# City of Portland – Willamette River CSO project

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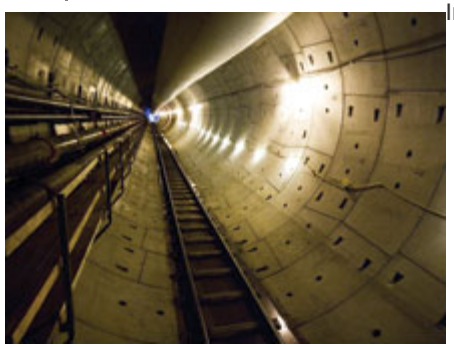

In unique method 1991, the state of Oregon gave the Portland Bureau of Environmental Services a final order to clean up the Willamette River and the Columbia Slough by Dec. 1, 2011.

After nearly 20 years, the program is nearly complete and will add up to approximately $1.4 billion in costs when it wraps up in 2011.

The program's final portion of the Willamette River combined sewer overflow program is tunneling on the east side of the river – work on the river's west side was completed in September 2006.

The $426 million east side segment began in March 2006 and will be completed in July 2011.

"The purpose of this is the diversion and transport of combined sewer overflows that would normally flow into the river every time it rains," Tunnel Program Chief Engineer Paul Gribbon says. "Instead, it will go to a pump station that has been previously built as part of the west side tunnel in 2006. From there, it will be pumped to the city's existing wastewater treatment plant."

The city of Portland has teamed up with joint venture Kiewit/Bilfinger Berger to install 29,200 feet of 22-foot-internal-diameter concrete segment tunnel, about 100 to 140 feet deep along the river. The project was designed by New York City-based Parsons Brinckerhoff.

Gribbon explains that the city used a unique

method to approach the construction, and its qualifications-based selection process ensured project success. The prime contractor was chosen before design completion, so the construction team had a chance to review design documents and make cost-saving suggestions where it saw fit.

“Then, the construction contract had a cost-reimbursable/fixed-fee payment structure,” Gribbon says. “A lump sum fee covering management costs, overhead and profit was submitted with the original proposals. Labor, equipment and materials are paid as reimbursable costs, and subcontracts are competitively bid.

“During the pre-construction phase, both the contractor and the city developed estimates of the reimbursable costs separately,” he continues. “We then had an independent expert review both estimates and compare them. An agreed-upon estimated reimbursable cost plus the fixed fee then became the value of the construction contract. We also performed a joint risk analysis with the city, designer and contractor, which determined the contingency to be carried by the city.”

**Dig That**

Crews are using a 25-foot-diameter slurry pressure-boring machine to bore the tunnels. “We have seven large shafts from 50 to 67 feet in diameter, anywhere from 112 to 153 feet deep into the ground,” Gribbon explains. “They will connect the 13 eastside outfalls down to the tunnel.”

Digging through various soil types and under an industrial area of Portland has presented difficulty, but the team overcame the challenges. “We’ve got a lot of cemented gravels and some areas of soft sands and silts, so the tunnel boring machine is going through all different types of soil,” Gribbon says. “In one area, we had to cross under the juncture of Interstates 84 and 5, and that was in a very soft sand and silt area. We had some ground settlement and building settlement, but no settlement to either of the freeways.”

Crews also faced “debris and unknowns” in the ground when tunneling under the Central Eastside Industrial District, which has some buildings dating to the early 1900s. Also challenging was working in an area where many businesses work around the clock. “We had a lot of surface work with a lot of connecting pipelines, and it was a challenge to get the work done and make sure everyone had access to their loading docks,” Gribbon explains. “We met with those businesses very

early on before we started, and we have a full-time public involvement staff that got an idea of how each business operated and where they needed access. And we always kept at least one route open to every business' loading dock.

"The contractor and subcontractors were very cooperative, and the community was very supportive," he continues. "Portland is a big small town, so that was very important for us. I can't over-emphasize the value of a good public involvement staff."

Another key to the east side project's success was the city's previous work on the west side. "The tunnel on the west side was smaller, but we [learned] what the ground was like and how this contract would work," Gribbon states. "It was a definite benefit to the east side."

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