CBD Metro

Preliminary Environmental Assessment

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Contents

Glossary of terms

Acoustic	Pertaining to the sense of organs of hearing, or to the science of sound.
Ambient	Surrounding or existing.
Bored tunnel	An underground tunnel constructed by a tunnel boring machine.
CityRail Station	Existing rail station on the CityRail network
Consent	Approval to undertake a development received from the consent authority. Also referred to as development consent.
Construction Environmental Management Plan	A document setting out the management, control and monitoring measures to be implemented during construction of a development, to avoid or minimise the potential environmental impacts identified during an environmental impact assessment process.
Crossover	Track form to allow trains to move to an adjacent track.
Cut and cover construction	Method of construction for underground structures where a hole is excavated from the surface down, the structure is built and then covered.
Director-General's requirements	Requirements for an environmental assessment issued by the Director-General of the Department of Planning in accordance with the *Environmental Planning & Assessment Act 1979*.
Diamond Crossover	Two crossovers located adjacent to each other in a diamond formation.
Geotechnical conditions	Relating to the form, arrangement and structure of geology, soils etc.
Kiss-and-ride	Where a car passenger is dropped off at a public transport station/bus interchange by a private car. This is generally by a family member, hence the 'kiss' goodbye.
Maintenance depot	Land including buildings and facilities for the maintenance of the Metro system, including rolling stock and the infrastructure.
Metro railway	A guided system designed to transport passengers on a railway track, together with its infrastructure and associated sidings, that: (a) provides high-frequency commuter and other passenger services, and (b) is operated using automated systems, that are integrated with trains, from one or more central control points, and (c) is operated using dedicated rail infrastructure facilities that are not operationally connected with other types of rail infrastructure facilities.
Metro railway system	(a) a metro railway and its rail infrastructure facilities, and (b) stations, platforms, maintenance facilities, depots and other transport interchanges, works, structures and facilities associated with or incidental to the metro railway or rail infrastructure facilities (including commercial and retail facilities).

Paid concourse	Area of the station that can only be accessed by ticket holders.
Project	The construction and operation of the proposed CBD Metro as considered by this preliminary environmental assessment.
Proponent	The person proposing to carry out development comprising all or any part of the project, including any person certified by the Minister for Planning to be the proponent (such certification to be obtained prior to commencement of the relevant part of the project). Sydney Metro is the proponent for the CBD Metro project.
Product	The new metro railway in total including assets, brand, systems, intellectual property, interfaces and metro services
Road header	Machine used to excavate tunnels with a boom-mounted cutting head.
Rolling stock	Standard single deck metro trains used on the metro railway.
Spoil	Excess material resulting from the cut and fill balance. Generally comprises soil and rock material. All volumes refer to solid volume.
Stabling facility	Location where rolling stock (trains) are stored when not in service.
Station	Refers to proposed Metro station infrastructure, including platforms, concourse, entrance, pedestrian connections, staff facilities and associated requirements/facilities to service the station.
Station Plan	Plans that may be prepared for land on which metro railway stations are to be situated, and land in the vicinity of such metro railway stations, with respect to development, traffic and parking management arrangements, pedestrian links and access facilities, retail and commercial development associated with metro railway stations, public domain amenities and improvements, and other matters ancillary to the operation of metro railway stations and any associated transport or other facilities.
Sydney Metro	Sydney Metro is the NSW Government agency constituted under the *Transport Administration Act* 1988 to develop a metro railway system, including procuring the CBD Metro and possible future extensions of it.
Traction power	Term used for electric power supply used on electric railways to power the movement of trains.
Tunnel boring machine	Machine used to excavate tunnels with a circular cross section through a variety of soil and rock strata.
Turnback	Configuration of tracks allowing a train to terminate a service and return to its starting point.
Unpaid concourse	Areas of the station that can be accessed by any member of the public.
Virgin excavated natural material	Natural material (such as clay, gravel, sand, soil and rock) that: (a) is not mixed with any other type of waste; and (b) has been excavated from areas of land that are not contaminated.

List of abbreviations

AHIMS	Aboriginal Heritage Information Management System
ATO	Automatic Train Operation
ATP	Automatic Train Protection
BSP	Bulk Supply Point
CBD	Central Business District (of Sydney)
CEMP	Construction Environmental Management Plan
DCP	Development Control Plan
DECC	Department of Environment and Climate Change
DEWHA	Department of Environment, Water, Heritage and the Arts (Commonwealth)
DoP	Department of Planning
EA	Environmental Assessment
EEC	Endangered Ecological Community
EP&A Act	*Environmental Planning and Assessment Act 1979*
EPBC Act	*Environmental Protection and Biodiversity Conservation Act 1999* (Commonwealth)
ESCP	Erosion and Sediment Control Plan
ESD	Ecologically Sustainable Development
GDP	Gross Domestic Product
Ha	Hectare
IGANRIP	*Interim Guideline for the Assessment of Noise from Rail Infrastructure Projects*
km	Kilometre
km/hr	Kilometres per hour
kV	Kilovolt
POEO Act	*Protection of the Environment Operations Act 1997*
LEP	Local Environmental Plan
LGA	Local government area
m	Metre
m3	Cubic metre
m2	Square metre
NES	National Environmental Significance

NES matters	Matters of national environmental significance, which are referred to in the *Environmental Protection and Biodiversity Conservation Act 1999* (Commonwealth)
OCC	Operations Control Centre
PAD	Potential archaeological deposit
PAH	Polycyclic aromatic hydrocarbons
RailCorp	Rail Corporation New South Wales
REP	Regional Environmental Plan
RTA	Roads and Traffic Authority of New South Wales
SEPP	State Environmental Planning Policy
SLA	Statistical local area
TBM	Tunnel boring machine
TIDC	Transport Infrastructure Development Corporation
TSC Act	*Threatened Species Conservation Act 1995*
VENM	Virgin excavated natural material

Executive Summary

Introduction

The NSW Government has allocated funding to immediately commence work on the CBD Metro, an entirely new public transport experience for Sydney. This is a major investment in our city's sustainable growth and prosperity. Running every 2-3 minutes from Central Station to Rozelle, this high capacity service will create a new pathway within and across the CBD. In doing so, it will work with, and improve, the operations of our other transport networks.

On 6 February 2009, the Minister for Planning declared that the CBD Metro project be a project to which Part 3A of the *Environmental Planning and Assessment Act 1979* (EP&A Act) applies. The CBD Metro is also critical infrastructure due to its significant economic, environmental and social benefits.

This Preliminary Environmental Assessment has been prepared to support a Project Application in accordance with section 75E of the EP&A Act for the project.

It responds to the statutory approval process requirements by characterising the project and the baseline environmental conditions, and undertaking a preliminary assessment of likely environmental impacts. It identifies the key environmental impact issues to be addressed during the Environmental Assessment and seeks environmental assessment requirements for the project in accordance with section 75F(3) of the EP&A Act.

The detailed Environmental Assessment will be exhibited in late 2009 for a minimum of 30 days and invites public comment. Advertisements are placed in appropriate newspapers, and relevant State agencies and local council/s are notified, as well as affected and adjacent landowners.

The project

The CBD Metro will be the first project of a Sydney-wide metro network delivering significant economic benefits for Sydney and NSW.

The CBD Metro is a 7km long metro railway from Rozelle to Central, with new stations at Rozelle, Pyrmont, Barangaroo-Wynyard, Martin Place, Town Hall Square and Central. Further, the provision of infrastructure at White Bay would allow for a future station in this location.

The metro railway alignment would be primarily within underground twin tunnels.

The proposed alignment would allow for extension of the CBD Metro to the West (Parramatta) via the Inner West from Central; and future extensions to the North West from Rozelle.

In addition, a stabling facility and maintenance depot is proposed at Lilyfield/Rozelle within the former Rozelle Marshalling Yards site. An Operation Control Centre to manage the day-to-day operation of the metro service would also be located in this locality.

Construction sites would be required at all station sites. In addition the White Bay precinct provides an opportunity to establish a major construction site to support tunnel construction, tunnel spoil removal and rail systems installation. Almost half a million cubic metres of spoil would be removed from this site. Construction activities, including construction of the stabling facility on the surface, would also occur at the former Rozelle Marshalling Yards site.

Prior to construction, property would need to be acquired for the proposed CBD Metro and associated facilities such as construction compounds, station entrances and ancillary tunnel services. Property

acquisition would be undertaken in accordance with the requirements of the *Land Acquisition (Just Terms Compensation) Act 1991*.

The areas and sites identified at this stage represent a preliminary preferred position, but will be subject to ongoing constructability investigations and property negotiations. A flexible approach to property requirements will be adopted, with a focus on minimising property acquisition.

Key environmental issues

This Preliminary Environmental Assessment for the CBD Metro identifies a number of key environmental impacts during the construction and operational phases that will require further investigation as part of the detailed Environmental Assessment, including:

- Traffic, transport, parking & access
- Noise & vibration
- Socio-economic factors
- Spoil management (including contamination)
- Non-Indigenous heritage

The Preliminary Environmental Assessment identifies mitigation strategies for these issues that would be further developed in the Environmental Assessment.

In addition, a number of relatively more minor impacts associated with the project have been identified that could be effectively managed and/or adequately mitigated through the design process and application of standard and/or tailored mitigation measures.

The design process has and will continue to consider environmental issues and incorporate refinements to the design of the project, to avoid or minimise all relevant impacts.

Where to from here?

A Project Application, supported by this Preliminary Environmental Assessment, is the first key step in the planning approvals and environmental assessment process. It identifies the benefits and potential impacts of the CBD Metro, then sets out mitigation strategies that will be developed and implemented. As we move ahead in developing a metro system for Sydney, more information regarding this exciting new initiative will become available.

Maximum use will be made of web-based communications and other innovative community engagement procedures to provide people with improved access to information. This consultation will assist with the design development and preparation of the Environmental Assessment.

A 1800 information line has been established (1800 636 910) to receive and respond to all public enquiries and a Sydney Metro website has been established (www.sydneymetro.nsw.gov.au).

Later this year, an Environmental Assessment will be exhibited with an invitation for public comment. Advertisements are placed in appropriate newspapers, and relevant State agencies and local council/s are notified, as well as affected and adjacent landowners.

The Environmental Assessment is exhibited at the Department of Planning's head office, relevant regional offices, local council offices and on the Department of Planning's website. During the exhibition period any person is able to make a written submission to the Director-General of the Department of Planning regarding the project.

1 Introduction

1.1 General

The NSW Government has allocated funding to immediately commence work on the CBD Metro, an entirely new public transport experience for Sydney. This is a major investment in our city's sustainable growth and prosperity. Running every 2-3 minutes from Central Station to Rozelle, this high capacity service will create a new pathway within and across the CBD. In doing so, it will work with, and improve, the operations of our other transport networks.

Sydney is a city of significance to the world as well as Australia. To maintain and improve Sydney's global position and contribution to national productivity, Sydney requires efficient transport networks for the free flow of people between their homes, jobs and places of business. Sydney has significant road and public transport networks in place. However, targeted investment is required to enhance and optimise the value of this network.

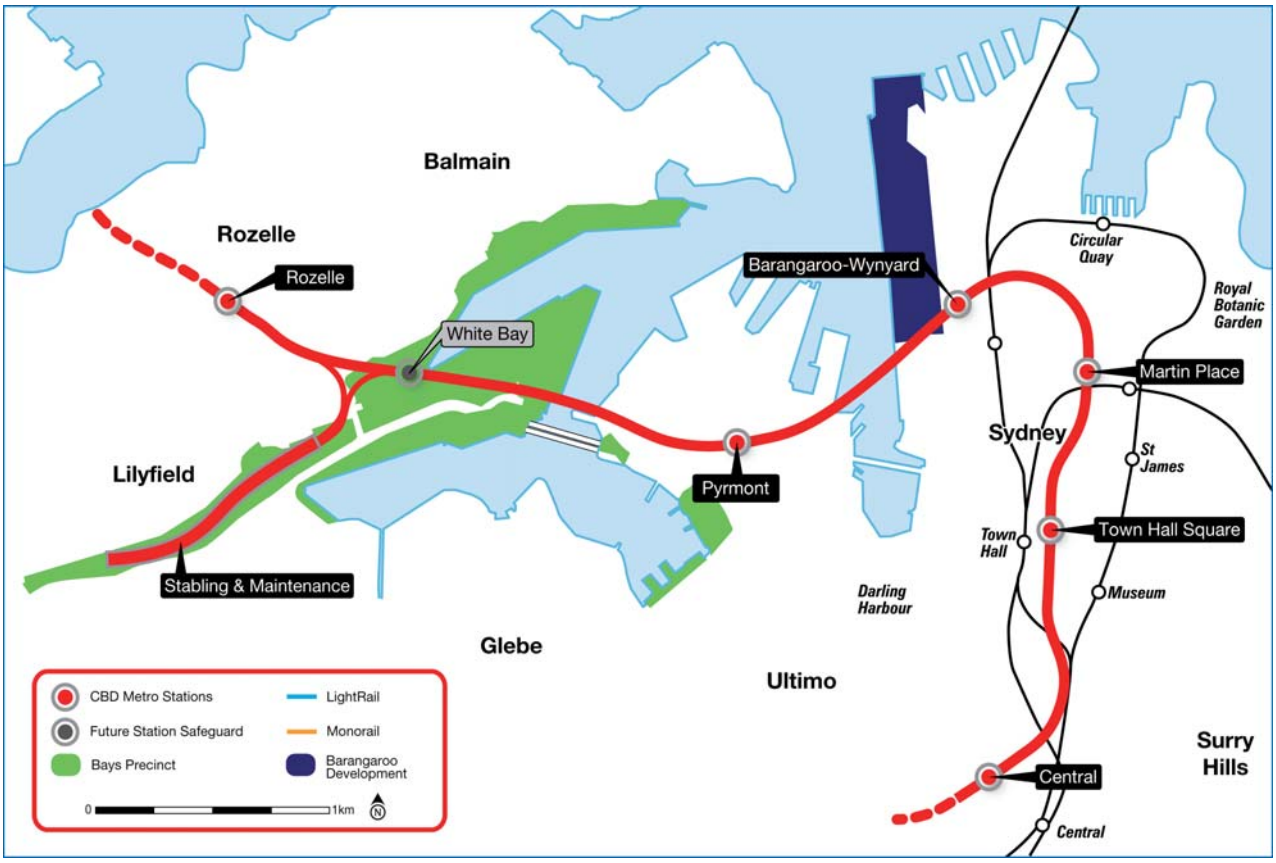
The CBD Metro is a critical component of that investment plan that will:

- create Australia's first world class metro rail, providing key access to Sydney CBD and adjoining rapidly growing inner city residential and employment areas;
- establish a network enabler allowing an extension to the West (Parramatta) via the Inner West, and future extensions to the North West;
- free up congestion of bus and rail services by providing a new transport service within and across the Sydney CBD;
- reduce crowding at CityRail stations by providing new station capacity at Wynyard, Martin Place, Town Hall and Central;
- make Central CityRail Station's underused terminus platforms a gateway to Sydney CBD via metro, generating capacity to run more trains on the CityRail network;
- support the major new precinct at Barangaroo at East Darling Harbour; and
- allow for future development of a station at White Bay.

The CBD Metro, shown in Figure 1.1, is a 7km long line from Rozelle to Central, with new stations at Rozelle, Pyrmont, Barangaroo-Wynyard, Martin Place, Town Hall Square and Central, and the safeguarding of a station at White Bay.

The CBD Metro is the first step in a revolution in the quality of Sydney's public transport network. Each incremental extension will widen the benefits, including increasing access to jobs, reducing traffic congestion, improving commuter journey times, limiting ancillary greenhouse emissions and increasing social inclusion.

Figure 1.1 CBD Metro alignment from Sydney CBD to Rozelle



1.2 Sydney Metro

Sydney Metro is a statutory authority established under Part 6A of the *Transport Administration Act 1988* having as its principal function the development of a safe and reliable metro rail system for Sydney and to select and manage a private operator for the ongoing operation of the metro system. Sydney Metro is responsible for planning, delivering, and commissioning the metro system and over the long term, managing all contractual arrangements and performance of the metro's private operator. It will be the proponent responsible for the development and delivery of the CBD Metro.

1.3 This report

This Preliminary Environmental Assessment has been prepared by Sydney Metro to support a Project Application in accordance with section 75E, Part 3A of the *Environmental Planning and Assessment Act 1979* (EP&A Act) for the project.

It responds to the statutory approval process requirements by characterising the project and the baseline environmental conditions, and undertaking a preliminary assessment of likely environmental impacts. It identifies the key environmental impact issues to be addressed during the detailed Environmental Assessment and seeks environmental assessment requirements for the project in accordance with section 75F(3) of the EP&A Act.

