Chapter 5

Project description

5 Project description

This chapter describes the key construction work for this proposal, including excavation of the tunnel and stations.

5.1 Overview

The proposed major civil construction work between The Bays and Sydney CBD (the proposal) would include:

- Enabling work such as demolition, utility supply to construction sites, utility adjustments, and modifications to the existing transport network
- Tunnel excavation including tunnel support activities
- Station excavation for new metro stations at Pyrmont and at Hunter Street, in the Sydney CBD.

The location of the proposal, including the underground tunnel and the construction sites for the stations, are shown on Figure 5-1. Property acquisition to enable the construction work is currently underway across sites between Pyrmont and the Sydney CBD. Property acquisition is carried out in accordance with the *Land Acquisition (Just Terms Compensation) Act 1991* and the NSW Government's property acquisition process (refer to Chapter 10 (Property and land use)). Construction of the proposal would require acquisition and leasing of property as described in Chapter 10 (Property and land use).

The tunnel alignment is indicative and subject to design development and construction planning. It has been used for the purposes of the environmental impact assessment, including all specialist investigations.

Further details and an indicative long section are shown on Figure 5-2 and Figure 5-3, with the location of construction sites shown in Section 5.4.

Figure 5-1 Indicative location and tunnelling direction of the major civil construction work between The Bays and Sydney CBD

Figure 5-2 Indicative alignment plan and long section

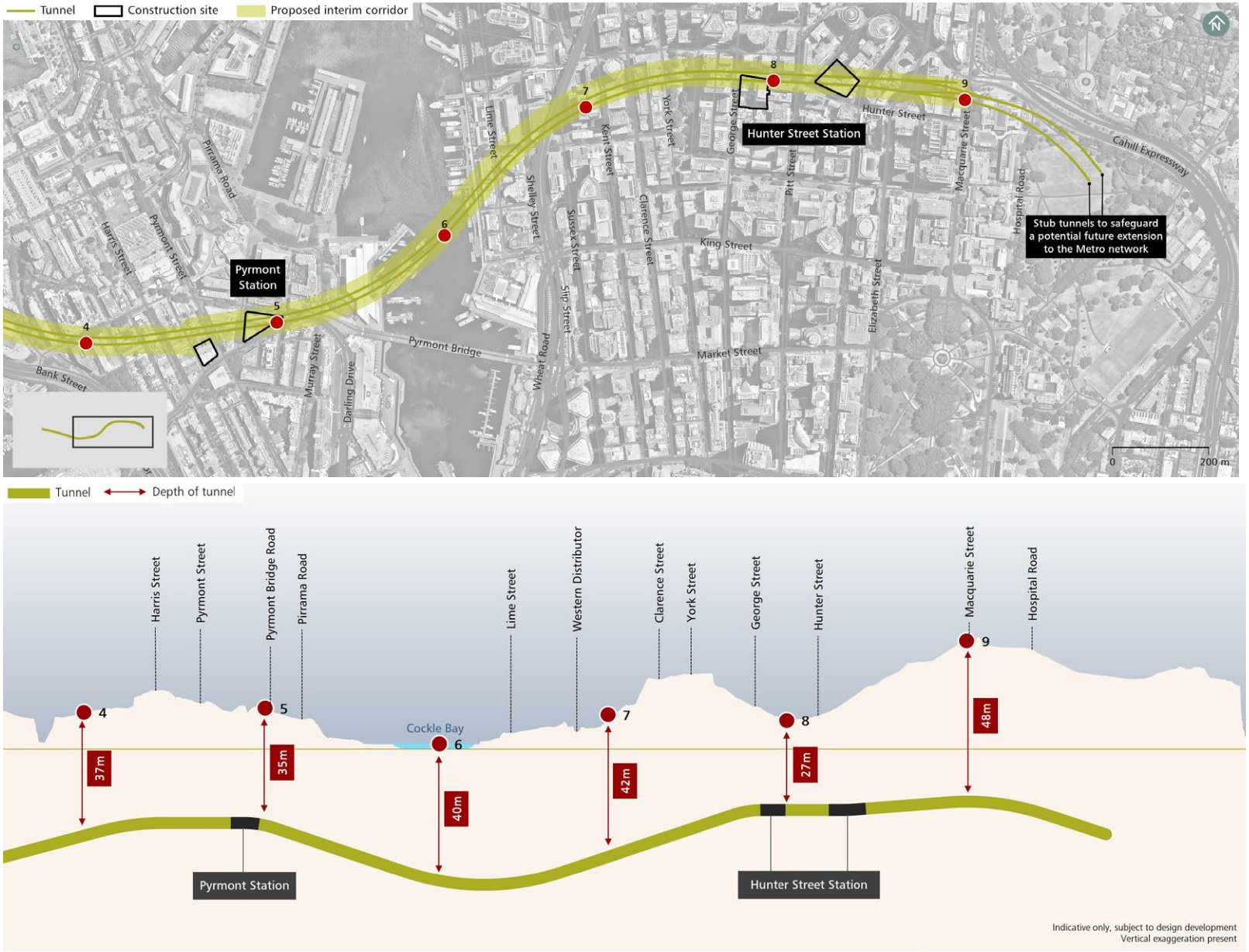

Figure 5-3 Indicative alignment plan and long section

5.2 Precinct considerations

The *Sydney Metro West Environmental Impact Statement – Westmead to The Bays and Sydney CBD* (Sydney Metro, 2020a) provides the approach to placemaking, the design process and the place and design principles for stations and ancillary facilities, and includes integration with strategic planning for The Bays Station.

The following sections detail the precinct-specific considerations to guide design and placemaking for the Pyrmont Station and Hunter Street Station (Sydney CBD) precincts.

5.2.1 Pyrmont Station

Integration with strategic planning for the precinct

The station at Pyrmont supports the aims of the *Pyrmont Peninsula Place Strategy* (Department of Planning, Industry and Environment, 2020), which includes a transition to a place where people walk and use public transport to connect to other places. A number of plans and strategies have been developed, which have informed the development of Pyrmont Station and guide the future design, as outlined in Table 5-1.

Table 5-1 Integration with strategic planning – Pyrmont Station

Plan or strategy	Overview
Pyrmont Peninsula Place Strategy	The *Pyrmont Peninsula Place Strategy* (Department of Planning, Industry and Environment, 2020) sets out a vision for Pyrmont at the forefront of the future of work. The strategy seeks to position Pyrmont as an attractor for global investment driven by connectivity to the Sydney CBD. The station at Pyrmont would support the aims of the strategy, which includes a transition to a place where people walk and use public transport to connect to other places.
Eastern City District Plan	As identified in the *Eastern City District Plan* (Greater Sydney Commission, 2018), the vision for Greater Sydney as a metropolis of three cities will see the Eastern City District become more innovative and globally competitive, carving out a greater portion of knowledge-intensive jobs from the Asia Pacific Region. The vision will improve the District's lifestyle and environmental assets. Pyrmont Station would support several priorities of the plan, such as planning for a city supported by infrastructure; providing housing supply, choice and affordability, with access to jobs, services and public transport; growing and investing in health and education precincts and the Innovation Corridor; delivering integrated land use and transport planning and a 30-minute city; and growing investment, business opportunities and jobs in strategic centres.
Sustainable Sydney 2030: Community strategic plan	*Sustainable Sydney 2030* (City of Sydney, 2017) is a plan for a green, global and connected city and expresses the City's commitment to the sustainable development of the city to 2030 and beyond. The plan focuses on physical, economic, social and cultural environments. Pyrmont Station would support the strategic directions outlined in the plan including the objectives associated with establishing integrated transport for a connected city.

Pyrmont Station place and design principles

Sydney Metro has defined the guiding place and design principles for Pyrmont Station. These are:

- Support Pyrmont's role as a significant employment and entertainment destination and urban renewal area with a new Metro Station, connected to the Sydney CBD, The Bays Precinct and Western Sydney
- Provide a direct rail service to Pyrmont to support a catchment not currently serviced by the Sydney Trains network
- Align with the strategic directions of Pyrmont Peninsula Place Strategy to deliver a Metro Station which will reinvigorate investment, and facilitate a future integrated development which achieves design excellence, responds to context and delivers Place Strategy aspirations
- Facilitate efficient interchange with bus and light rail, and enable comfortable and safe connections for pedestrians and cyclists, including Union Street, Pyrmont Street and Pyrmont Bridge Road
- Deliver an activated ground plane and high-quality public domain at Pyrmont Metro Station which contributes to the streetscape, complements the surrounding context and heritage character, and offers a welcoming place for people.

These principles will be further realised through detailed design and future stages of Sydney Metro West. Guiding place and design principles for Pyrmont Station are shown in Figure 5-4.

Figure 5-4 Guiding place and design principles for Pyrmont Station

5.2.2 Hunter Street Station (Sydney CBD)

Integration with strategic planning for the precinct

The station at Hunter Street (Sydney CBD) supports the aims of the *Eastern City District Plan* (Greater Sydney Commission, 2018). A number of plans and strategies have been developed, which have informed the development of the Hunter Street Station (Sydney CBD) and guide the future design, as outlined in Table 5-2.

Table 5-2 Integration with strategic planning – Hunter Street Station (Sydney CBD)

Plan or strategy	Overview
Eastern City District Plan	Hunter Street Station (Sydney CBD) would support several priorities of the plan, such as planning for a city supported by infrastructure; providing housing supply, choice and affordability, with access to jobs, services and public transport; delivering integrated land use and transport planning and a 30-minute city; and growing investment, business opportunities and jobs in strategic centres.
Sustainable Sydney 2030: Community strategic plan	A station at Hunter Street (Sydney CBD) would support the strategic directions outlined in the plan including the objectives associated with establishing integrated transport for a connected city.
City Plan 2036 Local Strategic Planning Statement	*City Plan 2036 Local Strategic Planning Statement* (City of Sydney, 2020) sets out the 20-year vision for land use planning in the City of Sydney local government area. The planning statement sets priorities to deliver the vision of a 'green, global and connected' city. Hunter Street Station (Sydney CBD) would support several priorities of the plan, such as movement for walkable neighbourhoods and a connected city; aligning development and growth with supporting infrastructure; creating great places; and a stronger and more competitive Central Sydney.

