17. Local impacts: Rozelle locality

Chapter 17 details the existing character and environment of the locality in the vicinity of the proposed Rozelle maintenance depot, as well as the key environmental impacts of the CBD and South East Light Rail Project ('the CSELR proposal' or 'the CSELR') in this locality. This chapter focuses on the following key environmental issues: local traffic transport and access; local property and land use; noise and vibration; visual and landscape character; built and non-Indigenous heritage; and socio-economics. Other regional environmental impacts and other environmental issues are covered in Chapters 9 to 11 of this Environmental Impact Statement (EIS).

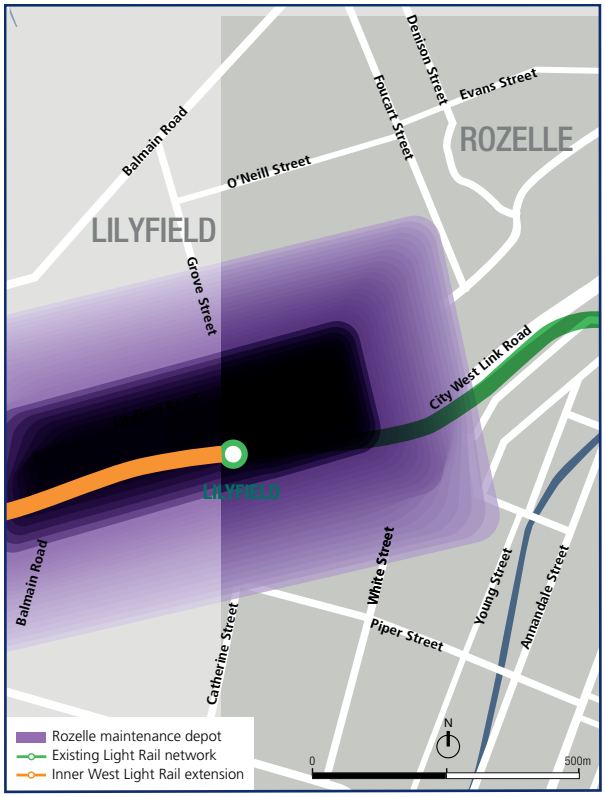
17.1 Key characteristics of the locality

The proposed Rozelle maintenance depot is located in the suburb of Lilyfield, a suburb in Sydney's Inner West, located approximately four kilometres from the City Centre Precinct (refer Figure 17.1). The locality forms part of the Leichhardt local government area (LGA). To the north and north-west Lilyfield is bordered by Iron Cove, to the east by Rozelle and to the south by Annandale and Leichhardt. Lilyfield is connected to Pyrmont and the Sydney CBD by the Anzac Bridge and to Drummoyne via the Iron Cove Bridge. Around the foreshore of Iron Cove is a circular track known as the Bay Run, which is popular with local walkers, runners and cyclists. Callan Park, a heritage-listed site, occupies a large area in the northern part of the suburb. Previously a psychiatric hospital, Callan Park is now used for cultural and recreation uses.

Historically, the Rozelle to Darling Harbour Goods Line passed through the suburb and major rail yards were located there. The heritage-listed White Bay Power Station still stands as a reminder of the former industrial foreshore. The Goods Line has been re-used as part of the Sydney light rail network, including a stop at Lilyfield.

Historically a working class suburb, Lilyfield has been through a period of gentrification and is now a cosmopolitan and eclectic suburb of Sydney.

Figure 17.1 Rozelle maintenance depot locality



Today many of Lilyfield's houses are home to people employed (predominately) as professionals, managers, clerical and administrative workers.

The Rozelle maintenance depot site is located to the north of the City West Link Road. The site is generally located to the east of the Catherine Street road bridge between Lilyfield Road and the City West Link Road.

The site is located within part of the former Rozelle Goods Line corridor (also known as the Rozelle Rail Yards). The landscape within the corridor is relatively level given the need for a gentle gradient for the former freight railway line. However, outside the immediate alignment of the existing tracks, the landscape has varying topography with some steep embankments on both the northern and southern sides of the corridor.

17.2 Key community concerns for the locality

Based on community consultations to date (see Chapter 2), the key community issue for the Rozelle locality was the proposed 24 hour operation of the Rozelle maintenance depot, associated noise and traffic impacts in the local area and proposed integration with the Inner West Light Rail maintenance facility.

17.3 Local traffic, transport and access

17.3.1 Existing conditions

The Rozelle maintenance depot site is situated adjacent to the existing Lilyfield light rail stop and is bounded by Lilyfield Road and the City West Link.

Lilyfield Road, adjacent to Catherine Street, was formally a major collector road, prior to the installation of the City West Link. Since then, traffic volumes have considerably reduced and the road re-classified to local road status with load restrictions. The traffic volume on Lilyfield Road is significantly lower than the City West Link and operates well within its available capacity. At present, parking is permitted along both sides of the street with a large number of light rail commuters parking along the southern side of the street. Spanning the entire length of Lilyfield Road are on-street cycle lanes connecting Hawthorne Canal and Anzac Bridge which are well utilised by cyclists during peak periods.

The existing road network is shown in Figure 17.2.

17.3.2 Impacts during operation

Site access

Vehicle access to the Rozelle maintenance depot and adjacent commercial properties within the Rozelle Rail Yards would be maintained via the existing driveway located on Lilyfield Road, east of Catherine Street, and the existing internal site access road. The existing driveway located on Lilyfield Road historically accommodated heavy vehicle movements for the purposes of hauling freight and materials via Lilyfield Road. As such, the existing vehicular crossing could be adapted for use during both construction and operation of the maintenance depot. The majority of vehicle movements, especially heavy vehicles, would be via the City West Link, with vehicles accessing Balmain Road and Catherine Street for movements in and out of the site. Given the proximity of these links and the low traffic volumes currently on Lilyfield Road, the traffic impact of additional traffic generated by the maintenance depot along Lilyfield Road would be minimal.

During the operation of the maintenance depot, peak traffic generation would be attributable to periods of shift changeovers where staff vehicles would be entering and exiting the site. To ensure efficient operation of the system, parking for staff vehicles would be accommodated internally, with approximately 50 parking spaces provided for both staff and visitors. This would be sufficient to accommodate all traffic generated by the maintenance facility and, therefore, impact on adjacent on-street parking provisions would also be minimal.

Furthermore, as the development of the maintenance depot would be wholly contained within the former Rozelle Rail Yards, with minimal changes to the existing access arrangements, it is considered that the traffic impacts on pedestrians, cyclists, existing light rail users and other road users would be minimal.

An internal road network would cater for independent heavy vehicle movements and would be designed to NSW Roads and Maritime Services (RMS) and Australian Standards and guidelines.

Access would be maintained for all existing businesses that would remain adjacent to the proposed Rozelle maintenance depot.

Interaction with the Inner West Light Rail

All vehicles associated with the CSELR, the existing light rail network and the Inner West Light Rail Extension (a separate project, under construction) would be maintained at the new integrated maintenance facility located at the former Rozelle Rail Yards in Lilyfield. The existing Inner West Light Rail maintenance and stabling facility at Pyrmont would be retained, with light rail vehicles for the Inner West Light Rail Project stabled at the existing Pyrmont facility and the proposed Rozelle Rail Yards stabling area (outside the scope of this EIS). The CSELR light rail vehicles (LRVs) would be stabled at a site adjacent to Royal Randwick racecourse, where the integrated Operations Control Centre (OCC) would be located (refer to section 5.10.2). The CSELR LRVs would infrequently transfer to Rozelle via the Inner West Light Rail system.

17.3.3 Impacts during construction

The proposed haulage routes for the Rozelle maintenance depot worksite are shown in Figure 6.8 (refer to Chapter 6). For trucks approaching from the west (Parramatta Road/M4) and City West Link, entry would be via Balmain Road and via Catherine Street on exit to the City West Link.

Traffic movements during construction are anticipated to be low due to the minor works required to adapt the existing site. While a detailed breakdown of truck movements by activity has not been undertaken at this stage, it is anticipated that at peak times, truck movements would not exceed 100 truck trips (two-way movements) per day.

The existing driveway access to Lilyfield Road is designed for heavy vehicle movements and would not require modification to accommodate the proposed maintenance depot. Existing industrial premises and the existing site uses generate truck movements on Lilyfield Road, which means that the proposed site use should be compatible with current uses.

17.3.4 Management and mitigation

Operation

As outlined in section 17.3.2, the operation of the proposed Rozelle maintenance depot would have minimal impacts on pedestrians, cyclists, existing light rail users, other road users and adjacent on-street parking provisions. To ensure efficient operation of the system, parking for staff vehicles would be accommodated internally. Furthermore, the development of the maintenance depot would be wholly contained within the former Rozelle Rail Yards, with minimal changes to the existing access arrangements. As such, site specific management measures for the operation of the Rozelle maintenance facility would not be required.

Construction

As discussed in section 9.2.4, a construction network management plan would be developed during detailed design to identify appropriate construction traffic management measures and establish a framework for coordinating their implementation during the construction of the CSELR proposal. The construction network management plan would identify key measures that would be implemented during construction to minimise impacts to journey times and congestion levels.

Site-specific traffic management plans would be prepared for the construction of the CSELR, providing details of individual traffic control plans and road occupancy licence requirements.

Overarching traffic, transport and access management strategies proposed during the construction of the CSELR proposal are described in sections 6.10 and 9.2.4 of the EIS.

17.4 Local property and land use

17.4.1 Existing conditions

Existing land use patterns, land use features and an overview of the potential future developments within the vicinity of the Rozelle maintenance depot area are described below. Figure 17.2 identifies the major existing and potential future land uses in the Rozelle locality adjacent to the CSELR proposal.

Existing property and land uses within the vicinity of the proposal

The northern portion of the proposed maintenance depot site currently contains a series of industrial buildings associated with the former Rozelle Rail Yards, ranging from approximately eight to 12 metres in height. The southern portion of the site is dominated by existing railway lines. The existing Lilyfield light rail stop is also located along the southern boundary of the site, to the east of the Catherine Street road bridge.

Given the previous use of this site as a railway goods yard and freight line, many adjacent land uses have been designed to 'turn away' from the site and face the adjoining street networks to the north and south of the site. A limited number of higher-density residential buildings overlook the site, particularly on the northern. Heavy planting along the southern edge of the site also provides some screening of views to the City West Link and adjoining residential areas of Annandale.

Other land uses within the vicinity of the maintenance depot site include a range of small-scale industrial uses (to the north-east of the site), a daycare centre (to the north-west of the site), open space to the north-west of the site and the Sydney Buses Leichhardt Depot to the south-west. In addition, the existing Rozelle Goods Line corridor to the west of the proposed maintenance depot site (to the west of the Catherine Street road bridge) is currently being developed as the maintenance and stabling facility for the Inner West Light Rail Extension network.

Photographs of the typical land uses within the Rozelle locality are shown in Figure 17.3 to Figure 17.6.

Planning controls

The site is currently zoned 'Ports and Employment' under the *Sydney Regional Environmental Plan 26 – City West* (City West SREP) (refer to Figure 17.7). The City West SREP outlines principles relating to the regional role of the City West region, land use activities, mixed use living, education, leisure and recreation, port functions, social issues, environmental issues, urban design, the public domain, heritage, movement and parking, and implementation and phasing. The currently allowable floor space ratio for the adjacent residential areas is 0.5:1 to the north, west, and south-west; and 0.6:1 to the east and south-east.

As of 1 July 2009, all regional environmental plans were deemed to be State environmental planning policies.

The proposed development of the Rozelle maintenance depot is wholly within land zoned under the City West SREP, whereas the land adjoining the site is zoned under the *Leichhardt Local Environmental Plan 2000* (refer to Figure 17.7).

Figure 17.2 Rozelle maintenance depot – Land use and property

Figure 17.3 Photograph of medium-density developments along Lilyfield Road

Source: Parsons Brinckerhoff 2013

Figure 17.4 Photograph of the existing Lilyfield light rail stop entrance looking east from Catherine Street

Source: Parsons Brinckerhoff 2013

Figure 17.5 Photographs of the existing land uses along Lilyfield Road including high density developments (top) and more recent townhouse developments to the north of the proposed maintenance depot site (bottom)

Source: *Parsons Brinckerhoff 2013*

Figure 17.6 Photograph of the typical infrastructure and buildings within the proposed Rozelle maintenance depot site

Source: Parsons Brinckerhoff 2013

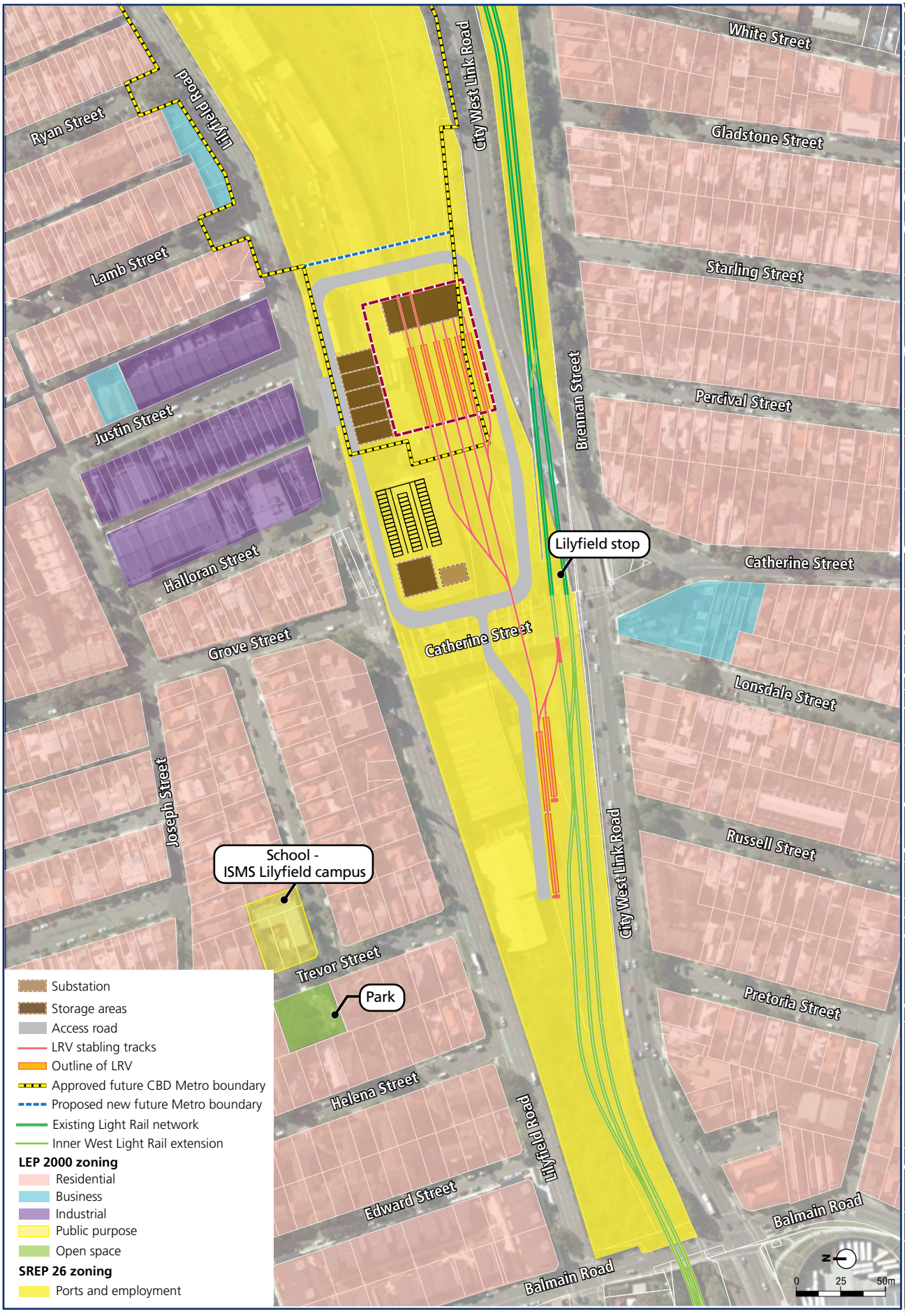
Potential future land uses within the vicinity of the proposal

An overview of the planned future development in the wider Sydney region is described in Chapter 9. As shown in Figure 9.15, two future urban land uses have been identified within the vicinity of the Rozelle maintenance depot. These major developments are described below.

