# Structural Stormwater Pollution Reduction Targeting Floatables, Gross-Pollutants, and Trash in Myrtle Beach

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## Background

The City of Myrtle Beach, SC has evolved in the past few decades into one of the most popular beach resorts on the East Coast of the United States with more than 15 million visitors annually. Removing trash, floatables and other gross-pollutants is a critical function of any stormwater collection system that requires water quality improvement. For a beach resort town like Myrtle Beach, SC, with a year-round population of about 30,000 residents, keeping trash out of the stormwater discharges is a high priority. Beyond keeping the water clean for residents, the perception of water quality by the millions of tourists that visit each year, can have a dramatic impact on the economy of this top-rated family beach destination.

Myrtle Beach has approximately 162 miles of stormwater drainage pipes, with more than 55 beach outfalls with 3 deep-water outfalls, draining primarily to the Atlantic Ocean along the 10.5 miles of beaches or to the Intracoastal Waterway on the city's western boundary. As such, the floatables and trash that are discharged have a direct impact on the aesthetic beauty of the coast line and beaches as well as posing a risk to public health and aquatic life. For over a decade, the city has used an advanced hooded outlet cover concept, whereby vented hoods cover the outlet pipes of key deep-sump stormwater inlets and distribution structures throughout the drainage network. More than 235 BMP SNOUT® equipped structures are in service at locations throughout Myrtle Beach. Periodic mass loading monitoring has shown a 70% reduction of trash and other gross-pollutants. On average, it is estimated that each structure removes one ton of solids and debris on an annual basis. In total, more than a half million pounds of solids are being collected and removed from the surface waters each year by these hooded structures.

## Design Considerations

DDC Engineers, the primary municipal engineering consultant for the City of Myrtle Beach first selected the SNOUT from Best Management Products, Inc. (BMP, Inc.) in 2003 after a search for solutions to minimize the discharge of trash onto the beach. The requirements were three-fold: 1. The technology deployed had to target the pollutants of greatest concern—trash, floatables and roadway oils. 2. The strategy had to be cost-effective. 3. The system had to be easy to install and maintain. For Myrtle Beach, developing the city's stormwater infrastructure moved forward that year with a $13 million project to make drainage improvements along N. Ocean Boulevard near 14$^{th}$ Avenue.

Of particular interest to designers was the skimming action of the hoods to remove pollution floating on the surface in the catch basins, along with the high hydraulic capacity and anti-siphon venting that prevents pollutants from being drawn down stream after a flashy high flow storm-- all too common in the southeast U. S. While the overall project had a significant budget, the 50 hoods and deep sump catch basins were estimated to add no more than $100,000 of material cost to the $13 million effort, with the structures accounting for the majority of that cost. For a project draining nearly 90 acres where the imperviousness approached 90%, this treatment train approach of utilizing over 50 water quality structures was extremely cost-effective. Of course, in a tourist dependent town, the work had to be completed in the off-season. This meant that construction could begin no sooner than late October and had to be finished in late April, before the mass of visitors begin their annual migration to this seaside resort. As the SNOUTs were easy to install in the town's standard inlet, requiring only a deeper sump, retrofitting was possible, and fitting new inlets with this pollution fighting technology was simply a matter of increasing the minimum sump depth based on a factor of 2.5 times the outlet pipe ID. As an example, for a pipe with an 18" ID, a sump depth of 4' is sufficient. For maintenance, BMP, Inc. recommends that the structure be serviced, typically by vacuum truck, when the sump is half full of material, meaning that 2' of material has accumulated in a 4' deep sump. This protocol ensures that floatable solids and liquids are also removed on a timely basis. In Myrtle Beach, structures are typically inspected, and maintained if needed, at six-month intervals.

**Applications**

The most common application is for the SNOUT is to skim off trash and oils while letting sand and other solids settle out prior to discharge. At 14$^{th}$ Avenue N. and N. Ocean Boulevard, 24" pipe runs parallel to the beach on the western side of Ocean Boulevard, with 15", 18" and 24" lines running perpendicular to the storm line on Ocean Boulevard, between 9$^{th}$ Avenue N. and 18$^{h}$ Avenue N. Here, there are a mix of businesses, condominium residences and hotels along the beachfront as well as a restaurant on a pier (Figure 1).

