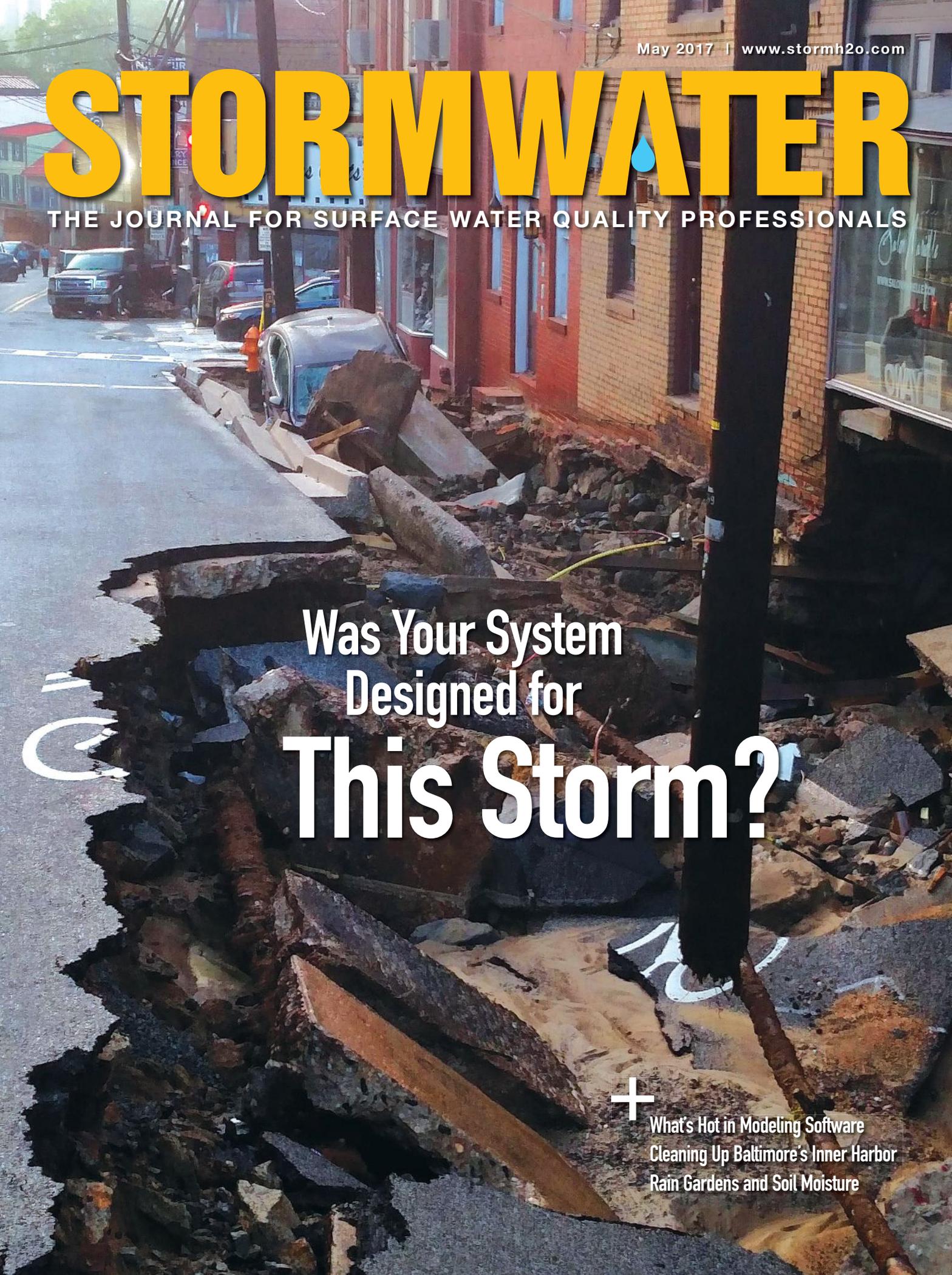


STORMWATER

THE JOURNAL FOR SURFACE WATER QUALITY PROFESSIONALS



Was Your System
Designed for
This Storm?



What's Hot in Modeling Software
Cleaning Up Baltimore's Inner Harbor
Rain Gardens and Soil Moisture

Gray Combined With Green: Retrofit of Existing Bioretention Facility With High-Flow Bioretention Technology



Annapolis business park after installation was completed

Surface stormwater treatment practices have a common use in development projects to provide collection and control of contaminants generated from runoff from impervious surfaces. Common surface stormwater treatment practices include wet ponds, grass swales and channels, and bioretention facilities. Grass swales and bioretention facilities rely upon filtration provided by the vegetation and soil cross section to remove and contain contaminants. These facilities typically occupy a significant surface footprint to have sufficient capacity to capture the majority of runoff from rainstorms, as the filtration rates are relatively low. Due to the high levels of both runoff volume and contami-

nant concentration, surface stormwater treatment practices implemented in highly urbanized areas can suffer various modes of failure that require extensive repair and reconditioning to remain functional. In addition, as systems of this type age, they can present aesthetic challenges (compared to landscape-only site features), which can impact the ability of the site to operate as intended from the standpoint of attracting tenants and shoppers.