Inner West Light Rail Extension

The Inner West Light Rail Extension is the first stage of the expansion of the existing light rail network in Sydney. The extension is proposed to connect to the existing light rail service between Central Railway Station and Lilyfield, and is proposed to run along the former Rozelle Goods Line corridor, through the Inner West to Dulwich Hill. The project includes an extension of approximately 5.6 kilometres of the light rail from Lilyfield to Dulwich Hill including nine new light rail stops, new access paths and facilities for changing between transport modes, in addition to expansion of the existing light rail stabling facility in Pyrmont. Major construction of the project commenced in November 2012. All nine new stops are now under construction. The extended service is proposed to commence operation in early 2014.

Figure 17.7 Rozelle maintenance depot – Existing zoning



Sydney Exhibition Centre at Glebe Island

To accommodate exhibitions during the development of the new Sydney International Convention, Exhibition and Entertainment Precinct in Darling Harbour (refer to section 12.4.1), due to be completed in late 2016, an interim exhibition facility is proposed to be built at Glebe Island, approximately two kilometres to the east of the proposed Rozelle maintenance depot site.

The Sydney Exhibition Centre at Glebe Island would provide a temporary (approximately four-year) pavilion-style exhibition space of approximately 20,000 square metres, with the option for an additional 5,000 square metres for temporary expansion for larger public exhibitions and trade shows. Early works for the facility commenced in July 2013. The Sydney Exhibition Centre at Glebe Island is proposed to be finalised in early 2014.

It is considered that the proposed Rozelle maintenance depot would not impact on the operation of the temporary Sydney Exhibition Centre at Glebe Island. Some cumulative traffic impacts may occur from the construction and operation of both facilities; however the existing traffic network is anticipated to be able to accommodate this potential increase.

Bays Precinct Strategic Framework

The Bays Precinct comprises approximately 94 hectares of the waterways of four connected bays west of Darling Harbour (Johnstons Bay, White Bay, Rozelle Bay and Blackwattle Bay) and 80 hectares of adjoining and largely Government-owned land. Part of the land identified within the Bays Precinct is the proposed Rozelle maintenance depot.

A strategic framework into the future use of this precinct was prepared in August 2012 (Bays Precinct Taskforce, 2012). This identified a series of recommendations for the future use and development of the existing waterways and adjoining land. With specific reference to the proposed Rozelle maintenance depot site, the strategic framework acknowledged and recommended the following:

- protect Rozelle Rail Yards as a significant asset for delivery of future regional transport requirements
- when future transport requirements at Rozelle Rail Yards are clarified, the NSW Government, in consultation with Leichhardt Council, investigate and test opportunities for mixed use development within the Rozelle Rail Yards, providing recreation, commercial and residential uses that integrate surrounding communities.

It is considered that the proposed Rozelle maintenance depot would be generally consistent with the strategic framework identified for the Bays Precinct and the Rozelle Rail Yards site, and would not preclude the progress of other proposed developments for the area.

17.4.2 Impacts during operation

Direct impacts on land use and property

The permanent footprint of the Rozelle maintenance depot would be wholly within the existing Rozelle Rail Yard site between the City West Link and Lilyfield Road. The land to be used for the Rozelle maintenance depot is currently owned by Sydney Trains and the Sydney Harbour Foreshore Authority and contains various existing commercial and industrial uses, including a valuers and auctioneers warehouse and a truck transport company. This land would need to be transferred to Transport for NSW as part of the proposal. Additionally, the leases for the existing commercial and industrial businesses that would be impacted by the Rozelle maintenance depot would be required to be terminated prior to construction of the depot.

Land use integration and amenity

The Rozelle Rail Yards site currently represents a highly industrial component of the Rozelle and Lilyfield area. The proposed Rozelle maintenance depot would be compatible with the current existing land use and the existing land uses within the immediate vicinity of the proposed facility. The Rozelle maintenance depot is not anticipated to result in short or long-term land use changes.

Operation of the Rozelle maintenance depot has been described in Chapter 5 (section 5.4.8). The operation of the depot has the potential to occur 24 hours per day and may result in some amenity impacts associated with employee access and LRV commencement procedures, such as testing of warning bells and start-up of air-conditioning units and power convertors. It may also have some potential visual amenity impacts such as the need for security lighting at night. The potential impacts of these activities (including management and mitigation measures) are assessed in greater detail in section 17.5 and section 17.6 respectively. Implementation of the proposed management and mitigation measures for these potential impacts is anticipated to result in a low level of overall amenity impacts within the vicinity of the Rozelle locality during operation.

Impacts on future land uses and developments

The proposed location and use of the Rozelle maintenance depot within the Rozelle Rail Yards site is generally consistent with the industrial nature of the existing land uses on the site. The Rozelle maintenance depot is therefore not anticipated to influence land use changes within the Lilyfield/ Rozelle area.

All future developments within the vicinity of the Rozelle maintenance depot that have not yet commenced, and in particular developments proposed for sensitive land uses, would be required to consider the potential impacts of the CSELR proposal on that development and the potential impacts of that development on the CSELR proposal.

17.4.3 Impacts during construction

Direct impacts on land use and property

Construction of the Rozelle maintenance depot is not anticipated to require the use of land outside of the area identified for the permanent footprint for the CSELR proposal. No additional impact on land use and property during the construction period of the proposal is therefore expected.

Amenity impacts on existing land uses within the vicinity of the proposal

The amenity of the area in the immediate vicinity of the Rozelle maintenance depot may be affected as a result of the construction activities for the depot. These impacts would primarily relate to construction activities and traffic and associated noise impacts. Activities would include demolition of the existing buildings, construction of the new buildings and facilities (including additional light rail tracks), and movement of construction vehicles carrying plant, equipment, materials or excavated material to or from the maintenance facility.

Construction activities in the vicinity of the Rozelle maintenance depot would be confined to the site area within the Rozelle Rail Yards site, which and would limit the impact to public areas such as Lilyfield Road and surrounding areas. The construction sequencing for the Rozelle maintenance depot outlined in Chapter 6 (approximately two and a half years) would also provide opportunities to undertake potentially adverse construction activities (such as activities that generate a substantial amount of noise) during appropriate times of the day to minimise impacts to surrounding land uses. Although amenity within the Rozelle locality would be affected by the construction activities, this is unlikely to influence land use changes in the short or long-term.

17.4.4 Management and mitigation

To minimise the land use and property impacts of the CSELR proposal within the vicinity of the Rozelle maintenance depot, consultation would occur with the surrounding businesses, community and commuters advising them in advance of proposed works and any temporary access arrangements that may be required along Lilyfield Road.

Additionally, the overall construction footprint would be refined during detailed design to identify areas where the proposal footprint can be minimised to reduce impacts on existing land uses. Detailed staging of the proposal would also be determined during detailed design and would aim to minimise the time that affected land uses are impacted during construction.

17.5 Noise and vibration

Technical Paper 11 — *Noise and Vibration Impact Assessment* in Volume 6 of the EIS includes a full noise and vibration assessment of the CSELR proposal, prepared by SLR. This section provides a summary of the findings of this assessment in relation to the Rozelle maintenance depot locality.

17.5.1 Existing conditions

The assessment of potential impacts associated with the Rozelle maintenance depot has been undertaken in accordance with the NSW *Industrial Noise Policy* (INP) (Environment Protection Authority, EPA 2000). To outline the existing noise environment and determine likely impacts, noise catchment areas (NCAs) were defined. Figure 17.8 shows the NCAs for the Rozelle locality and the noise monitoring locations (BG13 and BG14). Noise and vibration sensitive receptors within the locality include residences, and commercial premises.

Table 17.1 presents results of the unattended background noise monitoring undertaken in 2009 at locations BG13 and BG14. The unattended monitoring results are presented in the form of the Rating Background Level (RBL) and L_{Aeq} (energy averaged) noise levels for the day, evening and night-time periods. No attended monitoring was undertaken.

Table 17.1 Unattended noise monitoring results – Rozelle maintenance depot locality

NOISE MONITORING LOCATION (REFER FIGURE 17.8)	NOISE LEVEL (DBA)					
	DAYTIME (7 AM TO 6 PM)		EVENING (6 PM TO 10 PM)		NIGHT-TIME (10 PM TO 7 AM)	
	RBL	L_{AEQ}	RBL	L_{AEQ}	RBL	L_{AEQ}
BG13	56	66	55	64	47	59
BG14	49	58	49	57	42	51

Source: *Table 5 in Technical Paper 11 – Noise and Vibration Impact Assessment, Volume 6*

Note: *dBA = A-weighted decibels*

To provide protection against impacts on amenity, the INP specifies suitable maximum noise levels for particular land uses and activities during the daytime, evening and night-time periods. For this assessment, the existing residences in the vicinity of the Rozelle maintenance depot are considered to be 'Urban'. According to the INP, an 'Urban' area is characterised by an acoustic environment dominated by 'urban hum' or an industrial source noise, and through-traffic with characteristically heavy and continuous traffic flows during peak hours, located near commercial districts or industrial districts.

Figure 17.8 Rozelle maintenance depot locality – Noise catchment areas and noise monitoring locations

17.5.2 Impacts during operation

The Rozelle maintenance depot would consist of maintenance inspection roads for LRVs with a main facility building, workshops and storage. The maintenance facilities would provide general maintenance activities, bogie and underframe inspection of the LRVs from an under floor pit, elevated walkways and crane lifting facilities. A staff warning system would be used when LRVs are moving or about to start moving. The maximum LRV speed in the maintenance facility would be 10 kilometres per hour. Approximately four LRV movements each day into and out of the depot are expected at the Rozelle maintenance depot. Work on the LRVs at Rozelle would potentially take place on a 24 hour basis.

The movement of LRVs from the CSELR network to the Rozelle maintenance depot would result in a small number of additional LRV movements on the existing tracks between Hay Street and Lilyfield/Rozelle. The noise impacts of these additional LRV movements are not expected to be noticeable. That is, the maximum noise emissions would be equivalent to the noise from the existing LRVs, and the increase in L_{Aeq} noise levels during the daytime, evening or night-time would be much less than 2 dB.

Potential noise sources at the Rozelle maintenance depot include:

- *Maintenance workshop* — A wheel lathe in the maintenance building would be utilised to remove wheel defects and restore wheels to the correct profile. Correcting of LRV wheels would be performed on an infrequent basis.
- *Warning systems* — Some form of visible and audible warning system would be used in and around the maintenance building for the purpose of alerting staff of LRV movements.
- *Movements of LRVs around the facility* — LRV movements would occur at low speeds and the key noise emissions would be the on-board equipment (such as power converters and air-conditioners), with some contribution from wheel-rail noise at crossovers and turnouts.
- *Occasional heavy vehicles and staff movements* — The impact of staff cars accessing the on-site car park would be minimal due to the low vehicle numbers and the proximity to Lilyfield Road.
- *Preparation of LRVs* f— or passenger service and LRVs that are 'on-the-wire'.

A public address (PA) system is also likely to be installed at the maintenance depot. With appropriate design measures in place, the contribution of the PA system to the overall ambient L_{Aeq} noise level at the nearest receptors would be minimal. As this PA system would only be used in emergencies, noise from PA systems was not included in the noise predictions at the Rozelle maintenance depot.

The Inner West Light Rail Extension proposes (in future) to stable three LRVs at the western end of the Rozelle maintenance depot site. The noise emissions of these stabled LRVs included in the overall emissions from the Rozelle site to ensure assessment of cumulative noise impacts. Pre-start checks on these LRVs would commence after 5.00 am, with no more than two LRVs starting up in any 15 minute period. At this stage, it has been assumed that these LRVs may test warning bells at this location.

The predicted noise levels from the operation of the Rozelle maintenance depot are described in Table 17.2 for the most affected receptors for each operational scenario. The operational noise goals are sourced from the INP (EPA 2000). The total number of properties at which noise criteria exceedances were predicted under each scenario is included in the table, wherein each floor of each building is counted as a separate receptor.

Table 17.2 Rozelle maintenance depot predicted operational noise levels

SCENARIO	PREDICTED NOISE LEVEL – MOST AFFECTED RECEPTOR (dBA)			OPERATIONAL NOISE GOAL	TOTAL NUMBER OF PROPERTY EXCEEDANCES[1]
	GROUND FLOOR	FLOOR 1	FLOOR 2+		
Daytime operations	52	51	51	60 dBA $L_{Aeq(Period)}$	0
Evening operations	51	50	48	54 dBA $L_{Aeq(Period)}$	0
Night-time operations	51	50	48	49 dBA $L_{Aeq(Period)}$	6
Maximum noise emissions	53	53	52	62 dBA $L_{A1(60sec)}$	0

Note 1: *Total number of property exceedances – each floor of each modelled building is counted as a separate receptor for this purpose.*

Source: *Table 36 in Technical Paper 11 – Noise and Vibration Impact Assessment, Volume 6*

The noise criteria were not predicted to be exceeded at the nearest sensitive receptors to the Rozelle maintenance depot for the modelled scenarios during the daytime and evening periods. However, the noise criteria were exceeded by up to 2 dB at six receptors during the night-time period. Three of these properties are located to the north of the proposed facility and three are located to the south. The only significant contributor to the L_{Aeq} noise levels at these receptors is the open LRV entry doors of the maintenance building. Closing the LRV entry doors on the maintenance building during the night-time period would eliminate the predicted exceedances of the noise criteria (refer section 17.5.4 for an outline of the proposed noise mitigation).

The noise criteria for nearby commercial receptors were not predicted to be exceeded for any of the modelled scenarios during the daytime, evening and night-time periods. Furthermore, the sleep disturbance screening criterion was not predicted to be exceeded at the nearest sensitive receptors at Rozelle for the modelled scenario during the night-time period.

Notwithstanding this, compliance with the noise goals would depend on careful design of the facility, in particular warning systems to alert staff of impending vehicle movements, buildings and workshops (including the enclosure of the wheel lathe), the PA system and use of non-tonal reversing alarms.

Noise from operation of substations

The CSELR proposal includes a new substation within the Rozelle maintenance depot. The noise impacts of this substation have been assessed as part of the overall industrial noise emissions of the site.

17.5.3 Impacts during construction

The beginning of section 12.5.3 in Chapter 12 provides an overview of potential construction noise impacts of the CSELR, which also applies to the Rozelle maintenance depot locality.

Potential noise and vibration impacts in the Rozelle maintenance depot locality were assessed in relation to the following:

- construction airborne noise
- construction road traffic noise
- construction ground-borne noise
- construction vibration.

These issues are discussed in turn in the following subsections.

Predicted construction airborne noise

Airborne construction noise was predicted for the likely construction activity categories and scenarios (without mitigation), as detailed in Table 17.3 for the Rozelle maintenance depot locality.

