

## Mandated Management

Prevailing over design and construction obstacles to control Pacific Northwest CSOs

By Roy Cook & Ron Horres

Portland, Ore., has developed as an inland port along the banks of the Willamette River over the past 160 years.

In the newer and outer areas of Portland, separate systems deal with sewage and storm water. But in the oldest neighborhoods of the city, developed in the late 19<sup>th</sup> century and first half of the 20<sup>th</sup> century, sewage and storm water were combined into a single system discharging directly into the Willamette River and Columbia Slough. Both waterways became increasingly polluted, with the river reaching its worst state in the 1930s.

### Remediation Timeline

Portland designed and built its first sewer interceptor system and sewage treatment plant in the 1950s. Combined sewer flows exceeding the capacity of the new system, however, continued to reach the Willamette River and Columbia Slough.

In 1970, the city initiated a program to improve the quality of the river and other waters throughout the city. At that time, 10 billion gal of combined sewer overflow (CSO) was discharged into Portland's waterways annually. For the first 20 years, the city's Bureau of Environmental Services undertook a series of general sewer system improvements, including separation projects, sewer rehabilitation, maintenance to reduce groundwater infiltration to its system and the use

of sumps to discharge storm water into the ground. This work reduced overflows to about 6 billion gal per year.

In 1991, the city of Portland and the Environmental Quality Commission—a five-member citizen panel appointed by the governor to serve as the Oregon Department of Environmental Quality's (DEQ) policy and rule-making board—entered into a mutually agreed upon enforcement order that required the city to substantially reduce its CSO events by 2011. The order was amended in August 1994 after the original decree was determined to be too stringent and costly to implement. Northwest Environmental Advocates, an advocacy group that had challenged the city on its violation of the Clean Water Act, accepted the amended order.

The city subsequently developed plans that would allow it to meet the requirements of the amended order. Initially, these included easy-to-implement strategies, such as:

- Disconnecting storm water downspouts within the city;
- Separating urban streams that had been connected to the combined sewerage system; and
- Plans for and construction of projects to control CSOs discharging into the Willamette River and Columbia Slough.

### West Side CSO Project

A major milestone was reached

in late 2000 when the CSO control facilities for the Columbia Slough sewer basins were brought online. Earlier that year, design started for the diversion of CSOs from existing outfalls along the west bank of the Willamette River. It became the West Side CSO Tunnel, Shafts, Pipeline and Pump Station Project.

Parsons Brinckerhoff (PB) led a multidisciplinary team that designed a 3.5-mile-long, 14-ft-inner-diameter tunnel and 72- to 84-in.-diameter pipeline (Southwest Parallel Interceptor) located along the west bank of the river. The team also designed the diversion structures, pipelines and drop structures needed to divert flows from existing outfalls to the tunnel.

The tunnel passed through the city and by the ramps and bridge spans for six major bridges. It also included a 2,500-ft-long crossing beneath the river. The storage and conveyance tunnel terminated at a pump station on the east side of the river.

The 135-ft-diameter, 160-ft-deep Swan Island Pump Station will have a capacity of 220 million gal per day when it is fully built out, serving both this tunnel and another currently under construction for the east side. It sends the flows into force mains that transfer flows to the Columbia Boulevard Wastewater Treatment Plant.

The West Side CSO Project became operational in September 2006, ahead of schedule.



The Swan Island Pump Station serves the West Side CSO Tunnel; it will also serve the East Side CSO Tunnel once that project is complete.

### East Side CSO Project

In 2004, PB was awarded the design for the East Side CSO Project. The project consists of a 6.5-mile-long, 22-ft-inner-diameter tunnel running along the east bank of the river through residential, commercial and industrial areas. It also passes beneath the approach ramps and bridge spans for six major bridges.

Ten drop shafts located in seven large-diameter shafts connect diversion pipelines from 14 existing outfalls to the tunnel. Construction on this last phase of the program, which started in Spring 2006, is more than halfway complete.

### Progress & Projections

To date, the city has met all of the interim deadlines required by the agreement with the Oregon DEQ. Once complete in 2011, all of the programs and projects will have reduced overflows to the rivers from 10 billion to .25 billion gal per year—a total overflow volume reduction of 94% to the Willamette River and 99% to the Columbia Slough. **[SWS]**

**Roy Cook is project manager, East Side CSO Project, for Parsons Brinckerhoff. Cook can be reached at 213.896.5671 or by e-mail at cook@pbworld.com. Ron Horres is deputy project manager for Parsons Brinckerhoff. Horres can be reached at 503.478.2803 or by e-mail at horres@pbworld.com. Photos provided by David Sailors.**

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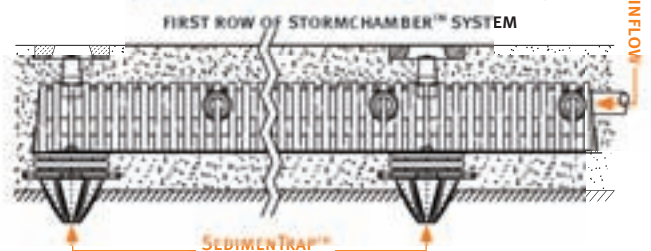
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