

18 Cumulative impacts and interactions

This chapter provides an assessment of the potential cumulative impacts and interactions that may arise as a result of the construction of other projects at the same time as the CBD Metro project. Although this issue was not identified as a key issue in the Director-General's requirements, the environmental risk analysis (Chapter 20) deemed cumulative impacts and interactions to have a high residual risk rating, requiring further detailed assessment.

18.1 Overview

Cumulative impacts are incremental environmental impacts that are caused by past, present or reasonably foreseeable future activities which, when combined, may have a synergistic or interactive effect. When considered in isolation, the environmental impacts of any single project upon any single receiver or resource may not be significant. Significant effects may arise, however, when individual effects are considered in combination, either within the same project or together with other projects.

Cumulative impacts may result from various types of interaction, including:

- **Different impacts upon the same receiver** – impacts that may arise as the result of an accumulation of impacts of a different nature at the same location. For example, the combined effect of construction noise and visual impacts may give rise to an overall significant impact on business viability, whereas individually these impacts may not be as significant. These impacts have been assessed as part of the economic and social assessment of this project (refer Chapter 16) and are therefore not considered further in this cumulative assessment.
- **Similar impacts at different locations** – impacts that may arise as a result of the accumulation of impacts of the same type at a number of different locations. For example, insignificant numbers of truck movements to different sites may collectively give rise to an overall significant impact over the overall project. These impacts are identified within the individual discipline areas (Chapters 9 to 17) and are therefore excluded from this assessment.
- **Combination of interactions between projects** – impacts that may arise as a result of the combination of similar impacts from multiple projects. For example, impacts caused by CBD Metro construction may be exacerbated by construction activity from other major construction projects nearby, or while an individual road closure during construction may not be considered significant in isolation, the impact of multiple road closures in the same vicinity arising from a number of different concurrent projects, may be significant.

The impacts associated with the construction of the CBD Metro and other relevant projects are the subject of this cumulative impact assessment.

Prediction and evaluation of cumulative impacts is not straightforward since it is not always possible to directly combine different types of environmental impacts on an objective basis. The following sections provide the criteria and parameters by which these impacts were assessed, and outline the potential cumulative impacts and recommendations to minimise these impacts.

18.2 Objectives and strategy

Sydney Metro has set the following objective for the project to guide the management of cumulative impacts during construction.

- Objective 1: Ensure that construction impacts arising from the CBD Metro are integrated and balanced against the construction impacts of wider redevelopment and other changes occurring within the CBD.

To achieve this objective, and along with specific construction mitigation measures, it is proposed that a Central Coordination Group be established to manage the number of different projects proposed or currently being constructed within the Sydney CBD. The Central Coordination Group would oversee a statutory agencies forum to ensure the CBD Metro works are coordinated with other concurrent developments and public works; and would aim to mitigate impacts on local business, residents and CBD visitors.

18.3 Specific issues

18.3.1 Methodology

The assessment of cumulative impacts is focused on the key environmental issues associated with the construction of the CBD Metro project that have been assessed in detail in Chapters 9 to 17. These include:

- Construction traffic.
- Construction noise and vibration.
- Non-indigenous heritage.
- Economic and social effects.

It is noted that spoil management and water management are not included within the above list, although assessed as key issues in Chapter 9 and Chapter 12 respectively. The impacts arising from the generation and management of spoil largely relate to noise or transport, which are assessed. In terms of water quality, it has been assumed that each project would sufficiently manage the potential for discharge from work sites in an appropriate manner to avoid cumulative impacts.

Given the extent of the CBD Metro project, and the number of developments occurring within Sydney, this cumulative impact assessment focuses on a number of key interfaces with other significant projects that may occur at the same time as the CBD Metro project.

The selection of projects to be included was based on the following criteria:

- **The project boundary** – given the extent of the CBD Metro project area, only projects located within suburbs intersected by or adjacent to the metro corridor were considered (refer Figure 18.1). The suburbs considered within the catchment of the assessment included Chippendale, Ultimo, Haymarket, Surry Hills, Darlinghurst, Sydney, Millers Point, Ultimo, Pyrmont, Rozelle, Balmain, Lilyfield, Leichhardt and Annandale.



- **The project timeframe** – only projects likely to be undertaken at some point during the CBD Metro construction period were considered. A number of projects within the project area are at a conceptual stage only and have not been approved. These projects were considered where approval of the project is likely and/or imminent, the impacts are likely to be significant, and construction is likely to coincide with construction of the CBD Metro.
- **The project size** – while no absolute measure was applied to determine the size of the project considered, projects considered were typically large-scale developments that would involve one or all of the following:
 - Substantial temporary changes to existing traffic conditions, including traffic generation and changes to traffic flows, large truck movements and disruptions to key access routes.
 - Substantial temporary changes to the existing noise environment.
 - Impacts on numerous and/or significant heritage items.
 - Substantial changes to the existing land use.
 - Substantial changes to the existing urban landscape.

Some projects, while classified as 'Major Projects' by the Department of Planning, were not considered to be of a sufficient scale (based on the above criteria) to warrant further assessment.

Projects or developments have been separated into those proposed by the public sector and those proposed by the private sector. All projects considered within this assessment are identified in Figure 18.1 and public and private proposals are described in Table 18.1 and Table 18.2 respectively.