Figure 1, Pier 14 Restaurant at Myrtle Beach, 14 Avenue and N. Ocean Boulevard

Among the 50 SNOUTs deployed along this section of the beach are the 18F for the 15" pipe, the 24F for the 18" pipe and the 30F for the 24" pipe. The primary pollutants of concern are trash and floatables that would otherwise be discharged to an ocean outfall (Figure 2). Each structure is typically a 3' x 4' or a 4'x 4' precast concrete catch basin with a 3' to 4' deep sump as a standard.

Figure 2, 14th Avenue N. and N. Ocean Boulevard, 30F SNOUT

Nearby the 14th Avenue N., and N. Ocean Boulevard location and running parallel to it is a run of an additional 40 inlets on Withers Drive from 9th Avenue N. to 14th Avenue N. One finds a mix of undeveloped lots, commercial space and parking lots and structures in this area. While not frequented by tourists like the Ocean Boulevard locations, trash and to a greater extent oils are a problem due to more commercial traffic and the prominence of vehicle parking. The structures are served by 15" and 18" pipe terminating into a main header pipe, which is then discharged into an ocean outfall. A structure with an 18" pipe and a 24F SNOUT shows a significant accumulation of oil (Figure 3).

Figure 3, Withers Drive and 9th Avenue N., 24F SNOUT

In some cases, stormwater inlets in Myrtle Beach discharge into perforated pipes or other types of infiltration systems, where the benefit of the of deep sump catch basins with

SNOUTs are multi-fold. In these infiltration applications, pollutants such as total suspended solids (TSS) and the nutrients that TSS can transport are typically targeted for removal. However by volume, trash and gross-particles can easily contribute an overwhelming mass load that will quickly fill the underground facilities, and greatly hamper the removal of targeted micro-pollutants if the gross solids are not addressed. This is the case at S. Ocean Boulevard between Wither Swash to 2nd Avenue S., where a 24" perforated pipe drains 20 inlets equipped with 30F SNOUTs (Figure 4). Here, organic debris from foliage in a nearby park mixes with trash and oil, as well as sediment, sand and grit. Whatever flow is not infiltrated is discharged through a flexible rubber check valve that drains to Withers Swash adjacent to the Family Kingdom (Figure 5), a Myrtle Beach seaside amusement park.

Figure 4, S. Ocean Boulevard at 3rd Avenue S., 30F SNOUT

Figure 5, S. Ocean Boulevard and 4th Avenue S., near Family Kingdom

One of the resort town's prominent features is its 1.2 mile long ocean front boardwalk (Figure 6). Completed in 2010, at a cost of $6.5 million, the beach side promenade stretches from N. 14th Avenue to N. 2nd Avenue. Along with Gross Solids Removal Devices (GSRDs) from Roscoe Moss Co., 40 SNOUTs were deployed for Trash, Floatables, Oil and fine solids removal prior to discharge into a series of 15" and 18" perforated pipes. As is often the case when protecting an infiltration gallery, hoods are used on both the inlet and outlet pipes as flow can occur in both directions with changes in the level of the water table due to rain events and seasonal fluctuations (Figure 7).

Figure 6, Myrtle Beach Boardwalk at N. 2nd Avenue

Figure 7, Near 3rd Avenue S., and Ocean Boulevard. Shown is a pair of 30F SNOUTs covering 24" perforated pipe

**Conclusions and Next Steps**

The implementation of hundreds of SNOUTs in Myrtle Beach, as well as the implementation of other gross-pollutant removal systems in Myrtle Beach including the GSRDs and Crystal Stream devices speak to the importance of addressing the pollution in stormwater runoff. The structural treatment train concept offers simple methods that transform inlets and other storm structures into micro-detention or strategic treatment nodes and is most successfully implemented when combined with Low Impact Development protocols. This application dramatically improves the pollution removal efficiency of stormwater quality, detention, infiltration or re-use systems by separating the high volume gross pollutants prior to the higher resolution treatment steps that target micro-pollutants like nutrients and other dissolved constituents. For next steps, more gross-pollutant removal systems are in planning and design phases. DDC Engineers is designing a 200 CFS gross-pollutant removal system for the Main Street outfall in North Myrtle Beach, which will utilize 96FTB SNOUTs and the BMP Bio-Skirt oil and bacteria reducing booms (Figure 8).

