



**PARSONS**

# People. Process. Technology.

Tunnel and Underground Structures

Parsons **PLUS** envision more





# Parsons

## Industry leaders. Delivering innovative solutions.

Parsons is a technology-driven engineering services firm with more than 70 years of experience in the engineering, construction, technical, and professional services industries. The corporation is a leader in many diversified markets with a focus on infrastructure, defense, and construction. Parsons delivers design/design-build, program/construction management, systems design/engineering, cyber/converged security, and other professional services packaged in innovative alternative delivery methods to federal, regional, and local government agencies, as well as to private industrial customers worldwide.

We have successfully delivered some of the largest and most complex tunneling and underground construction projects in the world. From planning and design through construction management and operations, Parsons provides a complete range of services for water, wastewater, and transportation tunnels. Whether your project involves soft ground, rock, or mixed-faced conditions, our dedicated staff of more than 100 tunnel professionals have the experience and skills to manage the risks and deliver safe, economical, and innovative solutions. Our recent award-winning projects, such as Lake Mead Intake No. 3 and the Sheikh Zayed Road and Tunnel, demonstrate Parsons' position as an industry leader and our dedication to delivering on challenging projects.



**Mission** - Deliver, protect, and sustain infrastructure, defense, security, and industrial solutions.



**Vision** - Grow the organization by consistently exceeding customer expectations.



**Business Model** - Use our people, processes, and technology to deliver engineering, procurement, construction, and value-added services to our customers on a global basis.



**Core Values** - Our core values are safety, quality, integrity, diversity, innovation, and sustainability.



**Work Ethos** - Empower teams, respect individuals, maintain agility, own decisions, communicate clearly, and enjoy work.

# Exceptional Reputation Worldwide

**ENR**  
Engineering News-Record

**TOP 10**

2017 **WORLD'S MOST  
ETHICAL  
COMPANIES™**  
WWW.ETHISPHERE.COM

**8 YEARS**



**ISO 9001  
ISO 14001**



**Information  
Week**

**TOP  
INNOVATOR**

## Parsons' Core Values



**Safety**



**Quality**



**Integrity**



**Diversity**



**Innovation**



**Sustainability**

"World's Most Ethical Companies" and "Ethisphere" names and marks are registered trademarks of Ethisphere LLC.



# Delivering Complex Tunnel & Underground Structure Projects and Programs Worldwide



**NYC DEP Rondout Bypass Tunnel**



**Ohio River Bridges  
East End Crossing Tunnel**



**Anacostia River Tunnel**



**Dubai Metro Red & Green Lines**



**Downtown Tunnel/Midtown Tunnel/  
MLK Extension**



**Riyadh Metro**



**Eglinton Crosstown East Tunnels**



**Lake Mead Intake No. 3 Tunnel**

# Parsons' Tunnel and Underground Structures

## What we do

### Areas of Expertise/Systems

Road & Highway  
Rail & Transit  
Water  
Sewer/Wastewater  
Hydroelectric  
Power, Oil, Gas & Utilities  
Outfalls

### Methodologies

Tunnel Boring Machine (TBM)  
Sequential Excavation Method (SEM/NATM)  
Roadheader  
Hand Mining  
Drill and Blast  
Cut and Cover  
Immersed Tube  
Microtunneling  
Jacked Box  
Horizontal Directional Drilling (HDD)

### Key Services

Construction  
Construction Management (CM)  
Design  
Design-Build  
Geotechnical Engineering  
Inspection & Rehabilitation  
MEP & Systems  
Planning  
Program Management (PM)  
Risk Management & Resilience Analysis