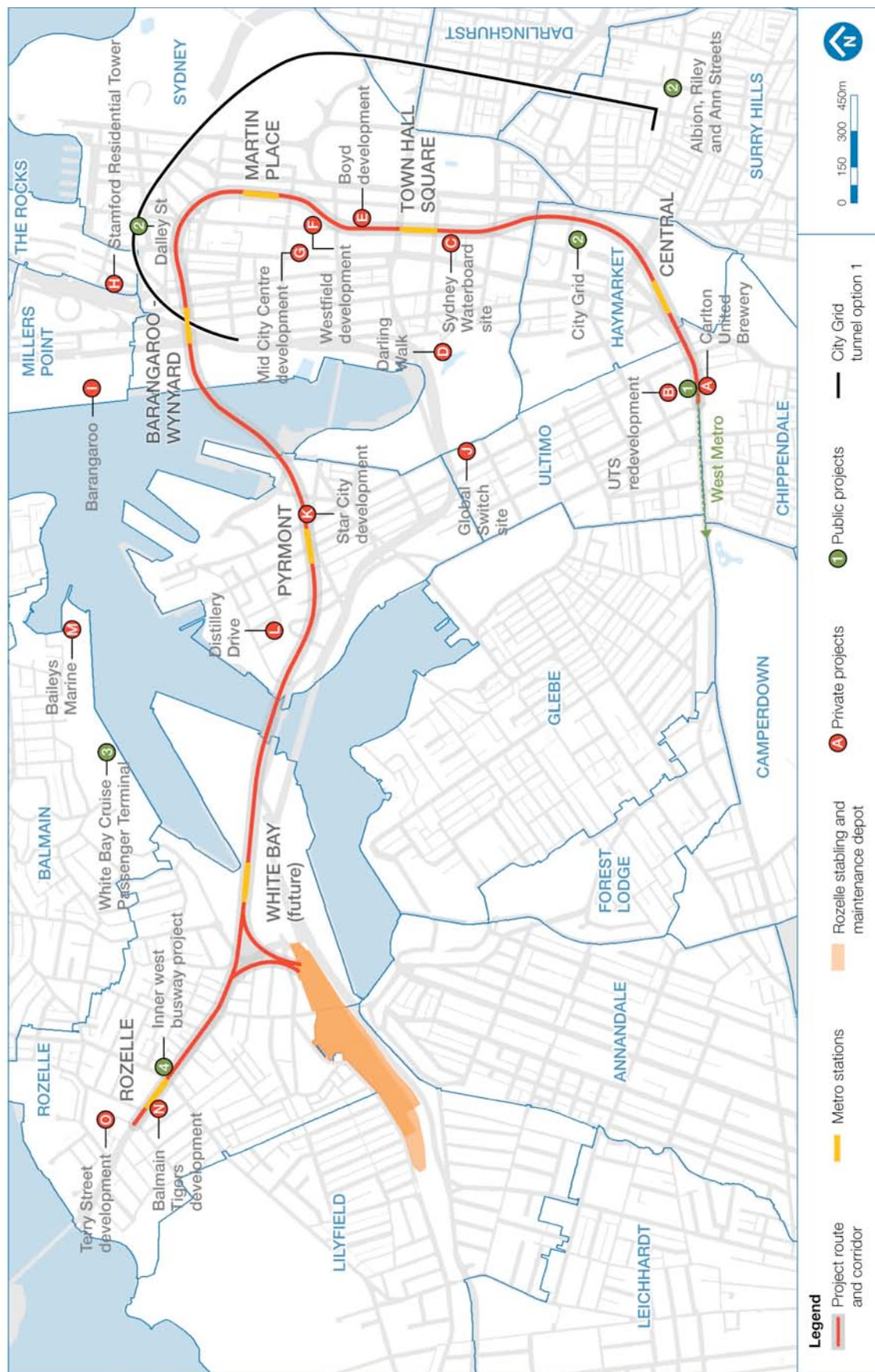


Figure 18.1 Projects considered within the cumulative impact assessment

Note: Project detail shown is indicative only, subject to detailed design

Table 18.1 Public sector projects considered as part of the cumulative impact assessment

Ref	Description	Relevance/key impacts
1	WEST METRO Description The West Metro is proposed to extend the CBD Metro, connecting directly from Central Station and creating a 25-km line to Westmead. Location Central/various locations. Timing Application submitted. Construction: 2011–2017.	• Generation of construction traffic along Broadway, Parramatta Road and other regional routes. • Noise impacts on local receivers in the vicinity of Central (commercial and residential). • Potential for impacts on archaeological relics and increased development at Lilyfield stabling depot affecting heritage items. • Generation of significant volumes of spoil requiring disposal by truck.
2	CITY GRID Description EnergyAustralia's development of a 3.2-km cable tunnel and three new substations and upgrades. Location Various CBD locations. Timing Application submitted. Construction: ~2009–2017.	• Construction sites at: – Albion, Riley and Ann streets, Surry Hills (main construction site for tunnel and new substation). – Pitt, Campbell and Hay streets, Haymarket – opposite Belmore Park (new Belmore Park substation). – Unknown – likely to be in the vicinity of Philip, Bent, Bligh and O'Connell streets (new City East substation). – Dalley Street (substation upgrade). • Significant truck movements from construction sites to remove about 229,000 m³ of spoil. • Partial or full temporary closure of Little Albion, Dalley and Underwood streets and other roads yet to be identified. • Road closures for delivery of large electrical equipment required. • Temporary possession of kerbside parking spaces at selected sites, with permanent loss of 100-car space parking station at Belmore Park site. • Construction traffic routes include: Wattle, Abercrombie, Cleveland, Elizabeth, Foveaux, Fitzroy, Campbell, Hay and Pitt streets, Wentworth Avenue and the Eastern Distributor. • Noise impacts on local receivers (commercial and residential) surrounding the sites. • Management of noise and vibration impacts from tunnelling required between 2010 and 2013. Potential for impacts on archaeological relics.



Ref	Description	Relevance/key impacts
3	WHITE BAY CRUISE PASSENGER TERMINAL Description Construction and operation of a Cruise Passenger Terminal. Location Robert Street, Balmain (White Bay). Timing Application being prepared. Construction: ≈ determined.	• Generation of construction traffic and potential changes to traffic along Robert Street and regional routes. • Generation of some demolition waste, which would be removed by trucks. • Noise impacts on local receivers surrounding the sites (commercial and residential).
4	INNER WEST BUSWAY PROJECT Description Victoria Road roadworks and Iron Cove Bridge duplication. Location Victoria Road, Rozelle and Drummoyne. Timing Approved. Construction: 2009–2011.	• Generation of construction traffic and potential changes to traffic on Victoria Road and other regional routes. • Typically, up to 20 truck movements per day, with some activities potentially requiring up to 120 vehicle movements in a single day. • Noise impacts on local receivers (commercial, residential and community) surrounding the site. • Potential for impacts on archaeological relics.