1.4 CBD Metro outcomes

As a stand-alone metro railway, the CBD Metro will achieve the following outcomes:

- create Australia's first world class metro rail, providing key access to Sydney CBD and adjoining rapidly growing inner city residential and employment areas;
- establish a network enabler allowing an extension to the West (Parramatta) via the Inner West, and future extensions to the North West;
- free up congestion of bus and rail services by providing a new transport service within and across the Sydney CBD;
- reduce crowding at CityRail stations by providing new station capacity at Wynyard, Martin Place, Town Hall and Central;
- make Central CityRail Station's underused terminus platforms a gateway to Sydney CBD via metro, generating capacity to run more trains on the CityRail network;
- support the major new precinct at Barangaroo at East Darling Harbour; and
- allow for future development of a station at White Bay.

In conjunction with future extensions, the CBD Metro will:

- provide metro access to Sydney's key economic corridors with reduced travel times and substantially more frequent services;
- improve existing public transport systems;
- extend the coverage of rail services to additional areas of Sydney;
- provide congestion relief on existing CityRail and bus services;
- provide highly attractive locations for new housing and jobs, supporting the Government's challenge to accommodate growth in population while sustaining the economic and environmental character of Sydney;
- provide greater passenger capacity over traditional Sydney heavy rail, requiring smaller stations and tunnels providing significant savings on infrastructure provision costs; and
- deliver a proven, safe and secure system, using automatic train operation which allows for a small workforce focused on customer service rather than operations.

1.5 Metro product

The metro product refers to the new metro railway in total including assets, brand, systems, intellectual property, interfaces and customer experience (Table 1.1). The CBD Metro will be the first project of a Sydney-wide metro network delivering significant economic benefits for Sydney and NSW.

The metro network, starting with the CBD Metro, will be designed to a specification that sets new benchmarks for customer experience with fast, frequent and reliable services.

Table 1.1 Metro product statement and principles

CBD Metro product statement	CBD Metro product principles
A fast, frequent and reliable transport system that: • is customer focused • is fully integrated into its urban context and existing transport infrastructure • supports the long term competitiveness and attractiveness of Sydney	• a customer-focused product that benefits passengers and the wider community • integrated land use and transport outcomes • integrated transport services across all modes • a 100 year investment that supports Sydney's global competitiveness and attractiveness • optimal sustainability and environmental outcomes • efficient and effective governance of product development, delivery and operation.

1.6 Stakeholder consultation

Initial meetings were held with Council officers (City of Sydney and Leichhardt) and key Government agencies regarding the CBD Metro in December 2008 and January 2009 to provide background to the project and obtain preliminary feedback.

Further stakeholder and community consultation will commence in February 2009. Maximum use will be made of web-based communications and other innovative community engagement procedures to provide people with improved access to information. This consultation will assist with the design development and preparation of the Environmental Assessment.

A 1800 information line has been established (1800 636 910) to receive and respond to all public enquiries and a Sydney Metro website has been established (www.sydneymetro.nsw.gov.au).

2 Description of the project

2.1 Context

Sydney CBD is the pre-eminent employment location in Australia with over 300,000 jobs making it a major centre of national significance. The strength of the Sydney CBD economy flows through to other strategic centres in the Sydney Metropolitan Region, and makes Sydney Australia's gateway to the international economy including Asia Pacific finance and insurance operations.

Although Australia scores well on most world data for productivity and wealth, and NSW and Sydney are at the heart of this performance, this position is at risk. Australia's recent strong economic growth is dominated by primary production and states with lower contributions from this sector are performing below the Australian average for GDP growth. Sydney's population is growing strongly (4.3 million in 2008 to 6.0 million in 2036). A further 70,000 new jobs are predicted for Sydney CBD by 2031 and transport systems are at capacity in their ability to take people to work. Opportunities to develop Sydney CBD employment such as at Barangaroo at East Darling Harbour (20,000 jobs) cannot be achieved without enhanced public transport links.

Sydney is in the world's top 50 urban agglomerations by GDP and yet it is one of only five of the top 50 cities without a significant metro or light rail system. To maintain and improve Sydney's global position and contribution to national productivity, Sydney requires efficient transport networks for the free flow of people between their homes and jobs, and to allow the planned agglomeration of high value employment in the city and wider centres. The CBD Metro addresses these risks and opportunities.

2.2 Overview

The CBD Metro is a 7km long metro railway from Rozelle to Central, with new stations at Rozelle, Pyrmont, Barangaroo-Wynyard, Martin Place, Town Hall Square and Central. Further, the provision of infrastructure at White Bay would allow for a future station in this location. See Figure 1.1 above.

It is proposed that the project would be delivered in one stage. Construction is proposed to commence in 2010 and the entire CBD Metro would be operational by the end of 2015.

An overview of the project and associated infrastructure for the CBD Metro is described in Table 2.1 below.

Table 2.1 Transport product and associated infrastructure for the CBD Metro (subject to design development)

Description	Details (subject to design development)
Station and service access	
Stations	• 6 stations, plus reservation for a future station at White Bay
Bus mode change	• Rozelle, Wynyard, Town Hall Square and potentially at Central Station
Rail mode change	• Barangaroo-Wynyard, Martin Place, Town Hall Square, and Central
Light rail mode change	• Pyrmont, Central
Ferry mode change	• Barangaroo-Wynyard (future potential)
Station features	• safe and secure environment, platform screen doors, automatic ticket gates, well lit (through natural light and ventilation where practicable)
Operations	
Frequency of service	• 2-3 minutes in the peak; a daytime maximum wait of 5 minutes in the off-peak
Hours of operation	• 24/7 operational capability with proposed 05.30 to midnight opening (Sunday to Thursday) extended to 01.00 Friday/Saturday nights
Infrastructure	
Route length	• 7km underground with Lilyfield/Rozelle stabling facility and maintenance depot above ground
Tunnel dimensions	• twin 5.7 metre internal diameter (nominal) segmentally pre-cast concrete lined tunnels
Bulk power supply	• 1 Bulk Power Supply feed
Traction power	• 1500 volt direct current
Rolling Stock	
Train type	• single deck metro air-conditioned trains, nominally 110 metre long and a body width of 3.2 metres, 5 cars per train, and 3 bi-parting doors per side per car to allow easy entry and exit
Train control	• automatic, driverless trains controlled from a central Operations Control Centre • trains operate under Automatic Train Operation (ATO) and Automatic Train Protection (ATP) systems
Train capacity	• 965 passengers per train with 360 seats and 605 standing capacity • ultimate capacity of 1,190 passengers per train using high capacity layout
Initial train fleet size	• 13 trains
Train stabling & maintenance	• depot on the Lilyfield/Rozelle site for train and infrastructure maintenance

2.3 Alignment

The project comprises a 7km metro railway alignment primarily within underground twin tunnels.

The proposed alignment, which is shown in Appendix A, has been optimised based on the objectives below and in consideration of a number of significant constraints, particularly in the Sydney CBD. The alignment presented in the preliminary environmental assessment is subject to further development and some modifications may occur as new information is obtained during the reference design phase (particularly information related to major services and building basements). The station locations identified may also require subsequent modification to allow for alignment changes. The alignment will be confirmed in the Environmental Assessment.

In developing the alignment, the following objectives were considered:

- Provide for stations to be built at optimal locations
- Take account of operational requirements for customer experience and maintenance
- Minimise impacts on existing and planned CBD developments by following road alignments as far as possible
- Minimise impacts on existing structures and basements
- Minimise impacts on existing underground infrastructure
- Utilise the Interim Rail Pitt corridor through the CBD (as identified in the Infrastructure SEPP) as much as possible
- Safeguard the Interim Rail West corridor through the CBD (as identified in the Infrastructure SEPP) and other underground infrastructure
- Assist management of risks arising from tunnel design issues

Starting at Central Station, the alignment heads north following Castlereigh and Pitt Streets to Hunter Street. Note that the protected Interim Rail Pitt corridor was considered for the CBD Metro between Central Station and Hunter Street only. The Interim Rail Pitt corridor north of Hunter Street continues north and precludes any connection to Barangaroo-Wynyard and was therefore not suitable.

The alignment would allow for overrun tunnels south of the CBD Metro Central Station at Railway Square to provide a crossover, turnback tunnels and/or stub tunnels for future extension of the Metro.

The alignment from Martin Place Station at Castlereagh Street to Barangaroo-Wynyard Station at Kent Street is constrained by a number of significant buildings that have deep basements. The proposed alignment has been designed to avoid the basements of buildings in Pitt Street, Bond Street and Grosvenor Street.

The alignment west of Barangaroo-Wynyard Station heads in a south west direction passing beneath the southern end of the Barangaroo site and crossing straight under Darling Harbour before curving into Union Square and the Pyrmont Station location. From Pyrmont Station the alignment curves round to run parallel to the Anzac Bridge as it crosses beneath Johnstons Bay and into the White Bay site where the provision for a future station is located. Turnouts for the Lilyfield/Rozelle stabling facility and maintenance depot are provided at this location. The alignment then curves into the Victoria Road corridor running slightly to the north of Victoria Road.

The proposed alignment would allow for extension of the CBD Metro to the West (Parramatta) via the Inner West from Central; and future extensions to the North West from Rozelle.

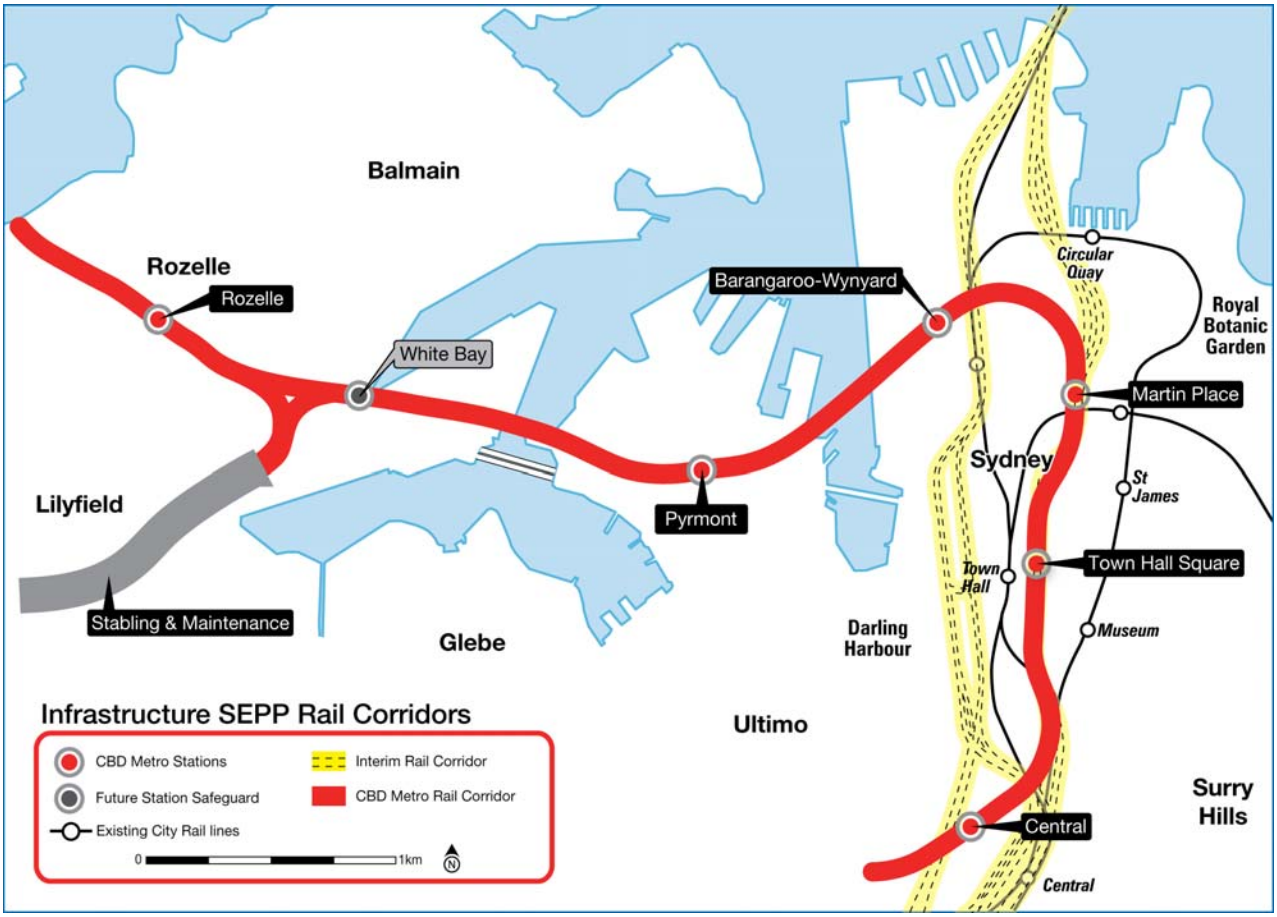
2.3.1 Rail corridor protection

The State Environmental Planning Policy – Infrastructure 2007 (the 'Infrastructure SEPP') was introduced to assist in the effective delivery of public infrastructure throughout the State of NSW. The Infrastructure SEPP includes, among other items, protection clauses to preserve two possible future underground railway corridors within the City of Sydney from being affected by development over the proposed corridors.

Amendments to the Infrastructure SEPP are proposed to add the CBD Metro corridor into the corridors protected, including provisions requiring certification by Sydney Metro for proposed development.

The CBD Metro corridor utilises parts of the eastern-most Interim Rail Pitt corridor currently protected by the Infrastructure SEPP (see Figure 2.1).

Figure 2.1 Protected rail corridors within the Sydney CBD.



Importantly, the development in the future of the Interim Rail West corridor (as identified in and protected by the Infrastructure SEPP) would not be precluded by the development of the CBD Metro and would be safeguarded for any future rail network expansion.

2.4 Stations

The CBD Metro includes new stations at Rozelle, Pyrmont, Barangaroo-Wynyard, Martin Place, Town Hall Square and Central. Further, the safeguarding of a station at White Bay would provide opportunities for any development that may be planned in the future for this important inner city area.

The CBD Metro will set new benchmarks for customer experience with fast, frequent and reliable services. The specific needs of the CBD Metro customers will be researched in the next project phase and validated through customer panels at key locations.

Convenient access and mode change is critical to the CBD Metro's success. The stations will be safe, well lit and visually appealing. Each station will be designed for easy access, providing access for pedestrians (including mobility and sensory impaired customers and people with strollers) and cyclists with appropriate bicycle storage, and mode change to rail, bus, light rail, and/or ferry.

Consistent with the CBD Metro objectives and the Ministry of Transport Interchange Guidelines, the key focus is on efficient, sustainable modes of travel. In the context of the CBD Metro and future extensions, priority will be given to pedestrian and cycling access, followed by public transport, taxi and kiss-and-ride. Conflict between pedestrians/ cyclists and other station access modes will be minimised.

An access strategy will be developed for each of the stations of the CBD Metro, based on an assessment of station connectivity and accessibility in the context of specific customer needs. Walking and cycling to stations will play a large role. Buses and rail also provide a key role in accessing the CBD Metro.

Access at each station would be provided with other modes as relevant, including CityRail, bus, light rail, taxi, CountryLink and ferry. Passengers will be able to efficiently transfer to/from the metro to any other mode within minutes depending on station complexity, minimising the inconvenience of moving between modes.

Stations would be sized to provide adequate space for:

- Suitable access points to the street level that suit the needs of the customer;
- Public areas e.g. unpaid concourse, paid concourse and platforms;
- Staff facilities;
- Retail and commercial development;
- Station electrical and mechanical services;
- Tunnel services including tunnel and trackway ventilation systems;
- Rail systems; and
- Egress in the event of an emergency.

There would be ventilation (vent) shafts incorporated at each station. A vent shaft is a vertical passage to bring fresh air underground, and to prevent the build up of hot air in the metro tunnel. There would be nominally four ventilation fans at each station. During operation, tunnel emissions (via ventilation points) would not affect air quality, as the project would use electric trains (see section 5.4).

Each proposed station is described in further detail below, focusing on the role of each station and the potential surface areas that would be required for construction and permanent facilities (station entries, vent structures, access ways, emergency access and ancillary facilities). The areas and sites

identified represent a preferred position, but will be subject to ongoing constructability investigations and property negotiations. A flexible approach to property requirements will be adopted, with a focus on minimising property acquisition. Heritage items in the vicinity of each station are identified in order to identify buildings and areas that require special consideration. The project would not directly impact on the majority of these heritage items, however careful management of construction activities would be required in order to mitigate any indirect impacts from vibration. In some localities, the heritage setting would influence the physical and architectural design of stations.

Further detailed assessment and design at each station location is required to confirm station entrance points, including construction areas for entrances. Entrance points would be integrated with surrounding land uses (existing and planned future, as relevant) and be designed to integrate with public space.

Concurrent with preparation of the Environmental Assessment document, Station Plans will be prepared to encourage development in the vicinity of the proposed stations to proceed in a coordinated way that supports the metro (improves access and patronage) and other strategic plans or developments. It is a requirement of the Sydney Metro legislation that Station Plans are prepared.

2.5 Rozelle Station

Rozelle Station is located in an inner suburban catchment area with surrounding land uses including restaurants, bars, food and clothes shops, and other specialised retailers located along Darling Street and Victoria Road.