Hunter Street Station (Sydney CBD) place and design principles

Sydney Metro has defined the guiding place and design principles for Hunter Street Station (Sydney CBD). These are:

- Reinforce Sydney's global standing by significantly improving public transport accessibility between the Eastern Harbour City and the Central River City, enhancing 'job-to-job' connections and catalysing economic growth
- Establish an integrated transport hub in CBD North, strengthening Sydney's rail network and linking important destinations to deliver a more connected City
- Deliver highly efficient interchanges between Metro and other public transport modes, with capacity to support high volumes of pedestrians above and below ground, while delivering a high quality customer experience
- Facilitate integrated station developments that promote design excellence and contribute to the unique attributes and character of this CBD North location, aligned with the Central Sydney Planning Framework
- Deliver a design that promotes active street frontages to support a vibrant public domain in the heart of the Sydney CBD, and which delivers a high-quality station address to George Street, the CBD's north-south pedestrian boulevard.

These principles will be further realised through detailed design and future stages of Sydney Metro West. Guiding place and design principles for Hunter Street Station (Sydney CBD) are shown in Figure 5-5.

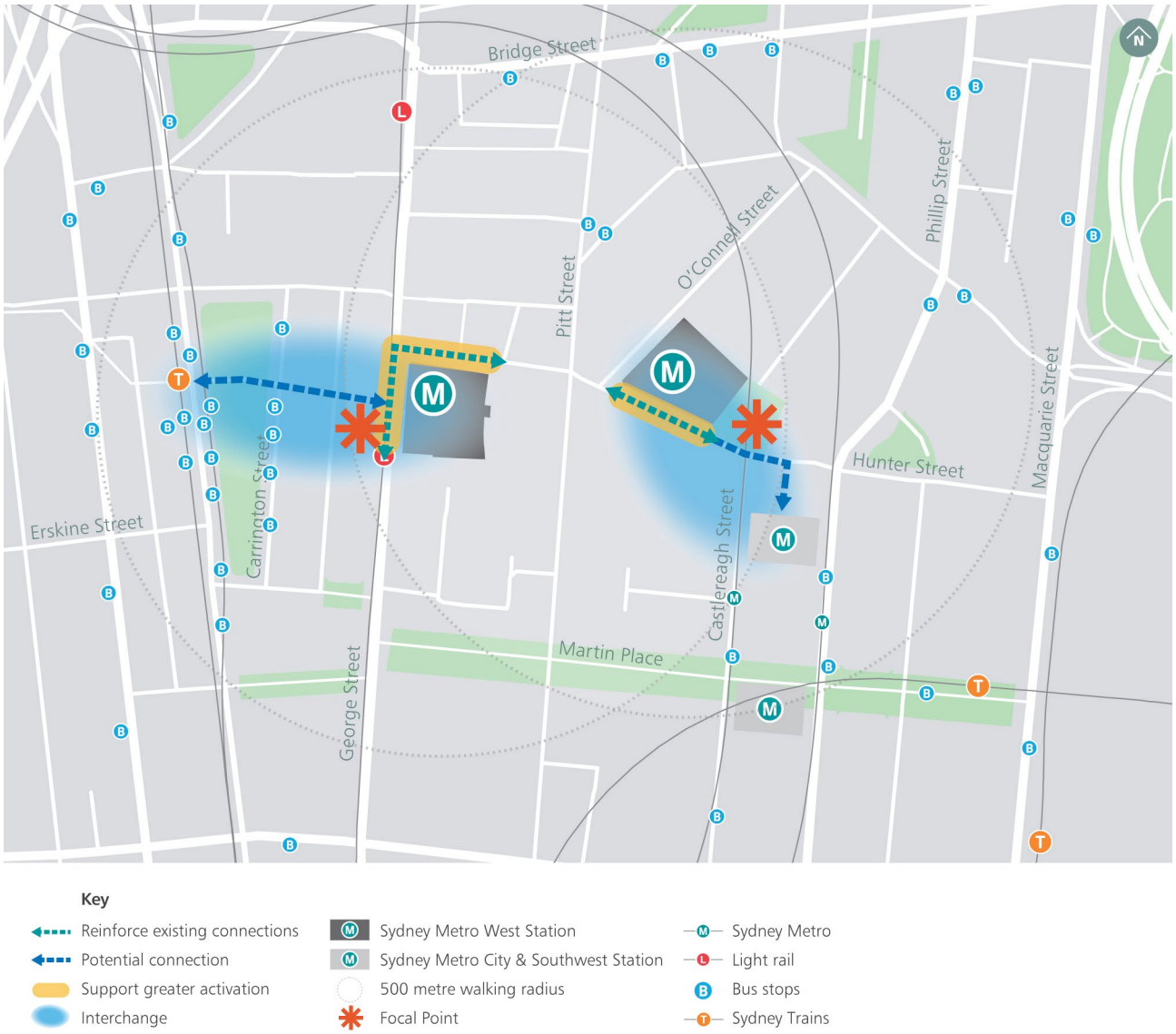

Figure 5-5 Guiding place and design principles for Hunter Street Station

5.3 Indicative construction program

An indicative construction program for the major civil construction work between The Bays and Sydney CBD is shown in Figure 5-6. The actual program and commencement of the civil work at each construction site may vary and is subject to ongoing design development and construction planning to be agreed with the successful contractor for each work package. The total construction period for this proposal would be around three years.

This proposal would be followed by a further period of construction and fit-out of stations and the rail systems, with time also required to test and commission and bring the Sydney Metro West line into operation (subject to future separate planning applications).

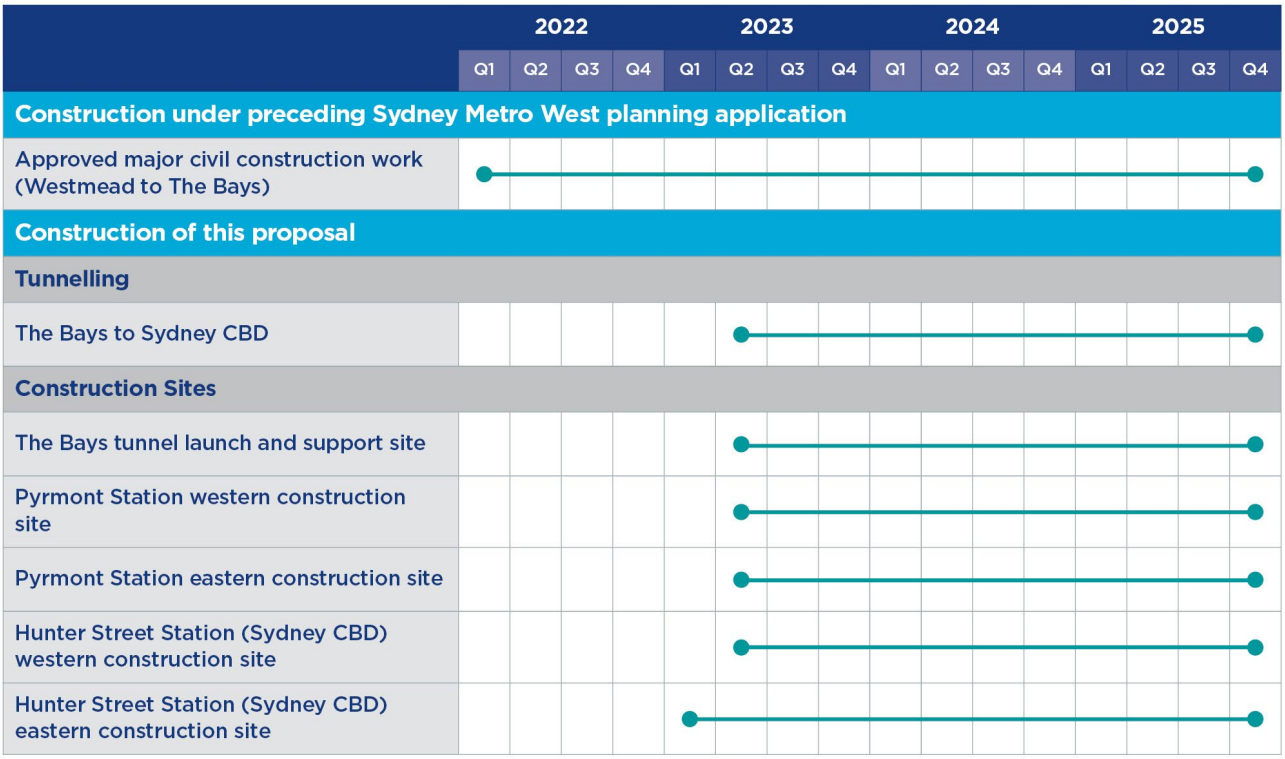

Figure 5-6 Indicative construction program

5.4 Construction sites

Five construction sites would be required for the activities listed in this section:

- The Bays tunnel launch and support site (which would be sited within The Bays Station construction site approved under the Stage 1 planning approval)
- Pyrmont Station western construction site
- Pyrmont Station eastern construction site
- Hunter Street Station (Sydney CBD) western construction site
- Hunter Street Station (Sydney CBD) eastern construction site.

The main activities that would take place at each construction site are shown in Table 5-3.

The location and indicative footprint of the proposed construction sites are shown in Figure 5-8, Figure 5-10 and Figure 5-12. Wherever possible, construction sites would be contained within the future operational station footprints for Pyrmont Station and Hunter Street Station (Sydney CBD). All construction sites would provide staff facilities such as offices, lunch rooms and amenities.

Table 5-3 Construction sites and their main activities

Construction / tunnel launch and support site	Tunnel boring machine launch and support	Tunnel boring machine retrieval	Roadheader work and support	Spoil removal	Station excavation	Construction staff facilities	Concrete segment storage
The Bays tunnel launch and support site	●	●	●	●		●	●
Pyrmont Station western construction site			●	●	●	●	
Pyrmont Station eastern construction site			●	●	●	●	
Hunter Street Station (Sydney CBD) western construction site			●	●	●	●	
Hunter Street Station (Sydney CBD) eastern construction site		●	●	●	●	●	

5.4.1 Existing construction sites

This proposal would use the following established construction sites:

- The Bays Station construction site – Approved and the construction site is being established under the Sydney Metro West Stage 1 planning approval
- 33 Bligh Street – Approved and an existing construction site under the Sydney Metro City & Southwest project; would form part of the eastern shaft of the Hunter Street Station (Sydney CBD) construction sites.