# Parsons' Tunnel and Underground Structures

## Who we are



**100+**

Subject Matter  
Experts



**150+**

Tunnels



**27+**

Avg. Years of  
Experience



**20+**

Countries



**60%**

Staff with post-  
graduate degrees



**\$10B+**

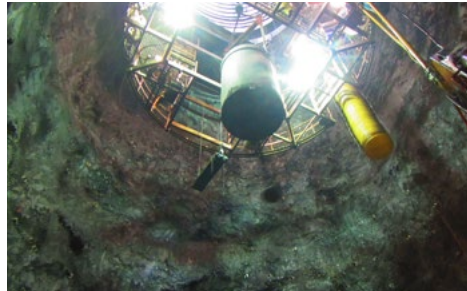
Construction  
Value

Parsons knows and understands the challenges associated with tunnels and underground structures. Our depth and range of expertise coupled with our innovative and sustainable solutions help us meet the needs of our customers today and in the future. Our expertise is illustrated through our commitment to our core values of safety, quality, integrity, diversity, innovation, and sustainability, and through our many award-winning projects.

# Program Management/Construction Management

## Parsons' Services

- Conceptual Design
- Construction Management
- Construction Support
- Commissioning
- Program Management



NYC DEP Rondout Bypass Tunnel



Ohio River Bridges East End Crossing Tunnel



Dubai Metro Red and Green Lines



Downtown Tunnel/Midtown Tunnel/MLK Extension



Eglinton Crosstown East Tunnels



# Design/Design-Build & Planning

## Parsons' Services

- Alternative Analysis
- Feasibility Study
- Engineering Design
- System Design
- Design Management
- Design-Build



**LA Metro Purple Line Extension**



**Anacostia River Tunnel**



**California High-Speed Rail, CP1**



**Sheikh Zayed (Al Salam) Road and Tunnel**

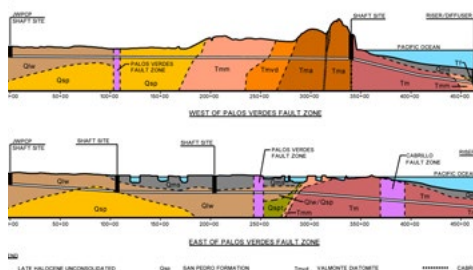


**Dubai Strategic Sewerage Tunnel**

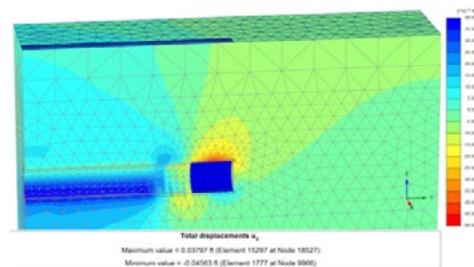
# Geotechnical

## Parsons' Services

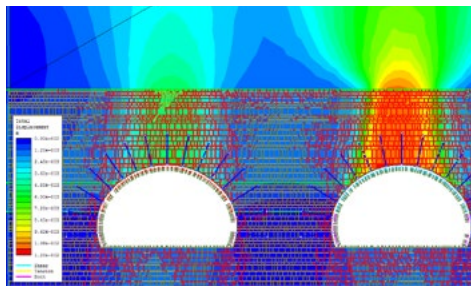
- Geotechnical Design
- Numerical Modeling
- Investigation
- Instrumentation & Monitoring
- Ground Improvement
- SOE Design
- Seismic Response Analysis
- Foundation Design
- Groundwater Control and Dewatering