Table 17.3 Summary of airborne construction noise scenarios considered – Rozelle maintenance depot locality

SCENARIOS	SCENARIO SOUND POWER LEVEL (dB)	APPROXIMATE DURATION OF WORKS AT ANY LOCALITY[1]
Site remediation, clearing and grubbing	113	18–24 months[2]
Building demolition at discrete locations	118	
Excavation	106	
Forming, reinforcing and concreting	110	
General mechanical and electrical works	105	

Source: *Table 55 in Technical Paper 11 – Noise and Vibration Impact Assessment, Volume 6*

Note 1: *Work estimate assumes one shift per day and based on typical 200 metre length of corridor and with a 2 x platform stop, and may not be over consecutive days (i.e. shorter periods of work adding up to total duration specified).*

Note 2: *Limited information is available on this activity at this phase of the proposal, and hence, the key activities determined have only had high level assumptions made with respect to proposed duration.*

The predicted construction airborne noise impacts at the Rozelle maintenance depot locality are summarised in Table 17.4 below. This table shows predicted exceedances of the adopted noise management levels (or NMLs) associated with the proposed activities and scenarios listed above.

Table 17.4 Summary of airborne construction noise level exceedances of NMLs – Rozelle maintenance depot locality

RECEPTOR TYPE	WORST-CASE NML EXCEEDANCE AT NEARBY RECEPTORS (dB) (LEAST NOISE INTENSIVE SCENARIO – MOST NOISE INTENSIVE SCENARIO)	
	STANDARD CONSTRUCTION HOURS	OUT OF HOURS WORKS
Residential	0–12	3–25
Commercial	0–8	0–8
Other Sensitive	-	-

Source: *Table 56 in Technical Paper 11 – Noise and Vibration Impact Assessment, Volume 6*

Moderate to high exceedances of the NMLs were predicted at the nearest residences to the works during standard construction hours (exceedances up to 12 dB) and out of hours work (exceedances of up to 25 dB). Commercial and other sensitive receptors were predicted to be subject to minor NML exceedances of up to 8 dB.

Within the Rozelle locality, the most noise intensive works are likely to be building demolition activities, which may require use of a rockbreaker.

The majority of works would be completed during the standard daytime construction hours of Monday to Friday 7.00 am to 6.00 pm and Saturdays 8.00 am to 1.00 pm; however some evening and night works would be required.

At this early stage in the proposal, out of hours works are included in the assessment for all proposed works in order to inform the scheduling of construction activity and management of noise during the detailed design phase. It is anticipated that the finalised requirements for out of hours works would be determined at a later design stage.

Predicted $L_{A1(1minute)}$ noise levels at the nearest noise sensitive receptors (refer Appendix D of Technical Paper 11) indicate that the sleep disturbance screening criterion is likely to be exceeded when night works are occurring adjacent to residential receptors for the majority of works scenarios. This level of noise is typical for construction works using noise intensive equipment in built up areas. The applicable guideline (the *Interim Construction Noise Guideline* (DECC 2009)) only requires the proposal to consider maximum noise levels where construction works are planned to extend over more than two consecutive nights.

As discussed further in section 17.5.4, various mitigation measures are proposed to minimise the predicted NML exceedances, including sleep disturbance.

Predicted construction ground-borne noise

Ground-borne construction noise is likely to be audible in the Rozelle maintenance depot locality during rockbreaker activities at the nearest residential and commercial buildings to the works; however airborne noise levels associated with the rockbreaker works are likely to be much higher than the ground-borne noise levels and, therefore, more prominent. For this reason, further assessment of ground-borne noise at these receptors is not considered warranted.

Predicted construction vibration

Potential construction vibration impacts from the CSELR proposal are discussed in Chapter 12 (section 12.5) for the whole CSELR alignment, including the Rozelle maintenance depot locality. In summary, most works would be expected to comply with the relevant construction vibration guidelines. However, some items of construction equipment are proposed to be operated within 20 metres of residential receptors and within the recommended safe working distances for 'cosmetic damage' and 'human comfort' from construction vibration, depending on the duration and nature of the construction activity.

Any exceedances would be expected to be of short duration. Mitigation and management measures to address potential impacts of this are discussed in section 17.5.4.

Under the British Standard (BS 7385) heritage buildings are assessed the same way as other buildings (unless they are structurally unsound). Therefore, the above assessment also applies to heritage buildings adjacent to the site.

17.5.4 Management and mitigation

Operational management and mitigation measures

The Rozelle maintenance depot would include a wheel lathe in the maintenance building which would be utilised on an infrequent basis to remove wheel defects and restore wheels to the correct profile. The design of the building and mechanical equipment would include noise mitigation measures (as required) to comply with the noise criteria at the nearest noise sensitive receptors.

At the Rozelle maintenance depot the predicted daytime and evening noise levels comply with the INP noise criteria. During the night-time period, noise levels exceed the noise criteria by up to 2 dB. This can be mitigated by closing the LRV entry doors during the night-time. Careful design of the workshop and wheel lathe enclosures would be required to assist in meeting the noise criteria at Rozelle. This would be developed through the detailed design process.

Noise from the proposed electrical substation would be controlled by inclusion of shielding or enclosures to comply with the INP.

It is anticipated that some form of visible and audible warning system would be used in and around the maintenance building for the purpose of alerting staff of LRV movements. It is proposed that all audible alarm systems would be non-tonal and that maintenance hard

stand areas and turning spaces would be designed such that vehicles do not need to reverse unnecessarily. Alarm systems would be designed to meet the noise goals for the facility.

A PA system is likely to be installed at the maintenance depot, but would only be used in emergencies. Appropriate design measures would be incorporated to ensure the contribution of the PA system to the overall ambient LAeq noise level at the nearest receptors would be minimal.

Construction management and mitigation measures

Consistent with the requirements of the ICNG, the construction noise impact assessment was based on a realistic worst-case assessment. For most activities, it is expected that the construction noise levels would be lower than have been (conservatively) predicted in this report.

Due to the proximity of residential and other noise sensitive receptors to noise-generating construction works, some construction scenarios have the potential to result in high noise impacts.

As set out in section 12.5.4, a construction noise and vibration management plan (CNVP) would be developed to document all necessary measures to manage and mitigation potential noise and vibration levels during standard daytime and any planned out of hours construction activities. This would include measures required for the construction of the Rozelle maintenance depot.

17.6 Visual and landscape character

The following section provides a summary of the potential local visual and landscape character impacts of the proposal within the Rozelle locality, based on Technical Paper 10 — *Visual and Landscape Assessment* contained in Volume 5 of this EIS.

17.6.1 Existing landscape character and visual conditions

The site for the Rozelle maintenance depot is located within the Rozelle Rail Yards site in a wide cutting. The site is dominated by rail infrastructure and large industrial sheds. The site contains rail yards, a range of large storage facilities, stacked shipping containers, and stockpiles. The site is industrial in character, although mature vegetation largely encloses the site to views from adjacent roads.

To the south of the site are the Inner West Light Rail Extension (currently under construction) and the Lilyfield stop light rail (part of the existing Pyrmont light rail network), which is located adjacent to the existing Rail Yards. The Lilyfield stop, which is built as an island platform, is accessed by stairs and a lift from Catherine Street. Catherine Street forms a bridge connecting Lilyfield Road with the City West Link Road which sits above the Rail Yards.

From Catherine Street there are limited views due to the tall brick walls which form the edge of the bridge. However, over the wall, and from the entry to the light rail stop, broad views are available across the site for example from some residential buildings (including proposed residential buildings) to the south of the City West Link. In these views, the City is visible in the background, with the Sydney Harbour Bridge, Anzac Bridge and CBD skyline forming part of the view.

Beyond the light rail, to the south, is the City West Link Road. This road is a broad four-lane arterial road, characterised by concrete barriers and high timber noise walls and buffer planting. This road is located above the Rail Yards, and connects with Anzac Bridge and the Western Distributor Freeway. Beyond the road, to the south, is a mix of residential and commercial development of mixed quality.

Lilyfield Road creates the northern boundary to the site. The road is located above the Rail Yards and includes mature Eucalypt planting and a row of semi-mature fig trees to the east of Catherine Street. To the west, large shrubs and scattered small Eucalypt trees filter views into the site. The residential areas to the north of the site are a mix of detached residential properties and apartments. The landform rises to the north, allowing these properties views over the site and across the suburbs.

17.6.2 Visual sensitivity

The Rozelle locality is influenced by the Rail Yards, the Inner West Light Rail Extension, panoramic views to the City, elevated residential areas with workers cottages, and the road corridors of Lilyfield Road and the City West Link. A summary of the visual sensitivity for the main viewing areas across the study area is provided below:

- Lilyfield stop is used by large numbers of local commuters and visitors to the area. The landscape and visual amenity of this existing light rail line are considered to be of local level sensitivity as this is an important public transport facility for the community.
- Lilyfield Road is a local route running mainly east-west along the southern edge of Lilyfield. The landscape and visual amenity of this road are characterised by the mature Eucalypts and Figs located along its southern boundary, and other shrub and scattered vegetation. This area is considered to be of local level sensitivity, as it is a local route.

These sensitivity levels have been applied throughout the impact assessment for the Rozelle locality.

17.6.3 Landscape character area

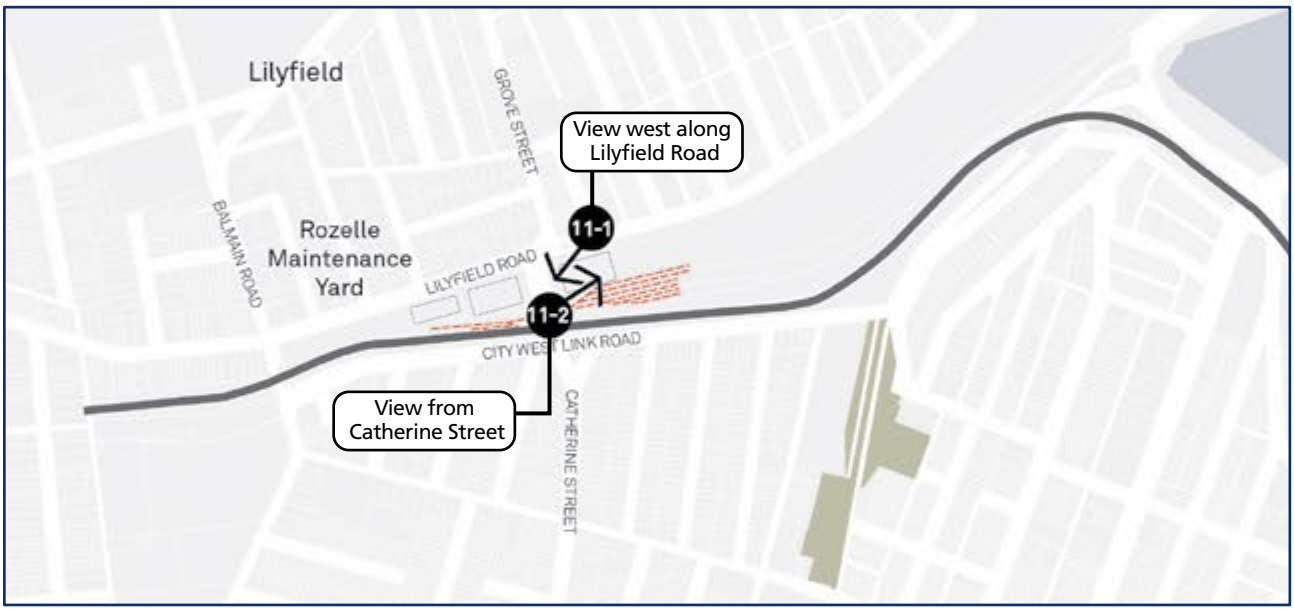
The landscape character area assessed within the Rozelle locality is shown on Figure 17.9. The impact of the CSELR proposal on this landscape character area is provided in section 17.6.5 and section 17.6.6.

Figure 17.9 Rozelle locality – Key landscape character areas

17.6.4 Representative viewpoints

The viewpoints which were selected as representative of the range of views to the CSELR proposal within the Rozelle locality are shown in Figure 17.10. The impact of the proposal on these viewpoints is provided in section 17.6.5 and section 17.6.6.

Figure 17.10 Rozelle locality – Key viewpoints



17.6.5 Impacts during operation

The key visual impacts during operation of the CSELR within the Rozelle locality would include the provision of a new large maintenance shed, additional site infrastructure, such as car parking and a new substation, and to the removal of some trees within the site.

Assessment of landscape impacts (daytime)

The landscape in the vicinity of the Rozelle maintenance depot is characterised by mature Fig trees and Eucalypt trees and shrubs. Additionally, the existing Rail Yards and light rail provide for a heavily industrialised landscape. There are filtered views of the site from adjacent residential properties and streets to the large industrial scale sheds on the site. However, viewpoints to the site are fairly limited, given the site is located generally below the level of Lilyfield Road and the surrounding streets, and is therefore partly enclosed by the surrounding landform.

Table 17.5 summarises the impacts identified by the landscape assessment during operation.

Table 17.5 Rozelle locality – Assessment of landscape impacts (operation)

LANDSCAPE CHARACTER (REFER FIGURE 17.9)	POTENTIAL IMPACT	ASSESSMENT OF IMPACT
1. Trees on Lilyfield Road	Minor adverse landscape impact	• It is unlikely that there would be the opportunity for significant tree and shrub planting in this area to replace the trees lost during construction. This would be investigated during detailed design to minimise potential tree impacts. • During operation, there would remain a break in this vegetated edge, reducing the visual continuity of this edge. This would result in a noticeable reduction in the amenity of the trees on Lilyfield Road.

Source: Based on Technical Paper 7 – Visual and Landscape Assessment

Assessment of representative viewpoints (daytime)

Table 17.6 summarises the daytime visual impacts identified in the representative viewpoints assessment during operation.

Table 17.6 Rozelle locality – Assessment of representative viewpoints (operation)

VIEWPOINT (REFER FIGURE 17.10)	POTENTIAL IMPACT	ASSESSMENT OF IMPACT
View west along Lilyfield Road (View 11-1)	Moderate adverse visual impact	• The existing sheds would be removed during construction and would be replaced, partially screened by the level change. However, these new sheds would be visually prominent due to their size and scale. Overall, the view to the maintenance depot would be more open and unfiltered by vegetation. • Although the maintenance depot would be similar in character to the sheds on the existing rail yards, the area would be more prominent in views due to the loss of filtering vegetation, resulting in a considerable adverse change to the amenity of these views.
View from Catherine Street (View 11-2)	Moderate adverse visual impact	• The new large shed structures would be prominent in the centre and middle ground of the view. The structures would be large in scale, spanning almost the entire site, and have a monotonous, utilitarian form. • There would be little vegetation remaining on the site. This scale of building would contrast with the finer urban grain of the surrounding landscape. Furthermore, it is likely that part of the view to the City and Harbour Bridge would be obscured by the new structures. • Although generally the maintenance depot would be a similar land use to the existing Rail Yards, the maintenance depot would be different in character. • It is likely that part of the view to the City and Harbour Bridge would be obscured by the new structures for those existing views from surrounding residential areas, to the south of the site over the City West Link.

Source: *Based on Technical Paper 10– Visual and Landscape Assessment, Volume 5*

Assessment of night-time visual impacts

During operation, the CSELR proposal would introduce lit LRVs, with moving headlights at regular intervals. These would be similar to the size, breadth and brightness of standard car headlights. The Rozelle maintenance depot, which is predominantly used at night, would require brightly lit working areas and security lighting. The shed would enclose a considerable area of the maintenance facility, so that the additional visible lighting would be reduced somewhat. These elements would be seen in the context of surrounding lit roads and partially filtered by existing vegetation, particularly to the south of the site.

