

Five Dock Station cavern excavation.

Cavern excavation underway in Five Dock

September 2023

The NSW Government is delivering Sydney Metro West, a new underground metro railway which will double rail capacity between Parramatta and the Sydney CBD, with a target travel time of about 20 minutes between the two centres.

Sydney Metro West stations have been confirmed at Westmead, Parramatta, Sydney Olympic Park, North Strathfield, Burwood North, Five Dock, The Bays, Pyrmont and Hunter Street in the Sydney CBD.

Sydney Metro has been granted planning approval to construct twin underground rail tunnels between Westmead and Hunter Street in the Sydney CBD for Sydney Metro West.

Acciona Ferroviaria Joint Venture (AFJV) has been awarded the contract to deliver 11 kilometres of twin metro rail tunnels between The Bays and Sydney Olympic Park and excavate five new metro stations including Five Dock Station.

Five Dock construction update

AFJV is continuing excavation work at the eastern and western construction sites in Five Dock to prepare for construction of the new metro station.

From the eastern construction site, two roadheaders have been excavating the station cavern between the two sites with breakthrough into the western site achieved mid-August 2023.

Bulk excavation of the western shaft is continuing and is expected to reach the required depth in October.

Two tunnel boring machines (TBMs) have started their journey from The Bays excavating the twin seven metre diameter tunnels and are expected to reach Five Dock in late 2023.



Five Dock western construction site August 2023.

Key activities

Excavation of the 30 metre x 20 metre shaft inside the acoustic shed at the eastern construction site has been completed to a depth of 28 metres. This has seen around 40,000 tonnes of excavated material removed.

Two roadheaders have been excavating the station cavern, linking the two sites to create an underground space where the station platform and facilities will be built. The station cavern is being excavated in short sections, with rock bolts installed and concrete sprayed for ground support.

Bulk excavation of the shaft on the western construction site is continuing. This shaft has a larger footprint of 60 metres x 30 metres and is being excavated to a depth of around 30 metres. Once completed, around 120,000 tonnes of material would have been removed from this shaft alone.

Bulk excavation of the station cavern will be completed in the last quarter of 2023 with concreting work on the floor required to allow tracking of the tunnel boring machines across the cavern.

A surface miner is a machine that is generally used in large open cut areas. One of these machines has been modified and is being used at the western construction site to reduce the overall amount of rock hammering required during shaft excavation work. The surface miner has an in-built dust collection system and is much less intrusive than traditional hammering.

Construction timeline

			We are here			
January to June 2022	April to late 2022	Late 2022 to late 2023	Mid to late 2023	Late 2023	Throughout 2024	Late 2024
Demolition	Site establishment	Shaft excavation	Cavern excavation	TBM arrival	Station lining, tunnelling support and site demobilisation	Site handover for station construction

The TBMs are expected to arrive into the Five Dock station cavern in late 2023. The TBMs will then track through the excavated station cavern before resuming their tunnelling journey towards the Burwood North Station site.

While AFJV planned to work 24 hours per day, seven days a week at both construction sites at Five Dock, a review of work methods and schedule determined AFJV only needs to work 24/7 at the eastern construction site in Second Avenue. Excavation work and truck haulage at the western site on Great North Road will continue during standard construction hours only on **Monday to Friday 7am -6pm and Saturday 8am -6pm**, so an acoustic shed is not required on that site. A copy of the consistency assessment for this change is available in the document library on the Sydney Metro website.

Construction look ahead

Activity	Sep	Oct	Nov	Dec	Jan	Feb
Shaft excavation	●	●				
Cavern excavation	●	●	●			
Cavern concrete lining		●	●	●	●	●
Tunnel boring machine arrival			●	●		
Construction activity ●						

Tunnel boring machines

The two double-shield, hard rock TBMs were specially built for Sydney’s geology to cut through the hard sandstone.

These two TBMs include some refurbished components from the TBMs used on the Sydney Metro City & Southwest project, that carved out the metro tunnels from Chatswood to Blues Point.

Tunnelling is carried out 24 hours a day, seven days a week. The average tunnel depth between The Bays and Sydney Olympic Park is 35 metres. All material excavated by the TBMs is transferred via conveyor belts to a storage shed at The Bays site and then removed by trucks for reuse at various other sites across greater Sydney.

The TBMs excavate up to 200 metres of tunnel per week and are expected to complete their journey to Sydney Olympic Park in the second half of 2024.

Ground-borne noise

Tunnelling work may cause some ground-borne noise. Ground-borne noise results from vibration being transmitted through the ground and “regenerated” as noise into a building. It typically has a low frequency “rumbling” sound due to the low frequency of the vibrations.

Like vibration, ground-borne noise is more noticeable when the TBM is closest to a property, increasing on approach and reducing as it moves away. It usually takes about two days for a TBM to pass under a property.

Ground-borne noise is likely to be heard at night when background noise levels are lower and is not expected to cause disturbance during the day.

Residents will be notified ahead of the TBMs approaching their property for each of the tunnels and then again before cross passage excavation starts.

AFJV has undertaken extensive noise and vibration modelling to predict the likely impacts of tunnelling and ensure they are within acceptable limits. Regular monitoring will continue throughout the project to ensure noise and vibration is within the expected levels.