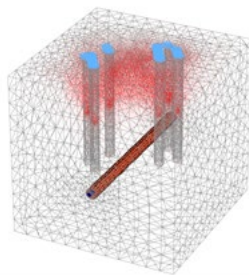
**JWPCP Effluent Outfall Tunnel**



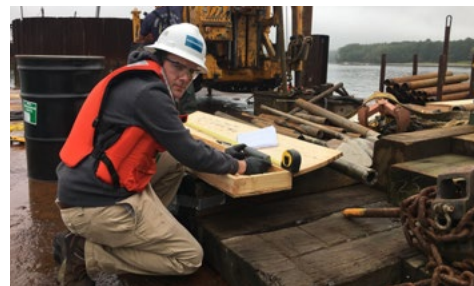
**Anacostia River Tunnel**



**Ohio River Bridges East End Crossing Tunnel**



**Austin Downtown Wastewater Tunnel**

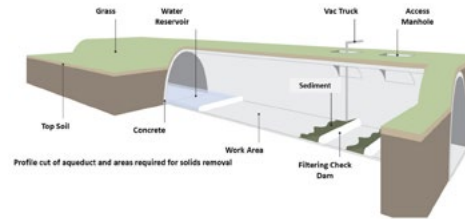


**DFSP Cofferdam**

# Inspection & Rehabilitation

## Parsons' Services

- Tunnel Inspection
- Tunnel Evaluation
- Tunnel Inventory
- Structural Assessment
- Repair & Rehabilitation



Catskill Aqueduct Repair and Rehab (CAT-RR)



Eisenhower-Johnson Memorial Tunnels

# Risk Management & Resilience Analysis

## Parsons' Services

- Qualitative/Quantitative Risk Analysis
- Operation Risk Assessment
- Construction Impact Assessment
- Vulnerability Analysis
- Resilience Analysis
- Activity Hazard Analysis



South Coast Water District Tunnel Rehabilitation



Dubai Strategic Sewerage Tunnel

# Construction

## Parsons' Services

- Alternative Project Delivery
- Heavy Civil and Transportation
- Site Development
- Water and Wastewater



California High-Speed Rail, CP1

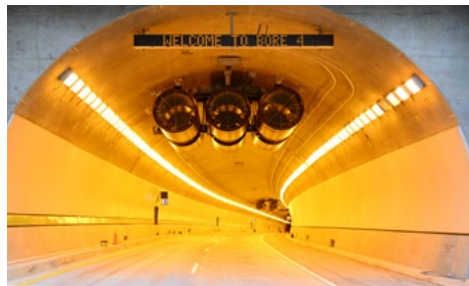


Anacostia River Tunnel

# MEP & System

## Parsons' Services

- Electrical Design
- Ventilation
- Mechanical Design/Plumbing
- Fire and Safety Design

