

Swan Island CSO Pump Station

HIGHLIGHTS

220-mgd pump station with dry pit/wet pit configuration.

160-foot-deep structure.

Largest self-cleaning wet well in the Pacific Northwest.

Five 2000-hp, variable-speed, vertical dry-pit pumps with 22-foot continuous intermediate shafting.

Two 800-hp, variable-speed, horizontal dry-pit pumps.

Optimized design through physical modeling.

Carollo recently completed the design of the 220-mgd Swan Island Pump Station. The pump station is currently under construction and is as a key component in Portland's combined sewer overflow (CSO) program, the largest capital construction project in the city's history. The pump station serves as the terminus of the "Big Pipe" project, consisting of two gravity flow tunnels deep beneath the city (in excess of 120-feet underground), designed to collect and store combined sewage. The circular structure is one of a kind and is believed to be the deepest of its type in the world.

The tunnel system's ability to store combined sewage in the tunnel system introduced several hydraulic considerations into the pump station design. When utilizing tunnel storage, the hydraulic grade line within the tunnel system can fluctuate by over 110 feet, creating a substantial range in pump operating performance. The design takes advantage of the hydraulic range by eliminating the need for a standby pump, thereby minimizing the overall footprint of the pump station.

The facility has many unique features, including:

- ▶ A 160-foot depth to accommodate flow from two CSO tunnels.
- ▶ A 140-foot diameter to accommodate a trench-type, self cleaning wet well.
- ▶ Two 800-hp, variable speed, horizontal dry pit pumps to accommodate average dry weather flows ranging from 8 mgd to 32 mgd.
- ▶ Five 2000-hp, variable speed, vertical dry pit pumps to accommodate wet weather flows of 220 mgd.



Currently under construction, Portland's Swan Island Pump Station is believed to be one of the deepest of its kind in the world.



Portland's 220-mgd Swan Island Pump Station will pump combined sewage to the Columbia Boulevard Wastewater Treatment Plant.

The wet well design features several special attributes that benefit pump station operation. The most distinguishing feature is its self-cleaning design, which reduces maintenance and risk to personnel by minimizing the need to enter the wet well. It is the largest self-cleaning pump station in the Pacific Northwest. Because of its uniqueness, Carollo utilized physical hydraulic modeling using a 1:7 scale to test for hydraulic inefficiencies, vortices and other adverse flow phenomena to optimize wet well and pump performance.