Due to the location within the existing Rail Yards corridor and levels, there would be limited opportunity for direct light intrusion into private properties. The additional lighting around the works would have a visual effect but would be generally compatible with the existing night scene. These elements would not create a noticeable reduction in the amenity of the area and would result in a negligible visual impact during evening hours.

17.6.6 Impacts during construction

Construction within the Rozelle locality would include the demolition of existing buildings within the site, construction of a new maintenance depot and associated facilities and other general construction works. During this time, construction equipment such as excavators, cherry pickers, mobile cranes and trucks would be seen within the precinct. Further detail regarding the proposed construction of the CSELR proposal is provided in Chapter 6.

Assessment of landscape impacts (daytime)

Table 17.7 summarise the impacts identified by the landscape assessment during construction.

Table 17.7 Rozelle locality – Assessment of landscape impacts (construction)

LANDSCAPE CHARACTER (REFER FIGURE 17.9)	POTENTIAL IMPACT	ASSESSMENT OF IMPACT
1. Trees on Lilyfield Road	Moderate adverse landscape impact	A number of mature Eucalypts and shrubs located on the southern boundary of Lilyfield Road would be removed to accommodate the site access road and associated retaining structures. This would result in a considerable break in the continuity of the roadside vegetation.

Source: Based on Technical Paper 10 – Visual and Landscape Assessment, Volume 5

Assessment of representative viewpoints (daytime)

Table 17.8 summarise the daytime visual impacts identified in the representative viewpoint assessment during construction.

Table 17.8 Rozelle locality – Assessment of representative viewpoints (construction)

VIEWPOINT (REFER FIGURE 17.10)	POTENTIAL IMPACT	ASSESSMENT OF IMPACT
View west along Lilyfield Road (View 11-1)	Moderate adverse visual impact	• This view would change noticeably as the mature trees, shrubs and buildings in the middle ground of the view are removed to accommodate the site works. This work would be visible in the foreground of the view, directly adjacent to the road. • As the facility is constructed, the site would be open to views across the site, with the lower areas of the site partially obscured due their location in cut. In particular, it is expected that the landform and orientation of the site would limit visibility of the major rock excavation works, required along the northern edge of the site, from this location. • These changes to the view are not visually consistent with the character of the surrounding landscape as the view would become more open to the industrial uses on the site.
View from Catherine Street (View 11-2)	Moderate adverse visual impact	• This view would change as some vegetation along the northern edge is removed. Further work to remediate the site, civil and building work would be seen across the site, which comprises a large portion of the middle ground of the view. • These changes are visually consistent with the character of the Rail Yards, as the view would remain generally as an industrial use. However, it is considered that the construction of the main shed, in particular, would be of a size and scale that would contrast with the surrounding urban grain.

Source: Based on Technical Paper 10 – Visual and Landscape Assessment, Volume 5

Assessment of night-time visual impacts

During construction there may be times when there would be 24-hour use of the Rozelle maintenance depot site. At these times the site would include brightly lit areas providing a safe work environment for construction activities. Headlights from construction related traffic would also be visible, including trucks accessing the site. It is expected that lighting on the site would be brighter than the current traffic and street lighting and this would have a noticeable visual effect. It is also expected that any additional skyglow (the illumination of the night sky or parts of it, typically as a result of artificial light) would be managed by cut-off light fittings and directed lights for the construction tasks.

These elements would be seen in the context of adjacent brightly lit roads, and partially filtered by remaining vegetation. Due to the location of the site within the existing Rail Yards and large cutting, there would be limited opportunity for direct light intrusion from the works onto any private properties. Overall, it is considered that these elements would create a moderate reduction in the amenity of this area at night and result in a moderate adverse visual impact.

17.6.7 Management and mitigation

A series of mitigation measures have been designed to mitigate the potential visual and amenity impacts of the CSELR proposal during construction and operation. Mitigation measures for the Rozelle locality are presented in Table 17.9.

General visual mitigation measures for the whole of the CSELR proposal are also provided in section 12.7.7 of this EIS.

Table 17.9 Rozelle locality – Visual and landscape mitigation measures (operation)

MITIGATION MEASURES	APPLICABLE LOCATIONS
• Provide tree and shrub planting to the northern side of the site, adjacent to Lilyfield Road, to restore the green edge and filter views.	Rozelle Rail Yards Trees on Lilyfield Road
• Investigate opportunities to provide screen planting along the southern edge of the site to filter views from the existing Lilyfield light rail station.	Rozelle Rail Yards Lilyfield Light Rail Stop
• Consider opportunities to locate buildings within the maintenance depot so that the cut embankments partially screen their size and scale.	Rozelle Rail Yards
• Where possible any areas of direct light intrusion (glare and spill) from LRV headlights would be identified and managed.	Rozelle maintenance depot
• At stops and stabling areas, cut off and directed light fittings (or similar techniques) would be used to minimise glare and light spill onto private property.	Rozelle maintenance depot

Source: *Based on Technical Paper 10 – Visual and Landscape Assessment, Volume 5*

17.7 Built and non-Indigenous heritage

A detailed historic heritage impact assessment for the CSELR proposal was undertaken by Godden Mackay Logan. A comprehensive technical report is available as Technical Paper 5 — *Heritage Impact Assessment* in Volume 4. A summary of the assessment relevant to the Rozelle locality is provided in the following sections.

17.7.1 Existing conditions

Heritage context and significance

The Rozelle maintenance depot is proposed to be located within the site of the former Rozelle Marshalling Yards which operated until 1988. The site is located within a large cutting on land that was partially reclaimed from Rozelle Bay and served the Darling Harbour Goods Line, which stretched from Central Railway Station to the western side of Darling Harbour, then wound through Pyrmont to Rozelle Bay. The site retains a range of sheds and tracks dating from its use as the marshalling yards, and a stormwater channel on its northern boundary. Heritage items include the Catherine Street overbridge (a brick and concrete bridge structure in the western part of the site) and the Easton Park stormwater channel.

Prior to the establishment of the marshalling yards, the area around Rozelle Bay comprised a mixture of residential and industrial areas. The industries in the area tended to be heavy polluting types, such as abattoirs and tanneries. In 1890 an enquiry into the living conditions of areas such as Rozelle and Annandale resulted in the Department of Public Works constructing a wide system of stormwater channels in the area over the next 20 years. These were designed to re-direct the

run-off from these industries, as well as untreated sewage from the surrounding residential areas, which had previously been carried along natural watercourses. The Easton Park stormwater channel, part of which is located on the northern edge of the Rozelle maintenance depot site, was one of the stormwater channels built at this time to control the flow of stormwater into Rozelle Bay.

While much of the heavy polluting industry is gone from Rozelle, the area retains some industrial character, particularly around the former marshalling yards (now known as the Rozelle Rail Yards). The historical residential character of Rozelle and Annandale provided the broader context for the yards. A heritage conservation area identified in the *Leichhardt Local Environmental Plan 2000* (the Leichhardt LEP) is located to the north of the site, separated from the site by Lilyfield Road.

Listed heritage items

A total of six heritage listed items were identified within the vicinity of the proposed Rozelle maintenance depot; however, only one of these items would have the potential to be directly affected by the CSELR proposal. A summary of these items is provided in Table 17.10.

Table 17.10 Summary of historic heritage-listed items located in the vicinity of the Rozelle maintenance depot – Rozelle locality

ITEM	LISTING[1]	LEVEL OF SIGNIFICANCE	POTENTIAL TO BE DIRECTLY IMPACTED?
Stormwater canal	Schedule 4, Part 3, SREP No. 26 — City West	Local	No
Former hotel	Schedule 4, Part 3, SREP No. 26 — City West	Local	No
'Cadden Le Messurier'	Schedule 4, Part 3, SREP No. 26 — City West	Local	No
Railway bridge	Schedule 4, Part 3, SREP No. 26 — City West	Local	No
Arched Bridge, Whites Creek	Schedule 4, Part 3, SREP No. 26 — City West	Local	No
Catherine Street railway bridge	Schedule 4, Part 3, SREP No. 26 — City West	Local	Yes

Source: *Adapted from Table 5.13 of Technical Paper 5 – Heritage Impact Assessment, Volume 4.*

Note 1: *SREP No. 26 – City West = Sydney Regional Environmental Plan No. 26 – City West.*

Heritage conservation areas

A heritage conservation area identified in the Leichhardt LEP is located to the north of the proposed Rozelle maintenance depot site, separated from the site by Lilyfield Road.

Areas of archaeological potential

As discussed in section 12.8.1, three historical archaeological zones have been developed to respond to known or potential archaeological significance in areas potentially affected by the CSELR proposal. These zones comprise:

- *Zone 1:* State significant archaeological resource — known or potential
- *Zone 2:* Locally significant archaeological resource — known or potential
- *Zone 3:* No archaeological resource present.

The CSELR corridor (including the Rozelle locality) has been divided into a number of discrete Historical Archaeological Management Units (HAMUs). Each unit has been allocated according to the nature of the potential archaeological resource in an area. These units have then been allocated a particular archaeology zoning based on the significance of the potential archaeology. This zoning would allow the varying nature and significance of the archaeological resource to be managed pragmatically and consistently throughout the course of the CSELR proposal.

The area covered by the proposed Rozelle maintenance depot has been designated as Zone 2 (Locally significant archaeological resource — known or potential). The potential archaeological significance of the proposed Rozelle Maintenance Depot HAMU is described below in Table 17.11. In summary, the Rozelle maintenance depot site was defined as having the potential to contain locally significant archaeology.

Table 17.11 Description of HAMU in Rozelle locality

HAMU	LISTING	DESCRIPTION OF HAMU
Rozelle maintenance depot	No listings specifically reference significance of the potential historical archaeological resource within the Rozelle Stabling Maintenance Depot HAMU	The former Rozelle Marshalling Yards would have heritage significance at a Local level. An assessment of significance was undertaken against the NSW Heritage Criteria in the *CBD Metro Non-Archaeological Assessment* (Casey and Lowe 2009).

Source: *Section 4.8 in Technical Paper 5- Heritage Impact Assessment, Volume 4*

17.7.2 Impacts on heritage listed items

The Rozelle maintenance depot is proposed to be located in the western end of the former Rozelle Marshalling Yards site. The only heritage item in the vicinity of the proposed Rozelle maintenance depot is the Catherine Street railway bridge. The bridge crosses the western end of the former Rozelle Marshalling Yards. It has a concrete deck and brick piers, and a brick parapet that rises at least one metre above the road level.

The proposed Rozelle maintenance depot would not require any physical alterations to the Catherine Street railway bridge. The continued use of the bridge for vehicles to cross the former Rozelle Marshalling Yards and light rail line is consistent with its historical use. The proposed depot would have a neutral heritage impact on the railway bridge.

17.7.3 Impacts on areas of potential archaeological significance

Direct impacts to areas of potential archaeological significance would generally be associated with the construction of the CSELR causing disturbance to, or loss of, archaeological resources.

Potential impacts during the construction phase of the proposal at the Rozelle locality could arise from:

- construction of extensive areas of CSELR track, including a 90 metre long shunt neck from the depot entrance road
- construction of the maintenance building, including four inspection roads (including inspection pits), one lifting road, one lathe road, and a second storey for staff facilities
- installation of small and large gantry cranes
- potential land remediation across much of the zone
- major rock excavation on the north-western side of the site
- service relocation
- regrading
- tree removal
- future landscaping works and access road construction
- use for infrastructure storage areas.

A description of the potential impacts to the Rozelle maintenance depot HAMU is summarised below in Table 17.12.

Table 17.12 Heritage impact assessment of HAMU in the Rozelle locality

HAMU	HERITAGE IMPACT ASSESSMENT
Rozelle maintenance depot	Construction of the CSELR track slab would involve excavation below the grade track. These works are likely to have a moderate adverse impact on the potential historical resource. Construction of facilities such as the maintenance building and the associated inspection pits is likely to involve deeper excavation in these areas. These works are likely to have a moderate adverse impact on the potential historical archaeological resource. Proposed works associated with the installation of the Rozelle maintenance depot substation have not been defined at this stage. It is assumed that ground disturbance works including excavation for the substation and associated services would have to occur. These works would have a moderate to major adverse impact, depending on the extent and nature of the proposed works. Other ground disturbance activities within the site (such as service relocation, road construction, tree removal) may have localised impacts on the historical archaeological resource. Much of the site may require land remediation; however, where possible, the ground surface would be left in situ and capped with clean material (if raised ground levels would not lead to drainage difficulties). If land remediation does not occur, and the current ground level is left in situ, this would have a neutral heritage impact on the potential historical archaeological resource. If land remediation is required then this would likely have a moderate adverse impact on the potential historical archaeological resource. The proposed major rock excavation is unlikely to affect any historical archaeological resources and would likely have a neutral impact on the historical archaeological resource. Use of the site as construction zone — if it would not involve removal of the existing ground surface and/or excavation — is unlikely to have an impact on the historical archaeological resource. The impact on the Rozelle maintenance depot HAMU would require reassessment once final designs are determined.

Source: *Section 4.8 of the Technical Paper 5, Volume 4*

17.7.4 Management and mitigation

Impacts on built and landscape heritage

Overarching environmental management measures that would be adopted for the CSELR proposal to manage potential impacts on built and landscape heritage items and heritage conservation areas are described in section 12.8.4. No additional management and mitigation measures would be required to specifically address potential heritage impacts within the Rozelle locality.

Impacts on areas of potential archaeological significance

Overarching environmental management measures that would be adopted for the CSELR proposal to manage potential impacts on areas of potential archaeological significance are described in section 12.8.4. The management and mitigation strategies described in section 12.8.4 were developed to address the likely significance of the identified historical archaeological resource.

Mitigation measures, as outlined for Zone 2 in section 12.8.4, would be implemented for the Rozelle maintenance depot HAMU. In addition to implementing these measures, the impact on the Rozelle maintenance depot HAMU would be reconsidered during detailed design once more detailed information on the proposed Rozelle maintenance depot has been determined.

Effectiveness of the mitigation measures

As discussed in section 12.8.4, the effectiveness of the built and non-Indigenous heritage management and mitigation measures proposed in this EIS has been ranked in section 6.2 of Technical Paper 5.

The effectiveness of the mitigation measures proposed for historical archaeology is identified against each of the specific HAMUs in Table 6.1 of Technical Paper 5, whereas the effectiveness of the mitigation measures proposed for built and landscape heritage are identified against each heritage item/conservation area in Table 6.4 of Technical Paper 5.

A summary of the general effectiveness of each form of mitigation for built and landscape heritage is provided in Table 12.47

17.8 Socio-economic characteristics

The following sections provide a summary of the potential local social and economic impacts of the proposal within the Rozelle locality, based on Technical Paper 3 — *Social Impact Assessment* and Technical Paper 4 — *Economic Impact Assessment* contained in Volume 3 of this EIS.

17.8.1 Existing conditions

The proposed Rozelle maintenance depot is would be located within an area of existing industrial uses and the Rozelle Rail Yards. Businesses currently located within the proposed maintenance depot site comprise a range of businesses such as:

- a valuer and auctioneer house
- truck/transport shipping
- general engineering.

Sections 17.1 and 17.4.1 describe the existing character and land uses of the Rozelle locality.

17.8.2 Impacts during operation

Social impacts

The key social impacts of the CSELR proposal during operation are summarised in Table 17.13. This table provides a summary and rating of the key potential social impacts both before and after implementation of mitigation measures. These mitigation measures are presented in section 17.8.4.