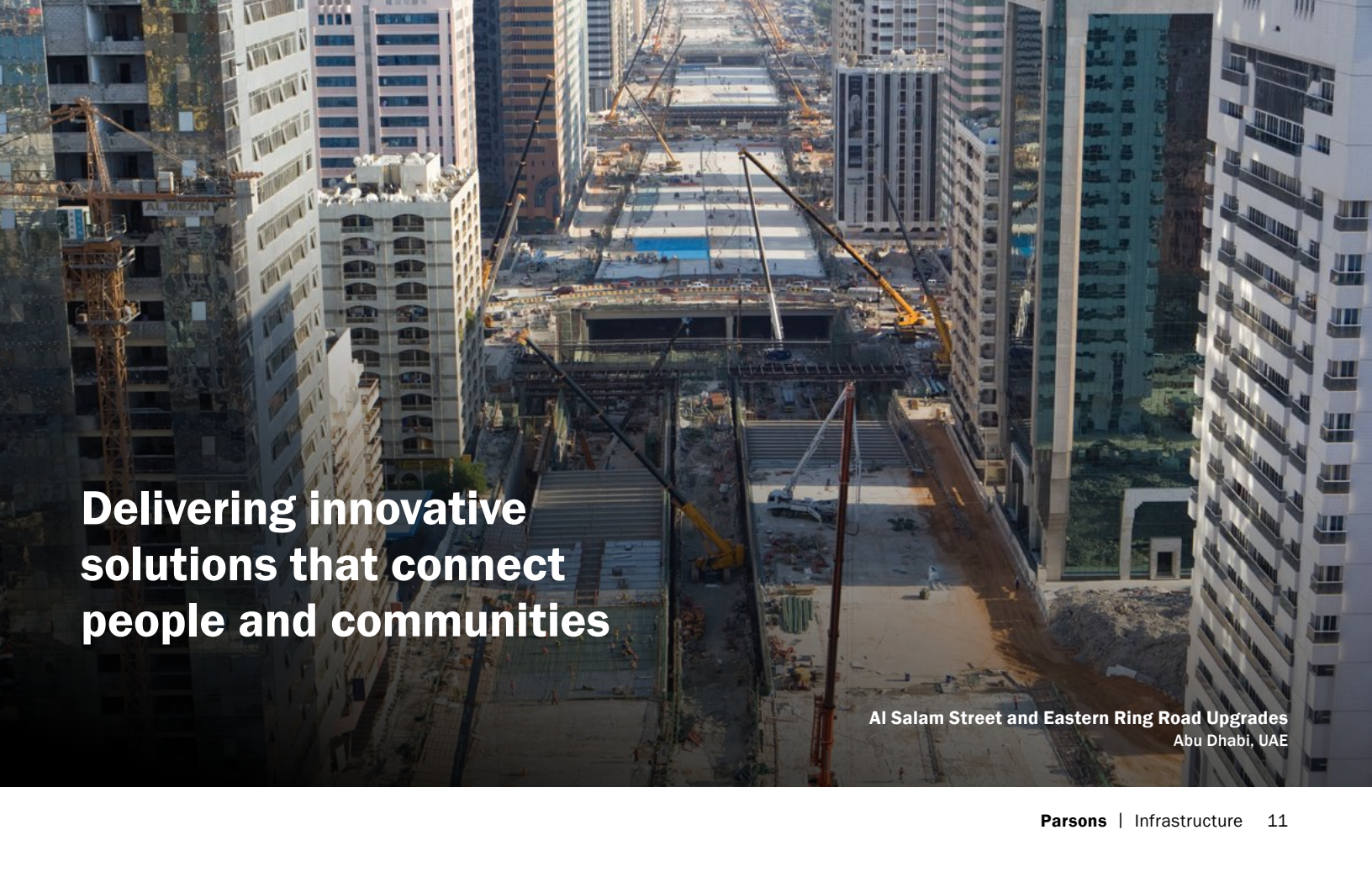


Caldecott Tunnel Improvement



Ohio River Bridges East End Crossing Tunnel





**Delivering innovative  
solutions that connect  
people and communities**

**Al Salam Street and Eastern Ring Road Upgrades**  
Abu Dhabi, UAE

# NYC DEP Rondout Bypass Tunnel

## Newburgh, New York

**Owner:** New York City Department of Environmental Protection (NYC DEP)

**Program Value:** USD \$1.2 Billion

### Program Scope of Work

Parsons is providing construction management services for construction of the NYC DEP Rondout, West Branch Bypass Tunnel. The project consists of two contracts, BT-1 and BT-2, for construction of two new deep shafts and a bypass tunnel to replace an existing section of the Delaware Aqueduct, New York City's leading source of drinking water. The new shafts are located on each side of the Hudson River between Newburgh and Wappinger Falls, New York. Shaft 5B, located on the west side of the Hudson, is a 30-foot finished diameter, circular shaft that was excavated to a depth of 900 feet below the ground surface (bgs). Shaft 6B, on the east side of the Hudson, is a 33-foot finished diameter circular shaft excavated to 750 feet bgs.

### Parsons' Services

- Construction Management
- Constructibility Reviews

### Project Details

- 12,500-foot-long bypass tunnel with 14-foot diameter
- Shaft 5B (900 feet deep) / Shaft 6B (750 feet deep)





# Ohio River Bridges East End Crossing Tunnel

## Prospect, Kentucky & Jeffersonville, Indiana

**Owner:** Indiana Department of Transportation and Indiana Finance Authority

**Program Value:** USD \$763 Million

### Program Scope of Work

The 1,700-foot-long twin-bore highway tunnels connect existing KY841 with the new 8-mile highway alignment that crosses the Ohio River east of Louisville on a new cable-stayed bridge and continues on into Indiana to connect with SR 265. It is part of the \$763 million East End Crossing, a P3 project that is managed by the Indiana Department of Transportation and the Indiana Finance Authority. The East End Crossing is part of the larger \$2.3 billion Louisville-Southern Indiana Ohio River Bridges Project, which also includes construction of a second bridge to carry I-65 NB in downtown Louisville, along with reconstruction of the Kentucky and Indiana approaches.