Rozelle Station is proposed to be located around the intersection of Darling Street and Victoria Road. The Metro station in this locality would focus on the long term goal of improving the community setting of the St Thomas Church Group, Rozelle Public School and St Paul's Church. It would also facilitate more effective links across Victoria Road.

Facilities to allow transfer of passengers between the Metro and bus (plus taxi, cycling and some kiss-and-ride) would be provided at this location. It is envisaged that many public transport passengers would choose to switch from buses to the Metro at Rozelle Station for a faster trip to the CBD. However, the detailed designs for bus passenger transfer facilities are still being developed and will be influenced by the nature of bus services at Rozelle. Other factors that will influence feasible designs include road and intersection performance and consultation with government agencies, bus operators and the local community.

The station would be constructed using underground cavern construction techniques (rather than cut and cover construction) to minimise impacts on road and pedestrian traffic, including impacts on the adjacent school and community facilities.

Construction sites for the station would be required on either side of Darling Street for two cut and cover shafts providing construction access to the underground caverns, as shown in Figure 2.2. These potential sites are highly constrained and in close proximity to sensitive receivers. Therefore, additional or alternate worksites would be investigated for construction and described in the Environmental Assessment.

A third, smaller construction site for a station entrance would be located on the north west corner of Darling Street and Victoria Road.

Figure 2.2 Rozelle Station construction footprint (indicative only)

The station precinct is located within a Heritage Conservation Area under the Leichhardt LEP 2000. The St Thomas Church Group (listed under the Leichhardt LEP) would be directly affected by construction activities (refer to Section 4.6). Numerous heritage items are located within the vicinity of the station site, including the York Buildings, the Mechanics Institute (listed under the Leichhardt LEP), Rozelle Public School (listed in Leichhardt LEP 2000 and Register of National Estate) and St Paul's Church (listed under the Leichhardt LEP 2000 and Register of National Estate). None of these items would be directly affected. Rather, the station provides an opportunity to enhance the heritage value in this locality.

2.6 White Bay Station (potential)

The Sydney Harbour Foreshore Authority, NSW Ports Authority and NSW Maritime have significant land holdings at White Bay, the Rozelle Rail Yards and at Rozelle Bay on James Craig Road which are collectively known as the Bays Precinct.

The NSW Government has committed to preparing a masterplan for the future use of the Bays Precinct with particular emphasis on the renewal of White Bay and the Rozelle Rail Yards. Some development options being considered would be compatible with a metro station at White Bay.

It is intended that White Bay will be used as a construction and spoil removal site for the project (see Section 2.14.4). A part of the Lilyfield/Rozelle rail yards will be used for metro rail stabling, a

maintenance depot and a control centre. The provision to allow a future station to be constructed at White Bay is included as part of the project.

Preliminary discussions have been held with the Sydney Harbour Foreshore Authority and NSW Ports Authority regarding the possible future uses of the Bays Precinct and potential impacts of the proposed metro alignment and location of a station within the precinct. Permanent facilities associated with the CBD Metro will be designed and constructed to minimise impact on the Bays Precinct and any plans that may be developed in the future.

Surrounding land uses relate to the Glebe Island port facilities. Residential development is located further to the north. White Bay is located adjacent to the site to the east. Some remnant vegetation remains on the site. However, due to the level of development at the site, there is limited habitat value for flora or fauna.

White Bay Power Station is listed under the State Heritage Register, Sydney Regional Environmental Plan No. 26 – City West, Section 170 Register and on the Register of the National Estate. There would be no direct impact to the Power Station.

2.7 Pyrmont Station

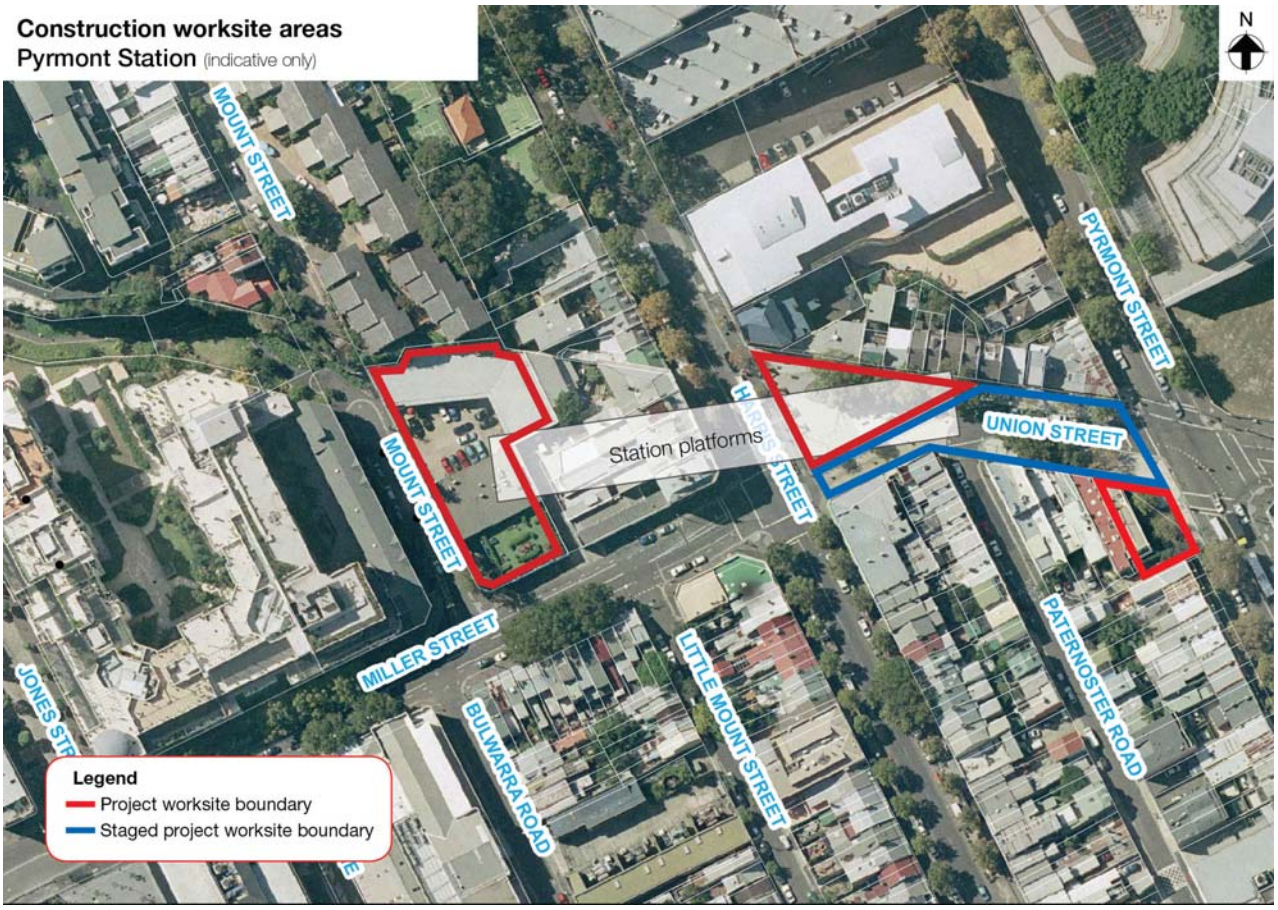
Pyrmont Station is located within the urban and commercial area of Pyrmont with considerable historic significance. The location will integrate with a key cycle route and the light rail and offers an opportunity to improve the existing urban amenity, including the potential to extend the pedestrian areas in the vicinity of station entrances.

Pyrmont Station is proposed to be located beneath Union Square and buildings on Harris Street, near the intersection of Harris Street and Miller Street. The station would be constructed using underground double cavern methodology, with three cut and cover shafts providing construction access to the caverns, indicatively located at:

- Corner of Mount Street and Miller Street
- Western end of Union Square, on the corner of Harris Street and Miller Street
- Corner of Union Street and Pyrmont Street

These areas would be affected for the duration of construction work. In addition, staged temporary construction would extend along the remainder of Union Square, including the current cycle path and the kerbside lane of Harris Street (as shown in Figure 2.3).

Figure 2.3 Pyrmont Station construction footprint (indicative only)



The proposed Pyrmont Station is in a mixed use area, with medium-density apartment buildings and terraces, street level cafes and pubs, and some commercial development dominating the streetscape. Star City Casino is located to the north east of the site. Pyrmont is a historic area and contains many heritage assets. A World War One Memorial is located within the construction footprint of the station, which is listed under the Sydney Local Environmental Plan 2005 and the Register of National Estate. Numerous items are located adjacent to the proposed construction site. The most notable of these items is the Pyrmont Post Office which is located adjacent to the western end of the proposed station, which is listed on the Commonwealth Heritage list, State Heritage Register, Register of National Estate and Sydney Local Environmental Plan 2005. None of these heritage items would be permanently affected (see section 4.6).

2.8 Barangaroo–Wynyard Station

Barangaroo–Wynyard Station is located close to the former maritime industry of Darling Harbour of the 19th and 20th centuries. It provides a gateway to the proposed new mixed use Barangaroo precinct with capacity for 20,000 new office workers, 1,500 residents, foreshore promontory, retail and headland park.

Barangaroo is a 22 hectare redevelopment site (formerly known as East Darling Harbour) located on the western apron of the CBD within close proximity to the proposed Barangaroo-Wynyard Station.

The NSW Government has formed a Barangaroo Delivery Authority to coordinate the delivery of this significant commercial mixed use development.

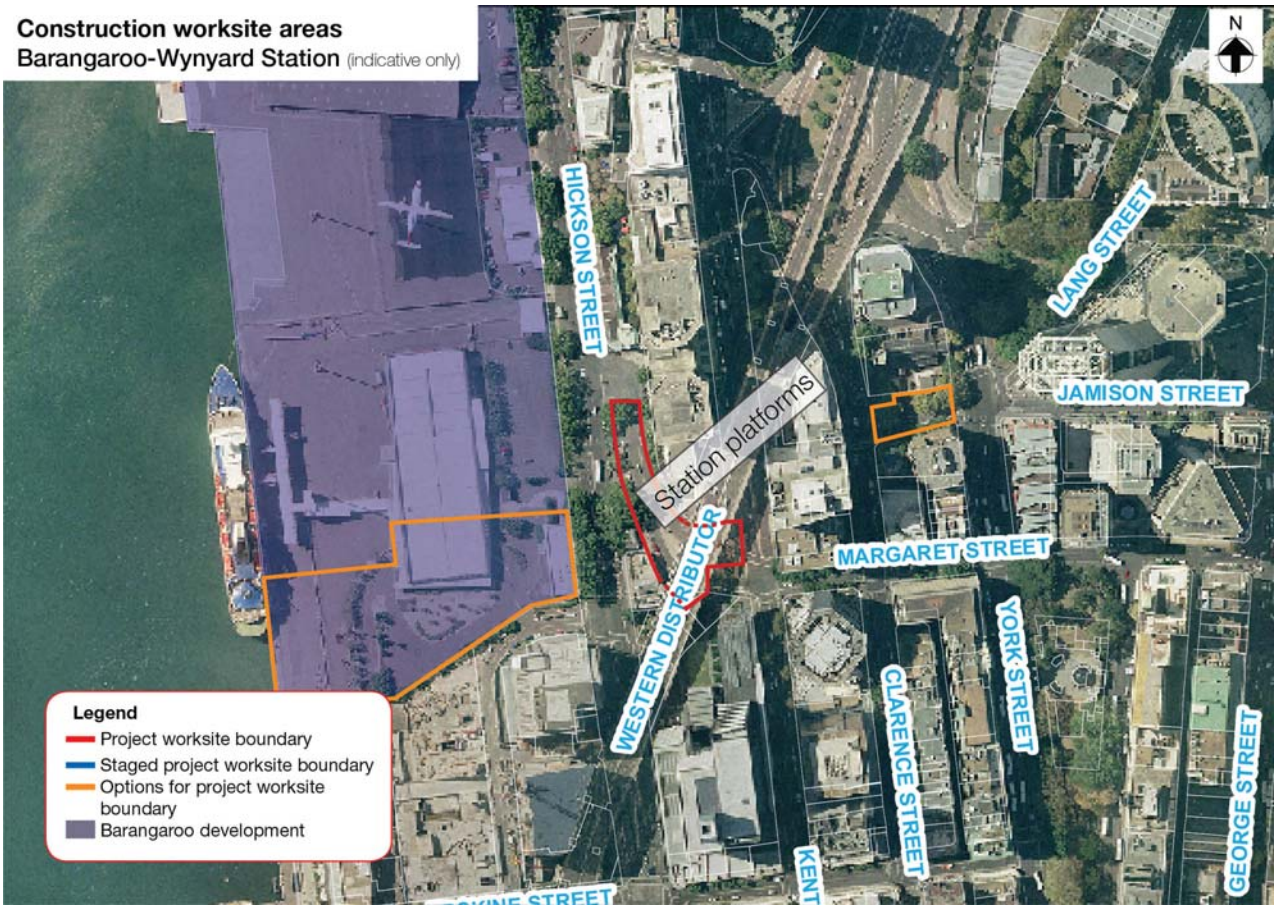
The Barangaroo-Wynyard Station is being designed to maximise connectivity with future development at Barangaroo and the existing Wynyard CityRail Station. Further investigation for the potential use by the CBD Metro of part of the Barangaroo site for construction purposes is being undertaken.

Barangaroo-Wynyard Station is proposed to be located beneath Kent Street between Clarence Street and Hickson Street. The station would be constructed using underground double cavern methodology, with two cut and cover shafts providing construction access to the caverns.

Preliminary construction work sites, as shown in Figure 2.4, would require temporary road occupancies on Jamison Street and Napoleon Street. Access to businesses and car parks would be maintained and Napoleon Street would be converted to one-way. A construction laydown and spoil handling area would be required in the Barangaroo site, indicatively located below off Hickson Road.

Pedestrian entrances to the Barangaroo-Wynyard Station are proposed to allow for access from both Sussex Street and Kent Street; and in the vicinity of Jameson Street. The station would also include pedestrian linkages between future development at Barangaroo, the new Barangaroo-Wynyard Station, and Wynyard CityRail Station. The station would also have strong links with bus stops.

Figure 2.4 Barangaroo-Wynyard Station (indicative only)



There are several heritage listed buildings within close proximity to the proposed station location, including the southern part of Transport House, which is listed on the State Heritage Register,

RailCorp Section 170 Register, Sydney Local Environmental Plan 2005 and Register of National Estate; and Moreton's Hotel (Big House Hotel) which is listed on the State Heritage Register and the Sydney Local Environmental Plan 2005. The St Philips Anglican Church (on Jamison Street) is listed on the Sydney Local Environmental Plan 2005 and the Register of the National Estate.

2.9 Martin Place Station

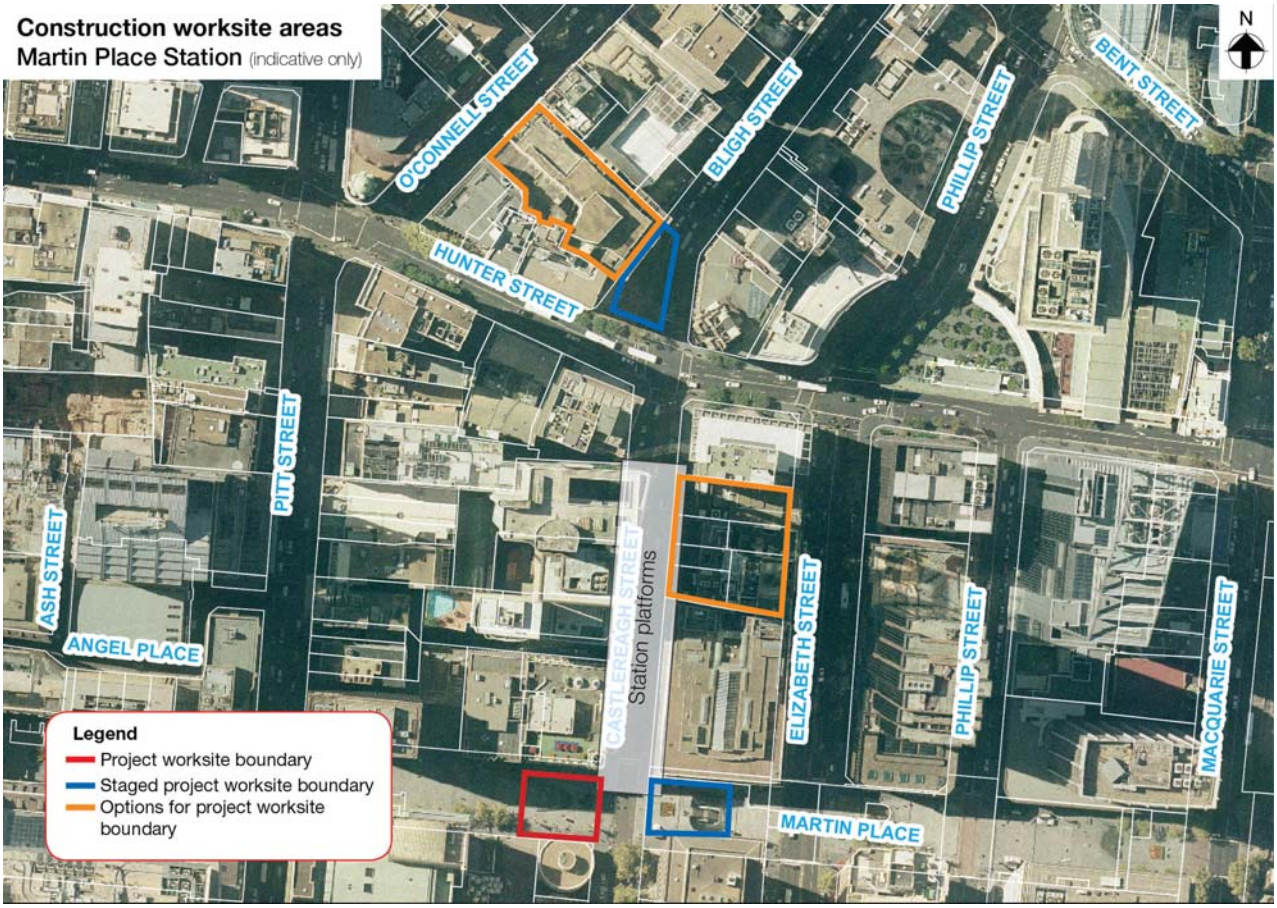
The Metro Martin Place Station is located in the financial core of the CBD in close proximity to the civic spaces of Martin Place, Chifley Square and Richard Johnson Square. The location provides an opportunity to acknowledge the historic significance of the precinct (Macquarie, Chifley, Philip, Bligh, Hunter and the Sydney Heritage Walk). The station would make use of the existing surface linkages around Martin Place and the subterranean links to the RailCorp concourse, MLC Centre and Prudential Building.