Table 17.13 Rozelle locality – Key social impacts during operation

POTENTIAL IMPACT	KEY EFFECTS OF IMPACT	IMPACT RATING (POST MITIGATION)
Local amenity, character, environment	Neutral • Impacts on local amenity during operation are likely to be minimal given that the maintenance depot would represent a repurposing of an existing rail yard and associated infrastructure.	Neutral
Visual	Neutral • Impacts on visual amenity are likely to be minimal during operation given that the maintenance depot would represent a repurposing of an existing rail yard and associated infrastructure. • The site is also at a lower elevation than its immediate surrounds. Additionally, the site is bordered by major arterial roads (including Lilyfield Road and the City West Link), which both shield the site from residences and affect the existing urban amenity.	Neutral
Changes to access and local traffic conditions	Neutral • Construction of the depot would not block access. nor would it require changes to existing traffic conditions.	Neutral
Noise and vibration	Neutral • Noise from Rozelle maintenance depot site has been assessed in accordance with the INP. • The majority of maintenance operations would be undertaken within the main maintenance building and would not generate a significant level of noise.	Neutral
Property acquisition/ leasing	Neutral • The leases for the existing commercial and industrial businesses that would be impacted by the Rozelle maintenance depot would be required to be terminated prior to construction of the depot..	Neutral

Table 17.13 cont.

POTENTIAL IMPACT	KEY EFFECTS OF IMPACT	IMPACT RATING (POST MITIGATION)
Safety and security	Neutral • Risks to the public are minimal given the site location. • Employees may be impacted during operation of the maintenance facility, in particular during the movement of LRVs in and out of the facility.	Neutral

Source: Based on Technical Paper 3 – Social Impact Assessment, Volume 3

Economic impacts

The key economic impacts of the CSELR proposal during operation are summarised in Table 17.14. This table provides a summary and rating of the key potential economic impacts both before and after implementation of proposed mitigation measures. These mitigation measures are presented in section 17.8.4.

Table 17.14 Rozelle locality – Key economic impacts during operation

POTENTIAL IMPACT	KEY EFFECTS OF IMPACT	IMPACT RATING (POST MITIGATION)
Amenity	Moderate Negative • Potential impacts by way of noise to the operation of surrounding businesses and facilities. • Noise mitigation measures are described in section 17.5.4.	Neutral

Source: Based on Technical Paper 4 — Economuc Impact Assessment, Volume 3

17.8.3 Impacts during construction

Negative impacts resulting from the construction of the Rozelle maintenance depot would occur, but are likely to be less significant than for other precincts affected by the CSELR proposal, given that the construction of the facility would generally be undertaken away from the immediate vicinity of potential receptors, and would be generally consistent with the existing, industrial use of the site.

Furthermore, noise is common within the local area given the heavy traffic and bus use along Lilyfield Road and the City West Link.

Social impacts

The key social impacts of the CSELR proposal during construction are summarised in Table 17.15 for the Rozelle locality. This table provides a summary and rating of the key potential social impacts both before and after implementation of proposed mitigation measures. These mitigation measures are presented in section 17.8.4.

Table 17.15 Rozelle locality – Key social impacts during construction

POTENTIAL IMPACT	KEY EFFECTS OF IMPACT	IMPACT RATING (POST MITIGATION)
Local amenity, character, environment	Neutral • Impacts on local amenity during construction are likely to be minimal given that the maintenance depot would represent a repurposing of an existing rail yard and associated infrastructure.	Neutral
Visual	Neutral • Impacts on visual amenity are likely to be minimal during construction given that the maintenance depot would represent a repurposing of an existing rail yard and associated infrastructure. • The site is also at a lower elevation than its immediate surrounds. Additionally, the site is bordered by major arterial roads (including Lilyfield Road and the City West Link), which both shield the site from residences and affect the existing urban amenity.	Neutral
Changes to access and local traffic conditions	Neutral • Construction of the depot would not block access nor require changes to traffic conditions during construction. • Some limited impact may occur as a result of some additional vehicles bringing materials and construction workers to the site during the construction period but is not anticipated to impact local access on the existing traffic network.	Neutral
Noise and vibration	Slightly Negative • The most noise intensive works would include building demolition activities and some excavation works which may require use of a rockbreaker. Noise levels would likely exceed guidance levels prescribed by the ICNG during some activities.	Neutral
Property acquisition/ leasing	Neutral • The leases for the existing commercial and industrial businesses that would be impacted by the Rozelle maintenance depot would be required to be terminated prior to construction of the depot.	Neutral
Safety and security	Neutral • Risks to the public are minimal given the site location.	Neutral

Source: *Based on Technical Paper 3 – Social Impact Assessment, Volume 3*

Economic impacts

The existing businesses that are currently located within the proposed Rozelle maintenance depot site would be removed as part of the initial construction of the maintenance depot once initially displaced, there are not anticipated to be any additional adverse economic impacts. Some benefit for local food outlets within the vicinity of Lilyfield Road may occur as a result of increased construction workers throughout the construction period.

The key economic impacts of the CSELR proposal during construction at the Rozelle locality are summarised in Table 17.16. This table provides a summary and rating of the key potential economic impacts both during and after implementation of proposed mitigation measures. These mitigation measures are presented in section 17.8.4.

Table 17.16 Rozelle locality – Key economic impacts during construction

POTENTIAL IMPACT	KEY EFFECTS OF IMPACT	IMPACT RATING (POST MITIGATION)
Perceived impact and business viability	Significant Negative • To enable construction, the existing light industrial and storage businesses located within the site must be relocated.	Moderate Negative
Amenity impacts i.e. noise and vibration	Moderate Negative • Potential noise and vibration impacts to surrounding businesses and facilities owing to construction works.	Slight Negative

Source: Based on Technical Paper 4 — Economuc Impact Assessment, Volume 3

17.8.4 Management and mitigation

A series of mitigation measures for the management of the social and economic impacts identified in section 17.8.2 and section 17.8.3 would be implemented as part of the CSELR proposal. The social mitigation measures are summarised in Table 17.17.

Table 17.17 Social construction and operational mitigation measures

POTENTIAL IMPACT	POTENTIAL MITIGATION
Operation	
Local amenity, character, environment	• Details for the mitigation of any potential amenity impacts are provided in section 17.6.
Visual	• Details for the mitigation of any potential visual impacts are provided in section 17.6.
Changes to access and local traffic conditions	• Details for the mitigation of any potential local access and traffic impacts are provided in section 17.3.
Noise and vibration	• Details for the mitigation of noise and vibration impacts are provided in section 17.5.4.
Construction	
Local amenity, character, environment	• Details for the mitigation of any potential amenity impacts are provided in section 17.4 and 17.6.
Visual	• Details for the mitigation of visual impacts are provided in section 17.6.
Changes to access and local traffic conditions	• Mitigation strategies for the mitigation of local access and traffic impacts during construction of the CSELR proposal have been prepared and are provided in section 17.3.4.
Noise and vibration	• Details for the mitigation of noise and vibration impacts are provided in section 17.5.4.
Property acquisition	• Where property acquisition is required, it would be acquired in accordance with the *Land Acquisition (Just Terms Compensation) Act 1991.* A Property Acquisition Plan would be prepared as part of detailed design.
Safety and security	• The CEMP would identify risks to safety and security on a site-by-site basis and provide appropriate mitigation measures. • Detailed design would comply with the principles of Crime Prevention through Environmental Design (CPTED). • *Disability Discrimination Act 1992* requirements would be adopted. • Construction lighting standards would be met or exceeded. • Hoarding/fence lines would be erected to maximise sight lines for pedestrians and avoid hiding places and blind spots to improve pedestrian personal security. • Any gantry arrangements would have internal lighting. • Relocation of closed circuit television (CCTV) cameras would be considered if construction obstructs their view field. • Separation barriers would be installed along the borders of worksites. • Safety and security impacts would be addressed as part of the CEMP.

Source: Based on Technical Paper 3 – Social Impact Assessment, Volume 3

Three main mitigation measures are proposed to be implemented during the construction and operational phases of the CSELR proposal to mitigate the potential economic impacts identified for the Rozelle locality. These include the preparation of the following:

- Through liaison with businesses and landowners, access plans would be prepared to establish existing servicing and delivery requirements, access periods or alternative arrangements for businesses and landowners affect by the proposal.
- A business and landowner engagement and management plan would provide ongoing information to businesses and landowners potentially affected by the CSELR proposal through a variety of sources including information packs, a website, regular newsletters/brochures and email alerts. The plan would also identify effective means for ongoing cooperation and communication with the business community.
- The construction environmental management plan (CEMP) would outline a range of mitigation measures to minimise the level of disturbance created as a result of construction related activities. The CEMP would contain a number of additional plans to manage specific impacts such as noise and traffic. Further details regarding the CEMP for the CSELR proposal is provided in Chapter 18.

CBD AND SOUTH EAST LIGHT RAIL PROJECT

ENVIRONMENTAL IMPACT STATEMENT

VOLUME 1B

PART E: ENVIRONMENTAL MANAGEMENT AND CONCLUSION

18. Environmental management and mitigation

Chapter 18 provides an overview of the environmental management framework which is to be implemented for the CBD and South East Light Rail Project ('the CSELR proposal' or 'the CSELR'). The chapter also provides a summary of an environmental risk analysis that was undertaken for the CSELR proposal. A compilation of the environmental management measures to be implemented during the detailed design, construction and operational phases of the CSELR is provided in Appendix I. These measures have been developed based on the environmental impacts identified in this Environmental Impact Statement (EIS).

18.1 Environmental management approach

Transport for NSW's ISO 14001 accredited environmental management system elements would be used to manage the CSELR proposal. The management system would provide the framework for implementing the environmental management measures documented in this EIS, as well as any other requirements specified in the conditions of approval, licences or permits. During operation, environmental issues and impacts would be managed under the Operator's environmental management system (to be developed by the Operator and approved by Transport for NSW prior to the operation of the CSELR proposal), as well as through any specific management measures relevant to the operation phase identified in Appendix I.

18.1.1 Construction environmental management plan

A construction environmental management plan (CEMP) would be prepared for the construction phase of the CSELR proposal. The CEMP would provide a centralised mechanism through which all potential environmental impacts would be managed. The CEMP would document mechanisms for demonstrating compliance with the commitments made in this EIS, the submissions report (yet to be prepared), as well as any other relevant statutory approvals (e.g. conditions of approval, licences and permits).

The CEMP would outline a framework for the management of environmental impacts during construction, including further details on the following:

- traffic, transport and access management
- noise and vibration management
- air quality and dust management (including dust suppression)
- community and stakeholder involvement
- water and soil management
- flora and fauna management
- contingency management
- spoil and waste management, including contamination management
- site compound and ancillary works management.

The CEMP would be prepared by the managing contractor(s) and endorsed by the project Environmental Management Representative (EMR) to the satisfaction of the Director-General of the NSW Department of Planning and Infrastructure (DP&I).

18.1.2 Construction traffic, transport and access management

Construction network management plan

As discussed in section 9.2.4, a construction network management plan would be developed during detailed design to identify appropriate traffic management measures and establish a framework for coordinating their implementation during the construction of the CSELR proposal. plan would have the high level objective of maintaining network journey times and congestion at acceptable levels. The plan would consist of the following three elements:

- *Demand management strategy* — Strategies that would be promoted and implemented prior to construction to reduce peak period demands on the network.
- *Network optimisation strategy* — Strategies that would be promoted and implemented prior to construction, which represent network optimisation objectives closely associated with the operational phase of the CSELR proposal.
- *Incident management strategy* — Strategies that would seek to pre-empt possible unplanned events based on general network operations during construction. These strategies are likely to represent enhancements to current incident management tools that would remain in place following construction to assist light rail network operations.

The construction network management plan would comprise a live document that would be updated as a greater understanding of the required construction staging is achieved, and as new management measures are identified in response to unforseen events during construction and light rail operations.

Construction traffic management plans

Site specific construction traffic management plans (TMPs) and site-specific traffic control plans (TCPs) would be prepared for the CSELR proposal. Given the range of approvals and consents that may be required to facilitate the construction of the proposal, the site-specific TMPs would provide the main basis for any required approvals.

Road occupancy licence

The contractor(s) would comply with the relevant Roads Authority procedures in applying for road occupancy licences.

Speed zone authorisation

An application to the NSW Roads and Maritime Services (RMS) would be made for any proposed adjustment to speed limits whether they are temporary, such as those required for short-term road occupancies, or longer-term such as for the duration of a construction stage or permanent works. No adjustments to speed limits would be undertaken without an approved speed zone authorisation.

Other traffic, transport and access management strategies

The traffic, transport and access management strategies that would be adopted during the construction of the CSELR proposal are provided in section 6.10. These strategies address the following aspects:

- intersection works (refer to section 6.10.1)
- South Dowling Street regrading works (refer to section 6.10.2)
- traffic signal modifications (refer to section 6.10.3)
- midblock works (refer to section 6.10.4)
- road changes (refer to section 6.10.5)
- bus operations (refer to section 6.10.6)
- interaction with the Inner West Light Rail (refer to section 6.10.7)
- pedestrian traffic management (refer to section 6.10.8)
- cycle routes (refer to section 6.10.9)
- on-street parking (refer to section 6.10.10)

- emergency access (refer to section 6.10.11)
- emergency evacuation procedures for buildings (refer to section 6.10.12)
- property and utility access (refer to section 6.10.13)
- special event management (refer to section 6.10.14).

18.1.3 Construction compounds and ancillary facilities management

A construction compounds and ancillary facilities sub-plan would be prepared for the CSELR proposal as part of the overall CEMP. This sub-plan would set out details for each of the approved construction compounds, ancillary worksites and laydown areas, including stockpile areas and other ancillary activities required to construct the proposal. The sub-plan would supplement, in greater detail, the information provided in the main body of the CEMP.

The objectives and strategies of the construction compounds and ancillary facilities management sub-plan would include the following:

- Minimise the impact of construction compounds and ancillary facilities on surrounding land uses and sensitive receivers.
- Locate construction compounds and ancillary facilities away from sensitive land uses and receivers, wherever practical and feasible.
- Manage stockpile areas to minimise potential pollution of watercourses, groundwater and local air quality.
- Minimise the clearing of vegetation (e.g. street trees and trees within public open spaces) to the minimum amount necessary to construct the CSELR proposal, particularly where primary construction compounds are proposed in public open spaces/parkland areas.
- Locate construction compounds and ancillary facilities away from (or able to be managed in such a way so as to not impact on) heritage items, significant trees (as listed under the City of Sydney Council's (2013b) *Register of Significant Trees* and Randwick City Council's (2007) *Significant Tree Register),* waterways, and areas prone to flooding.
- Situate construction compounds and ancillary facilities on relatively level ground.
- Minimise the visual impact of construction compounds and ancillary facilities through either siting such facilities away from sensitive receivers (where practical and feasible) and/or providing screening.

Environmental management measures for construction compounds and ancillary facilities would be developed as part of the overall CEMP, with the construction compounds and ancillary facilities sub-plan identifying where such measures are documented within the CEMP.

18.1.4 Earthworks management

An earthworks management sub-plan would be prepared for the CSELR proposal as part of the overall CEMP. This sub-plan would set out details for earthworks, stockpiling, erosion and sedimentation control, soil water management, and air quality management. The sub-plan would supplement, in greater detail, the information provided in the main body of the CEMP.

The objectives and strategies of the earthworks management sub-plan would include the following:

- Minimise the extent and duration of exposed surfaces (particularly those works that have the greatest potential to disturb soils that are contaminated or have a high erosion and run-off hazard) through completing earthwork operations in timely manner and progressively rehabilitating/re-establishing disturbed areas as soon as possible.
- Develop and implement adequate water quality control measures prior to the undertaking of significant earthwork operations.
- Minimise dust impacts on surrounding land uses.
- Undertake dust monitoring during construction to allow for the early identification of significant air quality impacts and the implementation of additional environmental management measures to address such impacts.
- Where possible, reuse excavated materials as fill on other parts of the proposal in preference to disposing off-site in accordance with NSW Office of Environment and Heritage's *Waste Classification Guidelines* (DECCW 2009b).

