The West Gate Tunnel Project is building twin tunnels between the Maribyrnong River and the West Gate Freeway, providing a vital alternative to the West Gate Bridge. The project will ensure quicker and safer journeys and remove over 9000 trucks a day from streets in the inner west.

The tunnels are being built using two tunnel boring machines (TBMs) so the community and businesses can continue above ground while work happens below ground.

Quick Fact

The TBMs being used to build the West Gate Tunnel are the largest in the southern hemisphere, standing at 15.6 metres in diameter – as tall as a five storey building – and 90 metres long.

TBM diameter
15.6 metres
How does a TBM work?

While the TBM bores up to 27 metres under the ground, it also installs a concrete lining, forming the walls, roof and base of the tunnel. The TBM excavates rock and soil with a rotating cutterhead, before moving forward to make space for the concrete lining. It then stops moving and installs the lining using a specialised rotating machine.

Tunnelling requires highly specialised skills. Behind the TBM, crews work to build the road surface and install electrics, ventilation and safety systems.

To inspect the TBM cutterhead, up to four workers will enter a pressurised air lock to perform routine maintenance work in compressed air conditions. The compressed air is used to keep the groundwater away from the working area. The physical effects are similar to scuba diving to a depth of up to 35 metres.

After completing the maintenance tasks, the workers then spend up to two hours depressurising before returning to the surface.

Where does the excavated material go?

The TBM will excavate around 1.5 million cubic metres of dirt and rock while building the tunnels – enough to fill the MCG.

During tunnelling, excavated dirt and rock is moved from the tunnel face to the rear of the TBM by a series of internal conveyor belts.

From there, the dirt and rock moves on to a covered conveyer that will transport the excavated material away from the northern portal and over Somerville Road, straight into the massive spoil handling shed at the project’s tunnelling hub.

Once it reaches the shed, the conveyor will empty the excavated material into huge bins before it gets loaded onto covered trucks and transported away from site.
1. **Cutterhead**: This is the part that rotates and excavates the soil.

2. **Air Lock**: Acclimatises workers prior to entering and exiting the pressurised excavation chamber.

3. **TBM Hydraulic Thrust Jacks**: These jacks push the whole TBM forward by creating pressure against the installed precast concrete lining segments. This is what makes it all move forward.

4. **Tail Skin**: Protective steel skin within which the segmented precast tunnel lining is built. This area is sealed to prevent groundwater entering behind the lining.

5. **TBM Conveyor**: This is a conveyor belt system that transports excavated material away from the screw conveyor discharge to the tunnel conveyor.

6. **Electrical Control Container**: Houses the panels for the distribution and control of electrical power to the TBM's many components.

7. **Electrical Transformer**: Changes the voltage of the incoming electrical power to a lower usable power for the motors. The electrical power runs from the transformer to the electrical control centre.

8. **TBM Control Cabin**: This is where the entire TBM and associated systems are operated (the TBM's cockpit).

9. **Engineer's Office**: This is where the tunnelling engineers plan how the TBM will be operated according to forecast geological conditions - metre by metre.

10. **Tunnel Conveyor Belt Transfer**: This is where the tunnel spoil changes from TBM conveyor to the tunnel conveyor belt.

11. **Ventilation Ducts**: This provides a constant flow of clean air and maintains a safe temperature for the workers.

12. **Refuge Container**: This is a safety refuge for underground personnel.

13. **Ventilation Canister**: Stores 200m of ducts which feed out as the TBM advances - similar to a telescope unfolding.

14. **Tunnel Conveyor Belt**: Material is transferred onto a conveyor belt that runs along the length of the tunnel up to the surface. Excavated material is then stockpiled on the surface and transported by trucks to designated fill sites.

15. **Toilet**:

16. **Multi Service Vehicle (MSV)**: Carries precast lining segments from the surface to the TBM. Also used to transport personnel in the tunnel.

17. **Segment Crane**: Lifts precast lining segments from the MSV then rotates and carries them to the segment feeder.

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19. **Bentonite Pumps**:

20. **Waste Water Tank**:

21. **Compressors**: Provides compressed air for air tools.

22. **Cooling Unit**:

23. **Hose Reels**:

24. **Grease Pumps**: Used for sealants and lubrication.

25. **Hydraulics**: Powers TBM hydraulic systems.

26. **Segment Feeder**: This is a transfer system for precast tunnel lining segments.

27. **Tunnel Lining**: Concrete segments that form the tunnel.

28. **Segment Lining Erector**: This machine works just like a big robot arm. It picks up the concrete lining segments using a vacuum plate and then rotates and places them into position to form a ring.

29. **Main Drive Unit**: This unit houses the main bearing (powered by several motors) and turns the cutterhead.

30. **Screw Conveyor**: Lifts excavated material from the excavation chamber up to the TBM conveyor. It also enables operation of an earth pressure balance system used for excavating soft material. It essentially maintains the ground support and controls the excavated material transfer.
Preparing to tunnel

Two state-of-the-art tunnel boring machines (TBMs) will build the twin West Gate tunnels. These machines use the latest tunnelling technology and are custom designed and built to suit ground conditions in Melbourne’s west. The West Gate Tunnel Project’s northern portal, on the corner of Youell and Whitehall streets in Footscray, is where the TBMs will start tunnelling.

In order to launch the machines into the ground, large piling rigs – some up to 45 metres high – bored steel and concrete support structures below the ground to create retaining walls for a 22 metre deep trench.

The trench is 40 metres wide and 330 metres long, and will ultimately become the freeway entrance to the tunnels.

Transporting the TBMs

The West Gate Tunnel Project’s TBM components have been partially assembled in Germany, with final assembly and testing in China. Each TBM took about 12 months to build, test and commission, before being disassembled and transported from China to Melbourne.

After arriving in the Port of Melbourne, the TBMs were transported to the northern portal and assembled on site. Some of the largest gantry cranes ever built in Australia – up to 500 tonnes lifting capacity and up to 28 metres high - were used to assemble the machines.

Work starts on the four kilometre outbound tunnel first, closely followed by the 2.8 kilometre inbound tunnel. The longer tunnel takes around 18 months to excavate.

How do you power a TBM?

TBMs this size need 10 megawatts of power per machine.

A new substation is built on site at the northern portal to ensure enough power is supplied to keep the machines moving 24 hours per day, seven days per week.

Did you know?

Saint Barbara is the patron saint of underground workers and it’s not uncommon to see pictures of the saint on tunnel walls to ensure the success and safety of the workers.

Noise and vibration

Tunnel boring machines are very good at reducing vibration so many people living and working above the tunnel may not notice construction happening underground. We will:

- Inspect properties above the tunnel before and after construction.
- Monitor ground movement and vibration levels at all times.
- Meet strict targets set to manage vibration and minimise disruption.

Working hours

The TBMs are expected to bore up to nine metres a day, 24 hours a day, and seven days a week. The main tunnelling construction compound at Whitehall Street will be busy both day and night.
Keeping you informed

We will keep people informed and work together to make things easier during construction. You can expect to see regular information from us about construction activities happening in your area, including:

• Newsletters to keep you up to date.
• Works notifications in your letterbox.
• Door knocks or street meetings before major works.
• Information on the website.
• News and updates on social media.

We have a team that is dedicated to working with the community. They are available 24 hours a day, seven days a week to answer any questions or concerns.

Our West Gate Tunnel Project Visitor Information Centre provides a one-stop shop for project information and enquiries.