A small commercial flex-office development in Anne Arundel County, MD, was built in phases starting in 2003. Surface bioretention facilities were constructed to collect stormwater runoff from impervious surfaces and provide water-quality control. These facilities are essentially closed

depressed channels within the parking areas into which the pavement drainage is directed. Despite ongoing maintenance conducted by the site owner, by 2015 the largest bioretention system had begun to demonstrate several failure modes, most notably clogging of the bioretention surface and failure of the asphalt pavement edges surrounding the perimeter of the facility. These failures resulted in reduction of aesthetic quality and would have required extensive rebuilding of the facilities, at a large expense, to correct the appearance and to restore the water-quality function of the facilities. The failure needed to be addressed to restore the curb appeal of the building space available for lease at the site.

The consulting firm, Bay Engineering,

of Annapolis, MD, proposed an innovative solution to repairing and replacing the bioretention cell. Rather than simply selecting a stormwater practice from the list of acceptable local and state options, Bay Engineering chose Filterra high-flow bioretention systems to provide water-quality control. Filterra has cost-effective installation and maintenance requirements. This approach also allowed the existing bioretention facility to be abandoned and replaced with more traditional landscaping.

The Filterra technology is a high-flow bioretention system used to directly collect and filter stormwater runoff from pavement, building rooftops, and other pollution-generating impervious surfaces. It consists of a proprietary filter media placed in a prefabricated tank and planted with vegetation. Runoff is directed into the tank, to be quickly and completely discharged through an exit pipe at the bottom of the unit as contaminants such as trash, debris, sediment, oils and greases, and nutrients are captured. Filterra units are comparable to standard storm drain inlets (curb opening type) in terms of

arrangement and function in pavement; in most applications the Filterra unit is simply placed as an opening in the curb and gutter and located at the appropriate collection point in terms of specific area of drainage to the facility. On this site, the first flush of runoff is directed to the Filterra units for treatment via the newly installed curb and gutter; two units are placed on opposite sides of the existing drainage and configured as mirror images of each other. Treated and bypass discharge flow is directed to the underground storm drain system; the discharge from the Filterra exits via an integral underdrain pipe, and bypass flows enter the existing riser overflow from the original bioretention facility.

Speed and cost control were of the highest priority in terms of installing the two Filterra units, abandoning the existing bioretention cell, and replacing it with more traditional landscaping. Installing the two Filterra systems was quick and easy. Being completely prefabricated, including the internal piping and filter media, the units were simply trucked to the site and offloaded into place like any standard inlet.



Before installation

Forester University Presents

Water Balance Methodology

May 2nd



Kim A. Stephens
Executive Director
Partnership for
Water Sustainability



Jim Dumont
Engineering Applications Authority
Partnership for
Water Sustainability

Join industry experts Kim A. Stephens and Jim Dumont as they delve into Water Balance Methodology and how watershed assessment and mitigation of urban development can be achieved using a continuous simulation model that demonstrates flood frequency, water balance, stream impacts and water quality.

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FU_WE1705_WaterBalance_Sp



During installation

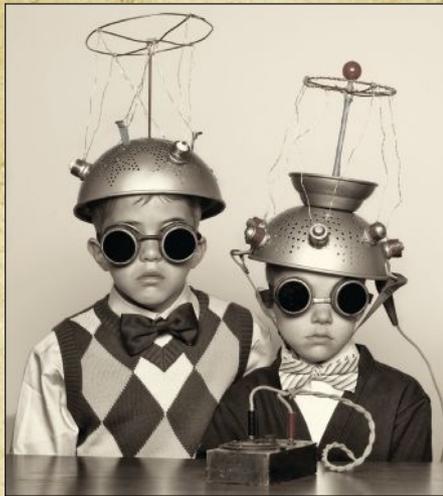
The entire process for both units was completed in a few hours. The protected throat opening was left in place during the remainder of the construction process. Once the final paving and site stabilization took place, a crew from the supplier of the Filterra systems performed the “activation” of each facility, which included planting the selected vegetation (not yet mature), placing the 3-inch mulch layer and rock cobble scour protection, removing the throat protection, and taking the corresponding data and photographs to document the process.

