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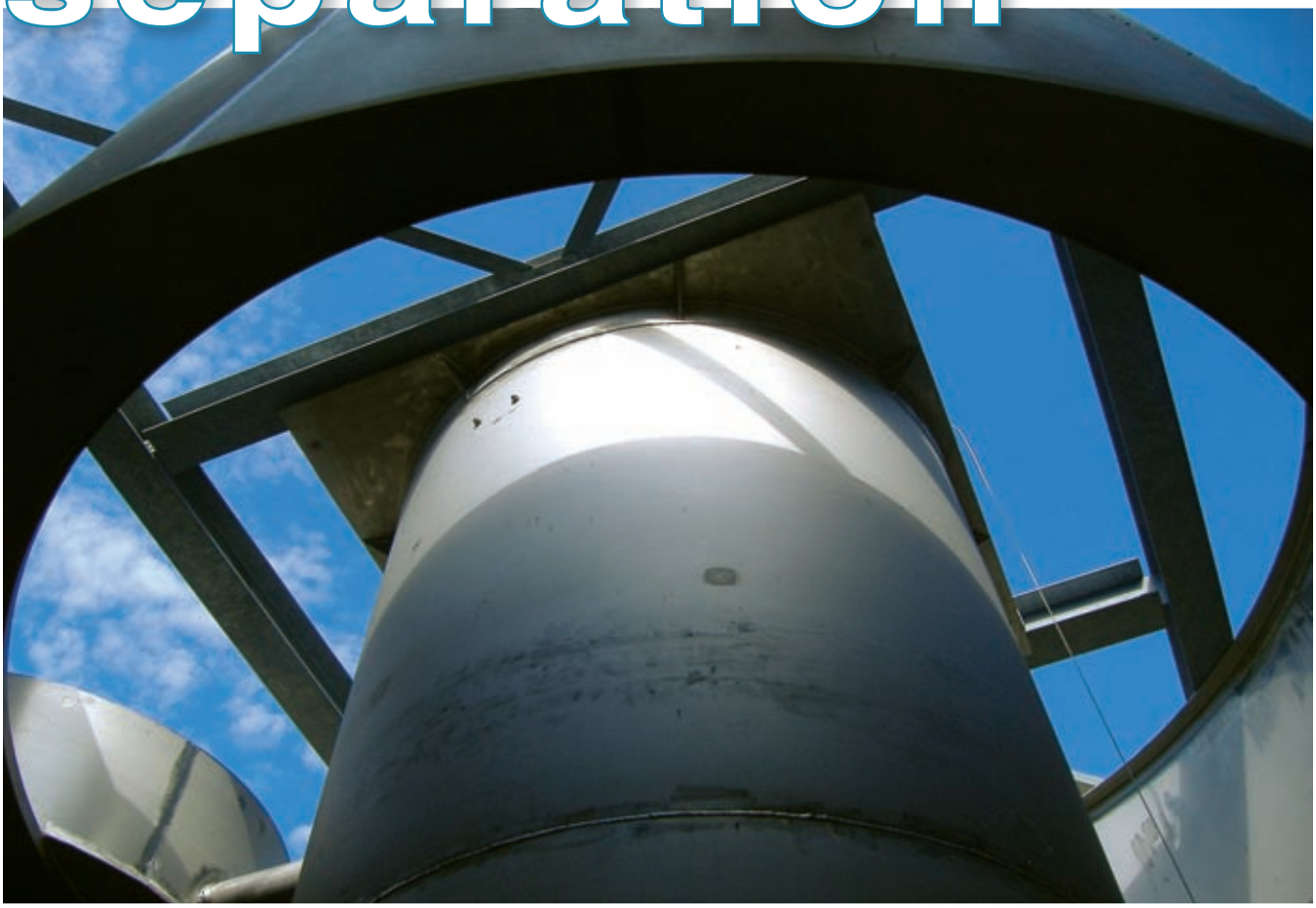

Saco, Maine, uses hydrodynamic vortex separator to protect its river

By Lisa Glennon

Like many other urban communities in the Northeast, the city of Saco, Maine, has been working hard in recent years to correct problems caused by combined sewer overflows. The city's combined sewers were built to collect wastewater and storm water runoff, but during particularly heavy rains the combined storm water and sewage has overflowed from pipes and seeped into the Saco River.

Saco opted for a hybrid solution to the problem. City officials pursued a plan to eliminate seven of eight combined sewer overflow (CSO) outfall sites by separating the storm water and wastewater sewers.

Saco leaders also looked into alternative solutions for the eighth site, which served the downtown area. Ultimately the leaders decided against further separation of the combined sewers in the highly urbanized downtown area to avoid costly traffic disruptions, as well as negative impacts on utilities and businesses.

The eighth CSO site required a mechanism near the overflow site for treating effluent before it reached the river. The question was whether to use a more conventional primary clarification system or to try an alternative technology.

Conventional primary clarification systems, typically contact chambers and settling basins, can be prone to short-circuiting. When this happens, the system needs lengthy contact time with disinfectants to ensure proper treatment. To avoid this problem, many municipalities use larger tanks to increase the amount of time that water resides within the tank and is exposed to coagulants and disinfectants.

