

Westside light rail the MAX Blue Line extension



TriMet's first extension of its light rail network headed for the fast-growing high-tech corridor on the Westside. One of the largest public works projects in Oregon's history, it bore through the West Hills, inspired extensive transit-oriented development and infused community-focused public art into its innovative design.

Background

In 1979, studies began on transit options and alignments to connect downtown Portland to Beaverton as far west as S.W. 185th Avenue. By 1983 the studies



were complete, and local jurisdictions selected light rail as their preferred alternative along the Sunset Highway (Hwy. 26) corridor. At this point the TriMet Board suspended further work,

awaiting completion of the 15-mile Eastside MAX light rail project, then under construction.

By 1988, Eastside MAX light rail had met with wide approval and work resumed on Westside light rail. The first hurdle was crossing the West Hills, which rose 700 feet above downtown Portland and required a six percent grade along Hwy. 26. While the original MAX light rail vehicles were designed to handle such a grade over short distances, concerns arose that the grade would reduce reliability, particularly during icy weather, and increase travel times and maintenance costs. After prolonged debate, the project decided to construct a three-mile tunnel under the West Hills.

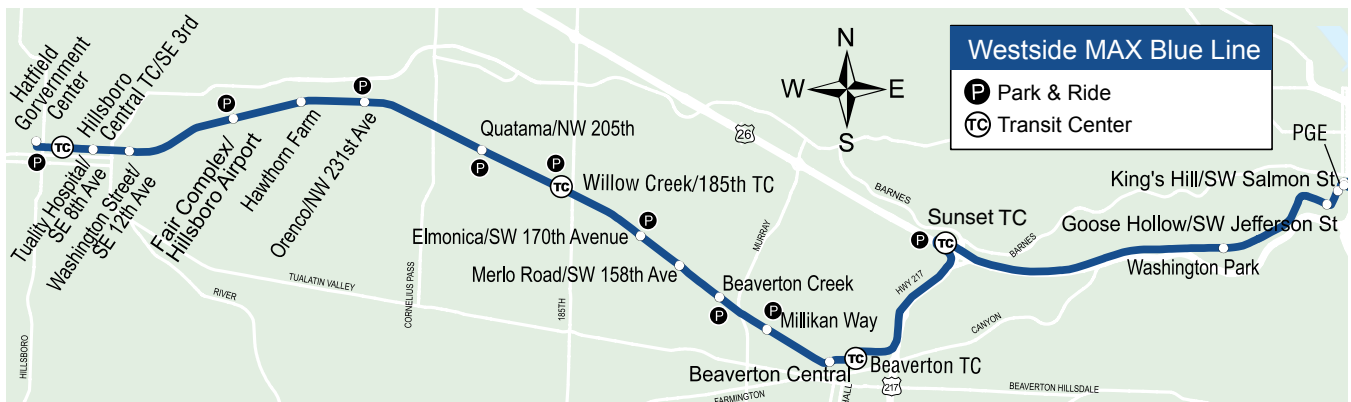
In 1993 construction began on the tunnel, and in 1994, track construction began in downtown Portland, where the Westside line tied into the existing line on Morrison and Yamhill Streets. Work began soon after on the Beaverton segment to S.W. 185th Avenue, including a new maintenance facility for low-floor cars at Elmonica.

The 1979 studies for the Westside anticipated that the line would eventually extend from S.W. 185th Avenue to the suburban city of Hillsboro. In 1989, the local jurisdictions asked to add that extension to the Westside project because of rapid development. The environmental studies for this 6.2-mile addition, mostly located on an abandoned rail right-of-way, progressed rapidly, and in 1994, Hillsboro became the western terminus of the Westside project.

Design and construction highlights

Twin tunnels

- The West Hills tunnel is actually twin tubes, each three miles long and 21 feet in diameter.



- Because its geology consists of hard rock from ancient lava flows up to 16 million years old, layered with soft ground and rock fragments, the tunnel has several horizontal and vertical curves as designers tried to follow the best rock conditions.
- Excavation began at the west end, where varied geologic material required the use of conventional drill and blast mining techniques.
- The eastern two-thirds of the tunnels, composed primarily of Columbia River basalt, were excavated using a 278-foot-long tunnel boring machine.

Tunnel boring machine

- Designed to bore through solid rock, the boring machine used hydraulically-driven arms to press against the tunnel walls and propel itself forward.
- The 42 hard metal cutting blades on the front of the machine ground the rock, which was caught in buckets and sent out on a conveyor belt that stretched as much as two miles long.
- In many places, the rock turned out to be highly fragmented, falling into the boring machine and jamming it. After months of delays, modifications to the machine eventually overcame the problem.
- Crews of a dozen people operated the boring machine three shifts per day, six days a week.
- The first tunnel was excavated in 17 months, the second in five and a half months. Following excavation, crews lined the tunnels with concrete.
- Cross passages between the tunnels were built every 750 feet.
- Trains travel through the twin tunnels at speeds up to 55 mph.

Washington Park Station

- Washington Park Station, the only stop in the three-mile tunnel, is the deepest transit station in North America at 260 feet below ground.



- Station elevators and stairwells are monitored through closed-circuit video cameras. Staff has direct 9-1-1 access and can operate fire doors, air vents and electricity in case of an emergency.
- The underground station's unique public art has helped make the stop a destination in itself.
- The station serves the Oregon Zoo, Forestry Center, Children's Museum 2nd Generation, the Vietnam Veterans Memorial and offers access to the rest of Washington Park.