### Parsons' Services

- Construction Management
- Environmental Impact Study Management
- Design Review
- Preliminary Design Oversight
- Design-Build Bid Documents
- Geotechnical Engineering

### Project Details

- 1,700-foot-long twin-bore highway tunnel
- Each tunnel is 32 feet high and 55 feet wide
- Hard rock drill-and-blast construction



# Anacostia River Tunnel

## Washington, D.C.

**Owner:** DC Water and Sewer Authority (DC Water)

**Program Value:** USD \$250 Million

### Program Scope of Work

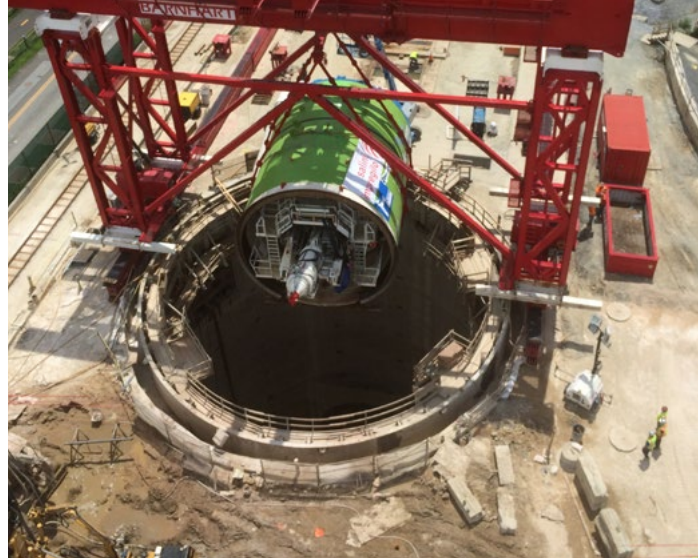
The Anacostia River Tunnel is one of four major tunnels that form the backbone of the DC Clean Rivers Project to reduce combined sewer overflow discharges in the District of Columbia. Parsons is a 35% equity partner in the design-build joint venture (JV) and lead designer for the 12,300-foot-long, 26-foot-diameter tunnel located more than 100 feet underground. It was driven through variable soft ground conditions by an earth pressure balanced tunnel boring machine (TBM). The project also includes six drop shafts, three adits to connect offset drop shafts to the main tunnel, and five diversion and odor control facilities. Evaluation, mitigation, and monitoring of construction impacts on numerous sensitive structures above the tunnel is critical to the success of the project.

### Parsons' Services

- Design
- Construction (35% JV Partner)
- Commissioning
- Geotechnical Engineering
- Risk Management

### Project Details

- 12,300-foot long, 26-foot-diameter tunnel
- Earth pressure balance TBM
- 6 drop shafts around 100 feet deep and up to 65-foot diameter
- 5 diversion and odor control facilities