Martin Place Station would be located under Castlereagh Street, between Hunter Street and Martin Place. The station would be constructed underground using a large single cavern, with one cut and cover shaft required (Figure 2.5) to provide construction access to the caverns.

The design and constructability of Martin Place Station is constrained by access and potential property development. Therefore, worksites as shown in Figure 2.5 represent options being investigated and are subject to further negotiations.

Pedestrian entrances to the Martin Place Station are proposed to be located near the corner of Castlereagh, and within Martin Place. The concourse levels of the station and Martin Place CityRail Station are proposed to be connected via underground pedestrian walkway.

Figure 2.5 Martin Place Station construction footprint (indicative only)



Commercial office buildings, including Chifley Tower, Qantas House and the Colonial Mutual Building dominate this area of the CBD. Martin Place, a significant pedestrian boulevard comprising boutique retailers and office buildings, flanks the southern extent of the station. There are numerous heritage buildings in close proximity to the proposed station location, including the Perpetual Trustee Building and the Commonwealth Bank Building which are both listed on the State Heritage Register, Sydney Local Environmental Plan 2005 and Register of National Estate. Numerous other items are located in the vicinity of the proposed station. None of these heritage items would be directly impacted (see section 4.6).

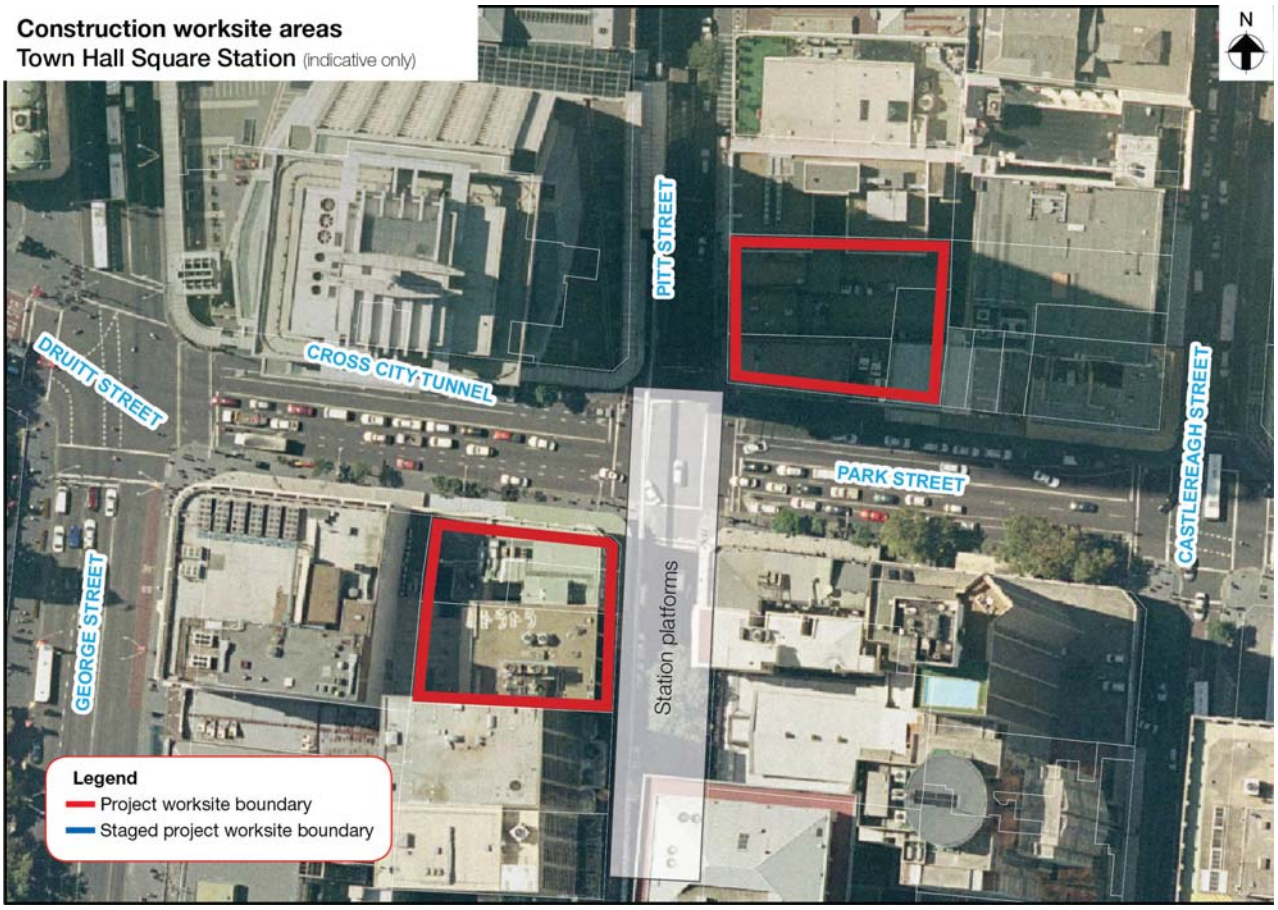
2.10 Town Hall Square Station

Town Hall Square Station facilitates the potential for creating a wider Town Hall precinct, in conjunction with the City of Sydney's planned square on the Woolworths site adjoining CityRail's Town Hall Station. It would extend the existing retail heart of the CBD along Pitt Street and embrace the existing and potential pedestrian network - both subterranean and surface.

Town Hall Square Station would be located under Pitt Street and Park Street. Worksites for station entrances and services shafts include sites at the north east corner of Pitt Street and Park Street, and the south west corner of Pitt Street and Park Street, as shown in Figure 2.6

The station construction would be a large underground single cavern.

Figure 2.6 Town Hall Square Station construction footprint (indicative only)



Town Hall Square is located within the midtown precinct of Sydney central business district, with a strong retail focus, as well as a mix of commercial, residential and civic buildings. The construction site would directly affect the former Headquarters of the Australasian Federation League on Pitt St (now McDonalds restaurant), which is listed on the Register of the National Estate. Potential heritage impacts are discussed in section 4.6.

2.11 Central Station

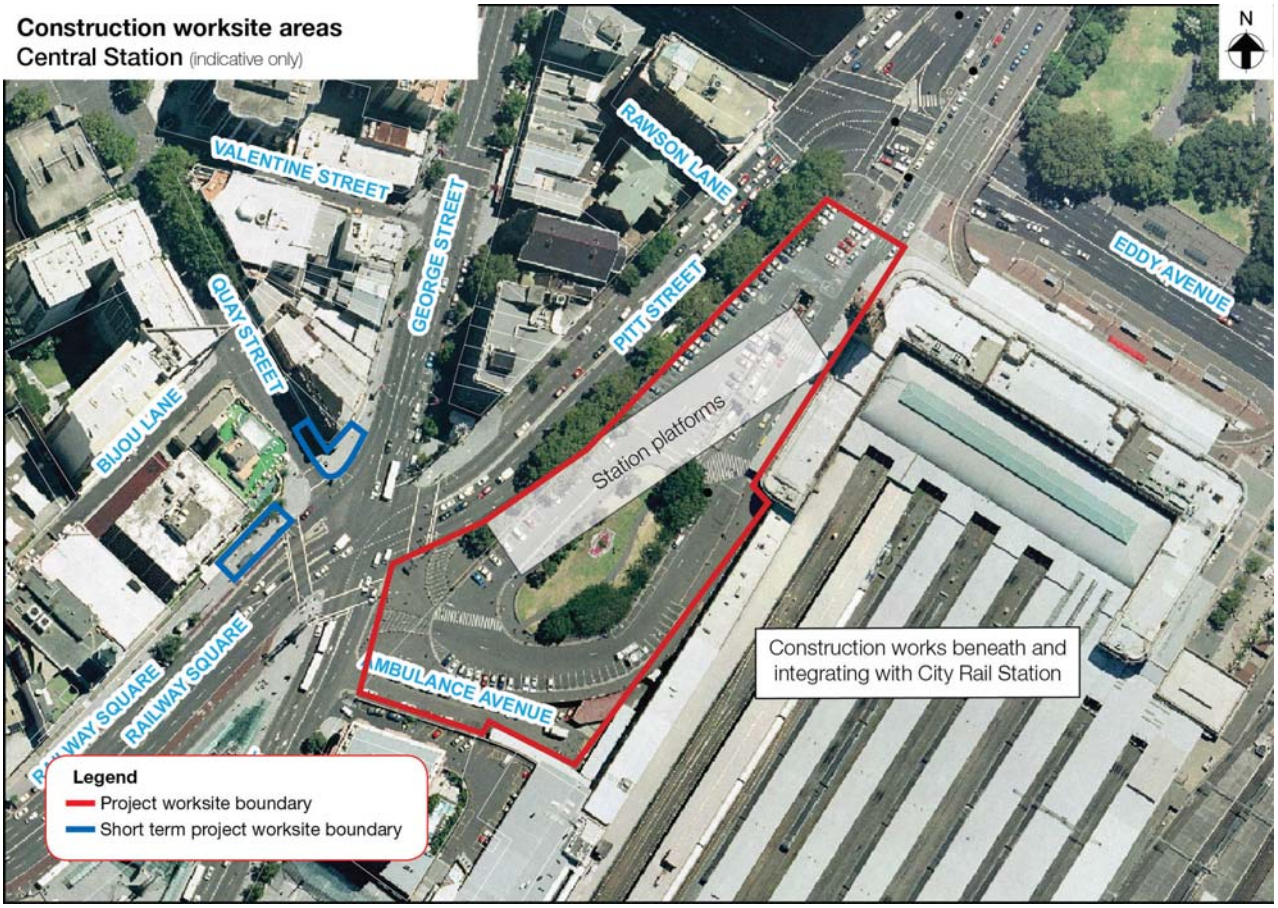
The Metro Central Station provides a unique opportunity for the creation of a gateway metro station for existing CityRail users, increasing pedestrian connectivity to service the university precinct to the west, the Carlton and United Brewery site, Broadway and Chinatown. It also provides an additional access point to Darling Harbour and the Entertainment Centre. There is the opportunity for place making at this location emphasising the context of the existing heritage buildings.

The location of the proposed Metro Central Station is on the western side of Central CityRail Station, adjacent to the existing Central CityRail Station buildings. The station construction site would be located on the western side of the existing Central Station bound by Eddy Avenue and Pitt Street, as shown in Figure 2.7. In addition, some construction activities may be required within Belmore Park, where the rail tunnels are relatively shallow. Works could include ground reinforcement or removal of tunnel boring machines. Further details, including constraints and mitigation measures, would be identified in the Environmental Assessment.

The station would be a shallow cut-and-cover station box with reinforced concrete walls and slabs. Entrances would be located on Eddy Avenue, Pitt Street and George Street and there would also be a direct link to the main concourse hall of the existing Central CityRail Station. In addition, pedestrian subways are proposed under the country platforms and under George Street. The concourse would be below ground level, with escalator and lift access to platform level.

Station planning would create and emphasise strong connections to CityRail platforms (suburban and country) and with bus, taxi and light rail modes.

Figure 2.7 Central Station construction footprint (indicative only)



Central Railway Station is listed on the Register of the National Estate. Central Railway Station includes all rail viaduct structures adjacent to Belmore Park and the colonnade along Eddy Ave and Pitt St. Railway Square Park is also part of this heritage item. Whilst there would be significant intervention to heritage buildings and areas in this location, a considerable amount of design and architectural work would be undertaken to ensure that impacts are minimised and the new Metro station is appropriate to its surroundings and place (see section 4.6).

2.12 Stabling facilities, maintenance depot and control centre

A stabling facility and maintenance depot is proposed at Lilyfield/Rozelle within the former Rozelle Marshalling Yards site. The facility would occupy approximately 5.5 ha (above ground) and provide for the following key functions:

- Maintenance depot
- Stabling for the initial train fleet (up to 13 trains)
- Infrastructure maintenance equipment
- Operation Control Centre (OCC) to manage the day-to-day operation of the metro service

- General administration and training
- Depot traction substation area

The maintenance depot would provide for the ongoing maintenance of the entire rolling stock fleet, including preventative and corrective maintenance, heavy lift and overhead work, automated exterior train washing, underfloor wheel lathe, general presentation area and associated office and storage facilities.

The stabling facility would be designed for expansion to ultimately provide for approximately 23 train sets in the future (including the use of the maintenance depot).

Infrastructure maintenance vehicles and equipment storage would also be located within the facility including a rail grinder, mobile cranes, locomotives, several wagons, and several hi-rail vehicles. These would have power supplies other than the traction supply system.

The OCC and the general administration and training area will also be accommodated adjacent to the stabling facility and maintenance depot. The OCC is discussed further in Section 2.8.15.

Details of the site layout and proposed activities will be included in the Environmental Assessment. The stabling facility, maintenance depot and OCC would be designed to minimise potential impacts on nearby residential areas. In particular, operational noise and light spill would be subject to stringent criteria.

2.13 Ancillary facilities

The CBD Metro also includes a number of ancillary facilities critical to the operation of the project, as outlined in the following sections.

2.13.1 Crossovers and turnbacks

Crossovers and turnbacks are required for the reliable operation of the metro network. The following crossovers and turnbacks are considered likely to be provided:

- Diamond crossover at Central Station (underground)
- Turnback at Central Station – approximately 180 metres long (underground)
- Diamond crossover at Rozelle Station (underground)
- Crossover at city end of future White Bay Station for connection to Rozelle Stabling and Maintenance Depot – approximately 180 metres long (underground)
- Crossovers to enable trains to enter and depart from the stabling facility and maintenance depot

2.13.2 Power supply

The CBD metro would require electrical power during construction and operations.

Construction power supplies will generally be 11kV or 33kV independent feeds to each station construction site and the White Bay tunnelling site. These supplies would be rated to feed the required road headers and TBM electrical loads (being underground works not suited to combustion engine powered plant).

These construction power supplies would generally be provided by underground cables from a local supply point to the sites with the installation of cable pits as necessary. Lengths of these construction supplies are estimated to range between 100m and 3km.

The operational power system is made up of various components.

1. Bulk supply point (BSP): The BSP is the electrical supply point from Energy Australia. This in turn feeds the CBD metro's HV reticulation system, which in turn feeds the traction supply and station and depot supply systems. The CBD Metro project would require only 1 BSP.

2. High Voltage (HV) reticulation: The HV reticulation system transfers and controls the supply of power throughout the CBD Metro infrastructure. The preferred system would be a 33kV ring network with controlling switchgear at each station and the maintenance depot.

3. Traction supplies: Traction supply substations would be used to provide electrical power to the Over Head Wire (OHW) contact system. The traction supply substations are proposed to be located within certain station plant rooms and within the maintenance depot.

4. Station and depot supplies: Station and depot supply substations are used to provide electrical power to the station and depot buildings. These substations would be contained within station or depot buildings.

Energy Australia is considering preferred supply options for both construction and operation.

2.13.3 Water treatment

The tunnels would be fully tanked and lined, and it is expected that there would be negligible seepage of groundwater. As such, no permanent water treatment facilities are expected to be required for normal operations within the tunnels. Local water control, such as drainage and storm water management, would be required at stations.

Water treatment facilities would be required at the maintenance depot.