Sunset Transit Center

Leaving the tunnel, the rail line follows Hwy. 26 to the Sunset Transit Center, then turns abruptly south along Hwy. 217 and descends a six percent grade for almost a mile. The Sunset Transit Center was originally intended as the junction for a light rail line continuing west along Highway 26, which accounts for the torturous, nearly 90-degree turn in the track.

Beaverton

The alignment approaching Beaverton Transit Center crosses a previously developed area and is the only place on the MAX light rail system where an entirely new right-of-way had to be created. Beaverton Transit Center was built 10 years before light rail opened, with space reserved on its south side for future light rail. As it turned out, final alignment ran along its north side. (The proposed Washington County Commuter Rail project is set to use the south side.) The transit center was rebuilt

at the same time, incorporating new amenities and facilities to support bus/rail connections.

Main Street Bridge

At Main Street in Hillsboro, a former railroad trestle that crossed over the street at an oblique angle had been the site of numerous accidents.



The City of Hillsboro did not want a pier in the center of the street, so a light rail bridge was built with a dramatic overhead arch straddling the road and the track.

Hillsboro

At 12th Avenue in Hillsboro, the tracks move from a former railroad right-of-way and enter Washington Street, which they follow for 14 blocks to the Hillsboro end of the line, mostly on a 24-foot-wide paved median. Here an alternative design gives light rail reserved lanes



on a narrower street while still allowing other vehicles to turn across the tracks at driveways and intersections.

Because there was no room for turn pockets, trains pass through these intersections on an “all-red” phase, with traffic stopped in all directions. When the train is not present, the intersection functions like any other, with left turns permitted.

The configuration in downtown Hillsboro copies that in Gresham, with a transit center adjacent to the pedestrian downtown, and a Park & Ride at the end of the line to divert its traffic from entering the downtown.

A first for art

The Westside MAX was the first light rail project to include a substantial budget for art. All of the 20 stations are embellished with artworks by a variety of artists and are designed to reflect the character, diversity and history of the surrounding community.



Technical Highlights

Vehicles and accessibility

The original Eastside MAX line used platform-mounted lifts to allow wheelchair access to light rail vehicles.



Increasing use led to service delays, and many in the disabled community felt the lifts focused attention on them as the cause of delays. In Europe, light

rail systems were introducing low-floor cars to enhance access for all users, including wheelchairs.

In 1991 TriMet began to study alternatives to the lift system. After meetings with the community, plus field trips to several North American and European systems, the study recommended converting the whole system to low-floor cars. By 1992, TriMet had begun procurement for low-floor cars, the first such cars to be ordered in North America.

Transit-oriented development

Westside MAX Blue Line traveled through stretches of undeveloped land, as well as the cities of Beaverton and Hillsboro. The line has become a magnet, with over \$825 million worth of residential and commercial development including 8,500 housing units launched within walking distance of the line.



Beaverton Central

Beaverton Central Station was sited on derelict land once occupied by a sewage treatment plant to act as a catalyst for redevelopment. A project known as The Round was built around the station, featuring a mix of office and high-density residential units, surrounding a circular plaza that includes the MAX station.

Oreco

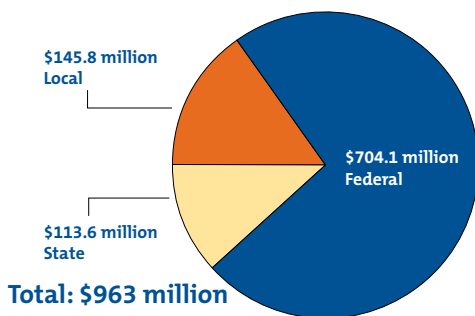
Oreco was once a small company town that supported a large nursery by the same name, located on the old interurban electric railway. With the nursery and most of the population having long since moved away, the City of Hillsboro designated Oreco for transit-oriented development as part of the light rail project. Today it has become a showcase community.

Snapshots

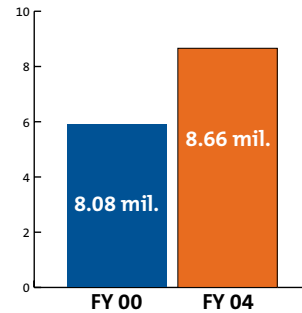
Travel times

- Downtown Portland (Pioneer Square) to Beaverton Transit Center** 23 minutes
- Beaverton Transit Center to Hillsboro end of line** 28 minutes
- Downtown to Hillsboro end of line** 51 minutes

Westside MAX Funding



Annual Ridership



Overall transit ridership in the corridor is up 188 percent since Westside MAX opened.

Timeline

- 1979** Alignment and environmental studies begin, to be postponed in 1983
- 1988** Preliminary engineering and environmental studies begin again
- 1990** Voters overwhelmingly approve a bond measure for the Westside extension
- 1993–1997** Tunnel construction
- 1994–1998** Alignment construction
- July 1996** First low-floor car arrives
- April–August 1998** Testing, training, service simulation
- September 1998** Opened

Facilities

- Length** 18 miles (MAX Blue Line: 33 miles total)
- Stations** 20
- Park & Rides** 9 with 2,733 total spaces
- Parking garages** 2 with 880 total spaces
- New maintenance facility** Elmonica

Bus connections

Connects with 65 TriMet bus lines and C-TRAN bus service to Vancouver, Washington.