The free edges of asphalt pavement were replaced with a concrete curb and gutter. The depressed areas of bioretention were replaced with clean fill. Grass and trees were planted as landscaping inside the curbed area. A clean, pleasing look—one that better matches the look of the office buildings and the relatively young age of the office park—was achieved successfully.

In summary, the originally constructed bioretention facility was not able to function and meet the curb-appeal needs of the site owner. The economics of replacing the system and restoring it was not feasible. Using an innovative treatment device—in this case the Filterra system—in conjunction with more standard landscaping islands was the most logical alternative. In addition, the use of a prefabricated system provided for the shortest possible window of time within which to complete the work and minimize the disruption to the tenants of the nearby offices. This option also allowed for the use of curbing for the edge of pavement, providing for a cleaner look and worry-free solution with respect to maintenance of the pavement and drainage. Maintenance of the Filterra system is predictable and reasonable—remove and replace the top 3-inch mulch layer twice a year and pump out the wet forebay every other year—which will allow for easy budgeting for operation and maintenance for the long term. In addition, the fully prefabricated nature of the Filterra system helped to keep the construction costs predictable and the timeline short, as the business park was open during construction. ♦

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Clarks Creek Stormwater Retrofit Project

Puyallup, Washington

Stormwater Treatment

Owner:

Pierce County

Engineer:

Pierce County

Contractor:

NW Cascade Inc.

Installation:

April 2014



In 2013, the Pierce County Department of Public Works and Utilities Surface Water Management Division installed a stormwater filtration system to treat stormwater from 0.6 acres of impervious surfaces that was discharging into Rody Creek, a main tributary to Clarks Creek. The intent of the project was to improve dissolved oxygen levels in Clarks Creek by meeting a TMDL goal from the Washington State Department of Ecology (WSDOE) through reducing sediment loads. Achieving this goal would improve the overall health of the Rody Creek watershed and accelerate the recovery of salmon populations in Clark Creek and its tributaries.

The engineer of record selected a spiral filter system based on the fact it was a WSDOE GULD listed product and the public bid process. A few months later, the county indicated the system had clogged twice since it was installed. The City tried to work with the manufacturer to solve the performance issues, but the City and the manufacturer could not agree on what was causing the system to fail. The City then contacted WSDOE who awarded a grant to get approval to retrofit the system with a Stormwater Management StormFilter.

Contech worked extensively with the county to develop a solution utilizing StormFilter cartridges. Being a retrofit, it was crucial for Contech to provide a flow kit with accurate cartridge placement. In addition, the project was located in a residential area, so quick installation was key. Contech provided proposal drawings, specifications, and installation documentation. This streamlined the process and provided a solution that was installed in just two days.

One of the unique features of the StormFilter is its patented surface cleaning mechanism that helps restore the permeability

Technical Description:

- Cast-in-place StormFilter® with custom flow kit



Clarks Creek Stormwater Retrofit Project

Puyallup, Washington

of the filter surface between storm events and prevent clogging. After 6-months of installation, the system was operating at full capacity and had not required any additional maintenance. When maintenance is needed, Contech offers a maintenance and certification program that has been well received by Pierce County and other WA jurisdictions.

2009 Virginia Avenue

Hagerstown, Maryland

Owner:

AC&T

Engineer:

Frederick, Seibert, & Associates

Contractor:

AC&T

Installation:

December 2014



In 2010 Maryland stormwater regulations that introduced the concept of Environmental Site Design (ESD). ESD tasks the engineer and the owner to look to the site first for cues in stormwater management. It requires the site be mapped for sensitive features worth protecting. Once the site has been mapped, the designer is meant to “fingerprint” site improvements that avoid impacting these features. Then, once the site has been laid out, the designer turns to more “structural” means of treating stormwater, both for quality and quantity.

This site development was for a largely impervious layout for the construction of a mini-warehouse storage facility that had very few (if any) natural features required to be mapped per the ordinance. In order to meet the requirements of both water quality and quantity management using ESD, a large area of the site was dedicated to bio-retention ponds.

The property owner asked engineer to take a second look at the proposed BMP. Upon further analysis, it became clear a structural solution to this problem was possible. Rather than installing the large bio-retention area, Contech recommended installing a StormFilter, a stormwater treatment system comprised of a concrete structure that houses rechargeable, media-filled cartridges that can treat stormwater to MDE standards. A 8x11 vault with 22 Cartridges utilizing compost filter media was installed.

Technical Description:

- Stormwater Management StormFilter®



2009 Virginia Avenue

Hagerstown, Maryland

Normally, these concrete vaults with filter cartridges are reserved for urban areas where water is stored in pipes upstream of the structure and slowly drawn through the filter media at a designed rate. In this case the structure was installed directly in the berm of the basin. The only difference is that the storage is taking place in a pond with a grass bottom.