Table 18.2 Private development projects considered as part of the cumulative impact assessment

Ref	Description	Relevance/key impacts
A	CARLTON UNITED BREWERY (CUB) Description Residential/commercial/open space, Location 26 Broadway, Chippendale, Timing Concept approved, Demolition approved and commenced, Construction: ≈2010–2020	- Up to 37 truck movements per day. - About 142,800 tonnes of demolition waste. - Construction traffic routes include: Eastern Distributor, Cleveland Street, Botany Road, Regent Street, City Road, Parramatta Road, Wattle Street, Western Distributor, and Victoria Road. - Noise impacts on local receivers (commercial and residential) surrounding the site. - Potential for impacts on archaeological relics. - Adaptive reuse of 33 heritage structures of exceptional, high and moderate significance.
B	UTS REDEVELOPMENT Description Demolition of 3 buildings, construction of 2 new buildings, modifications/extensions to 6 buildings. Location UTS Broadway precinct, Broadway. Timing Application submitted. Construction: ≈2010–2014.	- Generation of construction traffic. - Generation of some demolition waste (typical of a commercial development). - Noise impacts on local receivers (commercial and residential) surrounding the site. - Demolition of Bradshaw building (Federation Free Style building of local significance).
C	SYDNEY WATER BOARD SITE Description Mixed retail/commercial building up to 172 m high with retention of the northern wall of the existing 1939 heritage-listed building. Location 115–119 Bathurst Street, Sydney CBD. Timing Approved May 2009. Construction: unknown.	- Generation of construction traffic and potential changes to traffic on local routes around Bathurst, Pitt and George streets, and regional routes. - Generation of some demolition waste (typical of a commercial development). - Noise impacts on local receivers (mainly commercial) surrounding the site. - Modifications to 1939 heritage-listed building.



Ref	Description	Relevance/key impacts
D	DARLING WALK Description Commercial office space, retail and leisure facilities, new open space, public and private underground car spaces. Location Darling Harbour Timing Approved January 2009. Construction: 2009–2011 (work has commenced).	• Disruption to pedestrian traffic accessing Darling Harbour. • Partial and temporary lane closure on Harbour Street after hours. • Noise impacts on local receivers (residential) on the eastern side of Harbour Street. • Impacts on archaeology are considered unlikely.
E	BOYD DEVELOPMENT Description 43-storey commercial tower. Location 232–236, 244–248 Pitt St, 161–163, 165–167 Castlereagh Street, Sydney CBD. Timing Approved. Construction: unknown.	• Generation of construction traffic and potential changes to traffic on local routes around Pitt and Castlereagh streets, and regional routes. • Generation of some demolition waste (typical of a commercial development). • Noise impacts on local receivers (mainly commercial) surrounding the site. • Potential impacts on businesses (mainly ground floor retail) due to noise impacts and parking and access impacts.
F	WESTFIELD DEVELOPMENT Description Demolition of parts of existing buildings, construction of new retail podium building and pedestrian bridges. Location 168–174, 184–190 Pitt Street, 77–83A Castlereagh Street, Sydney CBD. Timing Approved. Construction: ≈2009-2012.	• Generation of construction traffic and potential changes to traffic on local routes around Market, King, Pitt and Castlereagh streets, and regional routes. • Generation of some demolition waste (typical of a commercial development). • Noise impacts on local receivers (mainly commercial) surrounding the sites. • Potential impacts on businesses (mainly ground floor retail) due to noise impacts and parking and access impacts.

Ref	Description	Relevance/key impacts
G	MID CITY CENTRE DEVELOPMENT Description 34-storey commercial office tower above a 4-storey retail podium. Location 416 George Street, Sydney CBD. Timing Approved. Construction: ≈2009–October 2010.	• Generation of construction traffic and potential changes to traffic on local routes around George, King and Market streets, and regional routes. • Generation of some demolition waste (typical of a commercial development). • Noise impacts on local receivers (mainly commercial) surrounding the sites. • Potential impacts on businesses (mainly ground floor retail) due to noise impacts and parking and access impacts.
H	STAMFORD RESIDENTIAL TOWER Description 27-storey residential tower. Location 190–210 Cumberland Street and 171–193 Gloucester Street, The Rocks. Timing Approved. Construction: 2008–2011.	• Generation of construction traffic and potential changes to traffic on local routes around Cumberland and Gloucester streets, and regional routes. • Generation of some demolition waste (typical of a commercial development). • Noise impacts on local receivers (mainly commercial) surrounding the sites.
I	BARANGAROO Description Development with commercial, residential, tourist, retail and community uses. Location East Darling Harbour. Timing Concept approved February 2006. Approval for demolition. Construction: ≈2009–2015.	• Generation of construction traffic and potential changes to traffic on local routes around Sussex, Hickson and Margaret streets, and regional routes. • Reclamation works requiring transportation of fill to the site and consequent truck movements. • Generation of some demolition waste (typical of a commercial development). • Noise impacts on local receivers (commercial and residential) surrounding the site. • Changes to visual amenity. • Changes to places and views of heritage value, e.g. Moreton's Hotel. • Potential for impacts on archaeological relics.