Cross passages and crossover cavern

A cross passage is a short tunnel that connects the two parallel tunnels located around every 240 metres along the tunnel alignment. Cross passages are an important safety feature that allow people to move from one tunnel to the other in the unlikely event of an emergency.

Construction of cross passages will occur below ground within the mainline tunnels after the tunnel boring machines have passed through the area. A remote controlled excavator with a rock breaking hammer will be used to excavate the passages.

Construction hours

Work at the Five Dock station sites is approved to be carried out during the following standard construction hours:

- Monday to Friday 7 am to 6 pm and Saturday 8 am to 6 pm.
- Highly noisy work is restricted to **Monday to Friday 8 am to 6 pm and Saturday 8 am to 1 pm** with a one(1) hour respite after every three hours of this activity.
- With the acoustic shed on the eastern site complete, the approved hours of work inside the shed have extended to 24 hours per day seven days per week under strict noise criteria.
- Tunnelling, cross passages and cavern excavation are approved for 24 hours per day seven days per week operation however truck haulage of excavated material from the site will not occur between **10 pm and 7 am**.

How a tunnel boring machine works

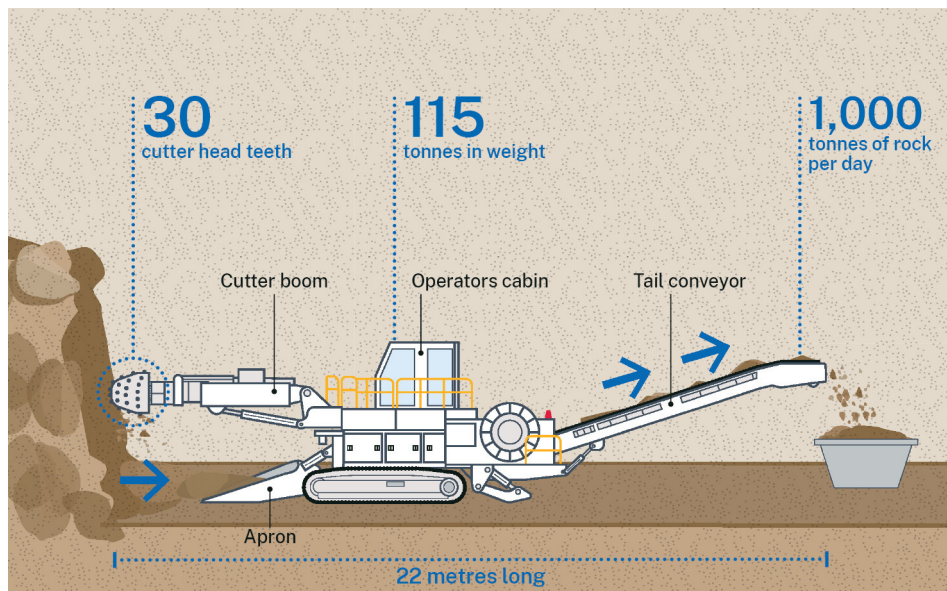
How does a TBM measure up?

Length

Up to 165 metres

Weight

>900 tonnes = 570 V8 cars



Key features of a roadheader machine.

The Central Tunnelling Package virtual engagement room for Sydney Metro West is now live.

To learn more about important aspects of the project visit caportal.com.au/afjv/ctp/virtual or scan the QR code.



What is a roadheader?

Roadheaders are powerful rock cutting machines that are often used for road and rail tunnel projects. With their highly advanced computer systems, roadheaders can accurately excavate in a wide range of rock formations. Using a rotating cutter head attached to a boom, they can freely swing from side to side or up and down. The cutter head looks like a pineapple with 30 tungsten carbide teeth that are capable of cutting through rock three times harder than concrete. Like an excavator, a roadheader has a crawler track which allows it to move forward as it cuts away the rock face. The excavated material is moved through the middle section of the roadheader via two conveyors into bins for removal offsite.

Roadheader assembly

After arriving on site in pieces, components of the roadheader are lowered into the shaft individually by the gantry crane. Once all pieces are on the floor of the shaft, they are assembled ready to begin excavating. At first, the machines don't have a tail conveyor and excavated material is removed with an excavator. When the cavern is large enough, the tail is installed and the excavated material is loaded into a skip bin for lifting into trucks on the surface via the gantry crane.

Weighing in at 115 tonnes and 22 metres long, the roadheaders excavate around 1,000 tonnes of rock per day. Thousands of cutter head teeth will be consumed by the two roadheaders during excavation of the Five Dock Station cavern.

Noise and vibration

Residents and businesses near the cavern excavation may experience some vibration and ground-borne noise. The impact from this varies depending on the geology, tunnel depth and type of buildings above. Regular monitoring is continuing throughout the work to ensure noise and vibration is within the expected levels. Discussions with residents and businesses about potential impacts and mitigations are continuing.

Environmental controls

Dust reduction and extraction is regulated by the integrated water sprayer on the cutter head which, in conjunction with dust extraction filters, safeguards the environment and reduces hazards for the workers.



Contact us

If you have any questions or would like more information please contact our project team:

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Translating and interpreting service

If you need help understanding this information, please contact the Translating and Interpreting Service on 131 450 and ask them to call us on 1800 612 173.



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