# LA Metro Purple Line Extension (Westside Subway)

## Los Angeles, California

**Owner:** Los Angeles County Metropolitan Transportation Authority (Metro)

**Program Value:** USD \$1.6 Billion

### Program Scope of Work

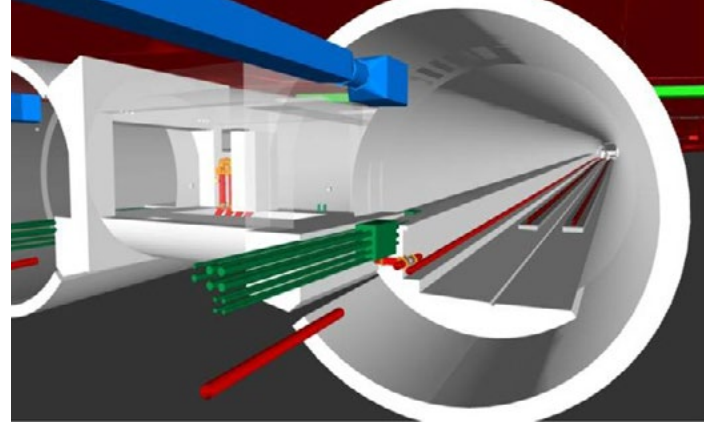
The Purple Line Extension's (Westside Subway) first construction segment will extend from the current terminal at Wilshire/Western in the city of Los Angeles to Wilshire/La Cienega in the city of Beverly Hills. The entire 9-mile project consists of three sections that will ultimately extend the subway to Westwood/VA Hospital. Section 1 includes designing and building a heavy rail transit subway extension of the existing Purple Line. Parsons is the lead designer to the joint venture and will perform design management and the final design for Phase 1. Parsons is also the lead architect for the design of three major multilevel underground stations.

### Parsons' Services

- Final Design
- Design Management
- Station Architecture

### Project Details

- 3 new underground stations, each approximately 1,000 feet long, 70 feet wide, and 80 feet deep
- 3.4-mile twin subway tunnels, each with an inside diameter of 18 feet, 10 inches
- 23 cross passages



# Dubai Metro Red & Green Lines and Expo 2020 Link

## Dubai, United Arab Emirates

**Owner:** Dubai Municipality Roads and Transport Authority (RTA)

**Program Value:** USD \$8 Billion (+ 2.7 Billion Expo 2020 Link)

### Program Scope of Work

Parsons performed project and construction management for this fast-track, 91-kilometer driverless rail system project. Combined, the Red and Green lines consist of 13.5 kilometers of tunnels, 37 elevated stations, 12 underground stations, and 62.5 kilometers of elevated viaducts. The Dubai Expo 2020 Link will be a 15-kilometer, 7-station extension of the Red Line. Parsons will provide project management, including a feasibility study, concept design, and preliminary design, as well as tendering/contract award.

### Parsons' Services

- Design Review/Management
- Project Management
- Construction Supervision
- Geotechnical Engineering

### Project Details

- Red Line: 5.7 kilometers in one bored tunnel, 3.5 kilometers at grade, and 42.8 kilometers on elevated viaduct
- Red Line: 2 depots, 1 ground level station, 4 underground stations, and 24 elevated stations
- Green Line: 8 kilometers in one tunnel and 15 kilometers on elevated viaduct
- Green Line: 12 elevated stations and 8 underground stations



# Downtown Tunnel/Midtown Tunnel/MLK Extension

## Norfolk and Portsmouth, Virginia

**Owner:** Virginia Department of Transportation (VDOT)

**Program Value:** USD \$2.1 Billion

### Program Scope of Work

Parsons is the managing partner of the Southeastern Transportation Partners Joint Venture, which is serving as the program management consultant to the VDOT for this public-private partnership project. Both the dual-tube Downtown Tunnel and the single-tube Midtown Tunnel cross under the Elizabeth River and connect the cities of Portsmouth and Norfolk, Virginia. The project includes construction of a new two lane immersed-tube tunnel adjacent to the existing Midtown Tunnel, as well as major rehabilitation of the three existing tunnels. This involves upgrades to the existing tunnel structures, traffic operations, ventilation, and fire/life safety systems to meet current standards.

### Parsons' Services

- Program Management
- Design and Construction Oversight

### Project Details

- New two-lane tolled tunnel under the Elizabeth River

- 4,300-foot-long Midtown Tunnel opened to traffic 6 months ahead of schedule
- Modifications to the existing tunnel to provide increased capacity and compliance with fire/safety standards





# Riyadh Metro

## Riyadh, Saudi Arabia

**Owner:** Arriyadh Development Authority *The executive arm of the High Commission for the Development of Arriyadh*

**Program Value:** USD \$22.5 Billion

### Program Scope of Work

A Parsons-led joint venture is performing project and construction management for 3 of the 6 lines of the \$22.5 billion Riyadh Metro project, which is one of the largest metro projects ever launched. The 6-rail, 176-kilometer system with 85 stations is projected to be delivered in 60 months. The stations will be elevated, at-grade, deep underground, and shallow underground facilities. The Parsons-led joint venture will be responsible for 60% of the program, totaling 104 kilometers, with 55 standard rail stations, 5 large stations (4 of which are transfer stations), 5 depots, and 4 park-and-ride facilities. It will involve bored as well as cut-and-cover tunnels, viaducts, and trackwork. Parsons' work will include management of design, construction, procurement, schedule, documentation, safety and quality, communications, testing, commissioning, and contracts administration.