5.4.2 Establishing construction sites

Site establishment activities would initially be carried out at the Pyrmont Station and Hunter Street Station (Sydney CBD) construction sites. Some of these site establishment activities may be carried out as enabling work (refer to Section 5.5.1) and could include:

- Demolishing buildings and removing vegetation
- Protecting and/or relocating utilities
- Providing services required for construction, such as power, water, sewer and communications
- Establishing site compound and ancillary facilities such as offices, amenities and workshops
- Establishing vehicle access and egress points
- Establishing truck wheel wash or rumble grid
- Establishing internal roads
- Establishing hardstand areas for storage and car parking
- Establishing site hoardings, noise barriers and/or fencing around the perimeter of the site.

5.4.3 The Bays tunnel launch and support site

The Bays tunnel launch and support site would cover about 25,000 – 35,000 square metres, as shown on Figure 5-7. It is sited within a portion of the approved Sydney Metro West The Bays Station construction site, established under the Stage 1 planning approval. The following activities would be undertaken at The Bays Station construction site under the Stage 1 planning approval:

- Carrying out the excavation of The Bays Station box
- Launching and supporting two tunnel boring machines for the drive west to the Sydney Olympic Park metro station construction site.

The activities above would be undertaken prior to the commencement of this proposal (establishing The Bays tunnel launch and support site). The area surrounding The Bays tunnel launch and support site primarily comprises industrial and wharf operations for White Bay and the State listed heritage item former White Bay Power Station.

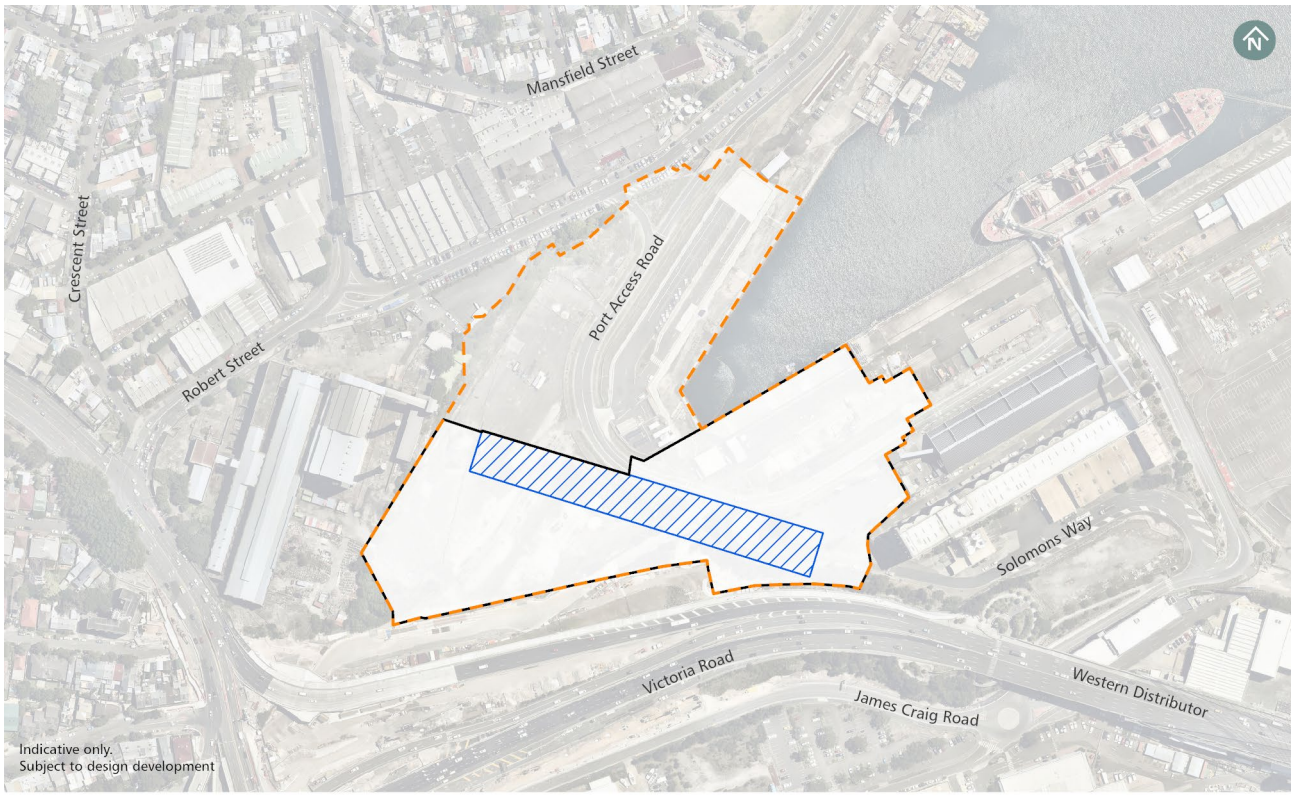

Figure 5-7 The Bays tunnel launch and support site

The Bays tunnel launch and support site is sited within a portion of The Bays Station construction site (an approved and established construction site under the Sydney Metro West Stage 1 planning approval). It is anticipated The Bays tunnel launch and support site would become available for this proposal in the first quarter of 2023.

The Bays tunnel launch and support site would be used for this proposal to:

- Mine a crossover cavern to the east of The Bays Station box
- Launch and support two tunnel boring machines to drive east from The Bays Station box to the Hunter Street Station (Sydney CBD) sites.

To excavate the crossover cavern, roadheaders at the bottom of The Bays Station excavation box (to be excavated under Stage 1 of the planning approval), would mine a crossover cavern about 200 metres long, east of the station excavation box. The crossover cavern excavation would be carried out alongside site setup and enabling work to prepare for the launch of the tunnel boring machines.

Following completion of the mined crossover caverns and retrieval of the roadheaders, two tunnel boring machines would be launched at the bottom of The Bays Station excavation box, to tunnel eastwards to Hunter Street Station (Sydney CBD) construction sites. The Bays tunnel launch and support site would provide ongoing support for tunnelling eastbound between The Bays and Hunter Street Station (Sydney CBD). The tunnel boring machine support services would include high voltage power supply, spoil storage and removal, fresh air ventilation, grout batching plant, water supply, water treatment and disposal, material storage as well as office facilities, worker amenities and parking, and storage and installation of precast concrete lining elements. Fresh air ventilation fans would operate 24 hours per day, seven days per week during tunnelling and station excavation. This would provide fresh air ventilation (both the extraction of air and the provision of fresh air) to the tunnels during construction to ensure the safety of workers.

Tunnelling is proposed to occur from early 2024 to early 2025. Some construction work, however, including crossover cavern concrete lining work, may take place within The Bays tunnel launch and support site until late 2025.

A total of about 306,000 cubic metres of spoil would be removed from The Bays tunnel launch and support site, including about 43,700 from crossover cavern excavation and about 263,000 from tunnelling to Hunter Street Station (Sydney CBD) (refer to Section 5.6.1). Access to and egress from the site would be from James Craig Road via the Port Access Road, Sommerville Road and Solomons Way. The Port Access Road has been relocated under a separate planning approval and access to the Port Access Road would be maintained at all times.

The location and indicative layout of The Bays tunnel launch and support site, including vehicle access and egress is illustrated in Figure 5-8. The indicative construction program is outlined in Figure 5-9.

