reduction of 90% for the 2-inch rainfall event. Numerous factors affect runoff reduction including soil type, age of lawn, slope, organic matter content, and management practices. The study noted that D-type (or compacted soils) would have resulted in less runoff reduction.

Rain gardens are an attractive alternative to lawn and allow 30% more water to soak into the ground than a conventional lawn (Wisconsin Department of Natural Resources, 2003). In addition to their ability to retain and infiltrate runoff, they provide important habitat for bees, butterflies and birds in urban and suburban areas.



SOURCE: www.GroundworkAppliedDesign.com

DESIGN CONSIDERATIONS

The physical disconnection is relatively simple as illustrated below, however there are a number of design considerations that need to be factored into a project.

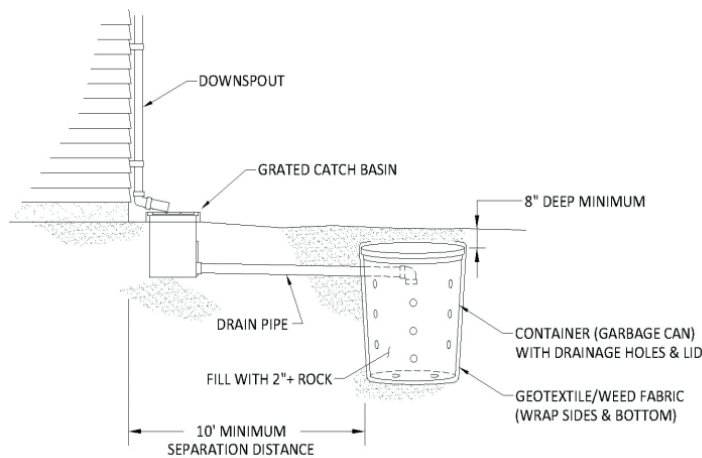
- » Evaluate soil type at the site to determine the type of on-site infiltration that will be most effective. Small highly compacted sites, or sites underlain with clay may not be feasible for on-site infiltration.
- » Direct downspout disconnections away from the basement foundation. Make sure downspout extensions end at least three feet away from basement foundations, and water is being directed on ground that slopes away from the building, however do not disconnect downspouts on slopes greater than 10%.
- » Downspout disconnections can redirect flows to vegetated areas such as a lawn or rain garden where there is the capacity for water to infiltrate into the ground.
- » Alternatively, a disconnected downspout can be plumbed into an underground drywell, gravel pit or trench where water is stored and slowly infiltrates into the ground.
- » Do not allow water to splash or pond on adjacent property. Infiltrate all water on site.
- » Do not redirect water to paved walkways and driveways as it will cause icing in the winter and unsafe conditions for pedestrians.



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A subsurface infiltration chamber can be built from a variety of materials. Key components include pipe, a perforated storage chamber, stone, and filter fabric.

SOURCE: Fairbanks Green Infrastructure Group www.fairbankssoilwater.org

HOW TO DISCONNECT A DOWNSPOUT

Step 1: Observe Your Site

It is important to understand where runoff from your downspouts go, including your house, garage, and other covered surfaces. Identify the location of downspouts and roof line, and estimate the square footage of your roof area. Map out areas in your yard for infiltration down slope of structures where you might disconnect downspouts.

Step 2: Design Your Disconnection

Make sure you have enough landscaped area for rain to soak safely into the ground. The ground area must be at least 10% of the roof area that drains to the disconnected downspout.

roof area	sizing factor	landscapes area size
500 sq. ft. X 10% =		50 sq. ft. (5'x10')

Step 3: Disconnect and Redirect

Cut off the downspout above the old connecting pipe. Cap or plug the top of the pipe. Fittings can be either approved adapters or blind plugs. These are available at most plumbing supply stores. Secure the cut downspout to the wall with a bracket. Next, install an elbow and extension to carry water away from the house. Add a concrete “splash pad” at the ground where the water spills from the downspout onto the lawn to prevent erosion, or landscape the area with stone, or install a rain garden to infiltrate the runoff water.



Step 4: Maintenance

Proper maintenance of your gutters, downspouts, and landscaping can reduce problems.

- » Clean gutters at least twice a year, and more often if you have overhanging trees.
- » Make sure gutters are pitched to downspouts, and repair low spots.
- » Check and clear elbows or bends in downspouts to prevent clogging.
- » The ground should slope away from the structures. Don't build up soil, mulch, or other landscaping materials against the foundation and siding.
- » Avoid draining water onto impermeable plastic weed block or cloth.
- » Maintain healthy vegetation (lawn or rain garden plants) in the drainage area to minimize erosion and promote optimum infiltration.

DEVELOPING A MUNICIPAL DOWNSPOUT DISCONNECTION PROGRAM

Some examples of successful municipal downspout disconnection programs are provided below. However, it is important to understand key program components so that a missing element does not become a barrier to program implementation.

Local Policies and Regulations

Municipalities should adopt a local policy or regulation prohibiting downspout connections and establishes a local program with standards and incentives for downspout disconnection and on-site infiltration. Such a program may not be appropriate in neighborhoods where soils are not suitable for infiltration. Neighborhoods with combined sewers are high priority areas for downspout disconnection programs. Soil suitability for infiltration should be assessed in these neighborhoods prior to implementing a program.

Stormwater plumbed into the sanitary sewer can not only cause combined sewer overflows, but it increases the volume of water to be treated at the waste water treatment plant at an expense to the municipality. Clean roof runoff does not need the level of treatment sewage receives at a treatment plant. By reducing the volume of water being treated at the plant, the municipality saves money that can be used to support other infrastructure needs.