2.14 Constructability

2.14.1 Construction staging and timing

The entire project would be built in a single stage with construction works commencing in 2010 and trains operating between Rozelle and Central by the end of 2015.

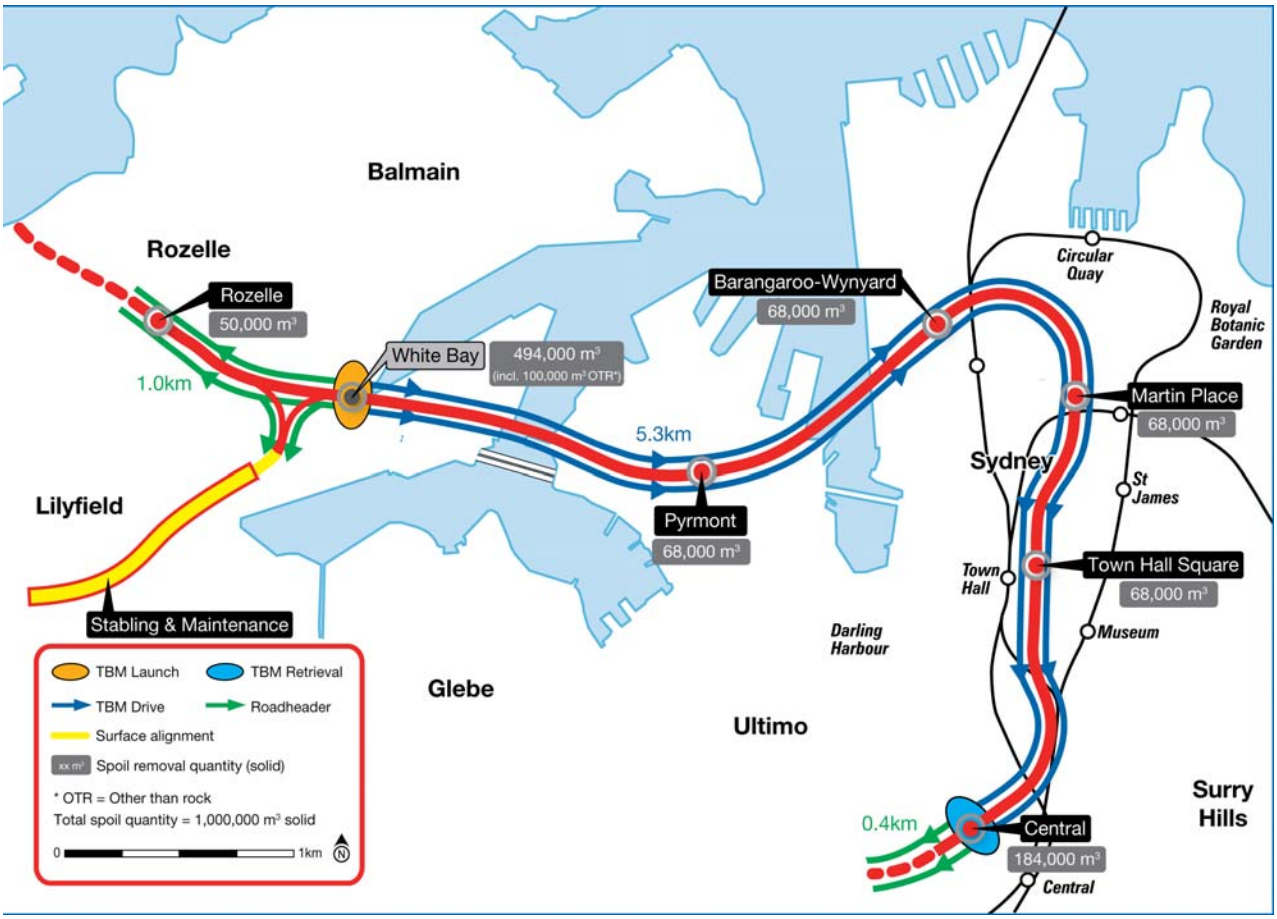
2.14.2 Construction methodology

The 7km tunnels from Central to Rozelle are likely to be constructed using Tunnel Boring Machines (TBMs), which would be launched from White Bay and operate concurrently for lengths of approximately 5 km each, and then retrieved either within the station construction site or Belmore Park. Excavated spoil from behind the TBMs would be removed via conveyor at White Bay and transported away for reuse or disposal. Figure 2.8 indicates a possible tunnelling sequence.

The tunnels from White Bay to Rozelle will be either excavated by road headers or TBMs, with precast rings being erected behind the excavation to provide a continuous pre-cast concrete lining. Spoil removal would be from the White Bay construction site.

The stabling connections would run separately in roadheader tunnels and surface via a portal and dive structure within the Rozelle/Lilyfield stabling facility and maintenance depot site.

Figure 2.8 Tunnelling Sequence – Possible scheme including approximate spoil quantities to be removed (subject to design development)



Construction of trackform, and installation of track, power, communications and other equipment would be undertaken when TBM operations and tunnel construction is completed.

Road headers, rock breakers and conventional excavation methods would be required for other underground construction activities such as station excavation, TBM access/retrieval shafts, take-off chambers and dives, services and ventilation shafts, crossovers and cross passages.

The harbour crossings would all be constructed using TBMs that would tunnel through the sediments overlying sandstone below each water body.

Below ground activities are proposed to occur up to 24 hours per day, 7 days per week, along with certain above ground sites that support tunnelling and fit out activities. However at above ground locations where sensitive noise receptors are close to the proposed construction works, specific noisy activities are likely to be restricted during evening and night-time periods.

Depending on road network conditions, spoil removal by truck is likely to be restricted to occur outside of peak hours and special events, and may therefore occur overnight. Spoil removal by rail or barge will be investigated.

2.14.3 Construction sites

A number of construction sites are proposed as part of the project, including a major TBM operations site, TBM retrieval sites, stabling and maintenance depot and station sites.

Table 2.2 details the construction activities that would occur at each of these sites.

Table 2.2 Construction activities

Sites	Construction Activity
Central	Station construction; TBM retrieval; roadheader launch and retrieval; spoil removal (possible contaminated material); underground crossover and turnback construction
Town Hall Square (more than 1 site)	Station construction; spoil removal
Martin Place (more than 1 site)	Station construction; spoil removal
Barangaroo-Wynyard (more than 1 site)	Station construction; spoil removal
Pyrmont (more than 1 site)	Station construction; spoil removal
White Bay	Major TBM site – see below
Lilyfield/Rozelle rail yards	Stabling facility and maintenance depot construction; major track and rail systems installation – see below
Rozelle (more than 1 site)	Station construction; underground crossover and turnback construction; spoil removal

Other ancillary construction activities would be required for:

- Batching plants (for the production of concrete or grout) that may be required at the White Bay construction site. The Environmental Assessment will assess the impacts of batching plants at the site if required.
- A temporary water treatment plant would be required to treat tunnel construction water during construction at the White Bay construction site.
- Temporary power supply augmentation would likely be required to support TBM operations and other construction activities. Details will be provided in the Environmental Assessment.

2.14.4 White Bay and Lilyfield construction sites

The White Bay precinct provides an opportunity to establish a major construction site to support tunnel construction (Tunnel Boring Machine launch site and major spoil removal) and rail systems installation. Spoil handling and removal at this site would involve approximately half a million cubic metres of spoil (solid) for the tunnel drives.

The worksites would occupy areas of White Bay and the Lilyfield/Rozelle rail yards. Heavy vehicle access to the worksites would be via James Craig Road and the City West Link. The construction site and footprint, identified in Figure 2.9, would be assessed further in the Environmental Assessment.

Figure 2.9 White Bay and Lilyfield construction site

The work activities on site would generally include:

- Enabling works that would include temporary construction of high voltage power supply and substation for TBM usage; services relocation; demolition works; vegetation clearing and grubbing
- Establishment of a site compound including site offices, parking area, amenities, workshops, materials / plant storage areas, and truck wheel wash facility
- Tunnel construction water treatment plant and water tanks
- Tunnel air ventilation and extraction plant
- Assembly and launching of TBMs
- Spoil storage area and disposal by road, rail and/or barge
- Tunnel precast segmental lining delivery and storage; electrical and mechanical lay down areas
- Tunnel grout or concrete batching plant
- Tunnel rail systems including track work, and electrical and mechanical related installation works
- Excavation of tunnel decline access for road/rail plant.

2.14.5 Management of spoil

The CBD Metro would produce spoil from the following:

- Excavation of tunnels (using TBMs and road headers) and tunnel dive structures, rail crossovers and turnbacks
- Excavation of underground station box structures
- Excavation of station access and ventilation shafts

- Construction of surface sections in cut or fill including stabling facility.

Spoil would be generated from the excavation of tunnels, the station boxes, vertical access shafts, dive structures, and (surface) cut/fill activities for the stabling facility.

Table 2.3 outlines the volumes of spoil generated from each site.

Table 2.3 Summary of estimated spoil quantities from each site (m^3 in ground)

Location	Tunnels by TBM (m^3)	Tunnels by Roadheader (m^3)	Stations (m^3)	Depot (m^3)	Total (m^3)	Material
Rozelle		3,000	47,000		**50,000**	Sandstone
White Bay	228,000 65,000	104,000	62,000	35,000	**394,000** **100,000**	Sandstone Other Than Rock
Pyrmont			68,000		**68,000**	Sandstone
Wynyard			68,000		**68,000**	Sandstone
Martin Place			68,000		**68,000**	Sandstone
Town Hall Square			68,000		**68,000**	Sandstone
Central		5,000 20,000	79,000 80,000		**84,000** **100,000**	Sandstone Shale
Sub-Totals	**228,000**	**112,000**	**460,000**		**800,000**	**Sandstone**
		20,000	**80,000**		**100,000**	**Shale**
	65,000			**35,000**	**100,000**	**Other Than Rock**
Totals	**293,000**	**132,000**	**540,000**	**35,000**	**1,000,000**	**All Spoil**

A number of potential spoil re-use options have been identified (Table 2.4). These would be further analysed for suitability during the preparation of the Environmental Assessment. It should be noted however, that the final spoil re-use location would be ultimately selected by the construction contractor.

Table 2.4 Summary of possible large-scale spoil disposal sites and quarries in and outside the Sydney Region

Company	Location	Capacity
Alexandria Landfill	Albert St, St Peters	Not known
Hornsby Shire Council	Hornsby quarry	3.5 million m3
Benedict Reclamations	Moorebank	Not known
Holt Land Rehabilitation *	Kurnell	Not known (but extensive)
CSR Schofields Quarry	Meadows Road, Schofields	1 to 1.5 million m3
Wallgrove Quarry	Eastern Creek	11 million m3
CSR PGH Horsley Park	Old Wallgrove Road	2 million m3
Austral Plant 3	Horsley Park	1.5 million m3
Penrith Lakes Development Corporation	Penrith Lakes Scheme at Castlereagh Road	5 million m3
Boral Peats Ridge	Peats Ridge and Other	1 million m3 per year
Dunmore Sand Quarry *	Near Shellharbour	Not known
Vineyard employment area	West side of Richmond Station	500,000 m3 from 2010
Rocla Sand Quarry	Newness Plateau, Lithgow	2 million m3
Port Kembla Port Corporation	Port Kembla	4 million m3 (approximately)

Note: * Designated VENM (virgin excavated natural material) only receivable sites

2.15 Operation

2.15.1 Service requirements

The CBD Metro would provide a service between Rozelle and Central with a travel time of approximately 10 minutes. The CBD Metro is currently proposed to operate from 5.30 am to 12 midnight Sunday to Thursday, and from 5.30 am to 1 am (Friday and Saturday). These operating hours can be adjusted to cater for special events, and capacity remains for 24 hour operation (subject to maintenance requirements).

It is likely that one train would be stabled overnight at Central and one at Rozelle to facilitate early morning start up operations. All remaining trains would be stabled within the stabling facility and maintenance depot at Lilyfield/Rozelle.

Generally all track maintenance activities would be undertaken during night time periods when trains are not operating.

2.15.2 Train operations

Trains are proposed to operate under Automatic Train Operation (ATO) with driverless capability. There would be provision for an on-board train attendant with defined duties to assist with customer service.

Train operational control functions would be centralised at the Operations Control Centre (OCC), located at the maintenance depot. Station systems would be controlled from a number of control rooms located at stations.

In the event of a breakdown or emergency the system is designed to continue to operate using Automatic Train Protection (ATP).

The exit path for train evacuation in a tunnel in the event of a breakdown or emergency would likely be via the front or rear train door directly onto the track centre towards the designated station(s) or emergency exit.

2.15.3 Station operations

Stations would be designed to provide easy access for all persons with a range of different needs. Platform screen doors would be utilised at all stations. These would effectively separate the station from the tunnel/surface rail line, and enable less disruption to service, less littering and trackside cleaning, improved safety and reduce the need for mechanical ventilation.

2.15.4 Stabling and maintenance operations

The stabling facility and maintenance depot would operate 24 hours a day to provide for the control and management of the metro railway network, maintenance, repair, refurbishing, upgrading, stabling, cleaning, despatch and retrieval activities on the operating passenger train fleet and a base for infrastructure maintenance activities.

The types of activities would vary considerably throughout the day. For example, trains would depart the facility from about 5:30am to 6:30am. About half of the train fleet would return to the stabling area after the morning peak (about 9:00am). These trains would depart again for the afternoon peak and return to the depot at about 7:00pm. The remaining trains would return to stabling around midnight, when the Infrastructure Maintenance Operations Period would commence. Infrastructure maintenance trains would leave the depot around midnight and return around 5:00am.

Rolling stock maintenance would occur during the day and after the evening peak. It would not normally be undertaken on a weekend. There would be a wheel lathe, in a properly sound proofed building. Wheel turning would occur infrequently.

Trains would proceed through the automated train washing plant when they return to the depot after the morning and afternoon peaks but this would not be a noisy activity. Brake testing would occur within the rolling stock maintenance building. As the trains would be driverless and controlled by an Automatic Train Operation (ATO) system it is not intended that horns be fitted to the rolling stock.

2.15.5 Rolling stock

The proposed trains will be procured through a high level performance and functional requirement specification to ensure proven “off the shelf” type rolling stock technologies can be supplied. The rolling stock will be standard single deck metro type trains in a 5-car set with overhead traction power.

Subject to detailed design, the trains will be nominally 110m long with a body width of approximately 3.2m. Each car will have three bi-parting doors per side, two-by-two transverse seating, a wide centre aisle, wheelchair spaces and an open full-width passageway (between cars) to assist passenger movement and provide a clean open environment.

The trains would be equipped with modern passenger surveillance and communication systems and have disability access provisions.

2.15.6 Track form

A ballastless (concrete slab) track form in the tunnels is proposed. Initial acoustic modelling indicates that a resilient booted sleeper design appears suitable in all locations. This involves providing a rubber 'boot' around the sides and bottom of the sleeper where the track is fastened, to reduce the transfer of noise and vibration into the surrounding ground and building structures above the tunnels.

In highly sensitive areas, rubber boots with a higher acoustic performance would be provided. In some locations higher attenuation track form may be required, where reasonable and feasible, to further mitigate ground-borne noise.

3 Planning framework and statutory requirements

3.1 Planning approval requirements

Part 3A of the *Environmental Planning and Assessment Act 1979* (EP&A Act) establishes an assessment and approval regime for major infrastructure or other projects. Projects to which Part 3A applies are declared to be a Part 3A project by either a State Environmental Planning Policy or Ministerial Order.

On 6 February 2009, the Minister for Planning's declaration was gazetted that makes the CBD Metro a project to which Part 3A applies. The declaration states that the flowing development is of State and regional environmental planning significance:

> *The construction and operation of a new electrified passenger metro railway between the Sydney CBD and Rozelle. The project includes development for all associated or ancillary works, activities, uses, structures or facilities including (but not limited to):*
>
> 1. *construction (including demolition works), and operation (excluding maintenance) of the project;*
> 2. *any winning, obtaining or disposal of extractive material as part of the construction work of the project including transport of material and any associated access roads/rail tracks and sidings, conveyors, loading facilities and wharf facilities constructed for this purpose;*
> 3. *temporary batch plants, concrete casting yards, excavated material reprocessing facilities associated with construction activities;*
> 4. *access for construction, maintenance or operation of the project, including roads, access for pedestrians, cyclists, public transport and vehicles, and emergency egress/access facilities;*
> 5. *metro stations, including car parks, and associated transport interchanges (ie. bus, rail, light rail, taxi, coach, ferry, bicycle and kiss and ride facilities) and public amenities;*
> 6. *retail premises, business premises or community facilities in a metro station complex, including areas in the complex that customers use to gain access to station platforms;*
> 7. *train stabling, maintenance, administration and control facilities;*
> 8. *utilities / service installations or diversions, including power supply and protection of existing assets,*
> 9. *landscaping and public domain improvements; and*
> 10. *advertising structures.*
>
> *This order does not apply to activities comprising of:*
>
> *(a) surveys;*
> *(b) test drilling;*
> *(c) test excavations;*
> *(d) preliminary geotechnical investigations,*
>
> *or the like, associated with the design and environmental assessments required for the development of the Project prior to the commencement of construction.*

The CBD Metro is therefore considered to be a project to which Part 3A applies.