Ref	Description	Relevance/key impacts
J	GLOBAL SWITCH SITE Description 6-storey specialist data centre. Location 390–422 Harris Street, Ultimo. Timing Application being prepared. Construction: unknown.	• Generation of construction traffic and potential changes to traffic on local routes around Pyrmont and Harris streets, and regional routes. • Generation of demolition waste would be minimal as the site is vacant. • Noise impacts would mainly affect residential receivers to the south of the site.
K	STAR CITY DEVELOPMENT Description New hotel and podium-level extension. Location 24–28 Union Street, Pyrmont. Timing Approved. Construction: ≈2009–2011.	• Generation of construction traffic (up to 100 truck movements per day) and potential changes to traffic along routes including Pyrmont Bridge Road, Pyrmont Street, Edward Street, Union Street (east), and Darling Drive. • Parking demand of about 133 cars per day with no on-site parking provided. • Noise impacts on local receivers (commercial and residential) surrounding Pyrmont Bay and along Union and Pyrmont streets. • Potential impacts on businesses (mainly Union Square) due to noise impacts.
L	1 DISTILLERY DRIVE Description Construction of a 5–8 storey residential building on Distillery Hill (Stage 5B of Jacksons Landing Master Plan) Location Distillery Drive, Pyrmont. Timing Approved. Construction commenced.	• Generation of construction traffic along Harris and Pyrmont streets and other regional routes. • Noise impacts on local receivers surrounding the site (residential).
M	BAILEYS MARINE Description Marine refuelling and supply facility. Location Robert Street, Balmain (White Bay). Timing Approved June 2009. Construction: unknown.	• Generation of a small amount of construction traffic along Robert Street and regional routes. • Generation of some demolition waste. • Noise impacts on local receivers surrounding the sites (commercial and residential).

Ref	Description	Relevance/key impacts
N	BALMAIN LEAGUES CLUB DEVELOPMENT Description Multi-use development including commercial, retail and residential uses. Location Victoria Road, Waterloo, Moodie and Darling streets, Rozelle. Timing Planning controls amended, no DAs yet approved. Construction: unknown.	• Generation of construction traffic and potential changes to traffic along Victoria Road and regional routes. • Generation of some demolition waste (typical of a commercial development). • Noise impacts on local receivers surrounding the sites (commercial, residential, educational and worship facilities). • Changes to land use. • Potential impacts on businesses (mainly ground-floor retail along Victoria Road and Darling Street) due to noise and parking impacts.
O	TERRY STREET DEVELOPMENT Description Retail/residential development. Location Victoria Road, Terry Street, Wellington Street, Rozelle. Timing Masterplan under preparation. Construction: unknown.	• Generation of construction traffic and potential changes to traffic along Victoria Road and regional routes. • Generation of some demolition waste (typical of a commercial development). • Noise impacts on local receivers surrounding the sites (predominantly residential). • Changes to visual amenity. • Changes to land use.

18.3.2 Potential impacts

This section presents the cumulative impacts that may result if the projects described in Table 18.1 and Table 18.2 were constructed during the same timeframe as the construction of the CBD Metro. The likelihood for cumulative impacts to occur, and the magnitude of these impacts, is assessed in Table 18.3 and Table 18.4.



Table 18.3 Cumulative interactions with public sector developments

Cumulative impact aspect	1	2	3	4
	WEST METRO ¹	CITYGRID	WB PASSENGER TERMINAL	INNER WEST BUSWAY PROJECT
Likelihood of interaction with CBD Metro (Low/Medium/High)	High	High	Medium	Low
Magnitude of interactions (Low/Medium/High)				
Construction traffic				
Construction traffic routes	High	High	Low	Low
Truck volumes	High	High	High	Low
Parking availability	Low	Medium	Low	Low
Construction noise and vibration				
Sensitive receivers affected	High	High	Low	High
Heritage				
Heritage setting	High	Low	Low	Low
Heritage items	–	–	Low	Low
Archaeology	–	High	–	High
Economic and social				
Businesses affected	High	Low	Low	High
Residents affected	High	Medium	Low	High
Public amenity	High	High	Low	Low

¹ Impact to be within Central Station precinct only

– Denotes an unknown impact

Table 18.4 Cumulative interactions between the CBD Metro construction and other private developments

Cumulative impact aspect	A	B	C	D	E	F	G	H	I	J	K	L	M	N ¹	O
	CUB	UTS	Sydney Water Board	Darling Walk	Boyd	Westfield	Mid City Devt	Stamford Residential Tower	Barangaroo	Global Switch Site	Star City	Distillery Drive	Baileys Marine	Balmain Leagues Devt	Terry Street Devt
Likelihood of interaction with CBD Metro Low/Medium/High	High	High	Medium	High	Medium	High	Low	Low	High	Medium	Medium	Low	High	N/A	Medium
Construction traffic Construction traffic routes	High	High	High	Low	High	Medium	Medium	Low	High	Medium	High	Medium	Medium	N/A	Medium
Truck volumes	High	High	Medium	Medium	–	Medium	Medium	Medium	High	Low	Medium	Low	Low	N/A	TBC
Parking availability	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Medium	Low	Low	N/A	Low
Construction noise & vibration Sensitive receivers affected	High	High	Low	Low	Medium	Low	Low	Low	High	Low	High		Low	N/A	Medium
Heritage Heritage setting	Low	Low	High	Low	Medium	Low	Low	Low	High	Low	Medium	Low	Low	N/A	Low
Heritage items	Medium	Medium	Medium	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	N/A	Low
Archaeology	High	–	Low	–	Low	–	–	High	High	–	–	–	–	N/A	–
Economic and social Business affected	Medium	Medium	Low	Low	Low	Low	Low	Low	Medium	Low	Medium	Low	Low	N/A	Low
Residents affected	Medium	High	Low	Low	Low	Low	Low	Low	Low	Low	Medium	Low	Medium	N/A	Medium
Public amenity	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	High	Low	Low	N/A	Low

– Denotes an unknown impact

1 As Rozelle Station would be constructed from the Balmain Leagues Club site, it is certain that this development would not be constructed at the same time as Rozelle Station. For this reason, the proposed development has not been considered in this table but is addressed as part of the economic and social assessment of 'back to back' construction impacts below.



Construction traffic

During the main excavation works, up to 30 truck movements per hour would be expected at some of the construction sites. Cumulative construction traffic impacts may occur where multiple construction projects use the same construction traffic routes at the same time. Cumulative impacts could include traffic congestion (particularly if truck movements occur during peak hour and if truck queuing occurs), amenity impacts (such as noise, visual and air quality) on sensitive receivers near these construction traffic routes, and pavement degradation.