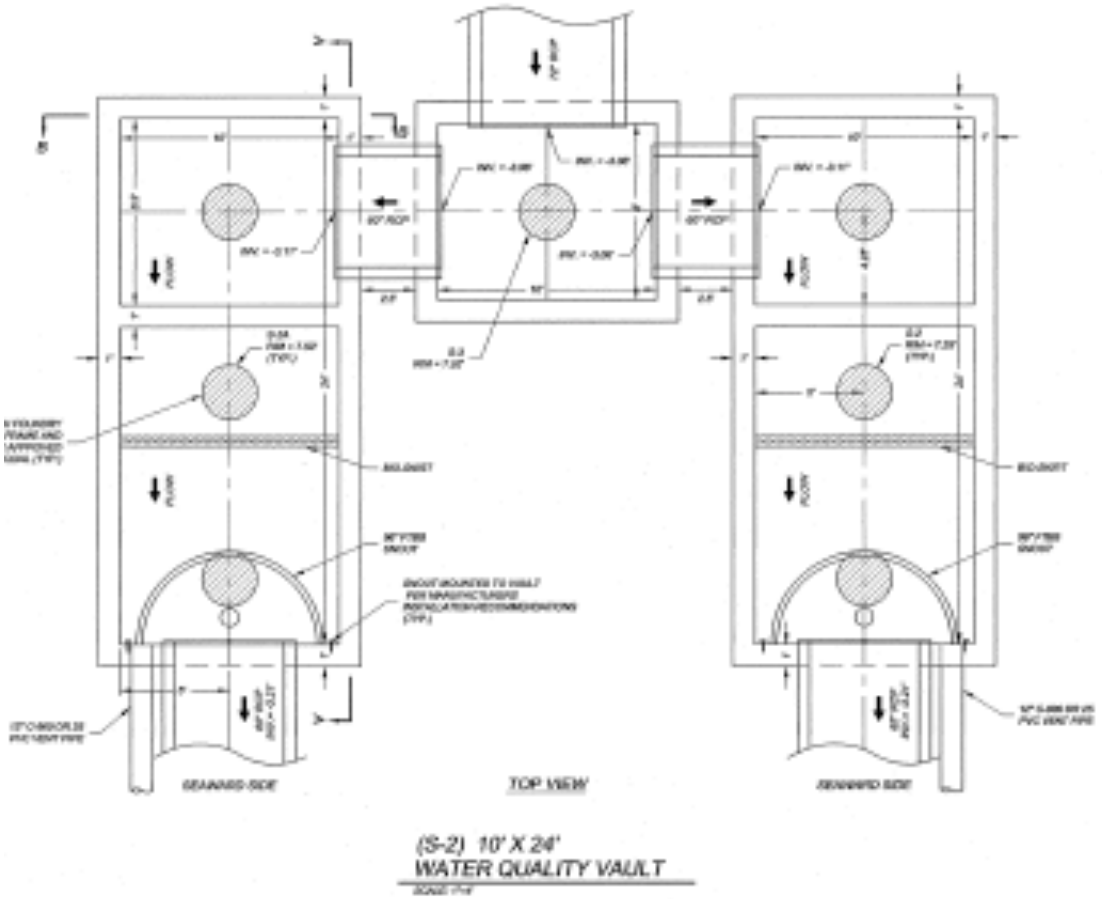


Figure 8, Water Quality Vault with 96FTB SNOUTs, N. Myrtle Beach, SC. by DDC Engineers, Inc., Myrtle Beach, SC

The forward thinking efforts of the municipalities and local engineering designers will insure that the Grand Strand of South Carolina remains one of the top ranked and environmentally sustainable beach destinations in the United States.

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All photos are by T. J. Mullen, BMP, Inc.