- Areas of potential contamination concern would be identified and works in these areas managed to minimise disturbance.
- Excavate pre-classified contaminated materials and transfer such materials directly into haulage trucks for off-site disposal at a waste facility licensed to accept the contaminated material.
- Develop procedures for the assessment, handling and stockpiling of potentially contaminated materials, in accordance with the NSW Office of Environment and Heritage's *Waste Classification Guidelines* (DECCW 2009).
- Develop a contingency plan to manage potential unexpected hazards that may arise during excavation works.

Environmental management measures for earthwork operations would be developed as part of the overall CEMP, with the earthworks management sub-plan identifying where such measures are documented within the CEMP.

18.1.5 Erosion and sedimentation

A soil and water management plan would be prepared as part of the CEMP. Specific measures would be identified in consultation with relevant government agencies, and would be consistent with the principles and practices detailed in Landcom's (2004) *Managing Urban Stormwater: Soils and Construction.* Additional soil and water management procedures are discussed in section 10.2.4.

18.1.6 Waste management

A waste management plan would be prepared as part of the CEMP. Construction waste would be managed through the waste hierarchy established under the *Waste Avoidance and Recovery Act 2001,* which comprises the following principles:

1. *Avoidance of waste* — Minimise the amount of waste generated during construction by avoiding unnecessary resource consumption (i.e. avoid the use of inefficient plant and construction equipment and avoid materials with excess embodied energy, waste and excessive packaging).
2. *Resource recovery* — Reuse, reprocess and recycle waste products generated during construction to minimise the amount of waste requiring disposal.
3. *Disposal* — Where resources cannot be recovered, dispose of them appropriately to minimise the potential adverse environmental impacts.

All waste requiring off-site disposal would be classified in accordance with the OEH's *Waste Classification Guidelines* (DECCW 2009) prior to disposal.

18.1.7 Hazards and risks

Hazards and risks associated with construction would be identified and managed by the construction contractor(s) as part of the CEMP. These may include consideration of issues such as fire, chemical and fuel storage and spillage, land slippage, utilities disruption, interruption to commuters, contaminated land, flash flooding and other aspects.

The construction contractor(s) would prepare a contingency management plan, including environmental and construction-related risks prior to works commencement. Site workers would be briefed on the site risks and appropriate response mechanisms prior to commencing work.

18.1.8 Compliance monitoring

A compliance tracking program would be developed and implemented by Transport for NSW to manage the requirements and obligations made in this EIS, conditions of approval, licences and permits. The program would guide the regular review of the compliance status of the project and establish a program for environmental auditing. Audits would occur routinely during the construction phase; in addition to surveillance by others (refer to section 18.1.9). The program would establish procedures to track compliance and pre-empt problematic issues based on similar past projects. The Director-General of the DP&I would be notified prior to the commencement of construction and operation of the proposal and the results of any audits would be made available to the Director-General on request.

18.1.9 Independent audit and surveillance

Independent auditing and surveillance of environmental performance would be undertaken by the EMR appointed by Transport for NSW.

18.1.10 Incident management

Incident management procedures would be developed as part of the CEMP. The procedures would clearly outline the process to be followed in the event of an environmental incident or non-compliance, including (but not limited to) the following:

- classification of the incident (e.g. minor, moderate, serious) based on the severity of the likely impact on the surrounding environment and community
- emergency response procedures
- notification requirements (e.g. Transport for NSW and/or other regulatory authorities)
- mechanisms for improving environmental controls to reduce the likelihood of a similar incident occurring
- incident reporting and tracking.

18.1.11 Monitoring and verification of environmental impacts

The environmental management system implemented during the construction and operation of the CSELR proposal would provide a framework for monitoring and verifying the environmental impacts documented in this EIS, as well as any other subsequent planning approvals documents (for example, the Submissions Report). Where the magnitude, extent and/or duration of an environmental impact is identified to significantly exceed the impacts predicted in the EIS (and other planning approvals documents), corrective actions would be developed and implemented to manage the impacts (as discussed in section 18.1.12).

18.1.12 Contingency plans and corrective actions

The environmental management system for the CSELR would be adaptive, establishing a continuous cycle of monitoring, assessment, investigation and corrective actions. This process, as illustrated in Figure 18.1, would be used to continuously evaluate and monitor the effectiveness of the environmental management measures proposed in this EIS (as summarised in Appendix I) and identify the corrective actions to be undertaken should such measures be identified as being ineffective.

During construction, the Construction Contractor(s) would be responsible for developing contingency plans to address any environmental impacts arising from lack of effectiveness of the proposed environmental management measures and/or unforseen events.

During operation, environmental issues and impacts would be managed under the Operator's environmental management system (to be developed by the Operator and approved by Transport for NSW prior to the operation of the CSELR proposal).

Figure 18.1 Adaptive management process

18.1.13 Ongoing community consultation and engagement

The community would continue to be consulted throughout the detailed design and construction phases of the proposal. The consultation activities that Transport for NSW would employ during construction would be documented in a community and stakeholder involvement plan, which would form part of the CEMP. These consultation activities are outlined in Chapter 2.

Newsletters and other communication tools would be distributed to keep the community informed of construction progress, activities and impacts. In particular, this would outline the need to undertake out of hours works and the process for the community to register complaints in relation to the works. A 24-hour toll free complaints and enquiries number would also be established for the duration of construction.

18.2 Environmental risk analysis

18.2.1 Overview

An environmental risk analysis was undertaken for the CSELR proposal during the preparation of the EIS. The purpose of the environmental risk analysis was to:

- Identify potential environmental risks that are likely to be associated with the construction and operational phases of the CSELR proposal, with a particular focus on identifying any additional issues that were not identified in the Director-General's requirements (DGRs) for the EIS.
- Evaluate the likelihood and consequence of each environmental risk without the adoption of environmental management measures and safeguards.
- Identify environmental management measures and safeguards that would be required to reduce the likelihood and/or consequence of the identified environmental risk to an acceptable level.
- Evaluate the effectiveness of the proposed environmental management measures (as documented in Appendix I) to adequately manage the identified environmental risks.
- Identify the residual environment risks that would occur following the implementation of the proposed environmental management measures (as documented in Appendix I), with a particular focus on identifying those residual risks that would require further consideration during detailed design and/or construction.

18.2.2 Environmental risk analysis methodology

Risk identification

A comprehensive list of environmental risks was developed for the CSELR proposal, based on the following: a review of the proposal design; the CBD and South East Light Rail Project *State Significant Infrastructure Application, Supporting Document* (Transport for NSW 2013c); technical studies prepared for the CSELR proposal as part of this EIS; the sensitivity of the receiving environment in which the CSELR proposal would be delivered; the location of known environmental constraints and sensitive receivers; and previous studies/literature on similar infrastructure projects. The environmental risks that were identified for the CSELR proposal are provided in Table 18.4.

Risk analysis and evaluation

The 'likelihood' and 'consequence' of each environmental risk was assessed and ranked using the criteria described in Tables 18.1 and 18.2. These rankings were then used to rate each environmental risk (as either low, medium, high or extreme) using the risk matrix presented in Figure 18.2.

Likelihood is taken to mean the 'chance of something happening' (AS/NZS ISO 31000:2009). Applying a criteria for likelihood (e.g. almost certain, likely, etc.) is based on professional judgement, previous experience and evidence available.

Consequence is by definition 'the outcome of an event affecting objectives' (AS/NZS ISO 31000:2009). Application of the definition of 'consequence' for this assessment will be informed by the nature of the impact such as spatial extent, duration, permanency and magnitude etc. (outcome) acting on the receptor.

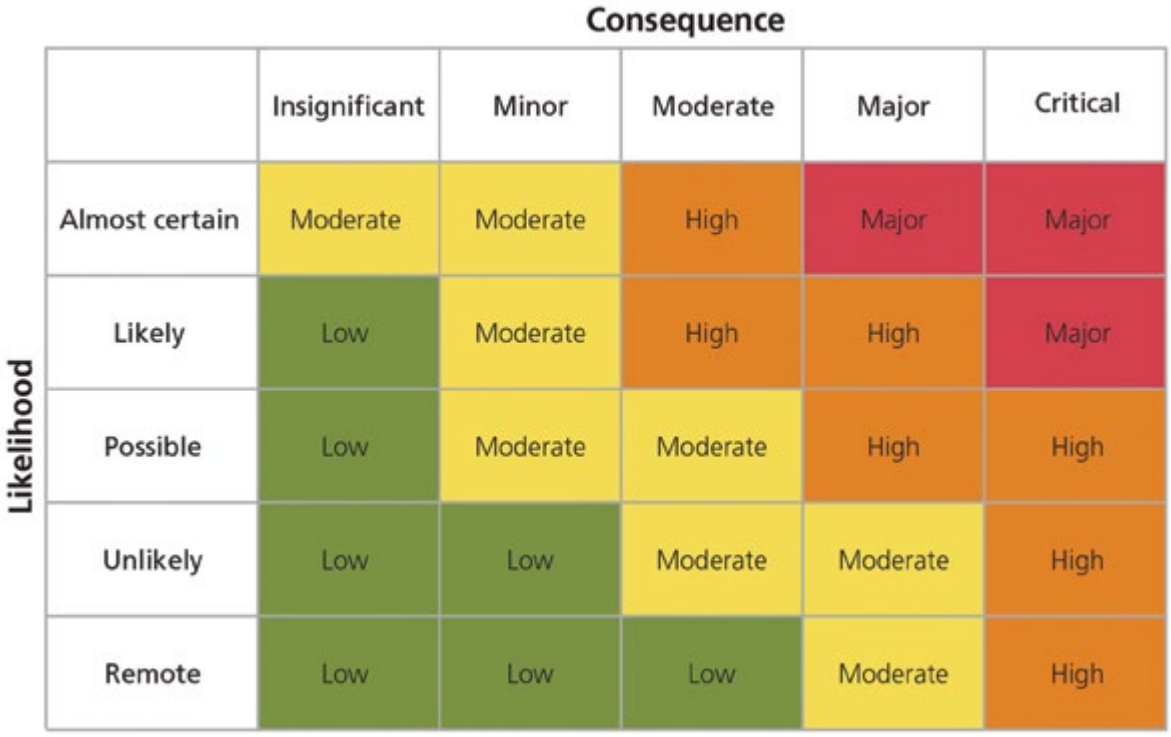
Table 18.1 Summary of likelihood criteria used in the environmental risk analysis

LIKELIHOOD	DESCRIPTION OF RATING
Almost certain	Is expected to occur in most construction or operation circumstances.
Likely	Could occur in most construction or operation circumstances.
Possible	Has occurred here and elsewhere.
Unlikely	Has not occurred yet but could in the course of normal construction or operation circumstances.
Remote	Very unlikely, may occur in exceptional construction or operation circumstances.

Table 18.2 Summary of consequence criteria used in the environmental risk analysis

CONSEQUENCE	DESCRIPTION OF RATING
Critical	Destruction of sensitive environmental features. Severe impact on ecosystem. An event would result in long-term environmental impairment felt in neighbouring or valued ecosystem functions; long-term remediation required; major breach of environmental law or regulation. Regulatory and high level government intervention/action is likely to be triggered.
Major	An event would result in impacts to an external ecosystem; considerable remedial work would be required; serious break of environmental law or regulation with investigation or report to authority with prosecution and/or moderate fine possible. Long-term impact of regional significance on sensitive environmental features (e.g. wetlands). Likely to result in regulatory intervention/action.
Moderate	An event would result in short lived environmental effects; effects to environment would be experienced mostly within the project boundary; minor remedial action would probably be required; breach of environmental law or regulation. Short-term impact on sensitive environmental features. Requires immediate regulator notification. Triggers regulatory investigation.
Minor	An event would result in a change from the normal conditions; however, this would be within environmental regulatory limits when measured at the compliance point. Incident reporting according to routine protocols.
Insignificant	An event would result in no appreciable change to the environment or would be a highly localised event. Negligible impact at receptors. Incident reporting according to routine protocols.

Figure 18.2 Risk matrix



An initial environmental risk rating (i.e. low, moderate, high or major) was assigned to each environmental issue, based on the 'likelihood' and 'consequence' of that risk occurring (as illustrated in Figure 18.2). The initial risk rating was used to reflect the severity of the environmental impact that is likely to occur without the adoption of environmental management measures to reduce the impact. The environmental risk categories assigned to each issue are described in Table 18.3.

Table 18.3 Summary environmental risk categories used in the environmental risk analysis

RISK CATEGORY	DESCRIPTION OF RATING
Major	Potential impacts would result in irreversible large-scale environmental impact and/or loss of valued ecosystems. Environmental impact would present a significant risk to the CSELR proposal. Environmental impacts would need to be specifically controlled during the detailed design and construction phases of the proposal. Environmental management measures and safeguards would need to be specifically developed to address the risk, in consultation with relevant stakeholders.
High	Potential impacts would result in long-term environmental impairment that would affect areas (including valued ecosystem functions) outside of the proposed construction footprint boundary and/or would require long-term remediation to be undertaken. Specific environmental management measures would need to be developed and implemented to reduce the risk of the impact occurring. Environmental impact would present a significant risk to the CSELR proposal.
Moderate	Potential impacts would be temporary and reversible, constrained within the proposed construction footprint boundary, and/or would require minor remedial action. General environmental management measures would be required to be implemented to reduce the risk of the impact occurring. Environmental impact would not present a significant risk to the CSELR proposal.
Low	Potential impacts would be minor and could be adequately managed through the design process and/or the application of standard mitigation measures. Environmental impact would not present a significant risk to the CSELR proposal.

An analysis was then undertaken for all issues and associated impacts to consider what the potential residual impacts would be for each issue with the application of mitigation measures. This process included a qualitative analysis of potential mitigation and management measures, and their potential effectiveness, to determine the extent to which the proposed measures would reduce the risk of the potential impact. The key conclusions from the environmental risk analysis are summarised in Table 18.4.

Environmental risk analysis

Table 18.4 provides a comprehensive list of environmental risks that were identified for the CSELR proposal during the environmental risk analysis. It also documents the initial risk rating (and associated likelihood and consequence) that was assigned to each environmental risk (i.e. the severity of the risk without the adoption of adequate environmental management measures), environmental management measures that would be implemented to reduce that risk, as well as the rating assigned to the likely residual impact, following the implementation of adequate environmental management measures.

Table 18.4 Environmental risk analysis for the CSELR proposal

ISSUE	INITIAL RISK RATING			KEY MITIGATION MEASURES	RESIDUAL ADVERSE IMPACTS	RESIDUAL RISK RATING		
	LIKELIHOOD	CONSEQUENCE	RATING			LIKELIHOOD	CONSEQUENCE	RATING
Operational traffic, transport and access								
Changes to existing traffic network operations, particularly due to the displacement of vehicular traffic from George Street	Almost certain	Major	Major	As discussed in section 9.2.4, a network management plan would be developed to identify key management measures that would be implemented to ensure journey times and congestion levels are maintained at acceptable levels. Transport for NSW would work alongside the relevant road authorities to develop appropriate demand management strategies both during the construction and operational phases of the CSELR proposal. In conjunction with the demand management measures, targeted traffic management upgrades are proposed to be undertaken to improve general traffic circulation in the vicinity of the CSELR proposal.	The reallocation of road space from general traffic to light rail is predicted to reduce traffic capacity on the corridor; however, is not predicted to significantly impact functionality of the wider network.	Almost certain	Minor	Moderate

Table 18.4 cont.