At a local level, the following traffic routes may experience cumulative impacts as a result of multiple construction activities nearby:

- Broadway and Pitt Street are likely to be common local construction traffic routes for the CBD Metro Central Station, the Carlton United Breweries development (A), the UTS development (B) and the CityGrid project (2) (Belmore Park substation).
- Pitt, Bathurst and Park streets are likely to be common local construction traffic routes for the CBD Metro Town Hall Square Station and services building, the Sydney Water Board site redevelopment (C) and the Boyd development (E).
- Castlereagh Street is likely to be a common local construction traffic route for the CBD Metro Martin Place Station and the CityGrid project (2) (City East substation likely to be in the vicinity of Philip, Bent, Bligh and O'Connell streets).
- Margaret, Sussex, Hickson, Napoleon, Erskine and King streets are likely to be common local construction traffic routes for the CBD Metro Barangaroo-Wynyard Station and the Barangaroo development (I).
- Union and Pyrmont streets are likely to be common local construction traffic routes for the CBD Metro Pyrmont Station, the Star City development (K) and the Global Switch Site development (J) (Pyrmont Street only).
- Victoria Road and The Crescent/City West Link are likely to be common local construction traffic routes for the CBD Metro White Bay construction site and Rozelle Station, the Balmain Leagues Club development (N), the Inner West Busway Project (4), the Terry Street development (O), the Baileys Marine project (M) and the White Bay Cruise Passenger Terminal (3).

At a regional level, CBD Metro construction traffic routes in and out of the CBD are identified in Figures 10.1 to 10.4 and include the Western Distributor, Cleveland Street and the Eastern Distributor. Given the proximity of other projects to the CBD Metro construction sites (refer Figure 18.1), many of these construction traffic routes are likely to be used simultaneously by other construction traffic vehicles.

The construction of the CBD Metro would also require temporary full and/or partial closures of a number of streets as outlined in Chapter 10. While the impact of these closures is assessed in Chapter 10, there is the potential for further impacts on city traffic if other road closures associated with other projects occur concurrently, such as the partial or full temporary closure of Little Albion, Dalley and Underwood streets for the CityGrid project (2). Multiple road closures have the potential to cause confusion to drivers and result in congestion to traffic if sufficient detours or other alternative arrangements are not provided and planned effectively. Sufficient detail of the location and timing of any other road closures is not currently available for further assessment.

The construction of the CBD Metro is likely to affect some on-street parking, which may be occupied by site equipment or work sites. Parking availability is likely to be further affected if a number of construction projects were undertaken concurrently and within the same locality. Potential parking impacts are summarised in Table 18.5.

Table 18.5 Potential parking impacts due to multiple construction works

Construction site	Potential parking impacts	
	CBD Metro	Other projects
Central Station	- The work site would occupy 59 parking spaces at Railway Square. - Potential relocation of shuttle bus operations to the eastern side of Pitt Street south of Hay Street would displace about 6–10 existing metered parking spaces.	CityGrid project (Belmore Park substation) - The project would be constructed on land currently occupied by a commercial, street-level car park that provides about 100 car spaces. - The construction works would also temporarily require six kerbside parking spaces.
Town Hall Square Station	- Re-allocation of existing kerbside loading/parking restrictions to enable provision of a works zone adjacent to each site. - Temporary lane closures in Pitt Street (northbound – parking only) on its approach to Park Street during off peak periods to enable trucks to serve the Pitt Street construction site. - Re-allocation of existing kerbside loading/parking restrictions to enable provision of a truck call-forward location in Bathurst Street, between Kent and George streets. - Temporary occupation of a parking lane in Pitt Street for building basement support works.	Parking impacts of other projects are not known.
Martin Place Station	The temporary removal of on-street parking on Castlereagh Street and Elizabeth Street adjacent to the site access locations to facilitate truck turns from the kerbside lane and avoid delays to through-traffic movements.	Parking impacts of other projects are not known.
Barangaroo-Wynyard Station	- Removal of parking – Kent Street, Hickson Road, Sussex Street, Napoleon Street, Margaret Street and Clarence Street. - Removal of loading zones – two spaces in York Lane and potentially elsewhere in York, Clarence and Kent streets. - Removal of authorised RailCorp parking from York Lane.	Parking impacts of other projects are not known.
Pymont Station	- On-street car parking displaced from Mount Street (six spaces) and Union Street (five spaces). - Displacement of on-street car parking in Pymont Street (about 11 spaces) (for Alternative 2 only).	Star City development The project is anticipated to generate demand for parking about 133 vehicles a day from construction workers. No on-site parking is proposed.

It should be noted that parking for construction workers' vehicles is proposed at White Bay and Barangaroo, with connecting buses to the construction sites. Construction workers' vehicles are therefore unlikely to contribute further to the demand for parking in the CBD, Pyrmont or Rozelle.

Construction noise and vibration

Sensitive receivers likely to experience noise impacts as a result of the construction of the CBD Metro are identified in section 11.3.1. These receivers include residents, small business owners, tenants in commercial offices and students at educational facilities. While the impact of construction noise on these receivers has been assessed in Chapter 11, there is the potential for the impacts to be exacerbated by other nearby construction sites operating either simultaneously with the project or very shortly before or after the project. Cumulative impacts could include:

- Longer periods of construction noise on a daily basis and an overall basis.
- Increased overall noise levels.
- Longer/extended periods of night works.

The overall cumulative impact would further reduce local amenity and, at some locations, potentially incremental impacts on business viability. Cumulative noise impacts may also result in receivers that were not identified as affected by the CBD Metro project experiencing impacts as a result of the cumulative effect.