Runoff will enter the basin via direct sheet flow along the entire basin perimeter adjacent to the pavement. A stone trench at the edge of the pavement is used to settle fines and reduce flow velocity prior to flowing into the pond. There is no traditional underground storm drain other than the outlet pipe from the basin. As water ponds up in the basin, runoff will drain into the StormFilter structure located in the berm via a small inlet orifice and trash-rack on the outside wall of the structure. Some evaporation of runoff in the basin will occur as it fills and slowly drains, which adds the benefit of at least some minimal volume/runoff reduction. Volume in excess of the ESDv will exit the basin through a new outlet control structure which provides overflow relief.

Given the circumstances, this design makes sense. With an impervious lining, there is no opportunity for infiltration and recharge of groundwater and so the bio-retention pond is just a filter, discharging clean water at a certain rate. We replaced the bioretention structure with a concrete structure that has filter media inside of replaceable cartridges. At the end of the day, this solution offered all of the same stormwater management benefits for a similar cost and much less maintenance, which is exactly what the developer wanted.

Stormwater Quality Treatment Retrofits

Bellingham , Washington

Stormwater Treatment

Owner:

City of Bellingham

Installation:

July 2017



The City of Bellingham Maintenance Department was burdened with the high cost and extensive labor required to maintain 3 spiral-type stormwater filter systems.

The City contacted Contech to explore the possibility of replacing the existing cartridge systems with the Stormwater Management StormFilter. The StormFilter uses rechargeable, media-filled cartridges to absorb pollutants from stormwater runoff including total suspended solids, hydrocarbons, nutrients, metals, and other common pollutants. All StormFilter structures provide access for inspection, media replacement, and washing of the structure. StormFilter has been designed for predictable maintenance intervals ranging from one to five years.

The City has a long history of using the StormFilter system, so they knew the retrofit would eliminate clogging, provide longer maintenance intervals, and lower maintenance costs. After thorough site evaluations, Contech was able to design StormFilter retrofits for all 3 of the existing systems.

The units were first cleaned using a vacuum truck. Next, all the existing components were cut out down to the inlet/outlet stubs. Stainless steel risers and StormFilter flow kits were then installed. Finally, the StormFilter cartridges were installed containing ZPG media, a proprietary blend of zeolite, perlite, and granularly activated carbon to target organics, soluble metals, and other pollutants.

The original cartridge systems were removed and customized StormFilter systems were installed within the existing structures providing the City with 3 new treatment systems utilizing a total of 14 StormFilter cartridges.

Technical Description:

- Stormwater Management StormFilter® Retrofit



Washington Navy Yard Sand Filter Retrofit

Washington, District of Columbia

Stormwater Filtration

Owner:

Naval Facilities Engineering Command

Engineer:

Naval Facilities Engineering Command
(NAVFAC) - U.S. Navy

Contractor:

EDC

Installation:

Spring 2014



The [Washington Navy Yard](#) (WNY) is a former shipyard and ordnance plant for the United States Navy and currently serves as a ceremonial and administrative center for the U.S. Navy.

The Navy Yard had two underground sand filters providing water quality treatment. Regular maintenance was needed to prevent trash and sediment from clogging the filters. This process was time-consuming, expensive and messy. As a result, engineers at the Naval Facilities Engineering Command (NAVFAC) researched alternatives to provide the desired treatment level per District Department of the Environment (DDOE) standards, and reduce maintenance. The solution they chose was to retrofit the existing sand filters into [Jellyfish Filters](#) from Contech Engineered Solutions.

The Jellyfish Filter is a stormwater quality treatment technology featuring pretreatment and membrane filtration in a compact stand-alone system. The compact design and high surface area cartridges provide effective fine sand and silt sized particles removal, combined with high removal percentage for particulate bound pollutants including nutrients, metals and hydrocarbons. The Jellyfish Filter offers easy maintenance, is available in multiple configurations for site specific design and has numerous agency approvals, including NJDEP certification of a TARP field test. It was important to the NAVFAC to design the Jellyfish units to work within the existing size and elevations of the sand filter vaults. Contech provided full engineering support and designed the units to require minimum modifications to the existing infrastructure.

The retrofit process involved cutting an opening in the top slab of the vaults, removing the existing internal components and pouring two new flow control baffles as directed by Contech. A Contech representative was onsite to assist the contractor

Technical Description:

- (2) Jellyfish[®] Filters with (9) 15" hi-flo cartridges and (3) 15" drain-down cartridges each



Washington Navy Yard Sand Filter Retrofit

Washington, District of Columbia

with installing the aluminum Jellyfish decks and filter cartridges. After the internals were installed, the contractor set a new top slab with a hatch cast-in on each system as designed and provided by Contech. The installation was completed in just two days.