ISSUE	INITIAL RISK RATING			KEY MITIGATION MEASURES	RESIDUAL ADVERSE IMPACTS	RESIDUAL RISK RATING		
	LIKELIHOOD	CONSEQUENCE	RATING			LIKELIHOOD	CONSEQUENCE	RATING
Permanent removal of parking spaces along the CSELR alignment	Almost certain	Major	Major	Opportunity to relocate loading and taxi zones from George Street to alternative locations (e.g. converting obsolete turning bays for movements onto George Street into parking). Effects could be managed through the implementation of the measures outlined in sections 12.3.4, 13.3.4, 14.3.4, 15.3.4, 16.3.4 and 17.3.4.	Permanent removal of between 761 and 888 on-street general parking spaces along the CSELR alignment during the pre-morning peak and interpeak respectively. Sufficient latent capacity across the Surry Hills Precinct and the Kensington sub-precinct to absorb displaced parking demand. Potential for parking demand to outstrip supply within the Randwick Precinct. Within the Kingsford sub-precinct, parking utilisation would be close to effective capacity allowing for inefficiency in demand and supply. Loss of parking spaces likely to have the greatest impact to businesses that rely on customer access along with uses that have less mobile customers and clients.	Almost certain	Minor	Moderate
Changes to private property access	Almost certain	Moderate	High	Access to private property would be maintained; however, some access arrangements would be changed (e.g. limited to left-in left-out arrangements at some locations).	Potential minor increase in travel time and distances for some property accesses.	Likely	Insignificant	Low

Table 18.4 cont.

ISSUE	INITIAL RISK RATING			KEY MITIGATION MEASURES	RESIDUAL ADVERSE IMPACTS	RESIDUAL RISK RATING		
	LIKELIHOOD	CONSEQUENCE	RATING			LIKELIHOOD	CONSEQUENCE	RATING
Disruptions to special events within the CBD	Likely	Moderate	High	For special events which typically utilise George Street and Circular Quay, consultation with the City of Sydney would be undertaken in order to develop management measures and re-routing of events in the CBD.	Potential for CSELR operations to be temporarily disrupted within the CBD during special events which require the use of George Street.	Likely	Minor	Moderate
Construction traffic, transport and access								
Reduced road network performance and carrying capacity and increased travel times due to construction vehicle movements and lane/road closures	Almost certain	Major	Major	Construction network management plan to be developed to identify appropriate traffic management measures and establish a framework for coordinating their implementation. Refer to section 9.2.4.	Increased travel times (albeit acceptable) due to construction traffic movements and lane/road closures.	Likely	Moderate	High
Disruption to pedestrian/cyclist facilities	Possible	Moderate	Moderate	Site specific pedestrian management to be adopted to manage existing longitudinal and transverse pedestrian movements. Exiting cycle routes to be maintained where the construction footprint permits. Alternative routes to be provided where construction works occupy existing cycle facilities (or make their retention unsafe). Refer to sections 6.10.8 and 6.10.9.	Potential minor increases in pedestrian/cyclist travel times and distances due to altered pedestrian/ cyclist facilities.	Possible	Minor	Moderate
Changes to private property access	Almost certain	Moderate	High	Access to private property would be maintained; however, some access arrangements would be changed (e.g. limited to left-in left-out arrangements at some locations). Refer to section 6.10.13.	Potential minor increase in travel time and distances for some property accesses.	Likely	Minor	Moderate

Table 18.4 cont.

ISSUE	INITIAL RISK RATING			KEY MITIGATION MEASURES	RESIDUAL ADVERSE IMPACTS	RESIDUAL RISK RATING		
	LIKELIHOOD	CONSEQUENCE	RATING			LIKELIHOOD	CONSEQUENCE	RATING
Disruptions to existing bus services within the South East suburbs	Almost certain	Moderate	High	Impacts to the operation of the South East bus network to be managed through a mixture of local route diversions and construction staging to ensure continuity of access. Refer to section 6.10.6.	Potential minor increase in travel time and distances for some bus services.	Likely	Minor	Moderate
Disruptions to emergency access	Likely	Critical	Major	Access for emergency vehicles would be maintained within all precincts and emergency services would be advised of all planned changes to traffic arrangements prior to applying the changes. Refer to section 6.10.11.	No significant disruptions to emergency access are anticipated with the application of adequate traffic management measures.	Remote	Major	Moderate
Disruptions to special events at Moore Park and Royal Randwick racecourse	Likely	Moderate	High	Temporary passenger set-down and pick-up areas for special event buses and coaches accessing Royal Randwick racecourse to be established along Darley Road. Refer to section 15.3.4. During events scheduled at Royal Randwick racecourse, construction activities adjacent to the main entrance to the racecourse on Alison Road would be put on hold. Refer to section 15.3.4. Construction works across Lang Road would not occur when major events are scheduled within Moore Park. Refer to section 14.3.4.	No significant disruptions to access are anticipated with the application of adequate traffic management measures.	Unlikely	Minor	Low

Table 18.4 cont.

ISSUE	INITIAL RISK RATING			KEY MITIGATION MEASURES	RESIDUAL ADVERSE IMPACTS	RESIDUAL RISK RATING		
	LIKELIHOOD	CONSEQUENCE	RATING			LIKELIHOOD	CONSEQUENCE	RATING
Disruptions to special events within the CBD	Likely	Moderate	High	Impacts to be managed by the construction contractor(s), in consultation with the City of Sydney. For special events which typically utilise George Street and Circular Quay, consultation with the City of Sydney would be undertaken in order to develop management measures and re-routing of events in the CBD.	Potential for special events within the CBD to be disrupted where construction works conflict with special events.	Likely	Minor	Low
Property and land use								
Impacts on property along the CSELR alignment	Likely	Moderate	High	Private property would be acquired in accordance with the *Land Acquisition (Just Terms Compensation) Act 1991*.	Potential for temporary reduction in property amenity and value due to construction impacts.	Likely	Minor	Moderate
Impacts on public property including footpaths and open spaces and existing and future land use plans along the CSELR alignment as a result of construction of the proposal	Likely	Moderate	High	Proposal construction footprint would be minimised as far as possible throughout the construction period. Construction methods would minimise impacts to footpath widths and crossing facilities to ensure sufficient pedestrian capacity is provided in a safe environment. Alternate routes to public open spaces would be determined during detailed design and construction. Consultation with relevant stakeholders would be undertaken to identify and review specific mitigation measures to reduce impacts on existing land uses, public property and open space areas and to identify appropriate post-construction configuration and facilities for open space land.	Risks are anticipated to be manageable through the application of standard mitigation measures.	Possible	Insignificant	Low

Table 18.4 cont.

ISSUE	INITIAL RISK RATING			KEY MITIGATION MEASURES	RESIDUAL ADVERSE IMPACTS	RESIDUAL RISK RATING		
	LIKELIHOOD	CONSEQUENCE	RATING			LIKELIHOOD	CONSEQUENCE	RATING
Operational business and economic								
Impacts to the operations of local businesses through the loss of parking spaces	Likely	Major	High	Access plans would be developed through liaison with businesses and landowners to establish existing servicing and delivery requirements, access periods or alternative arrangements. Effects could be managed through the implementation of the measures outlined for each precinct. Detailed mitigation measures for potential economic and business impacts are specified in sections 12.9.4, 13.9.4, 14.9.4, 15.9.4 and 16.9.4.	Permanent removal of up to approximately 888 on-street general parking spaces along the CSELR alignment (largest number of spaces would be affected during the interpeak period. Sufficient latent capacity across the Surry Hills and Kensington/Kingsford precincts to absorb displaced parking demand. Potential for parking demand to outstrip supply within the Randwick Precinct.	Possible	Minor	Low
Impacts on businesses from reduced access to their premises during operation	Likely	Major	High	Access plans would be developed through liaison with businesses and landowners to establish existing servicing and delivery requirements, access periods or alternative arrangements. Detailed mitigation measures for potential economic and business impacts are specified in sections 12.9.4, 13.9.4, 14.9.4, 15.9.4 and 16.9.4.	No significant disruptions to access are anticipated with the application of adequate traffic management measures.	Remote	Minor	Low

Table 18.4 cont.

ISSUE	INITIAL RISK RATING			KEY MITIGATION MEASURES	RESIDUAL ADVERSE IMPACTS	RESIDUAL RISK RATING		
	LIKELIHOOD	CONSEQUENCE	RATING			LIKELIHOOD	CONSEQUENCE	RATING
Construction business and economic								
Impacts to the operation of local businesses due to perceived adverse amenity and access constraints leading to reduced passing trade and demand for services during construction	Likely	Moderate	High	A business and landowner engagement and management plan would be developed to identify, rate a help manage the specific impacts associated with construction related works for individual businesses. Detailed mitigation measures for potential economic and business impacts are specified in sections 12.9.4, 13.9.4, 14.9.4, 15.9.4, 16.9.4 and 17.8.	Potential minor impact due to ongoing perceived amenity and access constraints.	Likely	Minor	Moderate
Impacts on businesses from reduced access to their premises during construction including access to loading docks/ servicing areas	Likely	Moderate	High	Access plans would be developed through liaison with businesses and landowners would to establish existing servicing and delivery requirements, access periods or alternative arrangements. Detailed mitigation measures for potential economic and business impacts are specified in sections 12.9.4, 13.9.4, 14.9.4, 15.9.4, and 16.9.4.	No significant disruptions to access are anticipated with the application of adequate traffic management measures.	Remote	Minor	Low
Social impacts								
Impact on local communities during construction, including reduction in amenity (such as noise, dust and visual impacts) and changes to services and accessibility	Almost certain	Moderate	High	These issues are considered to be manageable with the effective implementation of standard construction and operational environmental management measures. Detailed mitigation measures for potential social impacts are specified in sections 12.9.4, 13.9.4, 14.9.4, 15.9.4, 16.9.4, and 17.8.	Risks are anticipated to be manageable through the application of standard mitigation measures.	Likely	Minor	Moderate

Table 18.4 cont.

ISSUE	INITIAL RISK RATING			KEY MITIGATION MEASURES	RESIDUAL ADVERSE IMPACTS	RESIDUAL RISK RATING		
	LIKELIHOOD	CONSEQUENCE	RATING			LIKELIHOOD	CONSEQUENCE	RATING
Impacts to the functionality and use of community facilities and public open spaces	Almost certain	Moderate	High	Access to local community services and open spaces would be maintained as part of the CSELR proposal, where possible. Where this is not possible, alternative access arrangements would be made in consultation with relevant service operators. Additional planting of street trees and rehabilitation of public spaces would assist in mitigating overall impacts.	A number of parks may be affected by construction worksites.	Likely	Minor	Moderate
Potential safety and security impacts to pedestrians around construction sites	Almost certain	Critical	Major	Consideration would be given to the design and layout of any hoarding/fence lines to maximise sight lines for pedestrian, and design out hiding places and blind spots to improve pedestrian personal security.	Risks are anticipated to be manageable through the application of standard mitigation measures.	Remote	Moderate	Low
Operational noise and vibration								
Operational airborne noise impacts from light rail vehicle passbys that exceed the adopted noise goals at surrounding sensitive receivers	Almost certain	Moderate	High	Reasonable and feasible noise mitigation is proposed to reduce noise goal exceedances in Devonshire Street where greatest exceedances predicted (refer Chapter 13).	Marginal residual noise criteria exceedances likely along Devonshire Street with mitigation in place. Considered acceptable because existing noise levels higher than predicted light rail noise levels. Other marginal residual exceedances predicted in the CBD, Kensington/Kingsford and Randwick Precincts – considered acceptable because of existing high road traffic noise.	Likely	Minor	Moderate

Table 18.4 cont.

ISSUE	INITIAL RISK RATING			KEY MITIGATION MEASURES	RESIDUAL ADVERSE IMPACTS	RESIDUAL RISK RATING		
	LIKELIHOOD	CONSEQUENCE	RATING			LIKELIHOOD	CONSEQUENCE	RATING
Operational groundborne noise from light rail vehicle passbys that exceed the adopted criteria at surrounding sensitive receivers	Almost certain	Major	Major	Vibration attenuating trackforms proposed along much of the alignment to control groundborne noise at sensitive receptor locations. More detailed analysis of mitigation proposed during detailed design for particularly sensitive locations.	Potential residual impacts at some particularly sensitive locations along the route – although further assessment during detailed design may be able to mitigate this risk.	Possible	Moderate	Moderate
Operational vibration affecting vibration sensitive equipment	Almost certain	Major	Major	Vibration attenuating trackforms at key sections to control vibration at sensitive receptor locations. Consultation with equipment/facility operators and detailed analysis of mitigation proposed during detailed design for particularly sensitive locations.	Potential residual impacts at some particularly sensitive locations along the route – although further assessment during detailed design may be able to mitigate this risk.	Possible	Moderate	Moderate
Operational noise from the Randwick stabling facility that exceeds the adopted noise criteria at surrounding sensitive receivers particularly during the night time period	Almost certain	Major	Major	Reasonable and feasible noise mitigation is proposed to reduce noise criteria exceedances to within the applicable criteria (refer Chapter 15), such as an acoustic shed.	Minimal residual adverse impacts expected with mitigation in place.	Possible	Minor	Moderate

Table 18.4 cont.

ISSUE	INITIAL RISK RATING			KEY MITIGATION MEASURES	RESIDUAL ADVERSE IMPACTS	RESIDUAL RISK RATING		
	LIKELIHOOD	CONSEQUENCE	RATING			LIKELIHOOD	CONSEQUENCE	RATING
Operational noise from the Rozelle maintenance depot that exceeds the adopted noise criteria at surrounding sensitive receivers particularly during the night-time period	Almost certain	Moderate	High	Reasonable and feasible noise mitigation is proposed to reduce noise criteria exceedances to within the applicable criteria (refer Chapter 17), such as closing the light rail vehicle (LRV) entry doors of the maintenance building during the night-time period.	Minimal residual adverse impacts expected with mitigation in place.	Possible	Minor	Moderate
Operational noise from substations that exceeds the adopted noise criteria at surrounding sensitive receivers	Possible	Moderate	Moderate	Noise mitigation is proposed to reduce any marginal noise criteria exceedances to within the applicable criteria, such as shielding or enclosure of substation noise sources.	No exceedance of criteria likely.	Possible	Moderate	Moderate
Adverse operational road traffic noise impacts from changes in road traffic flows, particularly in the CBD	Likely	Moderate	High	Noise mitigation not considered reasonable or feasible due to nature of project.	Potential increase in noise levels at some locations in CBD in morning and evening peak traffic times up to 3.9 dB (but generally less than 3 dB). Receptors affected are mixed use but mainly commercial or office spaces.	Likely	Moderate	High
Construction noise and vibration								
Construction airborne noise levels that exceed the adopted noise management levels at surrounding sensitive receivers	Almost certain	Major	Major	A construction noise and vibration management plan would be developed and implemented. Mitigation measures documented in the Transport for NSW's (2012b) *Construction Noise Strategy* would be adopted, as outlined in section 12.5.4.	With mitigation, high exceedances of the adopted noise management levels would still be expected during some works at some surrounding sensitive receivers, particularly during night works.	Almost certain	Moderate	High

Table 18.4 cont.