3.1.1 Critical Infrastructure declaration

Section 75C of the EP&A Act provides that the Minister for Planning may declare a project to be a critical infrastructure project because it is, in the opinion of the Minister, essential for the State for economic, environmental or social reasons.

The critical infrastructure provisions of the EP&A Act:

- Ensure the timely and efficient delivery of essential infrastructure projects
- Allow the Government and the planning system to rapidly and readily respond to the changing needs of the State
- Provide certainty in the delivery of these projects
- Provide for rigorous scrutiny to ensure environmental outcomes are appropriate
- Focus on delivering outcomes essential to the NSW community.

On 2 May 2008, the Minister for Planning's declaration that "development for the purpose of a metro rail line to contribute to a metro rail network providing high speed, high frequency mass-transit capacity within the Greater Metropolitan Region" would be a critical infrastructure project under Section 75C of the EP&A Act was gazetted.

The CBD Metro is therefore considered to be critical infrastructure.

3.2 The proponent

Sydney Metro is the NSW Government agency constituted under the *Transport Administration Act* 1988 as amended by the *Transport Administration Amendment (Metro Rail) Act 2008* to develop a metro railway system, including procuring the CBD Metro and possible future extensions of it.

The principal functions of Sydney Metro is to develop safe and reliable metro railway systems for Sydney. It will be the governing body responsible for the development and delivery of the CBD Metro and possible future extensions.

3.3 Environmental Assessment and planning approval process

The proponent (Sydney Metro) now seeks a Project Approval under Part 3A of the EP&A Act for the CBD Metro. This Preliminary Environmental Assessment has been prepared to support the Project Application. A summary of the planning approval and Environmental Assessment process, and indicative key milestones is illustrated in Figure 3.1.

Figure 3.1 Indicative Planning approvals and Environmental Assessment process

3.4 Environmental planning instruments

3.4.1 State Environmental Planning Policies

Section 75R(2) of the EP&A Act states State Environmental Planning Policies (SEPPs) apply to:

> *"(a) the declaration of a project as a project to which this Part applies or as a critical infrastructure project, and*
>
> *(b) the carrying out of a project, but (in the case of a critical infrastructure project) only to the extent that the provisions of such a policy expressly provide that they apply to and in respect of the particular project."*

The CBD Metro has been declared to be a critical infrastructure project. To date there are no SEPPs that "expressly provide that they apply to and in respect of" the CBD Metro project.

By reason of the operation of sections 75J and 75R of the EP&A Act, and the critical infrastructure declaration, the project may be approved notwithstanding a prohibition contained in an environmental planning instrument, including a SEPP unless that SEPP specifically states that it applies to the critical infrastructure project.

State Environmental Planning Policy (Infrastructure) 2007 contains statutory provisions that permit the construction and operation of the project without the need for development consent under Part 4 of the EP&A Act.

Other SEPPs that may provide useful guidance, as opposed to statutory requirements, regarding potential issues and synergies to be addressed within the Environmental Assessment include:

- *State Environmental Planning Policy No. 55 – Remediation of Land*

3.4.2 Regional Environmental Plans and Local Environmental Plans

Section 75R(2) of the EP&A Act states that "environmental planning instruments (other than State environmental planning policies) do not apply to or in respect of an approved project". Further, Section 75J(3) states:

> *"In deciding whether or not to approve the carrying out of a project, the Minister may (but is not required to) take into account the provisions of any environmental planning instrument that would not (because of section 75R) apply to the project if approved."*

As the project is critical infrastructure, Regional Environmental Plans (REPs) and Local Environmental Plans (LEPs) do not apply to the project. The Minister may, but need not, consider these plans in his determination of the application.

The following REPs may apply to the land on which the project would be located, and will be reviewed where relevant as part of the Environmental Assessment:

- *Sydney Regional Environmental Plan (Sydney Harbour Catchment) 2005*
- *Sydney Regional Environmental Plan No 26 – City West.*

The following LEPs apply to the land on which the project would be located, and will be reviewed where relevant as part of the Environmental Assessment:

- *Leichhardt Local Environmental Plan 2000*

- *Sydney Local Environmental Plan 2005.*

3.5 Other regulatory licences and approvals that may be required

Section 75U(1) of the EP&A Act specifies certain authorisations that are not required for an 'approved project' under Part 3A, namely:

> *"(a) the concurrence under Part 3 of the Coastal Protection Act 1979 of the Minister administering that Part of the Act,*
>
> *(b) a permit under section 201, 205 or 219 of the Fisheries Management Act 1994,*
>
> *(c) an approval under Part 4, or an excavation permit under section 139, of the Heritage Act 1977,*
>
> *(d) a permit under section 87 or a consent under section 90 of the National Parks and Wildlife Act 1974,*
>
> *(e) an authorisation referred to in section 12 of the Native Vegetation Act 2003 (or under any Act to be repealed by that Act) to clear native vegetation,*
>
> *(f) a permit under Part 3A of the Rivers and Foreshores Improvement Act 1948,*
>
> *(g) a bush fire safety authority under section 100B of the Rural Fires Act 1997,*
>
> *(h) a water use approval under section 89, a water management work approval under section 90 or an activity approval under section 91 of the Water Management Act 2000."*

Section 75A defines 'approved project' as *"a project to the extent that it is approved by the Minister under this Part, but does not include a project for which only approval for a concept plan has been given"*. Consequently, any approvals that would otherwise be needed would not be required following project approval to carry out the project under Part 3A.

Under Section 75V(1) of the EP&A Act, the following relevant authorisations cannot be refused if necessary for the carrying out of an 'approved project' and are to be substantially consistent with an approval to carry out the project given under Part 3A:

- An Environment Protection Licence under Chapter 3 of the *Protection of the Environment Operations Act 1997*
- A consent under s138 of the *Roads Act 1993*.

In addition, with respect to a critical infrastructure project, Section 75U(3) provides that the following orders or notices cannot be made or given so as to prevent or interfere with the carrying out of an approved critical infrastructure project::

> *"(a) an interim protection order (within the meaning of the National Parks and Wildlife Act 1974 or the Threatened Species Conservation Act 1995),*
>
> *(b) an order under Division 1 (Stop work orders) of Part 6A of the National Parks and Wildlife Act 1974, Division 1 (Stop work orders) of Part 7 of the Threatened Species Conservation Act 1995 or Division 7 (Stop work orders) of Part 7A of the Fisheries Management Act 1994,*
>
> *(c) an environment protection notice under Chapter 4 of the Protection of the Environment Operations Act 1997,*

(d) an order under section 124 of the Local Government Act 1993."

3.5.1 Protection of the Environment Operations Act 1997

Activities for which a licence is required under the Protection of the Environment Operations Act 1997 (POEO Act) are detailed in Schedule 1 of the Act.

Clause 33 of Schedule 1 relates to 'railway systems activities', which are defined as:

"(a) the installation, on site repair, on site maintenance or on site upgrading of track, including the construction or significant alteration of any ancillary works, or

(b) the operation of rolling stock on track."

In Clause 33, track means *"railway track that forms part of, or consists of, a network of more than 30 kilometres of track, other than railway track that is used solely by railway vehicles that are themselves used solely for heritage purposes"*.

The project involves the construction and operation of less than 30 kilometres of railway track. Notwithstanding, future extensions of the Metro network would result in a network of more than 30 kilometres of track. The requirement and timing of an Environment Protection Licence under the POEO Act will be discussed with the Department of Environment and Climate Change.

3.5.2 Roads Act 1993

Section 138(1) of the Roads Act 1993 (Roads Act) states:

"A person must not:

(a) erect a structure or carry out a work in, on or over a public road, or

(b) dig up or disturb the surface of a public road, or

(c) remove or interfere with a structure, work or tree on a public road, or

(d) pump water into a public road from any land adjoining the road, or

(e) connect a road (whether public or private) to a classified road,

otherwise than with the consent of the appropriate roads authority."

The project is expected to involve erecting structures in, on or over some public roads, as well as temporarily occupying or disturbing the surface of some public roads. Consent from the appropriate roads authority, being the Roads and Traffic Authority or the local council as relevant, would be required in accordance with section 138 of the Roads Act in respect of work carried out by a *"public authority"* on a classified road.

3.6 Commonwealth legislation – Environment Protection and Biodiversity Conservation Act 1999

The Commonwealth *Environment Protection and Biodiversity Conservation Act* 1999 (EPBC Act) prescribes the Commonwealth's role in environmental assessment, biodiversity conservation and the management of protected areas and species, populations and communities and heritage items.

The approval of the Commonwealth Minister for the Environment, is required for:

- An action which has, will have or is likely to have a significant impact on "matters of National Environmental Significance" (NES matters). The current NES matters include:
  - The world heritage values of a declared World Heritage property
  - The National Heritage values of a listed National Heritage place
  - The ecological character of a declared Ramsar wetland
  - Listed threatened species and ecological communities
  - Listed migratory species
  - The Commonwealth marine environment
  - Nuclear actions
- An action by the Commonwealth or a Commonwealth agency which has, will have or is likely to have a significant impact on the environment
- An action on Commonwealth land which has, will have or is likely to have a significant impact on the environment
- An action which has, will have or is likely to have a significant impact on the environment on Commonwealth land, no matter where it is to be carried out.

The project is not anticipated to intercept or affect Commonwealth land.

NES matters are assessed through a referral process to the Commonwealth Department of the Environment Water Heritage and Arts (DEWHA). If the Commonwealth Minister for the Environment determines that a project is likely to have a significant impact on a NES matter then the project becomes a controlled action and approval of the Commonwealth Minister for the Environment would be required before construction could commence.

At this stage no actions that may have a significant impact on NES matters have been identified. This will be confirmed as part of the Environmental Assessment and, if required, a referral to DEWHA would be prepared.

4 Identification of key environmental issues

4.1 Overview

Environmental risk analysis enables the identification of potentially significant environmental effects associated with development projects. It is an important part of the Part 3A Environmental Assessment process. Evaluation of the construction and operating characteristics of development projects and the baseline environment assists in deriving important information on potential issues, and further assessment needs. Where relevant, existing assessments in the study area provide useful background information that aids the environmental risk analysis process.

Building on the review and reconfirmation of these existing key risk issues, the CBD Metro environmental risk analysis has adopted an iterative evaluation process. This enables environmental risk issues to be incorporated into the project design. The results of this preliminary environmental risk analysis have identified those issues considered to be key issues for the Environmental Assessment. These key issues are discussed, and anticipated requirements for further assessment have been identified.

This section of the Preliminary Environmental Assessment provides the conclusions of the environmental risk analysis and addresses those aspects as they generally relate to the whole project. The Preliminary Environmental Assessment provides information on the key environmental issues that relate to construction and operation of the project.

A number of other non-key issues that could largely be addressed using management measures have also been identified and are addressed in this section.

Table 4.1 presents a summary of the key environmental issues identified.

Table 4.1 Summary of key environmental issues

Key environmental issues	Construction	Operation
Traffic, transport, parking & access	X	X
Noise & vibration	X	X
Socio-economic factors	X	X
Spoil management	X	
Non-Indigenous heritage	X	

4.2 Traffic, transport, parking & access

4.2.1 Potential issues during construction

Construction traffic impacts would be expected at the station construction sites. The road network in the vicinity of these sites would experience additional heavy vehicle movements. Site specific issues are identified in Table 4.2 but will generally include:

- Traffic safety and capacity issues associated with the movement of construction related materials and equipment by trucks along the regional road network
- Congestion and amenity issues caused by construction traffic accessing the proposed construction sites from the local road network
- Temporary disruption to roads, car parking, pedestrian and cycle links, taxi stands and bus service routes as a result of construction works.

Table 4.2 Traffic, transport, parking & access – site specific issues

Site	Potential issues (construction and operation)
Rozelle	Construction • Increased traffic at the intersection of Darling Street and Victoria Road • management of bus services Operation • allowing for effective bus mode change
Pyrmont	Construction • staged temporary impacts to the trafficable part of Union Street • potential impacts on Harris and Pyrmont Streets • disruption to pedestrians and key bike route along Union Street and Union Square Operation • connectivity with light rail and bus services
Barangaroo-Wynyard	Construction • closure of part of Napoleon Street throughout the construction period at this site • staged closure of Jamison Street during construction • disruption to pedestrians around construction sites Operation • potential changes to Napoleon Street and Jamison Street • pedestrian connectivity to Barangaroo, Wynyard CityRail Station and bus services
Martin Place	Construction • impacts on Castlereagh Street, Bligh Street and potentially Hunter Street • disruption to pedestrians along Martin Place and Castlereagh Street • temporary removal of parking / loading zones (Castlereagh Street)

Site	Potential issues (construction and operation)
Town Hall Square	Construction • impacts on Pitt Street and Park Street • disruption to pedestrians along Pitt Street and Park Street • protection of the Monorail infrastructure • displacement/ removal of taxi rank, parking / loading zones (Pitt and Park Streets) Operation • changes to bus and taxi arrangements
Central	Construction • relocation of Interstate coach terminal on Eddy Ave and Pitt Street • disruptions to taxi, vehicular and pedestrian access (Main Entrance and Western Forecourt areas of Central) • management of country and intercity services during construction • management of pedestrians and bus services at Railway Square Operation • allowing for effective transport interchange, including between CityRail services, long distance passenger rail services, bus services, taxis, light rail and Interstate coaches
Lilyfield/Rozelle stabling facility and maintenance depot	Construction • construction traffic, including out of hours deliveries, on local roads Operation • traffic from staff and deliveries
White Bay construction site	Construction • significant construction traffic, including removal of spoil via Victoria Road and City West Link

Construction traffic impacts associated with the project will be identified further in the Environmental Assessment. In consultation with the RTA and/or relevant councils the surface components of the project affecting roads will be designed to minimise traffic disruptions as far as reasonable and feasible. Depending on road network conditions, heavy vehicle movements are likely to be restricted to occur outside of peak hours and special events, and some movements during the evening and night time may be necessary.

There will be a need to explore innovative approaches to traffic management to ensure that these potential combined impacts within the CBD are minimised.

Further assessment of the impacts on traffic in the CBD will be undertaken during preparation of the Environmental Assessment including the need to consider a CBD wide traffic management strategy focussed on the long term and the consideration of cumulative impacts originating from other construction activities at the same period. This will include consideration of cumulative impacts, such as the Victoria Road Upgrade Project, Barangaroo redevelopment works, and the City East Cable Tunnel.

4.2.2 Potential issues during operation

Some traffic issues may occur as a result of operation, such as changes to access arrangements (see Table 4.2). However, it is envisaged that, once operational, the CBD Metro will provide a number of traffic and transport benefits, including:

- Reduced traffic levels on major arterial roads
- Improved pedestrian environments at station sites, and integration with other transport modes around rail stations with new road crossings, footpaths and mode change areas encouraged as part of the design
- Improved accessibility of station areas to Sydney's public transport network, providing improved travel choice and potential for travel time savings
- Increased focus on prioritised bus, pedestrian and cycle movements at stations.

Once operational, the CBD Metro will provide efficient and convenient transport interchanges. These include interchanges with CityRail stations at Barangaroo-Wynyard, Martin Place, Town Hall Square and Central; and interchanges with buses at Barangaroo-Wynyard, Central and Rozelle. Central and Pyrmont would also provide a Light Rail interchange function.

The station precincts will be designed to provide a high degree of accessibility to all modes-of-access, consistent with the objectives of *Integrated Land Use and Transport* (DUAP 2001).

Mode-of-access arrangements at each new station will be identified, with consideration to (but not necessarily limited to) the following matters:

- Road access arrangements
- Bus access arrangements
- Interchange with CityRail stations
- Interchange with light rail
- Provision for kiss and ride and taxis
- Pedestrian and cycle linkages.

4.3 Noise & vibration

4.3.1 Potential issues during construction

During construction of the project, noise would be generated from the tunnelling activities, resulting in ground-borne noise sources. Tunnel Boring Machines (TBMs) would generally operate 24 hours per day, up to 7 days per week. However they would move progressively along the alignment, such that most receivers would be exposed to peak levels of construction noise emissions for a short period. The highest noise levels would occur when the TBM is close to receivers, with typical noise levels up to 50 dBA potentially experienced where the tunnel is constructed at shallow levels less than 25 metres below ground. However, any noise disturbance would occur for only short periods of time (no more than a few days).

Construction noise impacts are likely to be experienced at station sites. Below ground construction activities are proposed to occur 24 hours per day, 7 days per week, along with certain above ground sites that support tunnelling and fit out activities.

At locations where sensitive noise receptors are close to the proposed construction works, some specific noisy activities are likely to be restricted during evening and night-time periods. Depending on road network conditions, spoil removal is likely to be restricted to occur outside of peak hours and special events, and may therefore occur overnight. Construction during night time periods would be subject to reasonable and feasible mitigation measures (see section 6.2).