### Parsons' Services

- Project Management
- Construction Management

### Project Details

- 6 lines totaling 176 kilometers
- 85 new stations
- Bored and cut-and-cover tunnels, viaducts, and at-grade designs





# Eglinton Crosstown East Tunnels

## Toronto, Canada

**Owner:** Metrolinx

**Program Value:** CAD \$177 Million

### Program Scope of Work

Parsons is providing construction management services as part of a joint venture for the construction of 3.25 kilometers of twin 6.5-meter-diameter tunnels. The tunnels will also include two 4.3-meter-diameter hand-mined cross passages, a launch shaft (secant piled + tie backs) and extraction shaft (secant piled + shotcrete), six headwalls (secant piled and jet grout) for future station construction, and two emergency exit buildings. The project will eventually form part of the Eglinton Crosstown light rail transit (LRT) line, which will run in an east-west direction across the city of Toronto. The new LRT line will have a total of 25 stations and will link to 54 bus routes.

### Parsons' Services

- Construction Management

### Project Details

- 3.25 kilometers (2 miles) of twin tunnels
- Launch and retrieval shafts
- 2 emergency exit buildings
- 3 cross passages



# Lake Mead Intake No. 3 Tunnel

## Las Vegas, Nevada

**Owner:** Southern Nevada Water Authority

**Program Value:** USD \$1.5 Billion

### Program Scope of Work

The Southern Nevada Water Authority (SNWA) implemented a \$1.5 billion capital improvement program (CIP) to protect municipal water customers from water quality issues and reduced system capacity associated with declining Lake Mead water levels. Parsons, as SNWA's program and construction manager, assisted in developing the contracting strategy and construction documents for the CIP projects, and performed technical and constructibility reviews of the design long-lead items, including the Intake No. 3 structure and the TBM at the Herrenknecht plant in Germany. Parsons performed contract management, safety oversight, and quality control and quality assurance inspection work during construction. The Lake Mead Intake No. 3 Project received the 2016 tunnel achievement award for project excellence.

### Parsons' Services

- Program Management
- Construction Management

### Project Details

- 4 deep shafts
- 900 MGD pumping station
- 3 miles of 20-foot-diameter tunnel



# Sheikh Zayed Street and Tunnel

## Abu Dhabi, United Arab Emirates

**Owner:** Abu Dhabi Municipality

**Program Value:** USD \$1.28 Billion

### Program Scope of Work

The Sheikh Zayed Street and Tunnel is one of the most important infrastructure elements of Abu Dhabi, part of the Al Salam Street and Eastern Ring Road. It serves as the main carrier of traffic between the Central Business District and the Sheikh Zayed and Maqta bridges and provides nearly 15 kilometers of unimpeded journey. The tunnel is designed to link with new developments, including a future transport system, while improving connectivity between landmarks in Abu Dhabi and serves as a gateway to development opportunities. The project won multiple awards, including: Project of the Year at Middle East Electricity Awards in 2012; Infrastructure Project of the Year at the Construction Week Awards in 2013, and the International Road Federation Global Road Achievement Award for Construction Methodology in 2014.