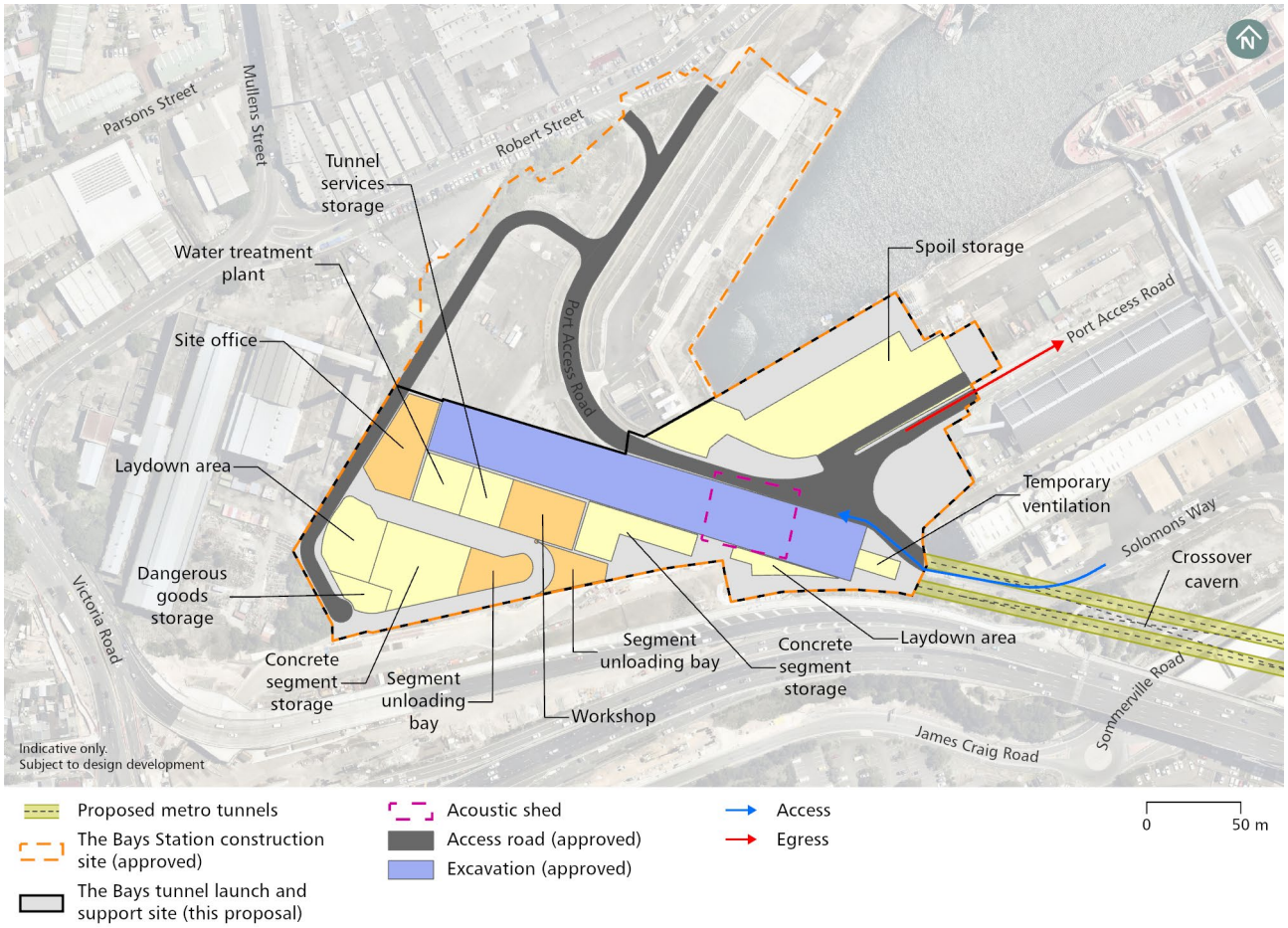

Figure 5-8 The Bays tunnel launch and support site indicative layout

	2023				2024				2025			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Crossover cavern excavation		●	—	●								
Tunnel boring machine support services and spoil removal					●	—	—	—	●			
Crossover cavern lining									●	—	—	●

Figure 5-9 The Bays tunnel launch and support site indicative construction program

5.4.4 Pyrmont Station construction sites

The excavation of Pyrmont Station would require two construction sites, a western construction site and an eastern construction site:

- The Pyrmont Station western construction site – Would cover about 1,250 square metres and would be located between Paternoster Row and Pyrmont Street, immediately north of Pyrmont Bridge Road. The site currently contains commercial buildings
- The Pyrmont Station eastern construction site – Would cover about 2,600 square metres and would be located between Edward Street, Union Street and Pyrmont Bridge Road. The site currently contains commercial buildings.

The construction sites would be used to excavate Pyrmont Station using a mined technique (refer to Section 5.5.2). Shafts would be excavated within the two construction sites to provide access for excavation of the station caverns. Adits would be mined beneath to connect the Pyrmont Station western construction site shaft to the excavated metro tunnels.

These construction sites would include spoil storage and removal, water supply, water treatment and disposal, temporary ventilation plant, material storage and office facilities, worker amenities and parking. The excavations are currently estimated to require the removal of about 220,000 cubic metres of spoil.

The main access to and egress from the western construction site would primarily be from Pyrmont Bridge Road. Access to and egress from the eastern construction site would be from Pyrmont Bridge Road, Union Street and Edward Street. To reflect the staging of the construction work, multiple ingress and egress access points into the eastern construction site could be required.

The location and indicative layout of the Pyrmont Station construction sites, including vehicle access and egress is illustrated in Figure 5-10. The indicative construction program for the Pyrmont Station construction sites is outlined in Figure 5-11.

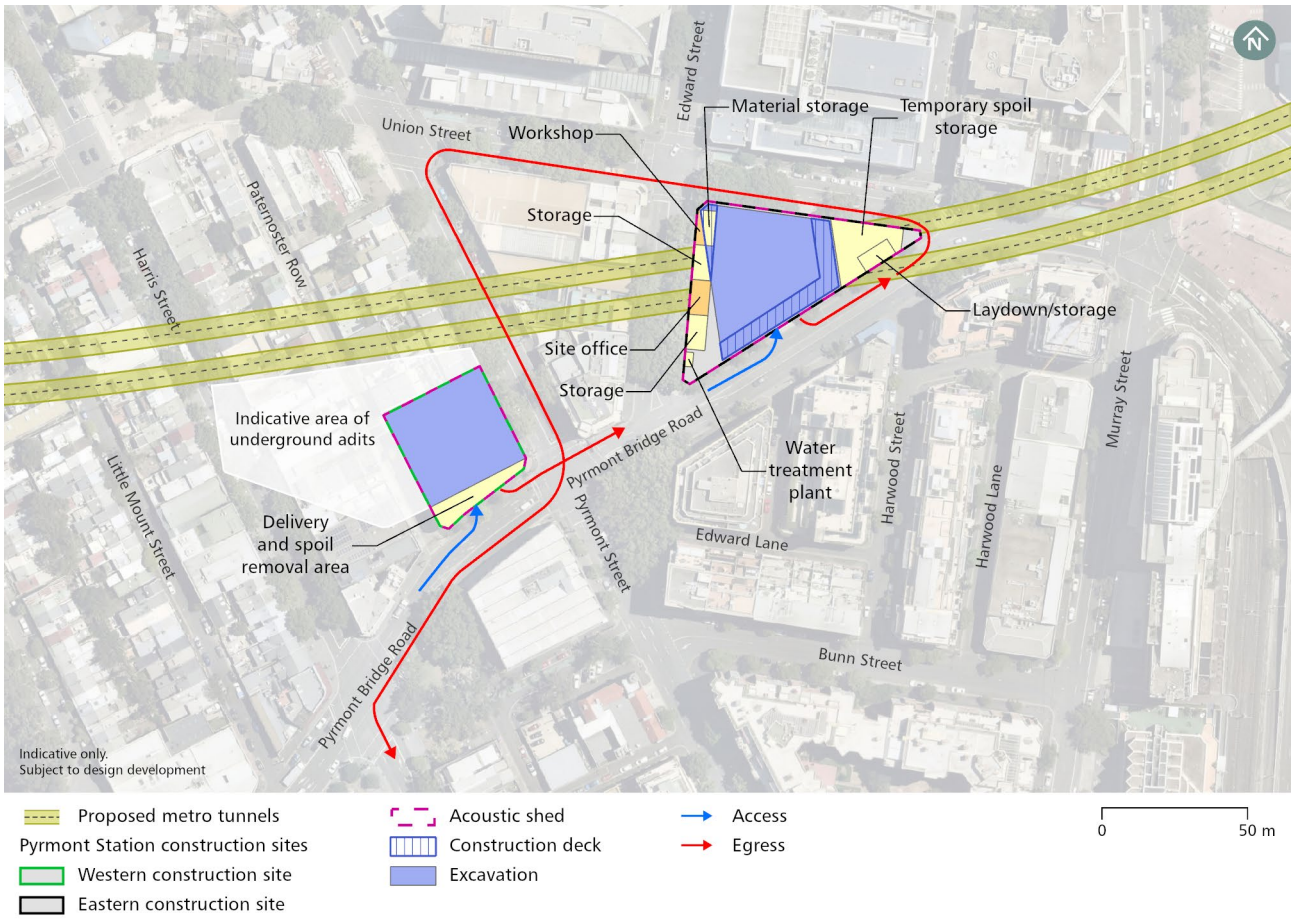

Figure 5-10 Pyrmont Station construction sites indicative layout

Figure 5-11 Pyrmont Station construction sites indicative construction program

5.4.5 Hunter Street Station (Sydney CBD) construction sites

The excavation of Hunter Street Station (Sydney CBD) would require two construction sites, a western construction site and an eastern construction site:

- The Hunter Street Station (Sydney CBD) western construction site – Would cover about 3,700 square metres and would be located on the south-east corner of Hunter Street and George Street and also contains De Mestre Place. The site currently contains seven commercial office / retail buildings
- The Hunter Street Station (Sydney CBD) eastern construction site – Would cover about 3,700 square metres and would be bounded by O'Connell Street, Hunter Street and Bligh Street. The site currently contains three commercial office / retail buildings and an active construction site. The construction site includes the existing Sydney Metro City and Southwest tunnelling support site at 33 Bligh Street, which would be handed over from the City and Southwest contractor to the Sydney Metro West contractor in early 2023. This site currently contains an existing acoustic shed, utility connections and site office buildings fronting Bligh Street. These would likely be retained during the handover to Sydney Metro West and used to facilitate construction of the Hunter Street Station (Sydney CBD).

The construction sites would be used to:

- Carry out the excavation of Hunter Street Station (Sydney CBD) and associated turnback caverns and stub tunnels
- Retrieve the tunnel boring machines driven east from The Bays tunnel launch and support site.

This station would be excavated using a mined technique (refer to Section 5.5.2). Shafts would be excavated within the two construction sites to the station cavern to provide access during construction. The excavations would require the removal of about 505,000 cubic metres of spoil. Adits would be mined beneath to connect the station caverns and shafts to the excavated metro tunnels and to facilitate future underground pedestrian movements including for connections to the future Sydney Metro City & Southwest station.

These construction sites would include spoil storage and removal, water supply, water treatment and disposal, temporary ventilation plant, material storage as well as office facilities, worker amenities and parking, and storage.

Access to and egress from the Hunter Street Station (Sydney CBD) western construction site would be from Hunter Street. Access to and egress from the Hunter Street Station (Sydney CBD) eastern construction site would be from O'Connell Street. Cantilevered decks would be used to facilitate loading and unloading of vehicles within the sites.

The location and indicative layout of the Hunter Street Station (Sydney CBD) construction sites, including vehicle access and egress is illustrated in Figure 5-12. The indicative construction program for the Hunter Street Station (Sydney CBD) construction sites is outlined in Figure 5-13.