Construction of the project would also generate airborne noise as a result of surface construction works and truck movements associated with deliveries and spoil removal and other associated construction activities. Noise emissions from station and above ground ancillary construction sites also have the potential to impact on adjacent residences and businesses for longer periods.

Preliminary assessments indicate that the implementation of noise mitigation measures and construction techniques at construction and station sites would need to be considered. These could include temporary barriers and enclosures; well planned site layouts to create noise shields; use of well maintained and modern and relatively quiet equipment; good construction planning; and scheduling work as much as possible in standard daytime construction hours. In addition at sites where night-time construction activity is necessary, higher noise generating activities would need to be minimised during this period along with implementation of appropriate mitigation measures including effective communication with affected receivers.

With regard to vibration, the recommended safe working distances to avoid any cosmetic or structural damage would be observed. Vibration from vibratory equipment may be potentially perceptible at some dwellings but would involve levels well below those that would have any potential to cause damage to buildings.

4.3.2 Potential issues during operation

The existing acoustic environment of the study area includes commercial development, entertainment activities, retail development, and a range of residential development from low to medium and higher densities. Transport-related noise from major road networks is the predominant existing noise source. Residential dwellings comprise the majority of sensitive receivers along the alignment at Rozelle and Pyrmont, and adjacent to the stabling facility and maintenance depot.

Motor vehicles (including buses) and port facilities are significant existing noise and vibration sources within Sydney CBD and Pyrmont. Commercial properties are not considered to be as sensitive to noise and vibration impacts as residential receivers. As commercial properties dominate in the CBD, noise and vibration impacts are not expected to be as significant as for other receivers.

There are however a number of recreational and entertainment receivers and some residential dwellings in the affected area, which are all sensitive receivers.

During operation of the CBD Metro, rail traffic in the tunnel would generate some ground-borne noise and vibration. The key parameters influencing the level of ground-borne noise are train speed, wheel condition, rail condition, track features and design, tunnel design, rolling stock design, receiver distance, ground conditions, depth of tunnel and the building design. Preliminary ground-borne noise modelling is underway as part of the design process, with all of the above parameters being considered. Preliminary modelling has identified some areas along the alignment where the risk of ground borne noise impacts is higher due to landuse and relatively shallow tunnel depths. The Environmental Assessment will focus on these areas and provide details of proposed mitigation measures to ensure that impacts would be within the *Interim Guideline for the Assessment of Noise from Rail Infrastructure Projects* (DECC, 2007) (IGANRIP) noise trigger levels.

Operations at the Lilyfield/Rozelle stabling facility and maintenance depot have the potential to result in noise impacts on nearby receivers. Mitigation measures for the stabling facility and maintenance depot would be developed so that operational noise would be minimised. Further assessment would be undertaken consistent with the relevant Industrial Noise Policy (Environmental Protection Agency, 2000).

4.4 Socio-economic factors

4.4.1 Potential issues during construction

The CBD Metro would be located close to established densely populated urban land uses. This includes residential areas, schools and churches, entertainment and recreational facilities, city parks, and small, medium and large businesses and retail.

Positive economic impacts are expected as part of the project, including increased economic activity and employment opportunities during the construction stage. Employment would be expected directly on the project and indirectly through manufacturing, services and support industries.

The main potential adverse socio-economic impact associated with the project would be the potential for disruption during construction. Increased noise and traffic levels, dust generation, access impacts, disruption to use of community assets and reduction of visual amenity during construction activities could temporarily adversely affect local residents, schools and businesses. There would also be disruption to business during construction from changed access and parking arrangements, and noise and vibration impacts. Property and business acquisitions would also be required along the corridor (see section 5.1).

In addition to direct impacts commercial businesses located outside the construction precincts may experience disruption to business activities, including temporary customer inconvenience.

A socio-economic assessment will be undertaken as part of the Environmental Assessment.

4.4.2 Potential issues during operation

The station sites would also become a catalyst to attract commercial development. Social benefits are expected once the project is operational, including improvements to accessibility and connectivity, and positive changes to amenity.

The CBD Metro, combined with future metro extensions, would deliver positive benefits at the local, regional and metropolitan level, mainly through improvements to accessibility. The CBD Metro will offer significant long term benefits through creating a modern, high speed and high frequency transport service, improved transport accessibility and provision of quality interchange facilities.

Note that potential impacts on land use are discussed in Section 5.1.

4.5 Spoil management

4.5.1 Potential issues during construction

Spoil would be generated from the excavation of tunnels, site preparation activities, excavation of station box sites and vertical access shafts, and cut/fill activities for construction of the stabling facility. Refer to Section 2.14.5 for further details.

The local impacts of spoil removal require further assessment, particularly in relation to truck movements and routes, traffic noise, water quality management and dust management.

All construction sites are located adjacent to, or in close proximity to, the arterial road network. Removal of spoil by truck is expected to be the most convenient form of transport at most major construction sites and station construction sites. The existing rail siding and port facilities at White Bay provide potential alternative transport options to removal by road.

Further assessment for spoil handling will include investigation into options for the use of barges or rail for spoil removal from White Bay, as well as evaluation of local impacts resulting from truck and/or barge movements, road and/or rail traffic noise, water and dust. Reuse and disposal options will also be examined in the Environmental Assessment (consistent with a hierarchy of spoil re-use) focusing on the principle of maximising reuse.

A number of sites have been identified (refer to Table 2.4) which may be able to accept some or all of the spoil. These sites would need to be assessed and determined closer to the commencement of construction, as the availability of the sites to accept spoil materials from 2010 through to completion of excavations may change from the availabilities predicted at this time.

Some spoil generated from surface excavation activities could potentially be contaminated by hydrocarbons, heavy metals or PAHs, depending upon the former use of the site. Soils may also potentially contain contaminants of concern to human health (that is to excavation workers and people occupying the land in the vicinity of the site during excavation works).

There is a reasonable likelihood that contaminated materials would be encountered during excavation, particularly at the location of the Lilyfield/Rozelle stabling facility and maintenance depot. This type of contamination is typical of a former industrial or rail site.

The Environmental Assessment will identify any significant contaminated land issues. If any contaminated spoil material was generated from the project it would need to be transported to solid waste landfills in western Sydney that accept contaminated spoil. Mitigation measures would be implemented to prevent potential health risks associated with exposure to possible contamination.

4.5.2 Potential issues during operation

There will be no spoil generated as a result of operation of the project.

4.6 Non-Indigenous heritage

4.6.1 Potential issues during construction

Due to the historic nature of Sydney CBD, Pyrmont and Rozelle there are numerous heritage-listed buildings and conservation areas and items in the vicinity of the proposed station locations. The project would not directly impact on the majority of these items, however careful management of construction activities would be required in order to mitigate any indirect impacts from vibration.

At some station locations, however, there would be direct impacts to heritage items, including demolition, and heritage conservation areas. Site specific issues are described in Table 4.3.

Table 4.3 Non-Indigenous heritage – site specific issues

Site	Potential issues
Rozelle	• Potential for indirect heritage impacts (vibration, dust, noise) during construction • Changes to the urban environment within Rozelle Heritage Conservation Area
Pyrmont	• Protecting heritage items within Union Square and associated buildings • A World War One War Memorial (listed under the Sydney Local Environmental Plan 2005 and Register of National Estate) is located within the Pyrmont Station construction site footprint. Measures to temporarily relocate this item would be required. • Potential for indirect heritage impacts (vibration, dust, noise) during construction • Changes to the urban environment within Pyrmont Heritage Conservation Area
Barangaroo-Wynyard	• Potential indirect impacts to heritage-listed buildings in close proximity to the station, including St Philips Anglican Church and Moreton's Hotel
Martin Place	• Visual and indirect heritage impacts of construction sites close to many heritage-listed items including the Perpetual Trustee Building and the Commonwealth Bank Building which are both listed under the State Heritage Register, Sydney Local Environmental Plan 2005 and Register of National Estate • Potential vibration impacts during construction, which would need to be carefully managed
Town Hall Square	• Demolition of heritage buildings in Pitt Street
Central	• Significant interventions to heritage buildings associated with Central Railway Station • Changes to the urban environment within the Railway Square Heritage Conservation Area • Visual and indirect heritage impacts during construction at Central Railway Station and other near by heritage places (eg, Belmore Park)
Lilyfield/Rozelle stabling facility and maintenance depot	• Potential discovery of rail related heritage
White Bay construction site	• Protection of White Bay Power Station

The potential future White Bay Station would be located in the vicinity of the White Bay Power Station grounds. The Power Station is listed on the State Heritage Register, Register of the National Estate, and Sydney Regional Environmental Plan No. 26 – City West. Construction activities would not directly impact on the Power Station and, due to the industrial nature of the site, the presence of the station is not expected to detract from the vistas or the heritage value of the site.

There would be potential impacts during construction on some underground heritage items, such as Sydney Water's Bennelong Stormwater Channel No 29A. Potential impacts require further investigation and would be assessed in the Environmental Assessment.

The Environmental Assessment will include a heritage impact assessment, describing measures to minimise and/or appropriately manage direct and indirect impacts. A high level of design will be undertaken, particularly at Central Station, to ensure that heritage impacts are minimised and each station is integrated with extant heritage items.

4.6.2 Potential issues during operation

Potential impacts from vibration on heritage structures during operation of the CBD Metro would need to be investigated. Note that potential vibration issues are discussed in Section 4.3.2.

Note that potential visual impacts and urban design are discussed in Section 5.2.

5 Other environmental issues

The environmental risk analysis process indicated that the following issues could be addressed by standard mitigation and management measures, and subsequently are not considered to be key environmental issues for the purpose of the Environmental Assessment.

5.1 Land use and property impacts

The CBD Metro passes through a mixture of high-density residential developments, high-density commercial office developments, civic buildings, entertainment and retail precincts, public open spaces within the CBD and a major rail and transport interchange at Central. Beyond Pyrmont it passes through a mixture of established residential suburbs, retail and commercial strips, and the White Bay precinct.

The CBD Metro passes through the proposed Barangaroo site which has been proposed for major redevelopment. It may also be influenced by the City of Sydney Council's 2030 Vision.

Potential issues

Prior to construction, property would need to be acquired for the proposed CBD Metro and associated facilities such as construction compounds, station entrances and ancillary tunnel services. Property acquisition would be undertaken in accordance with the requirements of the *Land Acquisition (Just Terms Compensation) Act 1991*.

The areas and sites identified at this stage represent a preliminary preferred position, but will be subject to ongoing constructability investigations and property negotiations. A flexible approach to property requirements will be adopted, with a focus on minimising property acquisition.

A number of properties would also be located above the Metro railway corridor. The presence and location of a rail tunnel and/or rail corridor should not result in physical impacts on the surface above the tunnel. Both ground-borne noise and vibration would be subject to stringent design requirements (see section 4.3). The detailed Environmental Assessment will identify strategies for consultation and property condition surveys.

During construction, impacts and disruption to adjacent properties and businesses would occur in the vicinity of construction sites.

During operation, the CBD Metro would have a mostly positive impact on land use as the provision of an efficient public transport system would enhance development potential and accessibility. For example, the project would substantially improve connectivity at Central Station and between the city and the future Barangaroo development site.

Provision for a future station at White Bay will be included as part of the project, however future land use change and uses of the Bays Precinct will be initiated by other Government agencies and require significant discussion with stakeholders and community.

Management measures

During design development and the Environmental Assessment, due regard will be given to ensuring that the project components achieve the objectives of *Integrated Land Use and Transport* (Department of Urban Affairs and Planning 2001).

The footprint of the project will be clearly identified in the Environmental Assessment with respect to alignment, station precincts, construction sites and ancillary infrastructure. Any development around stations would be subject to a separate approval processes, however commitments will be made in the Environmental Assessment to ensure the integration of future development and the project, particularly in terms of good urban form and site management/rehabilitation.

Further detailed consultation will be undertaken with relevant councils and relevant Government agencies including local councils, Ministry of Transport, Department of Planning and the Sydney Harbour Foreshore Authority, to ensure that surface components of the project are integrated with surrounding land use (existing and planned future, as relevant), to minimise the potential for land use conflicts.

In accordance with the Sydney Metro legislation, the stations would be integrated with surrounding land uses and development. Concurrent with preparation of the Environmental Assessment document, Station Plans will be prepared to encourage development in the vicinity of the proposed stations to proceed in a coordinated way that supports the metro (improves access and patronage) and other strategic plans or developments.

5.2 Visual and urban design

The CBD Metro would be constructed in tunnel, with the stations, construction sites, stabling and depot and ancillary facilities being the only surface visual indicators. The alignment travels through established built-up areas.

Potential issues

The majority of the proposed stations would have minimal visual impact due to pre-existing development at the station sites.

During construction of the project, workers, residents, pedestrians and motorists would be subject to temporary impacts to visual amenity associated with work sites, compounds, fencing, construction plant and equipment. At some stations site activities are expected to occur 24 hours a day and lighting required to facilitate construction activities would impact on the visual amenity for surrounding receivers.

When operational the CBD Metro infrastructure including new above ground structures, stations, stabling and changes to urban form at the interface between stations and the existing urban environment would result in a visual change to the existing environment.

Visual impacts associated with the stabling and maintenance facility will require careful consideration and assessment in the detailed Environmental Assessment.

Management measures

Overall it is not expected that the project would have a significant visual impact. Key visual impacts would be restricted to construction activities and the ultimate built form of the stations, stabling and depot and ancillary facilities.

The CBD Metro will be designed to integrate with the existing environment at the proposed station locations, so as to minimise the visual impact of the stations. Consideration will be given to existing relevant urban design guidelines and project sustainability principles in the design development. Where noticeable visual changes are proposed, the Environmental Assessment will include graphics to assist stakeholders and the local community to understand the nature of the impacts. Stations will incorporate sustainable materials and finishes, and be designed with the highest standard contemporary urban design criteria to integrate with the surrounding areas.

5.3 Geology, soils and groundwater

The study area traverses a number of geological zones, as follows:

- White Bay – Hawkesbury Sandstone with extensive areas of fill, some of which is contaminated
- Rozelle to White Bay to Wynyard-Barangaroo – Hawkesbury Sandstone, with Alluvium strata of sands, clays and silts at Johnston's Bay and Darling Harbour
- Wynyard-Barangaroo to Central – predominance of Hawkesbury Sandstone, shale in vicinity of Central Station and areas of fill

Potential issues

The major groundwater risk issue is the potential inflows of groundwater to the tunnel with resulting lowering of groundwater tables. However, the tunnels are designed to be concrete lined and sealed structures with no groundwater ingress. It is therefore expected that water collection systems with treatment plants would not be required for normal operations.

The areas of greatest geotechnical risk are the water crossings:

- Johnston's Bay near the former Glebe Island Bridge, with a crossing length of approximately 250m
- Darling Harbour, to north of the Australian National Maritime Museum with a crossing length of approximately 400m.

The tunnelling would be 30 metres below water level in the soft clays, silts and sands. Tunnelling experience for the airport rail link was through similar terrain.

Management measures

Geotechnical site investigations are currently being undertaken as part of design development. Risks to groundwater quality and/or risks to surface water quality from contaminated groundwater during construction and operation will be identified, including measures to avoid, manage, mitigate and monitor impacts.

In relation to the bored tunnel components of the project, the following will be assessed:

- Existing groundwater conditions (level and quality), taking into consideration seasonal variability
- Local and regional drawdown impacts, including any groundwater users impacted by the project and measures to offset impacts
- Surface locations (and associated infrastructure) above the tunnel alignment that are likely to be at risk to further ground settlement impacts, that will require further analysis to evaluate the impact on

adjacent building structures, including relevant settlement design criteria and measures to minimise, monitor and offset impacts.

The tunnelling equipment to negotiate the harbour crossing would be an earth pressure balance tunnel boring machine, purpose built for the geotechnical conditions.

5.4 Air quality

Existing air quality in the CBD Metro catchment is typical of developed residential and commercial areas. There are limited industrial sources in the area and local air quality is influenced by emissions from major traffic routes and other pollution in the Sydney basin.

Potential issues

During construction, there would be short-term, localised impacts on air quality. The main potential air quality impacts would be associated with dust generated during excavation earthworks and emissions from diesel powered equipment and vehicles transporting materials to and from the site. The TBMs and road headers use electric power and therefore do not create exhaust emissions. As the CBD Metro would be constructed in tunnel, dust impacts would primarily be confined to the above ground portion of the stations and major construction sites.

During operation, tunnel emissions (via ventilation points) would not affect air quality, as the project would use electric trains. The project is likely to have a positive impact on air quality as the CBD Metro is expected to result in a moderation of the increase in vehicle kilometres travelled. Unlike cars and buses, trains do not emit nitrogen oxides, carbon monoxides, hydrocarbons, lead, exhaust particles or tyre wear particles, which are a major cause of most types of air pollution in Sydney. Very small quantities of brake dust would be emitted at locations where trains are required to slow or stop at stations. These emissions, which are typical of all rail systems, would not result in any adverse impacts on surrounding receptors or require filtration.