Table 18.3 identifies the likelihood and magnitude of cumulative interactions. In terms of combined impacts on noise-sensitive receivers, the magnitude of impacts was assessed based on the proximity of the developments, the nature of the construction works and the nature of nearby receivers. The following developments, in conjunction with the construction of the CBD Metro, are identified as likely to have high combined effects on nearby noise-sensitive receivers:

- Sensitive receivers likely to be impacted by works at the Central Station construction sites include a number of hotels, commercial offices, retail, outdoor public space areas (including Belmore Park), educational facilities and residential developments. Given the proximity of the Carlton United Breweries development (A), the UTS redevelopment (B) and the CityGrid project (2) (Belmore Park substation) the impacts on some or all of these receivers may be exacerbated by the concurrent construction of these projects.
- Sensitive receivers likely to be impacted by the works at the Barangaroo-Wynyard Station construction sites include, at the eastern site: Wynyard Park, Scots Presbyterian Church, and a mix of hotels, residential apartments and commercial offices; and at the western site: predominantly commercial offices, as well as a block of serviced apartments and Moreton's Hotel. Impacts on some or all of these receivers are likely to be exacerbated by concurrent construction of the development of Barangaroo (I).
- Sensitive receivers likely to be impacted by the works at the Pyrmont Station construction sites include multiple land uses in and around Union Square (pedestrians, residential and commercial premises and educational facilities), the Star City casino (including the Lyric Theatre and Star City apartments), and commercial and residential premises surrounding Mount Street. The noise emissions from the CBD Metro construction are likely to combine with existing noise levels from the Star City development (K) (currently under construction) to exacerbate noise impacts in the area, particularly at the eastern end of Union Square where both these developments would occur.
- Sensitive receivers likely to be impacted by the works at the Rozelle Station construction sites include St Paul's and St Thomas churches and associated childcare facilities, Rozelle Public School, and commercial and residential premises. If constructed concurrently, the road works associated with the Inner West Busway project (4) along Victoria Road may combine with those from the CBD Metro works to give rise to higher noise levels than would otherwise be the case.

Heritage

Chapter 13 identifies items of heritage significance and archaeological relics that may be impacted by the CBD Metro project. Cumulative impacts on heritage typically fall into two categories:

- Impacts on the heritage setting of a single heritage item (or group of items) by multiple surrounding developments.
- Impacts on individual heritage items by a number of different projects that result in an overall loss of heritage of a particular significance (that is, loss of building types from a particular era or loss of structures from a particular architect).

Impacts on the heritage setting of a location as a result of the combined impacts of the CBD Metro project and other nearby projects include:

- The impact on the setting of buildings at the corner of Pitt and Bathurst streets by the combined developments at the southern end of the Town Hall Square Station and the Sydney Water Board site (C).
- The impact on the setting of Union Square by the combined development of the Star City hotel (K) and Pyrmont Station.
- The impact on the setting of Wynyard Park and precinct by the combined development of Barangaroo (I) and the Barangaroo-Wynyard Station.

Economic and social impacts

Economic and social impacts as a result of the project are identified in Chapter 16, and the potential for cumulative traffic and amenity impacts to occur is discussed in the above sections. The consequent economic and social impacts that may result include:

- Longer commuter travel times and consequent socio-economic affects due to increased traffic congestion.
- Impacts on small business viability if customer parking is no longer convenient or if deliveries are no longer possible.
- Impacts on ground-floor retail (particularly businesses such as cafes with outdoor seating) due to further amenity reductions in terms of noise and visual impacts.
- Impacts on company productivity due to increased noise levels in office buildings.
- Impacts on the enjoyment of public spaces due to increased noise and visual impacts and loss of heritage items.

This impact assessment focuses on the impacts of other projects being constructed at the same time as the CBD Metro project, but there is also the potential that a number of these projects may be constructed directly after completion of the CBD Metro project. While this would not result in synergistic impacts (for example, from increased congestion and noise), impacts of 'back to back' construction on sensitive receivers – sometimes called 'construction fatigue' – requires proper consideration, and is discussed below.

The concept of construction fatigue relates to sensitive receivers that experience construction impacts from a variety of projects, over a long period of time, with little or no breaks between construction periods. For residents, prolonged impacts such as noise disturbance (particularly sleep disturbance), reduced visual amenity and local traffic congestion may result in stress and poor health. For businesses, prolonged impacts such as noise disturbance, reduced visual amenity and loss of parking may affect business viability.

The potential for construction fatigue to occur is highly dependent on the nature of the location, the nature of the receiver, and the nature and duration of the impacts. For example, construction fatigue is more likely to be experienced by owner-occupiers intending to remain in the residence for an indefinite period of time compared to short-term residents such as renters and/or students. Additionally, some areas are more resilient than others and are less susceptible to construction fatigue. For example, background noise levels in the Sydney CBD are much louder than those at Pyrmont or Rozelle and impacts from developments are typically less intrusive to the surrounding environment. The threshold before construction fatigue may be experienced is likely to be much higher in the CBD compared to Pyrmont or Rozelle.

An example where 'back to back' construction impacts are likely to occur would be the construction of Rozelle Station and the subsequent redevelopment of the Balmain Leagues Club site (N). As Rozelle Station would be constructed from the Balmain Leagues Club site, the Balmain Leagues Club development would not be constructed at the same time as the station. Depending on funding and approvals, the Balmain Leagues Club development could commence once the CBD Metro construction is completed, potentially immediately following. Cumulative impacts would include noise impacts on local residents and businesses, traffic disruptions and the continued loss of amenity while significant construction works were being carried out at Rozelle.

'Back to back' construction may also occur at a number of the other CBD Metro construction sites where developments are proposed above the stations or services buildings (such as at Town Hall Square, Martin Place and Barangaroo-Wynyard). Depending on the interest from developers and the development approval, the construction of these developments could occur either at the same time as the CBD Metro project, or soon after. Noise, visual amenity and traffic impacts, and economic disruption typical of a commercial development would be expected and could occur immediately following the same impacts from the CBD Metro, therefore leading to incremental impacts on the same receivers.

18.3.3 Other interactions

Although not identified as 'major projects', it is appropriate to also consider a number of other activities that may have a material effect on, or be influenced by the construction of, the CBD Metro project.

Public domain improvements

Public domain improvements proposed by the City of Sydney Council in the CBD and by the Roads and Traffic Authority/local council at Rozelle are outlined in Table 18.6. All of these works would require temporary or permanent modifications to local roads and/or footpaths near the CBD Metro construction sites. If the public domain works are undertaken at the same time as nearby CBD Metro construction works, there is the potential for cumulative traffic impacts due to multiple road closures, and cumulative visual amenity effects as a result of continuing construction works.