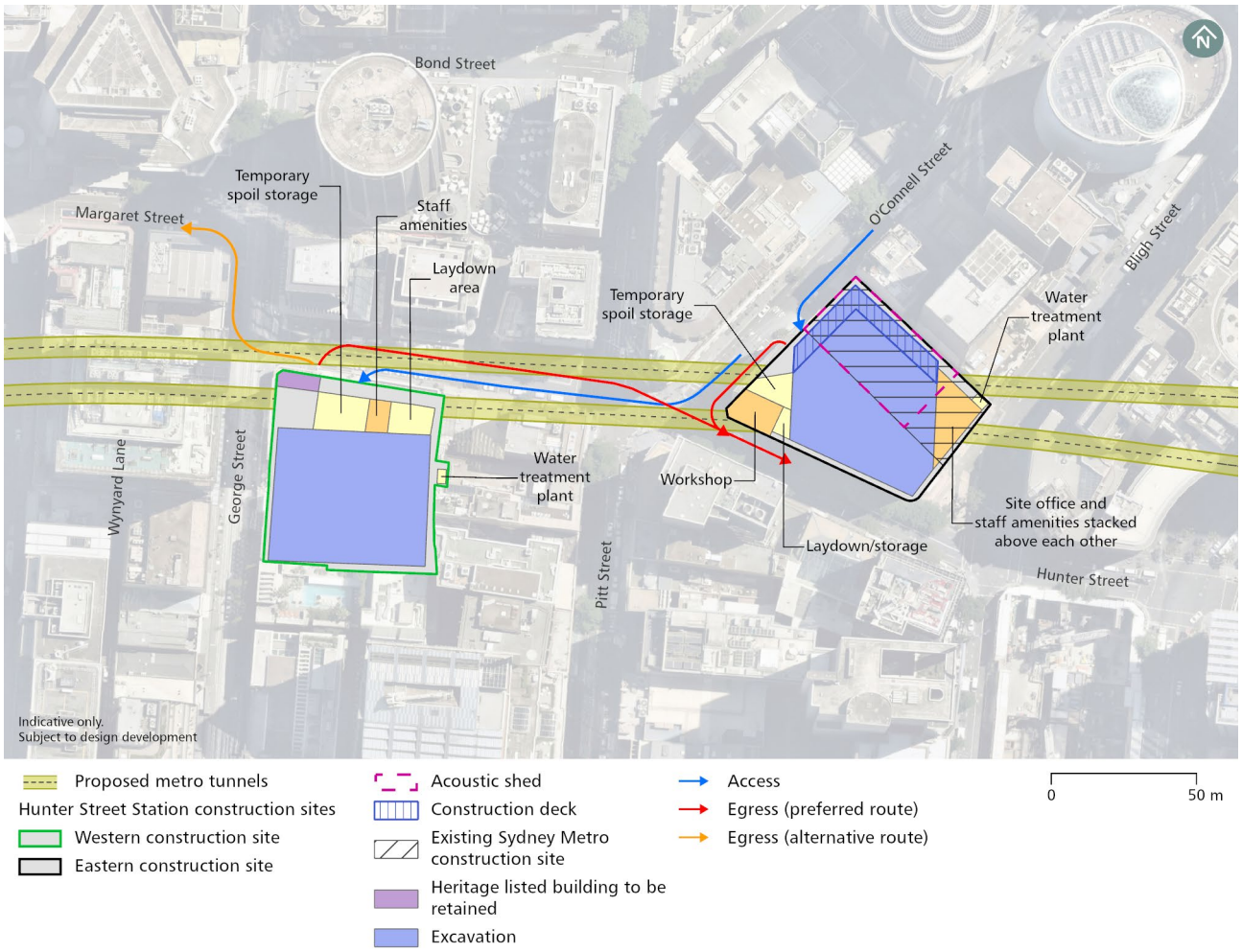

Figure 5-12 Hunter Street Station construction sites indicative layout

Figure 5-13 Hunter Street Station construction sites indicative construction program

5.5 Construction methods

This section describes the construction methods for the major civil construction work between The Bays and Sydney CBD. The construction methodology would be largely consistent with the major civil construction work between Westmead and The Bays, as described in the approved *Sydney Metro West Environmental Impact Statement – Westmead to The Bays and Sydney CBD* (Sydney Metro, 2020a).

5.5.1 Enabling work

Enabling work is activities that would typically be carried out before the start of substantial construction at a given construction site in order to prepare the site and to ensure safety measures are in place to provide protection to the public. Enabling work may include activities such as:

- Construction site establishment (refer to Section Plan or strategy)
- Demolition of buildings and structures within the construction sites (refer to Section 5.5.2)
- Utility adjustments and protection (refer to Section 5.6.4)
- Utility supply to the construction sites, including power and water (refer to Section 5.6.5)
- Transport network modifications to roads, public transport, and pedestrian and cyclist facilities (refer to Section 5.6.6)
- Heritage investigations, protection and archival recordings (refer to Chapter 8 (Non-Aboriginal heritage) and Chapter 9 (Aboriginal heritage))
- Additional geotechnical and contamination investigations and remediation, where required (refer to Chapter 14 (Groundwater and ground movement) and Chapter 16 (Contamination)).

5.5.2 Demolition

It is anticipated that 13 commercial buildings would be demolished as part of this proposal, as described in Table 5-4. No residential buildings are proposed to be demolished.

Table 5-4 Indicative number of buildings proposed for demolition

Construction site	Buildings (Commercial)
The Bays tunnel launch and support site	1
Pyrmont Station construction sites	2
Hunter Street Station (Sydney CBD) construction sites	10
Total	**13**

Typically, access to and egress from construction sites during demolition would use existing driveways. However, alternative site access may be required, in particular at the Hunter Street Station (Sydney CBD) western construction site where, during demolition, access would be established from Hunter Street. Indicative heavy vehicle movements associated with the demolition phase are provided in Chapter 6 (Transport and traffic).

Demolition would be carried out by licensed demolition contractors and in a staged manner, where possible. Typically, building demolition would involve:

- Establishment of hoarding, scaffolding and protection barriers around the perimeter of the site
- All services into the buildings would be decommissioned and made safe and redundant
- A hazardous materials assessment would be carried out prior to stripping and demolition of the main structure
- Soft stripping internal building materials
- Demolition of the building using an excavator, bobcat, cranes or other conventional methods following a top-down approach
- Temporary propping and/or waterproofing would be provided for structural integrity of adjacent structures as required during the demolition work.

If any hazardous materials are found, they would be removed and disposed of in accordance with the relevant legislation, codes of practice and Australian Standards. Materials such as bricks, tiles, timber, plastics and metals would be sorted where feasible and reasonable, and sent to a waste facility with recycling capabilities.

Construction contractors would be required to meet the requirements of the Construction Environmental Management Framework (Appendix C) (refer to Section 5.7).

5.5.3 Tunnelling, launch and support

The tunnelling methodology would be largely consistent with the major civil construction work between Westmead and The Bays, as described in the *Sydney Metro West Environmental Impact Statement – Westmead to The Bays and Sydney CBD* (Sydney Metro, 2020a).

Tunnel boring machines would be used to excavate the majority of the twin underground tunnels between The Bays and Sydney CBD. The two bored tunnels would have a circular cross-section with an internal lined diameter of about six metres and an excavated diameter of about seven metres.

The centre lines of the two tracks would typically be about 14 metres apart. This would depend, however, on specific geological constraints and the need to avoid building basements. The tunnels would be lined with precast concrete segments to ensure the long-term life of the asset and minimise groundwater inflow into the tunnel.

The depth of the tunnels would vary from about 15 to 50 metres due to changes in topography. The shallower tunnel sections would generally be near the stations, with the deeper sections generally under the major water bodies of Johnstons Bay and Cockle Bay.

The following tunnel features would be excavated using roadheaders and rock hammers:

- Crossover cavern east of The Bays tunnel launch and support site
- Cross passages between the two tunnels to allow for emergency access
- Tunnel turnback at the end of the line, east of the eastern Hunter Street Station (Sydney CBD) construction site, to allow for the future operational ability to turn trains around
- Stub tunnels at the end of the turnback tunnels to safeguard a potential future extension to the Metro network.

The total tunnel length between The Bays and Sydney CBD is about 3.5 kilometres, of which about 2.3 kilometres would be excavated by tunnel boring machines.

Tunnelling methods

A summary of the potential tunnelling methodologies which will be used is provided in Table 5-5. Underground vehicles may be required within the tunnels to transport materials, concrete lining segments and the workforce to the cutting face. Material may also be transported with conveyor systems or through pipes within the tunnel.

Table 5-5 Tunnelling methodology

Tunnelling methodology	Description	Applicability to major civil construction between The Bays and Sydney CBD
Tunnel boring machine	Each tunnel boring machine would typically consist of a shielded cutting head and trailing backup support services and mechanisms. At the front of the shield is a rotating cutter head, and behind the cutter head is a chamber where the excavated rock and sediments (spoil) are removed. The spoil would be transferred to a conveyor to transport the spoil to the tunnel boring machine support site for removal. The tunnel boring machine is propelled forward by hydraulic jacks pushing off the previously erected segments or pushing off the tunnel wall with rock grippers. Photos of tunnel boring machines are shown in Figure 5-14 and Figure 5-15. The type of tunnel boring machine used would be determined by the contractor.	Two tunnel boring machines would be used to excavate twin tunnels between The Bays and Sydney CBD.

Tunnelling methodology	Description	Applicability to major civil construction between The Bays and Sydney CBD
Roadheaders	A roadheader is an excavation machine consisting of a boom mounted rotating cutter head mounted on bulldozer style tracks, a loading device, and a crawler track to move the machine forward into the rock face. A photo of a typical roadheader is shown in Figure 5-16. Tunnel support for roadheader sections would consist of a primary lining (likely to be pattern rock bolting and shotcreting) and a final cast in-situ or sprayed concrete lining.	Roadheaders would be used to excavate irregular shaped tunnels such as stub tunnels, cross passages, crossover and turnback caverns and niches. Roadheaders would also be used to excavate mined station caverns and the mined adits for Pyrmont Station and Hunter Street Station (Sydney CBD).
Rock hammers	A rock hammer is an excavation machine consisting of a boom mounted hydraulic rock breaker mounted on bulldozer style tracks, a loading device and a crawler track to move the machine forward into the rock face. Tunnel support for rock hammer sections would consist of a primary lining (likely to be pattern rock bolting and shotcreting) and a final cast in-situ or sprayed concrete lining. A photo of a typical rock hammer is shown in Figure 5-17.	Rock hammers would be used to excavate cross passages and niches within the tunnels. These would generally be constructed following excavation of the main tunnels by the tunnel boring machines.

