Transport for NSW

Fact sheet – tunnelling from Birchgrove to Waverton

Western Harbour Tunnel

February 2025

We acknowledge the Traditional Custodians of the Country on which Western Harbour Tunnel is being constructed, including the Gadigal, Cammeraygal, and Wangal peoples, as well as the Aboriginal peoples of Emu Plains, and we pay respect to Elders past and present.

Western Harbour Tunnel will make it easier, faster and safer to get around Sydney.

The project is preparing to excavate two launch chambers under Birchgrove for our tunnel boring machines (TBMs) to tunnel under Sydney Harbour to Waverton.

We will start excavating the launch chambers in March 2025 for the TBMs to be launched in 2026.

About tunnelling for Western Harbour Tunnel

Tunnelling is a safe and commonly used construction technique that enables major infrastructure to be delivered in built-up residential areas with a relatively low impact as work activities are mostly underground.

We adhere to strict safety and environmental requirements for the project and every effort will be made to minimise the impact of our work on local residents.

We have approval from the Department of Planning, Housing and Infrastructure (DPHI) to tunnel **24-hours a day, seven days a week**. The impact on properties above the tunnel, such as noise and vibration, is expected to be minimal.

Our tunnelling methodology

Western Harbour Tunnel is using two types of tunnelling equipment:

- **Roadheaders –** we are using these to tunnel between Cammeray and Waverton, including excavation of the TBM launch chamber under Birchgrove.
- **Tunnel boring machines (TBMs) –** we will use TBMs to tunnel under Sydney Harbour from Birchgrove to Waverton.

About roadheaders

Roadheaders are specialised machines designed to excavate tunnels by cutting through hard rock. They have large rotating cutting heads fitted with metal picks designed to break and excavate rock. They also have bulldozer-style tracks that allow them to move across different ground surfaces as they excavate.

Roadheaders offer several benefits including:

Precision and control – roadheaders are highly manoeuvrable and are fitted out with advanced technology which allows for precise excavation

Enhanced safety – creating safe underground working environments

Efficiency – roadheaders can work continuously, reducing the time required to excavate

We will use roadheaders to excavate the TBM launch chambers below Birchgrove, our tunnel cross passages north of Cove Street, Birchgrove, and the receival chambers at Waverton.

About tunnel boring machines (TBMs)

TBMs are specialised machines designed to excavate tunnels by cutting through hard rock, wet or dry soil, or sand. They are fitted with a large rotating head that makes a hole in the ground by using a motor with a hydraulic or electric system.

TBMs are used worldwide and across Australia as a safe and effective tunnelling solution. Using a TBM to cross under Sydney Harbour will reduce the impact of construction on the community and the environment.

The Western Harbour Tunnel project was originally planned to be constructed using the immersed marine tube (IMT) tunnelling methodology to tunnel under Sydney Harbour, however a modification to the project approved in January 2024 changed this methodology to use TBMs.

Using TBMs will remove the need for construction support sites at Yurulbin Point and Berrys Bay, an IMT fabrication facility at White Bay, and the need for two cofferdams on Sydney Harbour at Birchgrove and Waverton. The TBMs will tunnel deep under the seabed from Birchgrove to Waverton and will not require any dredging activities in Sydney Harbour.

Using TBMs will require the excavation of launch chambers in the tunnels under Birchgrove and a receival chamber in Waverton where parts of the TBMs will be buried.

Constructing a road tunnel with a roadheader

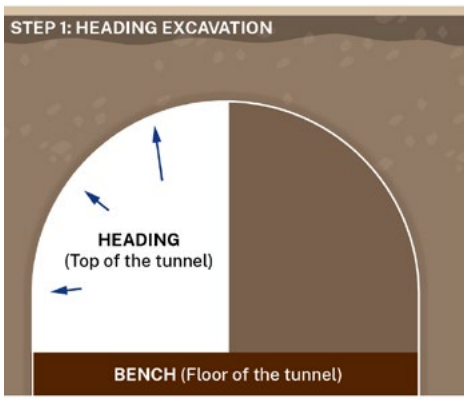
We will excavate the mainline traffic tunnels and launch chambers using a split heading methodology to excavate the roof and the floor of the tunnels. A split heading methodology means the roadheader will excavate half of the width of the tunnel and once it has progressed far enough, return to excavate the remaining half.

Roadheader tunnel excavation is done in three steps:

Step 1: Excavation of tunnel roof

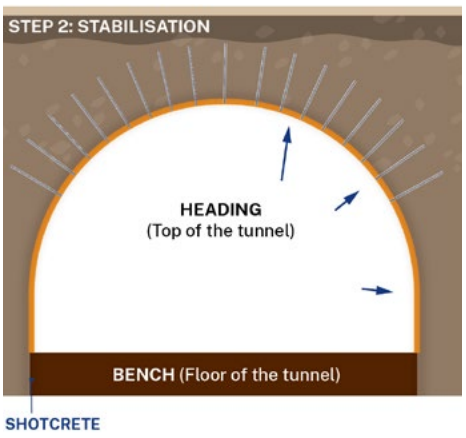
The first phase involves excavation of the tunnel roof using a roadheader.

The crew excavate one to five metres at a time (depending on the design), before installing support. We generally excavate around 20 to 25 metres of rock per week.



