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## REGIONAL CONNECTOR TRANSIT PROJECT Tunnel Mining Fact Sheet

WINTER 2017

The Regional Connector Transit Project will extend from Metro Rail's Little Tokyo Arts District Station to the existing 7th St/Metro rail hub in downtown Los Angeles, allowing passengers to access the Gold, Blue, Expo, Red and Purple Lines. The 1.9-mile addition includes three new stations, located at 1st/Central, 2nd/Broadway and 2nd/Hope. Service will connect cultural and historic communities such as Little Tokyo, the Arts District, Civic Center, the Historic Core on Broadway, Grand Av/Bunker Hill, and the Financial District.

The Regional Connector is Metro's "missing link", making possible a one-seat ride for rail travel across LA County — from Santa Monica to East Los Angeles and from Azusa to Long Beach. Riders can save up to 20 minutes in commute time come 2021, when the Regional Connector stations are scheduled to open.

### Construction Overview

Upon adoption by the Metro Board of Directors in 2014, the project began the complex and challenging work of relocating 100-year old downtown LA underground utilities identified to be in conflict with the project's construction. Soon thereafter, Metro's design-build contractor Regional Connector Constructor (RCC) completed the design and started building the project beginning with construction of the future stations. By the close of calendar year 2016, the project had completed the utility relocation, excavated the 1st/Central station and temporarily decked the 1st/Alameda intersection so that traffic could resume during the

construction period. The tunnel boring machine (TBM) that will mine the twin tunnels was also assembled at the 1st/Central station and is prepared to begin work in 2017. The project is scheduled to be completed in 2021.

### Tunnel Mining

The decision to construct a tunnel for the Regional Connector Transit Project, rather than an at-grade system, was taken to minimize construction impacts on neighboring communities and provide a transit connection, which would otherwise not be possible in the congested traffic urban corridor. Portions of the alignment are being constructed using an "open-cut" method, similar to station construction.

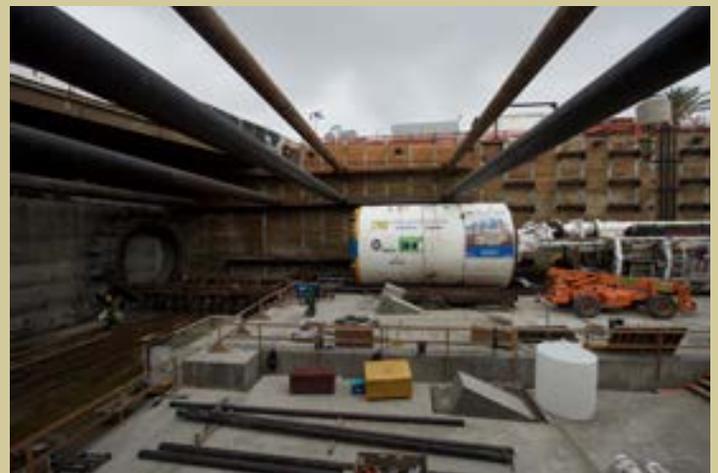


Photo Credit: Gary Leonard, 2017



Metro invites you to stay involved throughout construction. Project updates are provided to the public on a monthly basis at Community Leadership Council meetings. Learn more online.

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# REGIONAL CONNECTOR TRANSIT PROJECT

## Tunnel Mining Fact Sheet

### FREQUENTLY ASKED QUESTIONS

#### How many tunnels are being built and how big are they?

There are two parallel tunnels, one tunnel for train travel in each direction separated by about 20 feet of soil, being built for the Regional Connector Transit Project. The twin tunnels will be 1.1 miles long. Tunnels are typically about 20 feet in diameter. The depths of the tunnels vary between 25-120 feet deep, depending on the profile of the natural ground. The deepest tunnels pass beneath Bunker Hill where the future Grand Av Arts/Bunker Hill Station will be located.

#### Where is the tunnel boring machine now and how soon will it begin working?

The Regional Connector's tunnel boring machine (TBM), named "Angeli," was lowered by crane in multiple segments through a large shaft referred to as the TBM launch pit located at the corner of 1st St and Alameda St. It's comprised of the giant drill, known as the "cutter head," in addition to nearly 400 feet of support equipment, called "trailing gear," which follows behind the cutter head during the mining operation. The TBM will undergo extensive testing before it starts boring the first tunnel in February 2017.

#### How will the tunnels be built?

The twin tunnels between stations will be constructed using one TBM, which will construct one tunnel and then be re-assembled back at the starting point to complete the second bore. The mining will be done utilizing what is known as an earth-pressured-balance machine, which is designed to minimize the amount of ground surface disturbance while the tunnel is mined and the precast concrete linings are installed. Most recently, Metro successfully used the same pressure balance TBM technology on the Metro Crenshaw/LAX Transit Project. All the earth excavated by the TBM will be moved along a long conveyor back to the starting point and removed off-site from the Mangrove Yard located near the future Little Tokyo/Arts District Station at 1st St and Central Av. Approximately 1,300 tons of dirt is estimated to be removed on a daily basis.

#### During tunneling, will construction trucks be needed?

There will be approximately 10-20 trucks daily delivering materials needed to support mining operations, including the delivery of precast concrete tunnel segments, cement, lubricants, grease and oil to run the TBM. About 50 trucks per day will be needed to haul tunnel spoil to the disposal

locations. Deliveries of material and removal of spoil will use haul routes approved by the City of Los Angeles. Its anticipated trucks will enter and exit the Mangrove Yard through Temple St, using the shortest route to reach the 101 Freeway. Delivery and hauling will be done only during hours permitted in order to minimize impacts to the surrounding stakeholders and communities.

#### How many people does it take to run a 400-foot machine?

The TBM will have a team of 15 operators and technicians on every shift including one TBM operator and one grout operator. The rest of the team will support the operation, maintenance, and repairs of the TBM during mining. The machine's systems are highly computerized and monitored by the operators and engineers at the surface at all times.

#### Will I be able to feel or hear the Tunnel Boring Machine move?

When mining starts in early 2017, "Angeli" will move slowly and smoothly achieving about 50 feet a day during 12-hour shifts. Noise and vibration levels are not expected to be perceptible. Even imperceptible levels of noise or vibration will be captured and evaluated by engineers through an array of several monitors placed along the project alignment. From time to time, the public near the tunnel entrance may hear the sound of a horn, similar to that of a car, used as a safety signal and cautionary measure to alert construction crews of a service train entering or exiting the tunnel. This can happen as frequently as every hour. A commercial grade fan is necessary to provide the air quality needed for the crew's working underground.

#### What is the timeline for tunneling?

Mining will start in early 2017 with the first tunnel initiating at the future Little Tokyo/Arts District Station, progressing westerly towards the Historic Broadway Station, and finally reaching the Grand Av Arts/Bunker Hill Station four to five months later. The machine will then continue south along Flower St to 4th St intersection where it will be retrieved from a large excavation and returned to the beginning for the second bore. The retrieval of the machine will be conducted over a series of weekend street closures. It will require about two months to reassemble and test again back at Mangrove Yard before it starts the second tunnel. Both tunnels are anticipated to be completed within a year.

#### What happens after tunneling is completed?

Once the tunneling between the stations is completed, the tracks and electrical facilities can be installed over the next three years. Soon thereafter, safety testing will begin.