Figure 5-14 Photo of a tunnel boring machine cutter head

Figure 5-15 Photo of a tunnel boring machine at Epping Station on the Metro North West Line

Figure 5-16 Photo of a roadheader

Figure 5-17 Photo of a rock hammer

Tunnel lining

Tunnels would be lined with precast concrete segments which are erected by the tunnel boring machines as it moves forward. The precast concrete segments would be manufactured at the approved dedicated precast facility at the Sydney Metro West Eastern Creek Precast Facilities site with storage of precast concrete segments at The Bays tunnel launch and support site.

Tunnel launch, support and retrieval

Tunnelling launch and supporting activities would occur from The Bays tunnel launch and support site (refer to Section 5.4.3). Two tunnel boring machines would be launched from this site, with the tunnelling sequence shown in Figure 5-1. The tunnel boring machines would be launched from The Bays excavated station box (to be constructed under the Stage 1 planning approval) and driven almost three kilometres eastwards to the Hunter Street Station (Sydney CBD) eastern construction site. The tunnel boring machines would be dismantled and retrieved at either the Hunter Street Station (Sydney CBD) eastern construction site or The Bays tunnel launch and support site.

5.5.4 Station excavation

Two additional stations are proposed to be excavated along the indicative tunnel alignment. The Bays Station box would be excavated as part of the Stage 1 planning approval. This section provides an overview of the station excavation and structural work required at both of these stations.

Station excavation and structural work

Excavation method

The anticipated excavation types and details for the excavation of the station cavern and shafts for Pyrmont Station and Hunter Street Station (Sydney CBD) are provided in Table 5-6.

Table 5-6 Indicative station excavation details

Station	Excavation activity	Tanked/ untanked[1]	Depth (metres)
Pyrmont	Mined station cavern excavation using roadheaders Access shaft excavation using rock hammers	Tanked	36-39
Hunter Street, (Sydney CBD)	Mined station cavern excavation using roadheaders Access shaft excavation using rock hammers	Tanked	26-31

Note 1: Tanked structures are designed to inhibit the inflow of groundwater, typically using concrete lining and waterproofing membrane.

Excavation of the stations would generally be carried out in the following sequence:

- Excavation and temporary structural work for station shafts using rock hammers. In some cases, this activity may be carried out concurrently with or prior to the demolition of adjacent structures
- Excavation of mined caverns and adits using roadheaders.

Where existing construction sites have previously been established within the construction sites for this proposal, excavation work may commence alongside demolition work in adjoining areas of the site.

It is anticipated that both stations would be constructed as mined cavern stations using roadheaders. The indicative construction method for mined cavern station excavation is shown in Figure 5-18. The shafts for future station entry and vertical transport (escalators and lifts) would be progressively excavated from the surface within the footprint of the sites. Roadheaders and other excavation equipment would then be lowered through the shaft to excavate the station cavern and pedestrian connections. Spoil would be moved to the shafts, transferred to the surface and then removed from site.

Excavation of Pyrmont Station would be coordinated with the arrival of the tunnel boring machines from The Bays, which would transit through the stations before continuing towards Hunter Street Station (Sydney CBD).

Acoustic sheds are proposed at both the western and eastern Pyrmont Station construction sites. The existing acoustic shed at the Hunter Street (Sydney CBD) eastern construction site would remain in place (erected as part of the Sydney Metro City and Southwest construction site) for the initial excavation phase. This would need to be dismantled, however, once cavern excavation is complete to allow shaft excavation, as it is currently only over part of the Hunter Street Station eastern construction site. It is anticipated that shaft excavation would then be completed without acoustic sheds at both Hunter Street (Sydney CBD) construction sites. This is consistent with excavation work completed at the Sydney Metro City & Southwest construction sites within the Sydney CBD, given the higher existing background levels. This is due to the minimal benefit of establishing an acoustic shed for shaft excavation only compared with the time and noise impacts to build and remove an acoustic shed to complete this activity. Other site specific noise mitigation measures would be determined during detailed construction planning, taking into account the construction program, construction working hours and construction traffic management in accordance with the Construction Noise and Vibration Standard (Appendix E).

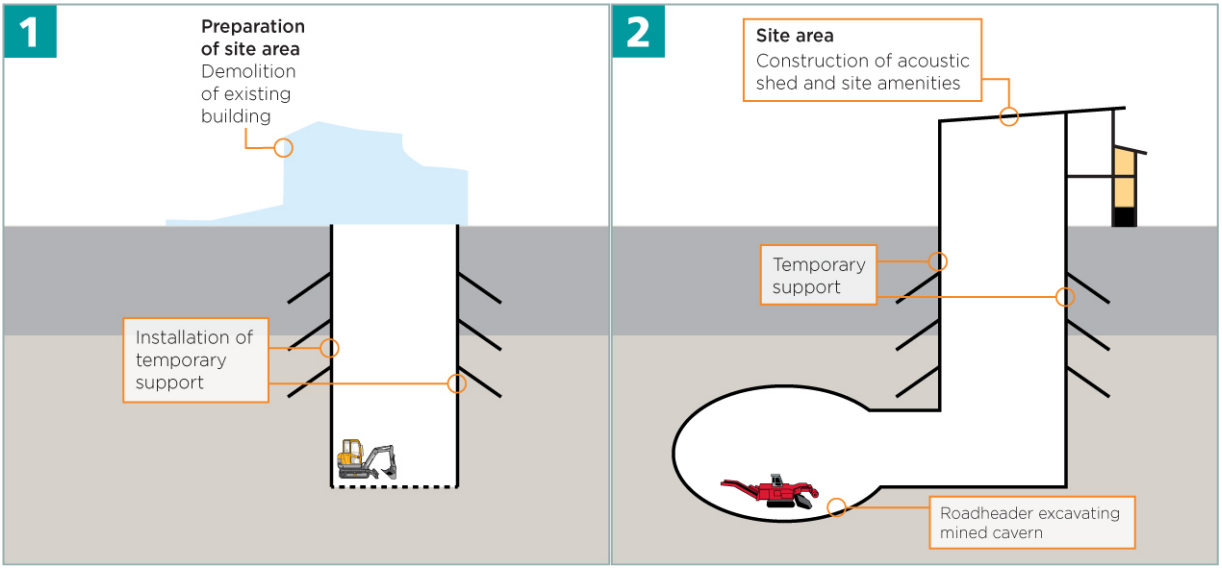

Figure 5-18 Cavern station construction – indicative methodology

5.6 Other construction elements

5.6.1 Spoil management

Whilst the majority of spoil associated with the tunnelling work would be removed through The Bays tunnel launch and support site, some spoil associated with turnback and stub tunnels excavation would be removed through the Hunter Street Station (Sydney CBD) eastern construction site.

It is estimated that the proposed excavation would generate about 1.1 million cubic metres of spoil, including all tunnels, stations, caverns and shafts. Indicative volumes for spoil removal from each tunnel support / construction site are provided in Table 5-7.

Table 5-7 Indicative spoil generation by construction site

Construction site	Indicative volume of spoil (cubic metres)
The Bays tunnel launch and support site	43,000 (from crossover cavern)
	263,000 (from tunnelling to Hunter Street Station (Sydney CBD))
Pyrmont Station western construction site	90,530
Pyrmont Station eastern construction site	190,250
Hunter Street Station (Sydney CBD) western construction site	123,100
Hunter Street Station (Sydney CBD) eastern construction site	396,200
Total	1,106,080

The primary transport method for transporting spoil from most construction sites would be by road. Road transport is considered feasible for all construction sites due to their location directly adjacent to the existing road network, in particular, the proximity to the motorway and arterial road network. However, the option to transport spoil by barge from The Bays tunnel launch and support site has also been considered and is discussed in Chapter 2 (Development and alternatives). Further consideration of barge options would be carried out during detailed construction planning for the proposal.

Further detail on the impacts associated with spoil generation and management is provided in the relevant chapters of this Environmental Impact Statement, including Chapter 6 (Transport and traffic), Chapter 19 (Air quality) and Chapter 20 (Spoil, waste management and resource use).

5.6.2 Construction traffic

Proposed access to and egress from the construction sites is described in Section 5.4.3 to Section 5.4.5. Wherever possible, access and egress is proposed to be directly via major arterial roads.

Construction traffic would be managed in accordance with the Construction Traffic Management Framework (Appendix D). Construction traffic management plans for each site would be submitted to the relevant roads authority for review before work starts. Further information relating to haulage routes, the daily profile of construction traffic movements for each site, construction traffic impacts and mitigation is provided in Chapter 6 (Transport and traffic) and Technical Paper 1 (Transport and traffic).

5.6.3 Construction hours

Proposed construction hours are shown in Table 5-8. These hours have been developed based on a balanced consideration of the construction program and the need to minimise noise and traffic related impacts. As the tunnel boring machines would operate continuously, the tunnelling and associated support activities would need to be carried out up to 24 hours per day and seven days per week.

Most aboveground construction work would be carried out during the following extended standard construction hours:

- 7am to 6pm Monday to Friday
- 8am to 6pm Saturdays
- No work on Sundays or Public Holidays.

Standard construction hours outlined within the Interim Construction Noise Guidelines (NSW Department of Climate Change, 2009) are proposed to be extended from 1 pm to 6 pm on Saturdays to reduce the overall program of the proposal. Earlier completion would bring considerable benefits to the community and would reduce the duration of construction related disruptions compared with the impacts.

At Pyrmont Station construction sites, the station cavern would need to be excavated prior to the tunnel boring machine passing through the underground station. If the cavern is not excavated prior to the arrival of the tunnel boring machine, the overall project duration at Pyrmont would need to be significantly increased to account for more complex construction sequencing methodology including the need to bring more excavators on site and hence more high impact construction work over a longer period. Through undertaking extended construction hours on Saturday afternoons, the overall duration of high intensity excavation works and its potential impact on the community would be reduced, rather than possibly having various phases of high intensity excavation works on and off over a longer period of time.