Step 2: Stabilisation

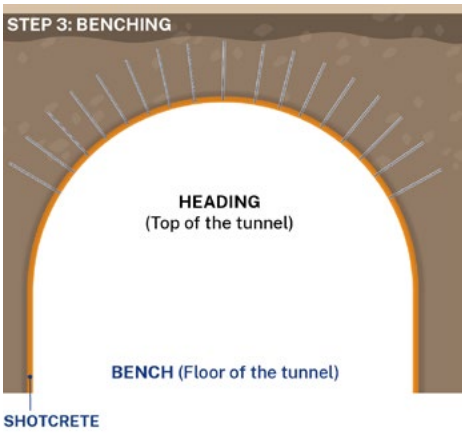
As the roadheader progresses with excavation, the tunnel will be stabilised with rockbolts (metal rods) and shotcrete (sprayed concrete).



Step 3: Excavation of tunnel floor

The roadheader will then reposition to excavate the floor of the tunnel.

On some occasions, we will need to use a rock hammer to excavate the floor or drainage channels.



Roadheader tunnelling activities at Cammeray

How TBMs work

Our two TBMs will be some of the largest in the world at an approximate diameter of 16 metres. We will use mix shield or slurry TBMs because they are best suited to the mixed ground conditions of sandstone and marine clay under Sydney Harbour.

Each TBM will have a large cutterhead on the front and use hydraulic arms to move the machine forward. The TBMs will be operated by a team of people as they navigate the underground conditions.

Once the TBMs begin tunnelling, they will move forward by up to nine metres each day. As tunnel excavation progresses, pre-cast concrete segments are installed to create the tunnel lining. The displaced spoil of rock excavated by the cutterhead will then be sent back through a pipe to a slurry treatment plant underground. Once the spoil is dewatered, it can then be removed and transported offsite.

What are TBM launch and receival chambers?

To support tunnelling with TBMs, underground TBM launch and receival chambers are required to construct the TBM underground and bury it after TBM tunnelling is completed. The excavation of these chambers will be entirely underground and will be supported by the existing construction sites at the City West Link portal, Glebe Island, Ridge Street North and Cammeray.

About the TBM launch chambers below Birchgrove

The TBM launch chambers will be constructed below Birchgrove to facilitate the launch of the TBMs from the southern side of Sydney Harbour before they move north towards Waverton.

The launch chamber will consist of an underground excavation of around 180 metres long, 25 metres wide and 25 metres tall and is built within the tunnel alignment.

The excavation of the launch chamber is expected to take six to nine months and will employ standard road tunnel construction techniques including roadheader excavation and rock bolting.

Read more in the TBM launch chamber fact sheet online at **nswroads.work/whtportal**

About the TBM receival chambers below Waverton

A TBM receival chamber will be constructed under Carradah Park, Waverton, on the outer sides of the mainline tunnel alignment. The receival chamber will be excavated by roadheaders from the mainline tunnel excavation and will be constructed several months prior to the TBM breaking through to the tunnels under Waverton.

Once tunnelling work has been completed, the TBM cutterhead will be decommissioned and encased in the receival chamber around 48 metres underground at Carradah Park, Waverton. All other components of the TBM will be dismantled and reused or recycled.

Inside a tunnel boring machine (TBM).

Tunnelling support: slurry treatment plant

As the TBMs excavate underground, spoil will be moved via pipes to a facility known as a slurry treatment plant.

Slurry treatment is a process in which the excavated material is removed from the slurry. This process is necessary to support the function of the TBM.

In an industry leading design, the slurry treatment plant will be entirely underground within an ancillary a ventilation tunnel below Rozelle to significantly reduce our impact on the community.

Managing noise and vibration

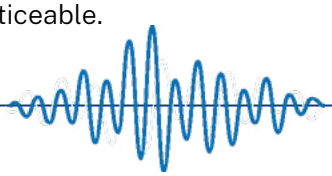
Noise from underground excavation and tunnelling transfers through the ground into a built structure, on the surface resulting in audible noise levels. This is referred to as ground-borne noise.

Noise and vibration are most noticeable when we are tunnelling close to a property increasing on approach, and reducing as we move away.

While we are tunnelling, we will monitor noise and vibration to make sure we are not exceeding our allowable limits.

Roadheader excavation sounds like an old refrigerator humming.

Rock bolting creates a temporary drilling noise. As it stops and starts, it may be more noticeable.



We have a fact sheet with more information about noise and vibration on our website, please visit **nswroads.work/whtportal**

Your property during tunnelling

Buildings naturally undergo ground movement due to environmental changes including seasonal climate variations, vegetation such as tree roots, structural effects (different building types or age of construction) or ground effects (reactivity to soil).

We understand there may be concern about the potential for vibration and settlement impacts from tunnelling, however ground movement typically does not lead to property damage, in fact it is highly unlikely.

Properties within 50 metres of our tunnel alignment, will be offered a free property condition survey (PCS). Even though it is highly unlikely for any damage to occur from our tunnelling, we encourage anyone who is eligible for a PCS to take up this offer.

We will send a letter to the owners of eligible properties about how to accept a PCS offer before we start tunnelling nearby.

Find out more on our website: **nswroads.work/whtportal**

Contact us

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Visit our website at nswroads.work/whtportal

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