



Water Conveyance

Client
Public Utilities Board

Location
Singapore

"To avoid the potential for surface settlement we specified the use of positive face control slurry or EPB tunneling."

Mrs. Ang-Tan Seow Kiak
PUB Deputy Director
DTSS Department

Deep Tunnel Sewerage System (DTSS)

Project Highlights

- CH2M HILL coordinated design and construction with many parties and provided consistent design and construction standards across all six design-construction contracts.
- CH2M HILL/PB JV's team employed expert tunnel design and construction supervision staff with a project overview role to ensure a consistent approach to design and construction compliance and contract administration.
- The finished quality of the 30-mile-long, up to 24-foot diameter tunnels exceeds industry standards. The client is satisfied that the 100-year maintenance-free design life will be achieved.



Project Description

CH2M HILL, in Joint Venture with Parsons Brinckerhoff, is managing and integrating the planning, design, and construction of the DTSS, which features large conveyance tunnels installed under the island nation. The DTSS will collect wastewater from link sewers in many Singapore catchments and convey it to ultimately one of two compact state-of-the-art treatment plants, one at each end of the island. Treated effluent will be available for reclamation and reuse or discharge through deep-sea outfalls into the Straits of Singapore. The system will collect, treat, and discharge all sewage from the island nation, eventually replacing more than 134 existing pump stations and six secondary treatment plants with individual outfall systems.

This improvement of the nation's infrastructure will result in cleaner waters around the island Republic, a healthier environment for the citizens of the Republic, and the enhancement of Singapore's reputation as a high-tech centre in Asia.

CH2M HILL/PB JV is the prime consultant for design and construction management of the program for the Public Utilities Board of the Republic of Singapore. CH2M HILL provided the feasibility study for the whole DTSS scheme, predesign of the sewer tunnels, tender evaluation of the sewer tunnel design and construct contracts, and is currently program managing the six contracts for the design and construction of 30 miles of large diameter sewer tunnels.

Under the first phase of DTSS, the North and Spur Tunnels are being constructed under six design-build contract packages. The first tender, Kranji Tunnel (T-05), was invited in March 1999 and an award made in December 1999. The sixth contract, Queensway Tunnel (T-06) was awarded in March 2000. Within that period of one year, 67 tenders were received and evaluated by the CH2M HILL/PB JV for the 6 contracts. Contractors awarded the design-build contracts for the six tunnels represent companies from Singapore, China, Japan, Korea and Germany. Additionally, tunnel designers representing the United Kingdom, the United States and Austria were appointed by the contractors.



The Sewer tunnels are currently under construction with 28 miles of the total 30-mile tunnel currently excavated. The project used eight, "State of the Industry" Earth Pressure Balance Tunnel Boring Machines (EPB TBM) up to 24-feet in diameter. EPB TBMs were required to deal with very onerous ground conditions, including fluvial sands, marine clays, as well as hard rock sections with numerous transitions into soft ground. Deep tunnels with up to 5 bars of water pressure required TBM tool changes in compressed air. The Tunnels are fully lined with a corrosion protection lining comprising of HDPE cast into 9-inch thick unreinforced insitu concrete to provide for 100 year maintenance free design life.