Appropriate acoustic mitigation measures would be in place to minimise impacts, as outlined in Chapter 7 (Noise and vibration). The extended construction hours on Saturdays for this proposal would also align with the Conditions of Approval for Stage 1 of the planning approval process.

Substantial construction work proposed to be carried out outside standard construction hours is identified in Table 5-8.

Table 5-8 Proposed construction hours

Construction work	Construction hours	Justification
Enabling and site establishment (including demolition and demobilisation), piling and surface construction work	Extended standard hours: • 7 am–6 pm Monday to Friday • 8 am–6 pm Saturdays • No work on Sundays or Public Holidays	Enabling and site establishment (including demolition), pilling and surface construction work are proposed between 1 pm and 6 pm on Saturdays (daytime out of hours work period 1) at the Pyrmont Station and Hunter Street Station (Sydney CBD) construction sites. Noise mitigation, including acoustic sheds, would be implemented where practicable. The receiver environment in the Sydney CBD is largely commercial with some distant residential receivers screened from view by intervening non-residential buildings, meaning impacts during this period would likely be low.
Tunnelling (including associated excavation) and tunnelling support work (including tunnel boring machine launch/retrieval and spoil handling).	24 hours per day, seven days per week	Tunnelling and associated excavation work would define the overall proposal duration. Earlier completion would bring considerable benefits to the community and would reduce the duration of construction related disruption. Other aspects of the justification for 24 hours per day, seven days per week tunnelling and support operations include: • Need to install ground support systems immediately following excavation • Need to construct cross passages closely following the progress of the tunnel boring machines to provide a critical secondary egress for people to evacuate and access for emergency services in the event of an incident • Reducing peak demand on the electricity network • Need to handle the spoil produced 24 hours per day, up to seven days per week, operation of the tunnel boring machines and the proposed out of hours transport of spoil.

Construction work	Construction hours	Justification
Station and crossover cavern excavation and concrete lining	24 hours per day, seven days per week	For mined excavations, temporary support in the form of shotcrete, steel sets and rockbolts must be installed immediately to ensure stability of the work and to minimise any potential ground movement or settlement. Grouting is required to transfer load directly to the adjacent rock and needs to occur immediately after bolt installation for safety and quality reasons. 24 hours per day, seven days per week work would allow for the completion of the entire support system following excavation. Excavation would be completed within acoustic sheds at Pyrmont, where 24 hours per day, seven days per week excavation work is proposed. Excavation within the Pyrmont Station eastern construction site would be staged in two phases – 'initial excavation' and 'main excavation'. 'Initial excavation' involves a smaller acoustic shed at the eastern portion of the site to allow early shaft and cavern excavation and 'main excavation' involves a longer-term and larger acoustic shed that would be in place for the majority of the excavation work. The existing acoustic shed at the Hunter Street (Sydney CBD) eastern construction site would remain in place (erected as part of the Sydney Metro City and Southwest construction site) for the majority of the excavation, however, this would need to be dismantled once cavern excavation is complete to allow shaft excavation, as it is currently only over part of the Hunter Street Station eastern construction site. It is anticipated that shaft excavation would then be completed without acoustic sheds at both Hunter Street (Sydney CBD) construction sites. Any high impact shaft excavation work carried out outside an acoustic shed would only be carried out during extended standard construction hours. This is consistent with excavation work completed at the Sydney Metro City & Southwest construction sites within the Sydney CBD, given the higher existing background levels. This is due to the minimal benefit of establishing an acoustic shed for shaft excavation only compared with the time and noise impacts to build and remove an acoustic shed to complete this activity. Refer to Chapter 7 (Noise and vibration) for further assessment of impacts inclusive of acoustic sheds throughout the proposal a construction work at each construction site.

Construction work	Construction hours	Justification
Construction traffic for material supply to, and spoil/ waste material removal from construction sites	24 hours per day, seven days per week at The Bays tunnel launch and support site and Hunter Street Station (Sydney CBD) construction sites Pyrmont- between 7 am to 10 pm (with a minor number of truck movements during night-time period for safety reasons)	Tunnelling and excavation work would require 24 hours per day, seven days per week materials deliveries and the transport by road of substantial quantities of spoil. To avoid impacting the operation of the road network, construction vehicle movements during the AM and PM peak periods are to be minimised. Given the volumes of spoil and space constraints at construction sites, which limit the extent of on-site spoil storage, transport of materials and spoil cannot be limited to the hours between 10 am and 3 pm, meaning night-time vehicle movements are necessary. Given the largely commercial receiver environment of the Hunter Street Station (Sydney CBD) construction sites, 24 hour work would be required for the removal of spoil during night-time hours. Pyrmont, where night-time sensitive receivers are close to construction sites, spoil haulage and material supply would be carried out predominately between 7 am and 10 pm with a minor number of truck movements outside these hours to ensure the safety of the construction site (e.g. shotcrete deliveries for the stability of the construction work and to minimise any potential ground movement or settlement). Construction work requiring the temporary possession of roads or to accommodate road network requirements may need to be carried out outside of the proposed construction hours during periods of low demand to minimise safety impacts and inconveniences to motorists. Restrictions may be in place during peak hours and special events. Heavy plant deliveries are likely to be restricted to outside of standard daytime construction hours during periods of low demand to minimise safety impacts and inconveniences to motorists.
Utility management and power supply work	Extended standard hours: • 7 am–6 pm Monday to Friday • 8 am–6 pm Saturdays • No work on Sundays or Public Holidays	While most utility work and power supply route work would be carried out within extended standard construction hours, this work requiring the temporary possession of roads may need to be carried out outside of the standard daytime construction hours during periods of low demand to minimise safety impacts and inconveniences to motorists.

Other activities that may be carried out outside of the extended standard construction hours as outlined above would include:

- Construction work that would require the temporary possession of roads
- Work determined to comply with the relevant noise management level at the nearest sensitive receiver
- The delivery of materials outside approved hours as required by the NSW Police or other authorities for safety reasons
- Emergency situations where it is required to avoid the loss of lives and property and/or to prevent environmental harm
- Situations where agreement is reached with affected receivers.

If receivers are anticipated to be impacted by the proposal, respite periods would be considered in accordance with the Sydney Metro Construction Noise and Vibration Standard (Appendix E) and the Overarching Community Communications Strategy (Appendix B).

Respite may be offered in the form of a reduction or absence of noise emissions for a period of time, or by removing the affected receiver from the noise emission point source (e.g. dinner/movie tickets and/or alternative accommodation offers). Consideration of respite would take into account many factors, including but not limited to the predicted noise level, duration, time of day, surrounding land uses and community feedback.

5.6.4 Utilities management

Utilities would need to be adjusted, relocated and/or protected where there is a possibility they would otherwise be impacted by construction. Utilities which may require protection and/or relocation include water, sewer, stormwater, drainage, recycled water, electricity, gas and communications assets. The location of utilities has been determined from Dial Before You Dig plans, utility geographic information system data supplied by the utility companies, and local authority and council records. Further investigation and consultation with service asset owners would be carried out as the design develops to confirm exact locations, heights and depths of the utilities.

Where an existing utility conflicts with the proposed design, it may be necessary to:

- Provide physical protection for the utility where the utility is not directly affected but may be indirectly affected by vibration or accidental impact. Protection could include constructing a piled wall between the excavation and the utility, plating over the utility to minimise the impact of construction traffic or marking out or fencing off the location of a utility to avoid it being accidentally damaged
- Modify construction methods to avoid impacting a nearby utility. For example, this could involve using only hand excavation and compaction tools such as hand digging tools, a vibration plate or pedestrian rollers where compacting within a specified distance of utilities
- Wrap and support the utility service to provide mechanical protection
- Relocate the utility outside the construction site
- Abandon the utility.

The major utilities in the vicinity of or nearby the Pyrmont Station construction sites and the Hunter Street Station (Sydney CBD) construction sites that may require treatment include:

- High voltage cable
- Sewer
- Water main
- Stormwater
- Communications
- Gas.

A utilities coordination manager would be appointed to coordinate the delivery of the utility work. Utility work includes any construction or physical modification of utility infrastructure to ensure continual operation of utility assets/services during major civil construction work between The Bays and Sydney CBD. Utility work does not include investigative work (such as surveying or potholing of utility assets) to gather information to inform design and construction methodologies.

The utilities coordination manager would:

- Establish a utilities working group with nominated representatives from utility service providers that may be impacted
- Review design and construction methodologies to assist with identifying potentially impacted utility assets
- Assist with coordination of design and construction methodology reviews by utility service providers to identify necessary utility work
- Communicate with the working group and Sydney Metro's contractors' delivery teams to understand the proposed program of work to coordinate intercepting, interconnecting and interrelated work and manage priorities as they may arise
- Observe utility work, where relevant
- Manage escalation of utility work-related issues within Sydney Metro and the utility service providers as required.

The utility coordination manager would endeavour to coordinate work to avoid the same receiver being affected more than three consecutive nights as much as possible. Furthermore, the utilities coordination manager would endeavour to stagger the timing of work by different contractors that affect the same receiver as much as possible in order to maximise the respite period between the work.

Preliminary consultation has been held with the utility owners in Table 5-9. In addition, Sydney Metro would consult with local councils and utility providers to identify any opportunities to support future initiatives or utility augmentations. Consultation with utility providers would continue during detailed design and construction to mitigate the risk of unplanned and unexpected disturbance of utilities.

Table 5-9 Preliminary consultation with utility owners

Utility type	Utility owner
Electricity	• Ausgrid
Water/Sewer/ Stormwater/ Recycled water	• Sydney Water • Aquanet Recycled Water • City of Sydney
Gas	• Jemena
Telecommunications	• NBN • Telstra • Optus/Uecomm • Vocus Communications (Axicom/Nextgen/ M2/Dodo/iprimus/Engine/Commander) • TPG (AAPT/Powertel/Pipenetworks/Soul Australia Communications) • Verizon/Worldcom • AARNet • Vodafone

5.6.5 Utilities and power supply

Utilities such as water, sewer and telecommunications would need to be supplied to each of the major construction sites. Generally, these utilities are located close to the sites (such as the adjacent footpath) and the connection and use of the utilities would be considered 'business as usual' for supply companies.

