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Rainwater Harvesting at the Department of Public Works

Abstract

As part of an urban Extension initiative that focuses on reducing storm water runoff from impervious surfaces, Rutgers Cooperative Extension installed 5,000-gal cisterns at the Department of Public Works (DPW) facilities in Clark Township and the Township of Parsippany-Troy Hills, New Jersey, to harvest rainwater from the rooftops of the garages at these facilities. This project intercepts rooftop runoff before it can carry nonpoint source pollutants from the land surrounding the DPW garages. The harvested rainwater is used to fill street sweepers, wash municipal vehicles, and supply water for a "green car wash" to support volunteer groups.

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Introduction

The New Jersey Department of Environmental Protection (NJDEP) has identified the operation of Department of Public Works (DPW) facilities (i.e., municipal maintenance yards and ancillary operations, such as impoundment lots, recycling centers, solid waste transfer stations, and mobile fueling stations) as a potential major source of storm water pollution in New Jersey. These maintenance yards are regulated under New Jersey's General Municipal Separate Storm Sewer System (MS4) permits (New Jersey Department of Environmental Protection, 2009). The MS4 permit requires that DPW facilities be regularly inspected and that standard operating procedures be established to ensure that storm water runoff from the facility does not affect local waterways. The focus of the MS4 permit is on eliminating runoff from secondary containment areas, sand and salt storage areas, fueling operations, and vehicle maintenance areas. The MS4 permit also promotes good housekeeping procedures that reduce the amount of rainfall coming in contact with hazardous

materials that might drain from the facility into the local waterways.

Statement of Problem

Many DPW facilities have large garages that are used for equipment storage. The rooftops of these garages are large impervious surfaces that funnel storm water runoff to the surrounding surfaces in the DPW yard. Many of the surfaces surrounding the garages are paved and often covered with oil, grease, and grit/sediment. The storm water runoff from the rooftops carries these pollutants to local waterways. Managing this runoff is important for reducing the pollutant loads to these waterways. Furthermore, there is often an overlap between storm water management and water conservation. The rooftops of the DPW garages are perfect surfaces or catchments for rainwater harvesting. Water can be captured from these rooftops and stored in cisterns for various uses. This practice is similar to homeowners' use of rain barrels to harvest rainwater for their gardens (Bakacs et al., 2013).

Solution

The Rutgers Cooperative Extension (RCE) Water Resources Program developed watershed restoration plans for the Troy Brook Watershed and the Robinsons Branch Watershed. These plans identified specific projects intended to help reduce nonpoint source pollution and minimize flooding in each watershed. In the Troy Brook Watershed, the Parsippany-Troy Hills DPW facility was identified as a significant source of pollution for Troy Brook. The facility has extensive impervious surfaces and is located on the banks of Troy Brook. In the Robinsons Branch Watershed, the Clark DPW facility was identified as a significant pollutant source of Robinsons Branch. The Clark DPW facility also has extensive impervious surfaces and is located on the banks of Robinsons Branch.

As part of an urban Extension initiative that focuses on reducing storm water runoff from impervious surfaces, the RCE Environmental and Resource Management county agents in Union and Morris Counties worked with the RCE Water Resources Program to install rainwater harvesting systems at the Parsippany-Troy Hills and Clark DPW facilities. A 5,000-gal cistern was installed to capture storm water runoff from the 5,500 sq ft of rooftop at the Parsippany-Troy Hills DPW facility. The cistern was sized to capture storm water runoff from the first 1.25 in. of rainfall from each storm. This allows up to 90,500 gal of storm water per year to be harvested and minimizes the amount of storm water pollutants draining into Troy Brook from the facility. The DPW facility uses the harvested storm water to fill street sweepers and to wash municipal vehicles. This project serves as the foundation for a new RCE program titled Greening Department of Public Works, which focuses on rainwater harvesting and storm water management in urbanized areas to reduce environmental impacts to local waterways.

A 5,000-gal cistern was installed at the Clark DPW facility to capture storm water runoff from 5,000 sq ft of the DPW garage rooftop. The cistern can capture up to 82,250 gal of storm water per year. Because the Clark DPW yard is adjacent to the Clark public high school, there were unique opportunities for water reuse. The youth groups in Clark frequently hold car washes to raise money for their organizations. The RCE Environmental and Resource Management county agent in Union County worked with the DPW to create a "green car wash" using the rainwater harvested from the rooftop of the DPW garage. A concrete pad was constructed on the edge of the DPW yard, next to the high school parking lot, to allow cars to gain access to the harvested rainwater for car washes.

The runoff from the car washes is then diverted to a rain garden for treatment (Obropta, Flahive DiNardo, & Rusciano, 2008). All attendees of the nonprofit car washes are provided with a flyer about the "green car wash" to educate them about the benefits of rainwater harvesting and to remind them to conserve water.

Each rainwater harvesting system is equipped with a first flush diverter. This captures the first 15 gal of runoff from the rooftop and diverts it from the cistern to prevent clogging of the cistern. The cisterns are in operation from April through November. For the remainder of the year, the rainwater harvesting system is drained, and storm water is bypassed around the system to drain directly into the storm sewer system.

Project Costs

The cost to install the cistern, piping, and gutters was \$10,000 per town (\$2 per gallon). The concrete pad for each cistern was not included in the price because each DPW paid for the installation. The cistern associated with the "green car wash" uses a pump for washing the cars. The cost of the pump was not included in the calculation. The rain garden used to treat the runoff from the car wash is 200 sq ft in size and cost approximately \$1,000 to construct. A concrete channel was constructed to convey car wash runoff from the concrete pad to the rain garden.

Acknowledgments

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