Of particular concern, if works were not undertaken concurrently, the public domain works may need to be temporarily demolished to allow for the CBD Metro construction works and reinstated later. This would clearly be an inefficient program of public works, resulting in a waste of materials and increased restoration costs. Potentially, where the CBD Metro works are undertaken prior to the public domain works, the complete restoration of roads and footpaths may be unnecessary if the public domain works are expected to follow.

Table 18.6 Proposed public domain improvements by others

CBD Metro station site	Proposed public domain improvements
City of Sydney Council	
Central Station	- Eddy Avenue southern footpath widening and coach station relocation. - Upgrade to Western forecourt.
Town Hall Square Station	- Bi-directional cycleway installed on Park Street, Sydney. - Future pedestrianisation/shared zone on Pitt Street. - Town Hall Square public domain works.
Martin Place Station	- Extension of King Street cycleway. - Future footpath widening/lane closures along Castlereagh Street.
Barangaroo-Wynyard Station	- Bi-directional cycleway on Kent Street. - York Lane upgrade.
Pymont Station	- Harris Street footpath widening and streetscape upgrade. - Union Square upgrade. - Bi-directional cycleway on Union and Miller streets.
Roads and Traffic Authority/Leichhardt Municipal Council	
Rozelle Station	- Street trees, paving, footpath improvements along Victoria Road and Darling Street. - Future widening of footpaths, with loss of one to two traffic lanes. - Future pedestrianisation of northern end of Hancock Street for public domain enhancement.

Sub-surface utility upgrades

Planned and unforeseen upgrades of sub-surface facilities by service providers such as EnergyAustralia and Sydney Water are likely to be required during the CBD Metro construction period. As most services are located beneath roads or footpaths, these works would require excavation and temporary changes to traffic conditions. If these upgrades were required near the CBD Metro construction sites, cumulative impacts such as multiple traffic changes, noise and visual impacts are likely.

Special events

The City of Sydney hosts a number of special events throughout the year. These events often require road closures and/or attract large numbers of people to specific locations within the city. If not appropriately managed, the interaction between the construction of the CBD Metro and special events may result in cumulative traffic impacts due to multiple road closures. Impacts of construction activities on special events could include loss of venues for construction sites (such as Martin Place and Union Square), noise impacts, impacts on amenity and impacts on pedestrian access.

Potential special events that may occur during the construction of the CBD Metro include:

- Festivals (such as Sydney Festival).
- Sporting events (such as Spring Cycle, City to Surf).
- National events (such as Australia Day, Anzac Day, New Year's Eve).
- Cruise ship docking (if the move to White Bay were delayed).
- Visiting heads of state and visiting naval ships.

18.4 Mitigation and management

The management of cumulative impacts may in some instances need to be addressed on a case-by-case basis, depending on the certainty of other projects being constructed. An overarching approach to development across Sydney and some more specific management measures are proposed below.

Coordination mechanisms

Existing management mechanisms

A number of mechanisms and requirements are already in place to manage the effects of construction projects in Sydney CBD. These would also be relevant to the CBD Metro project, and include:

- The requirement by City of Sydney Council to prepare Construction Traffic Management Plans, which must be submitted to, and approved by, Council prior to issue of a Construction Certificate. The Department of Planning/Minister for Planning imposes similar conditions on Major Project Approvals.
- The requirement for separate approvals to be obtained for:
 - Hoardings and scaffolding in a public place, under s138 of the *Roads Act 1993*.
 - Mobile crane permits, where partial or full road closures are required.
 - Work zones (clearway restrictions are required to be observed).
 - Temporary road closures (whether the closure is partial or full).
- The City of Sydney's Traffic Committee, which includes representatives from Roads and Traffic Authority (RTA), State Transit Authority (STA), Police, Sydney Harbour Foreshore Authority (SHFA), Transport Workers Union (TWU), Fire Brigades, Bicycle NSW and the Taxi Council. It is primarily a technical review body that is required to advise the City of Sydney Council on any traffic related matters. The Committee meets on a monthly basis.
- A special Working Group of the City of Sydney Council's Traffic Committee. The role of the Working Group is to manage traffic and pedestrian issues associated with the Westfield/Myer/Mid City Centre 'hot spot'. It meets on a fortnightly basis (or as required).
- The Central Sydney Operations Group, which has been established to arrange and coordinate major public events in the City of Sydney.

Proposed Traffic and Transport Liaison Group and Network Coordination Liaison Group

A Traffic and Transport Liaison Group and Network Coordination Liaison Group would be formed to ensure that all authorities affected by construction traffic associated with the Sydney Metro are aware of the proposed construction activities, upcoming works and related transport implications, and have the opportunity to comment on the mitigation measures proposed prior to implementation.

A primary function of the Traffic and Transport Liaison Group would be to address the coordination and management of construction traffic and transport network performance during the construction phase.

The participants may vary depending on the construction site and potential issues and areas affected, but the core group may consist of:

- Transport bodies such as Sydney Metro (and its contracted representatives), RTA (including Transport Management Centre), NSW Transport and Infrastructure, RailCorp, STA, Taxi Council and Bus and Coach Association.

- Environmental and planning authorities, such as Department of Planning and Department of Environment, Climate Change and Water.
- Emergency services and utility providers, such as Police, Fire, Ambulance, Sydney Water, EnergyAustralia and Telstra.
- Land owners/governing bodies, such as City of Sydney Council and Leichhardt Municipal Council traffic officers, Building Designers Association, Sydney Harbour Foreshore Authority, Sydney Ports Corporation.
- Coordination representatives from the main CBD developers, such as Westfield and Multiplex.

It is proposed that this group would undertake the consultation functions that would otherwise occur at forums such as Council Traffic Committee, when determining traffic management measures to be put in place to manage construction activities.