See local examples below for more information on funding and operating a downspout disconnection program.

Education and Outreach

Public service announcements, community meetings, YouTube videos, brochures, and financial incentives have proven very important to successful programs. On-going education to residents about the benefits of disconnection and redirection, and alternative uses of stormwater such as rainwater harvesting for irrigation or greywater, cannot be overlooked. This means adequate funding is needed for dedicated staff, outreach materials, and possibly materials such as a downspout disconnection kit or a drywell for infiltration.

Technical Support

All successful downspout disconnection programs provide a licensed plumbing contractor to perform the work at no cost to the homeowner. Alternatively, the homeowner can do the work themselves or hire a licensed plumber at their own expense, sometimes from a pre-approved list of contractors provided by the City. If a homeowner chooses not to use a city contractor, or a pre-approved contractor, a site inspection is performed upon completion to ensure compliance with local sewer regulations and/or plumbing codes. In some cases, dye testing may be needed to determine if a downspout is connected to or has been properly disconnected from the sanitary sewer.

Funding Sources

Funding sources are typically derived from one of the following or a combination thereof: sewer rates, stormwater utility fees, and State Revolving Fund (SRF). Dedicating funding to downspout disconnection from any of these sources is identified in planning phases such as I/I studies and master plans, capital improvement plans, or through enforcement proceedings such as Administrative and Court Orders.

DISCONNECTION PROGRAMS – LESSONS LEARNED

City of Portland, Oregon

The City of Portland, Oregon's Department of Environmental Services operated a very successful downspout disconnection program from 1993 to 2011, disconnecting more than 58,000 downspouts at a total cost of \$13 million, inclusive of disconnection construction, staffing, and outreach materials and media. The program was funded solely from their sewer and stormwater utility fee, established in 1977. Some key lessons learned include:

- » **Scale Matters** – The program targeted a large geographic area to reduce CSOs to the Columbia, Slough and Willamette Rivers. To do this successfully, they used a simple technique for disconnection that was conservatively applied to only downspouts that could be disconnected safely.
- » **Downspout Disconnections Only Tool in the Toolbox** - They did not build rain gardens or other systems, seeking as much benefit as simply as possible. If a downspout disconnection could not be done safely, they didn't do it.

- » **Build Trust with Consistent Messaging** – Consistent and persistent messaging through targeted and direct outreach to homeowners helped build trust in the community and grow the program. Homeowners were slow to sign up at first, but the programs reputation for working well with property owners and careful attention to site details encouraged others to participate.
- » **Financial Incentives are Important** - Homeowners could earn \$53 for each downspout disconnection toward the stormwater portion of their city utility bill. Homeowners could have their downspouts disconnected for free by a licensed and bonded plumber under contract with the City, do it themselves, or utilize one of the volunteer community groups trained by the City. All sites were inspected after disconnection by the City. Later, the City also established the Clean River Rewards program which offered on-going discounts on utility bills for other on-site stormwater management options.
- » **Keep Risk Low** – High safety standards meant some downspouts could not be disconnected without risk of onsite flooding or harm to workers performing disconnection.

Boston Water and Sewer Commission

The Boston Water and Sewer Commission's (BWSC) downspout disconnection program was established 25 years ago as a component of their combined sewer separation. Through numerous Infiltration and Inflow Studies, the Commission identified neighborhoods and individual properties with downspouts connected to the combined or sanitary sewer, and initiated direct outreach to property owners about disconnecting their downspouts. Homeowners may choose to allow a contractor hired by BWSC to disconnect the downspouts at no cost to the homeowner, or the homeowner may hire a licensed plumber to disconnect at the owner's expense. The program has disconnected downspouts on 39,000 buildings, and estimates to have disconnected over 75,000 downspouts.

Funding sources have varied over the course of the program. In general, funding has been provided by the Metropolitan Water Resources Authority (MWRA), which gets its funding for sewer separation projects from SRF. MWRA operates the regional Deer Island Waste Water Treatment Plant. The funding structure has varied from full coverage to a cost share depending on different factors over time including the phase of separation, funding levels, and whether the project was located in a combined or separated sewershed. BWSC's portion of the cost share structure has come from their sewer rates revenue.

To support the sewer separation program, the City adopted a Sewer Use Regulation in 1998 prohibiting downspout connection to the combined sewer and requiring disconnection. The program saves BWSC money by reducing the volume of water it sends to the Deer Island Wastewater Treatment Plant, and supports MWRA's mandates to eliminate CSOs. More about this program can be viewed here:

<http://www.bwsc.org/SERVICES/Programs/downspout/downspout.asp>

REFERENCES AND RESOURCES

CITY OF PORTLAND, OREGON ENVIRONMENTAL SERVICES. HOW TO MANAGE STORMWATER: DOWNSPOUT DISCONNECTION.

www.cleanriverspdx.org

LAW, NEELY AND DANA PUZEY. DOWNSPOUT DISCONNECTION STUDY SHOWS GREAT POTENTIAL FOR RUNOFF REDUCTION ON SMALL URBAN LAWNS. CENTER FOR WATERSHED PROTECTION WINTER NEWSLETTER, 2012.

UNIVERSITY OF CONNECTICUT. RAIN GARDENS: A DESIGN GUIDE FOR CONNECTICUT AND NEW ENGLAND HOMEOWNERS.

www.nemo.uconn.edu/raingardens/

UNIVERSITY OF WISCONSIN EXTENSION. RAIN GARDENS: A HOW-TO MANUAL FOR HOMEOWNERS. 2003

<http://dnr.wi.gov/topic/shorelandzoning/documents/rgmanual.pdf>

FOR MORE INFORMATION, PLEASE CONTACT

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