Management measures

Due to the developed nature of the existing environment, dust and emissions from plant are not likely to result in any detectable deterioration in air quality within the surrounding area. Mitigation measures to control dust and plant emissions will be outlined in an air quality management sub-plan as part of a construction environmental management plan (CEMP).

5.5 Water quality

The CBD Metro is located within the Sydney Harbour catchment. The waterways of the Sydney Harbour catchment represent a significant recreational, scenic and economic resource for the people of Sydney, and as a result the area is a very important and sensitive resource protected by numerous water quality objectives. The catchment has been highly modified and water quality is generally low during wet weather periods due to poor-quality stormwater from urban runoff.

Potential issues

The CBD Metro comprises two harbour crossings, traversing Johnston's Bay and Darling Harbour. Due to the tunnel boring method of construction, no disturbance on the harbour bed or waterways are expected.

Potential impacts to water quality during construction include stormwater pollution from run-off of sediments and other materials from construction sites. During operation, pollutants may be introduced to waterways by surface runoff from station sites and the stabling facility and maintenance depot.

Management measures

Construction impacts can be avoided or managed effectively with the implementation of a construction phase soil and water management plan as part of the CEMP. This plan will detail stormwater management strategies in accordance with the guideline *Soils and Construction, Managing Urban Stormwater* (Landcom, 2004).

Operational impacts at stations and the stabling facility and maintenance depot will be managed through appropriate stormwater controls.

5.6 Ecology

The CBD Metro would be in tunnel. Surface impacts would be restricted to areas where the project would be above ground i.e. at station sites, stabling depot and surface construction sites. As the proposed stations are generally located in highly developed areas, there is generally limited habitat remaining and the potential for significant ecological value is generally low.

Potential issues

Due to the highly urbanised environment, there is likely to be minimal ecological issues. Potential habitat does occur in the proposed stabling and maintenance depot site.

Management measures

Ecological investigations would be undertaken as required, with a focus on the stabling and maintenance depot site.

As appropriate, management of topsoil, sediments and the spread of weeds would be undertaken as part of the CEMP for the project.

5.7 Surface water and flooding

There are no creek systems or waterways directly affected by the project. The Tank Stream is located beneath the CBD, from King Street to Circular Quay. The CBD Metro tunnels are expected to travel under the Tank Stream, however this would need to be confirmed during concept design.

Potential issues

An assessment will be undertaken to identify any floodplain topography and/ or waterways that might be impacted by the proposed construction methods, and the potential requirements for any re-instatement and/or rehabilitation, consistent with pre-construction conditions.

Management measures

The proposed construction methodology will identify measures to minimise the risk of localised flooding and provide appropriate control of drainage and water run off during construction.

5.8 Indigenous heritage

The proposed stations of the CBD Metro would be located in highly disturbed and previously developed areas, where there is limited potential for intact items of places of Indigenous heritage significance.

Management measures

Due to the extent of development and disturbance it is unlikely that any previously undiscovered Indigenous artefacts or places would be found. If any previously unidentified Indigenous heritage items are encountered, works in the vicinity of the find would cease immediately and advice would be sought from an Indigenous Heritage consultant or DECC as necessary to determine the significance of the finding and any actions required under the *National Parks and Wildlife Act 1974*.

5.9 Waste management

The project has the potential to generate different types of waste, which would require management and disposal in accordance with relevant state legislation and government policies.

Potential issues

General waste produced during construction includes:

- Surplus construction waste including building materials, packaging and plastics
- General domestic waste and rubbish
- Waste from potable on-site toilets at construction compounds
- Wastewater from dewatering activities.

During operation, waste products would be limited to those associated with operations, maintenance and repair requirements. A train wash facility would be required at the maintenance depot.

Management measures

A detailed assessment of waste management issues is not considered necessary as part of the Environmental Assessment and no further assessment is proposed at this stage, other than for spoil. The selection of materials for use in the project will consider ‘whole of life’ costs and will look to maximise the use of recycled products where reasonable and feasible.

The following guidelines will be applied throughout the project to ensure responsible waste management:

- *Construction and Demolition Waste Action Plan* (Department of Environment and Conservation, 1998)

- *Environmental Guidelines: Assessment, Classification and Management of Non-Liquid and Liquid Waste* (Department of Environment and Conservation, 1999)
- *Green Waste Action Plan* (Department of Environment and Conservation, 1997)
- *NSW Government's Waste Reduction and Purchasing Policy 1997*
- *Waste Planning for Industry: A Guide* (Waste Management Authority of NSW) 1990.

ESD principles in waste management will also be recognised in the construction of the project through adherence to the waste hierarchy and by ensuring:

- The production or generation of waste does not exceed the assimilative capacity of the means/method of disposal and the environment
- The adoption of a whole of lifecycle approach in formulating a waste minimisation and management plan for the project.

Environmental management measures based on these guidelines and principles would be prepared and incorporated into a waste management sub-plan as part of the CEMP for the project.

5.10 Energy and greenhouse

The CBD Metro project would require a substantial amount of energy use both during construction and operation. Energy use would be minimised through the application of a number of design measures including the use of passive systems (natural ventilation and natural lighting solutions for stations where feasible) and optimisation of the vertical alignment of the track so that minimal energy is required by the trains for braking and accelerating, and for passenger access. Further optimisation would be evaluated through careful consideration and selection of energy efficient systems and components. Rolling stock performance would be a key aspect for long-term energy use minimisation. Technologies available to provide regenerative braking, train control systems, reduced car weights, etc would be further investigated. Energy efficient lighting would also be considered during design development.

Management measures

The project design development process will include the evaluation of the potential for the use of sustainable sources of energy such as renewable energy sources. This will include an assessment of the reliability of supply of energy, the rising costs of electricity, and the carbon emissions associated with traditional electricity generation.

6 Conclusion

6.1 Overview

Sydney Metro is seeking Project Approval under Part 3A of the *Environmental Planning and Assessment Act 1979* for the CBD Metro, a twin track passenger metro railway, approximately 7 km in length, commencing at Rozelle to Central featuring six stations (and one potential future station at White Bay).

This Preliminary Environmental Assessment for the CBD Metro identifies a number of key environmental impacts during the construction and operational phases that will require further investigation as part of the detailed Environmental Assessment.

In addition, a number of relatively more minor impacts associated with the project have been identified that could be effectively managed and/or adequately mitigated through the design process and application of standard and/or tailored mitigation measures.

6.2 Matters to be further addressed in the design process

The design process has and will continue to consider environmental issues and incorporate refinements to the design of the project, to avoid or minimise all relevant impacts. Table 6.1 outlines those environmental issues to be addressed as the design progresses.

Table 6.1 Matters to be further addressed in the design process

Key environmental issue	
Traffic, transport, parking & access	• The surface components of the project affecting roads will be designed to minimise traffic disruptions as far as reasonable and feasible, in consultation with the RTA and/or relevant councils. • The station precincts will be designed to provide a high degree of accessibility to all modes-of-access, consistent with the objectives of Integrated Land Use and Transport (DUAP 2001).
Noise & vibration	• To control operational noise and vibration, the rail corridor will be assessed consistent with the Interim Guideline for the Assessment of Noise from Rail Infrastructure Projects (DECC, 2007); and the project will be designed to be consistent with Assessing Vibration: A Technical Guideline (DECC, 2006). • To control operational noise, the stabling facility and maintenance depot will be assessed consistent with relevant Industrial Noise Policy (Environmental Protection Agency, 2000). • To control construction noise, reference will be made to the Construction Noise Strategy (Rail Projects) (November 2007) and draft NSW Construction Noise Guidelines (DECC, August 2008).
Non-Indigenous heritage	• The architectural designers will be informed by specialist heritage architects.

Key environmental issue	
	• Establishment of an independent Design Review Panel, which will include three eminent architects, to review design proposals for consistency with the overall project design objectives, and with State and Local Government master planning.
Non-key environmental issue	
Land use	• During design development, due regard will be given to ensuring that the project components achieve the objectives of *Integrated Land Use and Transport* (DUAP 2001). • Further detailed consultation will be undertaken with relevant councils and relevant Government agencies including local councils, Ministry of Transport and Department of Planning, to ensure that surface components of the project are integrated with surrounding land use (existing and planned future, as relevant) to promote opportunities for integration.
Visual and urban design	• The CBD Metro will be designed to integrate with the existing environment at the proposed station locations, so as to minimise the visual impact of the stations. • Consideration will be given to existing relevant urban design guidelines and project sustainability principles in the design development. • Establishment of an independent Design Review Panel, which will include three eminent architects, to review design proposals for consistency with the overall project design objectives, and with State and Local Government master planning.
Energy and greenhouse	• The project design development process will include the evaluation of the potential for the use of sustainable sources of energy such as renewable energy sources. This will include an assessment of the reliability of supply of energy, the rising costs of electricity, and the carbon emissions associated with traditional electricity generation.

6.3 Proposed scope of the detailed Environmental Assessment

In accordance with the Preliminary Environmental Assessment undertaken for the project, Table 6.2 summarises the proposed scope of the detailed Environmental Assessment, having regard to the issues identified throughout this report.

Table 6.2 Proposed scope of the Environmental Assessment

Key environmental issue	
Traffic, transport, parking & access	• Construction traffic impacts associated with the project will be identified, including: – Haulage routes – Peak congestion and intersection performance impacts at local and arterial roads considering where relevant cumulative impacts from surrounding development and from concurrent construction sites – Reasonable and feasible construction options at road crossings to avoid and/ or minimise traffic disruptions – Requirements for road and/or lane closure and alternative travel arrangements. • Mode-of-access arrangements at each new station will be identified, with consideration to (but not necessarily limited to) the following matters: – Road access arrangements – Bus access and mode change requirements – Interchange with CityRail stations and the light rail, where relevant – Provision for kiss and ride and taxis – Pedestrian and cycle linkages.
Noise & vibration	• A noise and vibration assessment will be undertaken to determine the impacts of the project during construction and operation. • The construction noise and vibration assessment will identify reasonable and feasible noise mitigation measures to be implemented at major construction and station sites. • The operational noise and vibration assessment will focus on areas that have been identified in the preliminary modelling as likely to exceed the IGANRIP noise trigger levels without high level mitigation measures. Details of reasonable and feasible mitigation measures will be provided.
Socio-economic factors	• A socio-economic assessment will be undertaken to identify the impacts of construction and operation on these communities and the measures required to mitigate adverse impacts. Social benefits, including improvements to accessibility and connectivity, and impacts such as changes to amenity, severance and construction impacts will be identified. Impacts to local businesses and economies as a result of construction and operation of the project will also be examined.
Spoil management	• The local impacts of spoil removal will be further assessed, particularly in relation to truck movements and routes, traffic noise, water and dust. • Further assessment will be undertaken to determine appropriate re-use and disposal options, consistent with the spoil management hierarchy and following the

Key environmental issue	
	principle of maximising reuse. This will include identification of sites that may be available to receive large quantities of spoil from the project. • Further details and technical assessment of potential contamination at White Bay and the stabling and maintenance depot site.
Non-Indigenous heritage	• A heritage impact assessment will be undertaken outlining proposed direct and indirect impacts to heritage items and describing measures to minimise and/or appropriately manage impacts. • Where required, an analysis of the view corridors to and from identified heritage properties will be undertaken to determine the significance of these vistas and any impact on heritage values.
Non-key environmental issue	
Land use	• The footprint of the project will be clearly identified in the Environmental Assessment with respect to alignment, station precincts, construction sites and ancillary infrastructure.
Visual and urban design	• Where noticeable visual changes are proposed, the Environmental Assessment will include graphics to assist stakeholders and the local community to understand the nature of the impacts.
Geology, soils and groundwater	• Risks to groundwater quality and/or risks to surface water quality from contaminated groundwater during construction and operation will be identified, including measures to avoid, manage, mitigate and monitor impacts. • In relation to the bored tunnel components of the project, the following will be assessed: – Existing groundwater conditions (level and quality), taking into consideration seasonal variability – Local and regional drawdown impacts, including any groundwater users impacted by the project and measures to offset impacts – Measures to minimise the risk of bed cracking and loss of surface flow when tunnelling below creek lines and contingency measures for restoring affected waterways consistent with pre-construction conditions, including monitoring procedures and performance criteria – Surface locations (and associated infrastructure) above the tunnel alignment that are likely to be at risk to further ground settlement impacts, that will require further analysis to evaluate the impact on adjacent building structures, including relevant settlement design criteria and measures to minimise, monitor and offset impacts.
Ecology	• Further assessment to identify any flora and/or fauna issues at the stabling and maintenance depot site.

6.4 Proposed management measures

The Preliminary Environmental Assessment also identifies a number of environmental issues that can be managed through the implementation of standard and/or tailored mitigation measures. These measures are summarised in Table 6.3.

Table 6.3 Proposed management measures

Non-key environmental issue	
Geology, soils and groundwater	• A preliminary contamination assessment will be undertaken prior to construction at White Bay to confirm the presence of contaminated material.
Air quality	• Construction impacts can be avoided or managed effectively with the implementation of a construction phase air quality management plan as part of the CEMP. This plan would detail mitigation measures to control dust and plant emissions.
Water quality	• Construction impacts can be avoided or managed effectively with the implementation of a construction phase soil and water management plan as part of the CEMP. This plan would detail stormwater management strategies in accordance with the guideline *Soils and Construction, Managing Urban Stormwater* (Landcom, 2004).
Indigenous heritage	• Due to the extent of development and disturbance it is unlikely that any previously undiscovered Indigenous artefacts or places would be found. Appropriate management measures will be implemented in the event that previously undiscovered items were found.
Ecology	• Ecological issues will be addressed with appropriate management measures.
Waste Management	• Environmental management measures based on appropriate guidelines and principles will be prepared and incorporated into a waste management plan as part of the CEMP for the project.

6.5 Where to from here?

A Project Application, supported by this Preliminary Environmental Assessment, is the first key step in the planning approvals and environmental assessment process. It identifies the benefits and potential impacts of the CBD Metro, then sets out mitigation strategies that will be developed and implemented. As we move ahead in developing a metro system for Sydney, more information regarding this exciting new initiative will become available.

A 1800 information line has been established (1800 636 910) to receive and respond to all public enquiries and a Sydney Metro website has been established (www.sydneymetro.nsw.gov.au).

In response to the Project Application and Preliminary Environmental Assessment, the Director-General of the Department of Planning will issue requirements which outline the key issues that the proponent must address in its detailed Environmental Assessment. These requirements are prepared in consultation with relevant agencies and other key parties.

Following receipt of the Director-General's requirements, the Environmental Assessment will be prepared, supported by specialist studies to address the key issues identified.

The detailed Environmental Assessment will be exhibited in late 2009 for a minimum of 30 days and invites public comment. Advertisements are placed in appropriate newspapers, and relevant State agencies and local council/s are notified, as well as affected and adjacent landowners.

The Environmental Assessment is exhibited at the Department's head office, relevant regional offices, local council offices and on the Department's website. During the exhibition period any person is able to make a written submission to the Director-General regarding the project.

Submissions received by the Director-General are provided to the proponent, and any relevant public authorities. The proponent may be required to prepare and submit:

- a submissions report, providing a response to the issues raised in the submissions; and/or
- a preferred project report, outlining any proposed changes to the project; and/or
- a revised statement of commitments.

The Director-General prepares a report to the Minister for Planning on the Environmental Assessment, for the purposes of the Minister's consideration of the application for approval to carry out the project.

The Minister determines whether to approve or refuse the project. A project may be approved with such modifications of the project or on such conditions as may be determined by the Minister.

A summary of the planning approval and Environmental Assessment process, and indicative key milestones is illustrated in Figure 6.1.

Figure 6.1 Indicative Planning approvals and Environmental Assessment process

7 References

Department of Environment and Climate Change (DECC), 2006, Assessing Vibration: A Technical Guideline

Department of Environment and Climate Change (DECC), 2007, Interim Guideline for the Assessment of Noise from Rail Infrastructure Projects

Department of Environment and Climate Change (DECC), 2008, Draft NSW Construction Noise Guidelines

Department of Environment and Conservation (DEC), 1997, Green Waste Action Plan

Department of Environment and Conservation (DEC), 1998, Construction and Demolition Waste Action Plan

Department of Environment and Conservation (DEC), 1999, Environmental Guidelines: Assessment, Classification and Management of Non-Liquid and Liquid Waste

Department of Planning (DoP), 2008, Sydney City Draft Subregional Strategy

Department of Urban Affairs and Planning (DUAP), 2001, Integrated Land Use and Transport

Environmental Protection Agency (EPA), 2000, Industrial Noise Policy

Landcom, 2004, Soils and Construction, Managing Urban Storm Water

NSW Government, 1997, Waste Reduction and Purchasing Policy

Transport Infrastructure Development Corporation (TIDC), 2007, Construction Noise Strategy (Rail Projects)

Waste Management Authority of NSW, 1990, Waste Planning for Industry: A Guide

Appendix A Preliminary Alignment (indicative)