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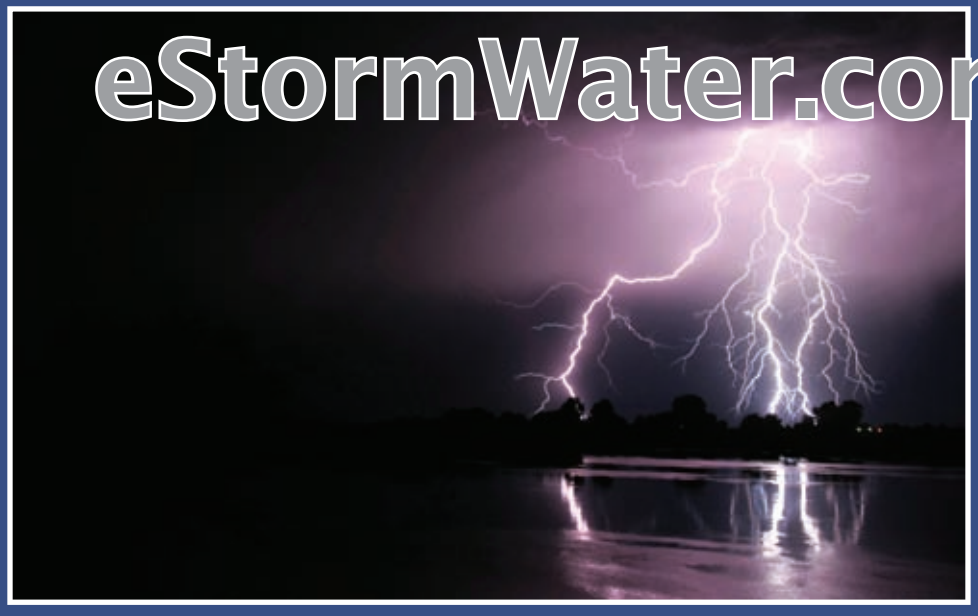

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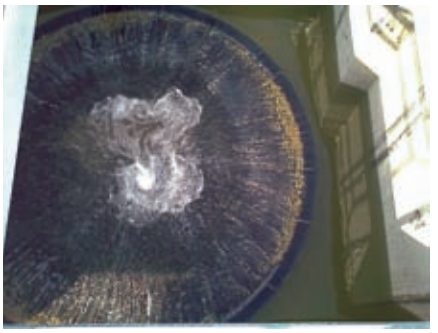

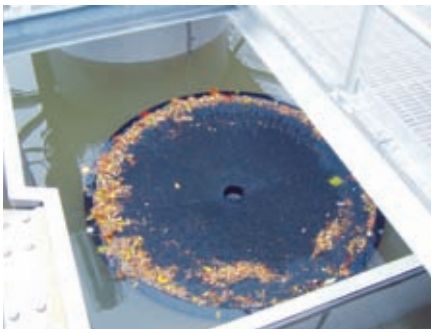

Saco's excess flow treatment systems at work.

Larger tanks, however, require a considerably larger capital investment and far greater maintenance costs. For the effluent to meet the water quality standard required by the Maine Department of Environmental Protection, Saco officials would have had to double the size of their city's tank.

The challenge was twofold. First, how to treat excess storm water? And second, how to control the flow of water to ensure proper treatment and avoid polluting runoff?

To gauge Saco's storm system needs, researchers analyzed precipitation in the Saco River from the 1980s and 1990s, as well as a recent four-year period. Based on these findings, city officials felt confident they had a good gauge on estimating future storm events.

"Treating storm water isn't a finite thing," said Christopher J. Osterrieder, senior engineer with Deluca-Hoffman Associates Inc. of South Portland, Maine, the engineering firm that worked on the Saco sewer project. "We had to be careful to only send enough water so that we can perform within the vortex separator's rated range."

The city implemented a new conveyance line at the treatment plant and installed two vortex flow control valves from Hydro International Inc. of Portland, Maine, to control the flow. Saco officials chose to utilize this alternative excess flow treatment system to avoid the cost and performance challenges of more conventional tank systems.

The system's first valve restricts the flow that goes down to the treatment plant, and the second valve splits the flow, letting the maximum volume go through the regular secondary wastewater treatment process. The rest goes to Saco's new CSO treatment system based on Hydro International's Storm King advanced hydrodynamic vortex separator (HDVS). When that capacity is exceeded, the overflow is treated by the vortex separation system prior to discharge.

This type of system was developed

A view of Saco's new CSO treatment system.

for CSOs but also can be used to treat storm water as long as the flows are connected to a sanitary sewer; that way any resulting sludge is sent directly to a wastewater treatment plant.

In the new CSO treatment system, sedimentation, screening and disinfection are all accomplished in the HDVS vessel. The disinfectant sodium hypochlorite is injected into the HDVS flow. The disinfectant and combined sewer then mix in the Storm King vessel, and gravitational and rotational forces slow the flow, increasing disinfectant contact time and allowing for the removal of more undesirable materials. The city, then, was able to use its smaller tank to achieve required treatment levels while vastly reducing up-front and maintenance costs.

As solids settle and collect in the base of the vessel, the flows are directed through the central area of the vortex chamber and then down through the swirl-cleanse screen, which captures all floating solids and neutrally buoyant material greater than 4 mm in diameter. The screened effluent is discharged from the system through an air-regulated siphon, which also provides an effective self-activating backwash mechanism to prevent the screen from blinding.

After screening, the treated sewer flows are discharged into the Saco River. Collected screenings and grit are pumped a short distance back to the wastewater treatment plant for processing.

"We've had some very large storms beyond set design criteria, and the system still performed very well," Osterrieder said. "Prior to the project, storm overflow caused the discharge of untreated sewage right into the river."

Maintenance crews wash down the tank after rainstorms. "Low maintenance is a big thing for municipalities like Saco," Osterrieder said.

With its new system fully in place, Saco now captures and treats greater volumes of water. "We're getting consistent results from varying degrees of storms," said Osterrieder. **SWS**

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