Power supply

High voltage power supply would be required for the operation of tunnel boring machines and for roadheaders at the tunnel launch and support site and construction sites. The power supply for each site would be brought in from existing substations. Table 5-10 describes the indicative power supply required at each construction site. Preliminary consultation has been carried out with energy suppliers. A program of ongoing consultation is underway to further assess the requirements for the construction sites.

Table 5-10 Construction power supply requirements

Construction site	Supplier	Supply source	Power (mega volt ampere)
The Bays tunnel launch and support site	Ausgrid	Rozelle sub-station transmission station (to be provided by the power supply being established under the Stage 1 planning approval)	35
Pyrmont Station	Ausgrid	Pyrmont sub-station transmission	35
Hunter Street Station (Sydney CBD)	Ausgrid	Existing Sydney Metro City & Southwest power supply	35

Power supply routes would generally be located within existing road reserves. Construction of power supply routes would generally be carried out by open trench. Underbores would be used when crossing major infrastructure or to avoid other major constraints.

High voltage power supply would be provided to The Bays tunnel launch and support site under existing arrangements as approved within Stage 1 of the planning approval.

The indicative supply route for Pyrmont is provided on Figure 5-19. The power supply route for Hunter Street (Sydney CBD) would be provided through the existing Sydney Metro City & Southwest power supply route in place.

Figure 5-19 Pyrmont Station – indicative power supply route

5.6.6 Transport network modifications

This section provides an overview of the modifications that would be required to the pedestrian and cyclist, public transport and road networks and the in the vicinity of each construction site. Further details and the potential impacts of these modifications are provided in Chapter 6 (Transport and traffic).

Pedestrian and cyclist facilities

Indicative pedestrian and cyclist facilities modifications are outlined in Table 5-11 and are subject to design development and construction planning, with the objective of minimising disruptions to pedestrians and cyclists.

Table 5-11 Indicative modifications to pedestrian and cyclist facilities

Construction site	Indicative modifications to pedestrian and cyclist facilities
The Bays tunnel launch and support site	• No modifications proposed
Pyrmont Station	• Temporary closure of the pedestrian footpath on the south side of Union Street between Edward Street and Pyrmont Bridge Road • Temporary closure of the pedestrian footpaths at all construction site frontages intermittently throughout construction
Hunter Street Station (Sydney CBD)	• Temporary closure of the existing underground pedestrian walkway between Wynyard Station and Pitt Street • Temporary diversions to footpaths and cycleways during construction and oversized deliveries

Public transport adjustments

Indicative public transport adjustments are outlined in Table 5-12 and are subject to design development and construction planning, with the objective of minimising disruptions to public transport.

Table 5-12 Indicative public transport adjustments

Construction site	Indicative public transport adjustments
The Bays tunnel launch and support site	• There is potential for a minor temporary increase in travel time for buses
Pyrmont Station construction sites	• One bus stop on Pyrmont Bridge Road, adjacent to the Pyrmont Station western construction site, would be temporarily decommissioned as part of the proposal, in consultation with Transport for NSW. This bus stop is not currently used by regular timetabled bus services • There is potential for a minor temporary increase in travel time for buses
Hunter Street Station (Sydney CBD) construction sites	• There is potential for a minor temporary increase in travel time for buses • Construction vehicles may interface with the light rail network at the George Street/Margaret Street and George Street/Hunter Street intersections

Road network

Indicative road network modifications are outlined in Table 5-13 and are subject to design development and construction planning, with the objective of minimising disruptions to the road network.

Table 5-13 Indicative road network modifications

Construction site	Indicative road network modifications
The Bays tunnel launch and support site	• No modifications proposed
Pyrmont Station	• Temporary removal of both parking lanes along Union Street, between Edward Street and Pyrmont Bridge Road, including all parking spaces
Hunter Street Station (Sydney CBD)	• Permanent full closure of De Mestre Place • Temporary removal of parking spaces on the south side of Hunter Street between George Street and Pitt Street adjacent to the Hunter Street western construction site, comprising loading and taxi zones • Temporary removal of parking spaces on the eastern side of O'Connell Street adjacent to the Hunter Street eastern construction site, comprising a coach pick-up zone, loading/parking spaces and a mail zone (if required through consultation with Australia Post) • Extension of the duration of the existing restrictions for the parking lane on the northern side of Hunter Street between Pitt Street and Bligh Street, to include an AM peak clearway in addition to the existing PM peak clearway (if required through consultation with City of Sydney and Transport for NSW) • Sydney Metro is investigating options to consider road space reallocation on the western part of Hunter Street (between Pitt Street and George Street) to cease through traffic between Hunter Street and Margaret Street. These investigations will be carried out in consultation with relevant stakeholders such as Transport for NSW and City of Sydney.

5.6.7 Construction plant and equipment

Plant and equipment likely to be used during construction include the following:

- Excavator
- Hydraulic rock breakers
- Articulated dump trucks
- Frontend loader
- Crawler crane
- Rock saw
- Concrete pump
- Sprayed concrete robots
- Rock drills
- Grouting equipment
- Compressors
- Ventilation equipment and fans
- Elevated work platforms
- Pumps
- Conveyors
- Water treatment plant
- Roadheader
- Dust suppression system
- Spoil removal system
- Rigid truck and trailer
- Road sweeper
- Tele-handler
- Water cart
- Hand tools.

A piling rig would also be used at the Pyrmont Station construction sites and the Hunter Street Station (Sydney CBD) construction sites. This list is indicative only. Actual plant and equipment used on site and the numbers required would be further refined during the detailed design phase.

5.6.8 Construction workforce

Table 5-14 provides a breakdown of the peak construction workforce numbers for this proposal. Sydney Metro has developed a Workforce Development and Industry Participation Strategy which includes objectives to support local employment and business opportunities, provide skills development and increase workplace diversity.

The Sydney Metro West project would create an anticipated 10,000 direct and 70,000 indirect jobs during construction (based on Sydney Metro analysis).

Table 5-14 Indicative construction workforce for this proposal

Construction site	Peak workforce numbers
The Bays tunnel launch and support site	270
Pyrmont Station western construction site	110
Pyrmont Station eastern construction site	120
Hunter Street Station (Sydney CBD) western construction site	80
Hunter Street Station (Sydney CBD) eastern construction site	120
Total	**700**

5.6.9 Demobilisation, rehabilitation and handover

At the end of the construction phase, the contractor(s) would demobilise all construction equipment, site sheds and other temporary construction site elements not required for future construction stages and stabilise the construction sites prior to the construction of future stages.

Where elements (such as acoustic sheds, site offices and amenities) are required for future stages of construction (the subject of separate planning applications), these may be retained on site at the completion of the major civil construction work between The Bays and Sydney CBD.

5.7 Sydney Metro Frameworks, Strategies and Standards

5.7.1 Construction Environmental Management Framework

The Sydney Metro Construction Environmental Management Framework (Appendix C) was developed and successfully implemented as part of the Sydney Metro Northwest and Sydney Metro City & Southwest projects. This framework has been reviewed and amended to be applicable to Sydney Metro West.

The Construction Environmental Management Framework details environmental management systems and processes that would be applied to the major civil construction work between The Bays and Sydney CBD. Specifically, it details the requirements in relation to the content of the construction environmental management plan, sub-plans and other supporting documentation for each specific environmental aspect.

5.7.2 Overarching Community Communications Strategy

The Overarching Community Communications Strategy (OCCS) (Appendix B) has been prepared to guide Sydney Metro's approach to stakeholder and community liaison including engagement with communities, stakeholders and businesses. This plan is intended to be used as a framework for community engagement across all Sydney Metro projects and contracts. The OCCS considers all work activities and packages for Sydney Metro and its projects for the duration of work, and 12 months following the completion of construction. The OCCS is further considered in Chapter 4 (Stakeholder and community engagement).

5.7.3 Construction Traffic Management Framework

The Construction Traffic Management Framework (Appendix D) sets out the approach to managing traffic impacts during the construction of the Sydney Metro projects (the Project). The CTMF also outlines contractor requirements, with reference to third party agreements. The CTMF provides the overall strategy and approach for construction traffic management for the Project, and an outline of the traffic management requirements and processes that will be common to each of the proposed work sites. It establishes the traffic management processes and acceptable criteria to be considered and followed in managing roads and footpaths adjacent to project construction sites.

A site specific Construction Traffic Management Plan (CTMP), along with Traffic Control Plans (TCPs) as required, will also be prepared based on the CTMF. The CTMF is further considered in Chapter 6 (Transport and traffic) and Technical Paper 1 (Transport and traffic).

5.7.4 Construction Noise and Vibration Standard

The Construction Noise and Vibration Standard (CNVS) (Appendix E) establishes a consistent strategy for the assessment, mitigation and monitoring of noise and vibration generated by construction activities across Sydney Metro. It defines a minimum standard for managing noise and vibration impacts that considers currently best practice guidelines and other regulatory requirements, and adopts strategic objectives to understand and manage potential noise and vibration impacts.

Where work would cause significant noise and vibration impacts upon sensitive receivers, a Construction Noise and Vibration Management Plan would be prepared. The CNVS is further considered in Chapter 7 (Noise and vibration) and Technical Paper 2 (Noise and vibration).

5.8 Sydney Metro West – related development

The following related developments that are not part of the State significant infrastructure, are excluded from this Environmental Impact Statement and are subject to separate assessment and planning approvals:

- The Bays Road Relocation Works
- Sydney Metro West Eastern Creek Precast Facilities.

Sydney Metro determined on 11 March 2021 that the Sydney Metro West Eastern Creek Precast Facilities may be carried out. The precast concrete segments for the permanent tunnel lining for the tunnel excavation would be manufactured at the approved Eastern Creek Precast Facilities. The Determination Report is available at www.sydneymetro.info/metrowest.

Where relevant, cumulative impacts of the proposal and related Sydney Metro West developments have been considered in Chapter 6 to Chapter 22 (Sustainability, climate change and greenhouse gas).