The Network Coordination Liaison Group would provide a strategic and tactical forum for ensuring the CBD Metro works are coordinated with other development and public works. It would aim to mitigate impacts on local businesses, residents and CBD visitors by ensuring that construction impacts arising from the CBD Metro are integrated and balanced against the construction impacts of wider redevelopment and other changes occurring within the CBD.

These other developments may include City of Sydney upgrade works, redevelopment of existing buildings/sites, and major services relocations. The scope of this group would be more strategic in its approach and would be concerned with longer term plans such as the end state arrangements. The Network Coordination Liaison Group would coordinate with other existing groups to ensure an integrated planning approach before, during and after the Metro is constructed.

The participants of the Network Coordination Liaison Group may include:

- Transport bodies such as Sydney Metro (CBD Metro), RTA and RailCorp.
- Environmental and planning authorities, such as Department of Planning and Department of Environment, Climate Change and Water.
- Land owners/governing bodies, such as City of Sydney Council and Leichhardt Municipal Council, Sydney Harbour Foreshore Authority, Barangaroo Delivery Authority, and major CBD redevelopment proponents (e.g. Energy Australia, land owners etc).
- Other groups including major special event proponents, and the PRI & IMO Contractor.

Proposed Central Project Coordination Committee

As discussed in Section 18.2, in addition to the existing and proposed management mechanisms detailed above (which relate primarily to traffic impacts), it is also proposed that a Central Project Coordination Committee be established to manage and coordinate the number of different projects proposed or currently being constructed within the Sydney CBD. The Central Project Coordination Committee would oversee a statutory agencies forum to ensure the CBD Metro works are coordinated with other concurrent developments and public works; and would aim to mitigate impacts on local business, residents and CBD visitors by ensuring that construction impacts arising from the CBD Metro are integrated and balanced against the construction impacts of wider redevelopment and other changes occurring within the CBD.

The scope of this group would be strategic in its approach and would be concerned with longer term plans such as the end-state arrangements. The group would co-ordinate with other existing and proposed groups and initiatives such as the Traffic and Transport Liaison Group, Network Coordination Liaison Group, Central Sydney Operations Group and the Wynyard Transport Precinct

Working Group, to ensure an integrated planning approach before, during and after the Metro is constructed.

The forum would provide a framework for early and effective consultation with the agencies and keep them apprised of progress and issues during the ongoing design and construction phases of the project.

In association with the Department of Planning, any proposed committee would consider framework measures and protocols, prior to the start of works, to ensure that any potential for cumulative impacts is kept to a practical minimum.

The group would also advise on:

- A strategic approach to the avoidance or mitigation of potentially significant impacts relating to noise, construction vibration, utilities, heritage-listed structures, amenity and any other factors deemed relevant at the time.
- The strategic management of the construction of the projects, with environmental monitoring undertaken across projects.
- The effectiveness of the Environmental Management System (EMS) for the CBD Metro project.
- The development of site-specific mitigation measures that are of strategic interest and likely to affect more than one concurrent project.

Specific measures

To address the potential for cumulative impacts during construction of the CBD Metro project, the following specific mitigation measures are proposed:

- Preparation of Traffic Management Plans within the context of the Traffic and Transport Liaison Group with consideration of any other proposed changes to traffic conditions that are likely to occur.
- Further consideration of measures to minimise congestion on local traffic routes, loss of parking spaces and changes to traffic conditions. Measures could include:
 - Combined construction vehicle parking sites to minimise the loss of on-street parking and/or the size of construction sites.
 - Combined construction worker shuttle buses to transport construction workers to CBD work sites and minimise the demand for parking within the CBD.
 - Beneficial reuse of spoil from the CBD Metro on other projects, to minimise spoil being trucked out of the city.
 - Targeted communication with road users likely to be affected by multiple changes (this could be done by radio broadcasts, signage, etc).
- Targeted consultation with sensitive receivers identified as noise-affected by the construction of the CBD Metro project and likely to be simultaneously affected by the construction of other projects.
- Discussions with proponents of nearby developments to identify measures to minimise cumulative noise impacts. Measures could include:
 - Undertaking particularly noisy activities at the same time (to minimise the duration of noise impacts) or at different times (to minimise the overall noise levels)

- Undertaking night works concurrently to minimise the number of nights during which the sleep-disturbance criteria might be exceeded.
- Consideration during the detailed design phase of measures to further reduce noise emissions from construction sites.
- Consideration by developers for the integration of mitigation measures for one project with another. For example, hoardings and noise barriers could be extended over time to minimise disruption and further reduce amenity or visual impacts.
- Consultation with City of Sydney Council to identify the timing and location of any public domain improvements near CBD Metro construction sites. Where possible, these works should be delivered sequentially to avoid multiple disruptions.
- Consultation with the Roads and Traffic Authority to identify the timing of cyclist and pedestrian improvements near the Victoria Road and Darling Street intersection. Consultation should include consideration of delivering these works sequentially to avoid multiple disruptions.
- Consultation with utility providers to identify the timing and location of any sub-surface utility works near CBD Metro construction sites.
- Consultation with the Central Sydney Operations Group.

18.5 Conclusions

Given the number of projects currently under construction or likely to be constructed at the same time as the CBD Metro, it is likely that some cumulative impacts would occur. These impacts would include traffic impacts (e.g. increased traffic due to construction vehicles, multiple changes to traffic routes and potential loss of parking), noise and vibration impacts (e.g. increased noise levels or longer periods of noisy works), heritage impacts (e.g. impacts on the setting of heritage buildings due to a number of surrounding developments), and social and economic impacts (e.g. cumulative traffic and amenity impacts resulting in longer commuter travel times and impacts to business viability, and construction fatigue from multiple 'back to back' developments).

It is proposed that, as well as undertaking specific mitigation measures as part of the CBD Metro project, a Central Coordination Group should be established to manage the number of different projects proposed or currently being constructed within the Sydney CBD. The Central Coordination Group would oversee a statutory agencies forum to ensure the CBD Metro works are coordinated with other concurrent developments and public works; and would aim to mitigate impacts on local business, residents and CBD visitors.