### Parsons' Services

- Design and Construction Supervision

### Project Details

- 3.6-kilometer-long tunnel
- 9 generators in case of power failure to provide uninterrupted power supply and UPS

- 22 emergency exits with stairs leading to the surface
- 3 emergency U-turns and 22 sliding doors
- SCADA system to monitor and control all the subsystems





# South Cobb Tunnel

## Cobb County, Georgia

**Owner:** Cobb County Water System (CCWS)

**Program Value:** USD \$305 Million

### Program Scope of Work

As a result of our performance providing construction management services for the Chattahoochee Tunnel, Parsons was selected by the Cobb County Water System (CCWS) to provide construction management services for the South Cobb Tunnel project. This project includes a large-diameter deep-rock tunnel with a 130-MGD-capacity influent lift station constructed in a deep shaft, and small-diameter connecting tunnels with surface intake structures to convey flows to the tunnel.

### Parsons' Services

- Construction Management

### Project Details

- 29,000 feet of 27-foot TBM excavated diameter, 24-foot finished ID tunnel
- 3,300 feet of a 8.5 foot diameter TBM connecting tunnel
- 2,000 feet of drill-and-blast connecting tunnels
- Tunneling main construction shaft under residential area
- 130-MGD, 220 feet deep, 120 feet diameter wet well/ dry pit influent lift station with secant piles used to support soil at pump station
- 6 tangential vortex intake structures with related diversions structures, raise bore shafts and tunnel level chambers





# Mississippi Avenue Outfall

## Denver, Colorado

**Owner:** Colorado Department of Transportation and Regional Transit District

**Program Value:** USD \$1.28 Billion

### Program Scope of Work

Parsons provided design-build services for the I-25 Southeast Corridor Transportation Expansion (T-REX) project. An important feature of the I-25 reconstruction was the \$30 million Mississippi Avenue Outfall. The outfall is 3,000 feet long and conveys stormwater away from the I-25 and Logan bridge intersection that, on any given heavy-rain day, flooded and stranded travelers in an area of the interstate referred to as “Lake Logan” by the media. Two earth pressure balance machines tunnel boring machines were employed.

### Parsons' Services

- Pre-Bid Services
- Tunnel Liner Design
- Plans and Specifications
- Design Services during Construction
- Energy dissipation structure
- 300 feet of 84-inch-diameter Class V reinforced concrete pipe
- 1,817 feet of 13-foot, 2-inch ID Tunnel
- Transition structure
- 872 feet of 18-foot-wide by 8-foot-high cut-and-cover box structure

### Project Details

- 3,000-foot-long stormwater outfall tunnel





## Caldecott Tunnel Improvement

### Contra Costa and Alameda, California

**Owner:** Transbay Joint Powers Authority (TJPA)

**Program Value:** USD \$420 Million

#### Program Scope of Work

The Caldecott Tunnel improvement project involved the construction of a fourth bore through the Berkeley Hills near Oakland. Parsons partnered with the Contra Costa Transportation Authority and Caltrans District 4 to provide project approval/environmental document and design services for the project. Parsons supported Caltrans District 4 in the preparation of the environmental impact report and led the effort to prepare preliminary engineering and final design for the tunnel, the operations building, and two related roadway projects. The Parsons team was responsible for the final design of tunnel and portal structures, drainage, waterproofing, ventilation, fire and life safety, traffic control systems, and building architectural design.



## Austin Downtown Wastewater Tunnel

### Austin, Texas

**Owner:** City of Austin Water Utility (Austin Water)

**Program Value:** USD \$45 Million

#### Program Scope of Work

Parsons was hired by Austin Water's planning team to develop a master plan for the downtown wastewater system to promote sustainable development and advance the city's capital improvement plan. Our involvement continued through the design phase, bidding, and construction, for which we provided construction inspection and contract phase engineering. The project was constructed with tunnel boring machines, and included 70-foot-deep access shafts (~25-foot diameter) that were converted to tunnel access manholes. The 20,600-foot-long tunnel (about 4 miles) crosses downtown and intercepts wastewater flows from main downtown interceptors at five locations.





# PARSONS

100 M Street, SE  
Washington, D.C. 20003

+1 202.775.3300  
[www.parsons.com](http://www.parsons.com)

© Copyright 2017 Parsons Corporation. All Rights Reserved.