ISSUE	INITIAL RISK RATING			KEY MITIGATION MEASURES	RESIDUAL ADVERSE IMPACTS	RESIDUAL RISK RATING		
	LIKELIHOOD	CONSEQUENCE	RATING			LIKELIHOOD	CONSEQUENCE	RATING
Construction road traffic noise that exceeds applicable criteria	Possible	Moderate	Moderate	Additional assessment of night-time truck movements on public roads proposed at detailed design stage when detailed traffic plan developed.	Noise levels expected to be comparable with existing heavy vehicles on sub-arterial roads.	Possible	Moderate	Moderate
Construction groundborne noise levels that exceed the adopted noise management levels at surrounding sensitive receivers	Possible	Moderate	Moderate	Additional assessment of groundborne noise impacts from rockbreaking activities near cinema and theatres buildings required prior to construction.	Cinema and theatre buildings may experience audible groundborne noise during quieter periods of movies or shows.	Possible	Moderate	Moderate
Construction vibration that exceeds adopted criteria for cosmetic damage for some works within 20 metres of residential receptors	Likely	Major	High	Attended vibration monitoring or vibration trials proposed when proposed works are within safe working distances for cosmetic vibration impacts to ensure levels remain below cosmetic damage criterion. Building condition surveys proposed before and after works at potentially affected properties.	With mitigation, construction vibration expected to be below cosmetic damage criterion.	Unlikely	Major	Moderate
Construction vibration that exceeds adopted criteria for human comfort	Likely	Moderate	High		Potential for ground vibration levels to exceed human comfort criteria for short durations at some locations.	Likely	Moderate	High
Built and non-Indigenous heritage								
Direct and indirect impacts to the Sydney Opera House World Heritage Site and curtilage	Almost certain	Critical	Major	Detailed design of the Circular Quay stop, associated infrastructure and the proposed Circular Quay construction compound would take into account impacts on the setting of the Sydney Opera House.	Potential temporary disruption to setting associated with the construction works at Circular Quay.	Likely	Minor	Moderate

Table 18.4 cont.

ISSUE	INITIAL RISK RATING			KEY MITIGATION MEASURES	RESIDUAL ADVERSE IMPACTS	RESIDUAL RISK RATING		
	LIKELIHOOD	CONSEQUENCE	RATING			LIKELIHOOD	CONSEQUENCE	RATING
Direct and indirect impacts to non-Indigenous heritage items, including significant components of Royal Randwick racecourse	Almost certain	Major	Major	Detailed mitigation measures for non-Indigenous heritage items with the potential to be directly and/or indirectly impacted are specified in sections 12.8.4, 13.8.4, 14.8.4, 15.8.4, 16.8.4, and 17.7.	Direct impacts to some non-Indigenous heritage items would be unavoidable. Opportunities to avoid or further reduce impacts to be further considered during detailed design. Where direct impacts cannot be avoided, archival recording would be undertaken.	Likely	Minor	Moderate
Direct and indirect impacts to heritage conservation areas, particularly within the Surry Hills and Randwick precincts	Almost certain	Major	Major	Detailed mitigation measures for heritage conservation areas with the potential to be directly and/or indirectly impacted are specified in sections 12.8.4, 13.8.4, 14.8.4, 15.8.4.	Impacts to some heritage conservation areas would be unavoidable. Opportunities to avoid or further reduce impacts to be further considered during detailed design.	Likely	Minor	Moderate
Direct impacts to areas of potential archaeological significance	Almost Certain	Moderate	High	Detailed mitigation measures for areas of potential archaeological significance with the potential to be directly impacted are specified in sections 12.8.4, 13.8.4, 14.8.4, 15.8.4 and 16.8.4.	Potential impacts to areas of potential archaeological significance anticipated to be manageable through the application of the mitigation measures specified in sections 12.8.4, 13.8.4, 14.8.4, 15.8.4 and 16.8.4.	Likely	Minor	Moderate
Direct impacts to significant trees listed under City of Sydney's (2013) *Significant Tree Register* and Randwick City Council's (2007) *Register of Significant Trees*	Almost certain	Major	High	Detailed mitigation measures for significant trees with the potential to be directly impacted are specified in sections 12.8.4, 13.8.4, 14.8.4, 15.8.4 and 16.8.4.	Direct impacts to some significant trees would be unavoidable. Opportunities to avoid or further reduce impacts to be further considered during detailed design.	Almost certain	Minor	Moderate

Table 18.4 cont.

ISSUE	INITIAL RISK RATING			KEY MITIGATION MEASURES	RESIDUAL ADVERSE IMPACTS	RESIDUAL RISK RATING		
	LIKELIHOOD	CONSEQUENCE	RATING			LIKELIHOOD	CONSEQUENCE	RATING
Aboriginal heritage								
Loss or damage to Aboriginal archaeological potential	Likely	Major	High	Targeting investigation and consideration of geotechnical information to determine areas of high potential. Development of archaeological management plan to manage potential for loss or damage. Detailed mitigation measures are set out in Technical Paper 5.	Potential impacts to areas of potential archaeological significance anticipated to be manageable through the application of the mitigation measures specified in Technical Paper 5.	Possible	Minor	Moderate
Urban design and visual								
Impacts on visual amenity due to construction sites and hoardings	Almost certain	Moderate	High	Regular maintenance of site hoardings and perimeter site areas would be undertaken. Designing hoarding as a feature would be considered at appropriate locations. This may include artworks or proposal information. These would be installed as early as feasible and reasonable in the construction process. Hoardings would be designed to visually recede into the existing environment (e.g. parkland setting within Moore Park) including the prompt removal of graffiti.	Risks are anticipated to be manageable through the application of standard mitigation measures.	Possible	Minor	Moderate
Impacts on views currently enjoyed by residential receivers adjacent to the CSELR proposal	Almost certain	Moderate	High	Existing vegetation around the perimeter of construction sites would be retained where feasible and reasonable to act as a visual screen. Where vegetation is removed during construction, replacement of these trees would occur where possible following completion of construction on a 'like for like' basis.	Risks are anticipated to be manageable through the application of standard mitigation measures.	Unlikely	Minor	Low

Table 18.4 cont.

ISSUE	INITIAL RISK RATING			KEY MITIGATION MEASURES	RESIDUAL ADVERSE IMPACTS	RESIDUAL RISK RATING		
	LIKELIHOOD	CONSEQUENCE	RATING			LIKELIHOOD	CONSEQUENCE	RATING
Impact on visual amenity during operation due to the introduction of additional built elements including the overhead wires, and stop platforms and associated infrastructure (canopies etc.), tunnel portals in Moore Park and the removal of vegetation	Almost certain	Moderate	High	Visual mitigation would be implemented as soon as feasible and reasonable, and remain for the duration of the construction period. Detailed mitigation measures for potential visual impact are specified in sections 12.7.4, 13.7.4, 14.7.4, 15.7.4 and 16.7.4.	Risks are anticipated to be manageable through the application of standard mitigation measures.	Unlikely	Moderate	Moderate
Planted trees								
Removal of planted street trees that make a significant contribution to the visual character/ amenity of the receiving environment and/ or are of heritage significance	Almost certain	Major	Major	Impacts to trees not directly affected by the CSELR proposal would be retained. Transport for NSW would replace trees removed as a result of the CSELR, in accordance with the Transport for NSW *'Vegetation Offset Guide'* (2013d). The Landscape Strategy in Appendix F would be finalised in consultation with Councils and other relevant stakeholders. Detailed mitigation measures for planted tree impact are specified in sections 12.6.3, 13.6.3, 14.6.3, 15.6.3 and 16.6.3.	Up to approximately 760 planted street trees would be removed along the CSELR alignment, which include significant trees along Alison Road, Wansey Road, Devonshire Street and High Cross Park. Opportunities to avoid or further reduce impacts to be further considered during detailed design. Use of low impact construction techniques for installation of new services would be considered, where appropriate and feasible.	Almost certain	Moderate	High

Table 18.4 cont.

ISSUE	INITIAL RISK RATING			KEY MITIGATION MEASURES	RESIDUAL ADVERSE IMPACTS	RESIDUAL RISK RATING		
	LIKELIHOOD	CONSEQUENCE	RATING			LIKELIHOOD	CONSEQUENCE	RATING
Impact on large mature Figs adjacent to Anzac Parade from groundwater drawdown	Likely	Major	High	An irrigation strategy would be developed for any Fig that is deemed to be at risk of being affected by a potential lowering of the water table. Potential impacts to the large mature Figs adjacent to Anzac Parade would be reviewed by a suitably qualified arborist during detailed design, once the final tunnel construction technique has been determined.	Potential for the viability of some of the large mature Figs to be adversely affected during dewatering activities. The health of Fig trees within Moore Park would be monitored by a qualified arborist both during and post construction.	Possible	Moderate	Moderate
Utilities and services								
Significant number of services and utilities requiring relocation or protection as part of the CSELR proposal, increasing the area of disturbance, particularly within the City Centre Precinct	Almost certain	Major	Major	Services or utilities that may be impacted by the CSELR would be protected and/or relocated using the hierarchy described in section 10.8.4. Detailed mitigation measures to address service and utilities are specified in section 10.8.4.	Some services such as power poles, existing street lighting and other such services would require relocation or replacement as part of the CSELR proposal. The extent of impact would be confirmed during detailed design in consultation with the relevant utilities providers including the City of Sydney and Randwick City Council. Impacts to services and utilities are anticipated to be manageable during the detailed design and construction phases.	Possible	Moderate	Moderate

Table 18.4 cont.

ISSUE	INITIAL RISK RATING			KEY MITIGATION MEASURES	RESIDUAL ADVERSE IMPACTS	RESIDUAL RISK RATING		
	LIKELIHOOD	CONSEQUENCE	RATING			LIKELIHOOD	CONSEQUENCE	RATING
Disruption to asset owner access to services and utilities	Likely	Moderate	High	All appropriate service utility providers (e.g. electricity, communication, water and other utility services) would be consulted during detailed design and construction. Access points would be provided to allow for access during routine maintenance operations by relevant services providers. Refer to mitigation measures in section 10.8.4.	Access to services and utilities during routine maintenance operations by relevant services providers would be maintained during construction and operation.	Remote	Moderate	Low
Damage to services and utilities during construction of the proposal (including associated safety risks, such as earth potential rise)	Likely	Major	Major	Construction contractor(s) to check the locations of existing underground utilities and services prior to commencing construction works. Refer to mitigation measures in section 10.8.4.	Impacts to services and utilities are anticipated to be manageable through the implementation of the mitigation measures specified in section 10.8.4.	Remote	Moderate	Low
Additional draw of electrical power (and thus additional power supply required in the local area) to run the light rail vehicles and electrical equipment at each of the stops, maintenance depot and stabling facility	Likely	Minor	Moderate	The CSELR proposal would be designed to operate in the most energy efficient manner possible with minimum drawdown on local power.	Electricity would be required to operate the CSELR proposal; however, electricity demand is not expected to increase such that demand outstrips electricity supply in the area.	Likely	Insignificant	Low

Table 18.4 cont.

ISSUE	INITIAL RISK RATING			KEY MITIGATION MEASURES	RESIDUAL ADVERSE IMPACTS	RESIDUAL RISK RATING		
	LIKELIHOOD	CONSEQUENCE	RATING			LIKELIHOOD	CONSEQUENCE	RATING
Buried cables and stray leakage currents from the running rails into surrounding earth causing cause electrolysis corrosion of nearby buried metalwork	Possible	Major	High	Electrolysis corrosion risks caused by potential stray leakage currents from the running rails into surrounding earth would be managed through the design of the track bed cable duct insulation.	Residual electrolysis corrosion risks are not anticipated to be significant through the application of suitable design measures to reduce the risk.	Remote	Moderate	Low
Biodiversity								
Clearing of marginal foraging habitat for the Grey-headed Flying-Fox; Eastern Bent-wing Bat; Powerful Owl	Almost certain	Moderate	High	Trees not directly affected by the CSELR proposal would be retained. Use of low impact construction techniques for installation of new services would be considered, where appropriate and feasible. Transport for NSW would replace trees removed as a result of the CSELR, in accordance with the Transport for NSW *'Vegetation Offset Guide'* (2013d). Detailed mitigation measures for planted tree impacts are specified in sections 12.6.3, 13.6.3, 14.6.3, 15.6.3 and 16.6.3.	Clearing of marginal habitat; however, this is unlikely to have a significant impact on the Grey-headed Flying-Fox; Eastern Bent-wing Bat; Powerful Owl.	Unlikely	Minor	Low

Table 18.4 cont.

ISSUE	INITIAL RISK RATING			KEY MITIGATION MEASURES	RESIDUAL ADVERSE IMPACTS	RESIDUAL RISK RATING		
	LIKELIHOOD	CONSEQUENCE	RATING			LIKELIHOOD	CONSEQUENCE	RATING
Clearing of potential habitat for two migratory species: the Fork-tailed Swift and White-Throated Needletail	Likely	Minor	Moderate	Trees not directly affected by the CSELR proposal would be retained. Use of low impact construction techniques for installation of new services would be considered, where appropriate and feasible. Transport for NSW would replace trees removed as a result of the CSELR, in accordance with the Transport for NSW '*Vegetation Offset Guide*' (2013d). Detailed mitigation measures for planted tree impacts are specified in sections 12.6.3, 13.6.3, 14.6.3, 15.6.3 and 16.6.3.	Clearing of potential habitat; however, the site is not classed as 'important habitat', as defined in the *EPBC Act Policy Statement 1.1 Significant Impact Guidelines.*	Unlikely	Minor	Low
Fauna death or injury during construction activities (e.g. tree clearing)	Possible	Moderate	Moderate	Implement pre-clearing protocols (e.g. check for fauna before clearing begins).	Risk of fauna death or injury unlikely to be significant.	Remote	Moderate	Low
Fauna death or injury during operation of the project, due to vehicle strike and electrocution from overhead wires	Unlikely	Minor	Low	Consider risk minimisation as part of the detailed design process.	Risk of fauna death or injury unlikely to be significant.	Remote	Minor	Low

Table 18.4 cont.

ISSUE	INITIAL RISK RATING			KEY MITIGATION MEASURES	RESIDUAL ADVERSE IMPACTS	RESIDUAL RISK RATING		
	LIKELIHOOD	CONSEQUENCE	RATING			LIKELIHOOD	CONSEQUENCE	RATING
Dispersal of plant pathogens (such as Cinnamon fungus) and weeds due to: soil and plant propagules attached to construction vehicles/ machinery; and introduction of soil and other landscaping materials to the site and tree planting	Likely	Moderate	High	Manage noxious weeds in accordance with *Noxious Weeds Act 1993*. Avoid excessive soil disturbance. Implement weed control measures, including ensuring equipment is clean prior to commencement of earthworks, disease free certification of landscaping materials and disposal of pathogen-contaminated soils at appropriate weed disposal facilities.	Risk of plant pathogen dispersal unlikely to be significant.	Remote	Moderate	Medium
Hydrology, drainage and surface water quality								
At the Randwick stabling facility and Rozelle maintenance depot there is the potential for contamination of stormwater to result from the storage of oil and other substances during operation	Possible	Major	High	Manage and control storage and use of potentially contaminating materials.	Impacts would be effectively avoided through application of mitigation described in section 10.2.	Remote	Moderate	Low
Potential stormwater ponding along the alignment affecting operation of the LRVs	Almost certain	Moderate	High	Further detailed stormwater investigations to be undertaken during detailed design to define extent of ponding.	Localised ponding may still occur and interfere with LRV operation.	Likely	Minor	Moderate

Table 18.4 cont.

ISSUE	INITIAL RISK RATING			KEY MITIGATION MEASURES	RESIDUAL ADVERSE IMPACTS	RESIDUAL RISK RATING		
	LIKELIHOOD	CONSEQUENCE	RATING			LIKELIHOOD	CONSEQUENCE	RATING
Potential risk of flooding affecting operation of the CSELR	Almost certain	Major	Major	Design of proposal to ensure no worsening of the existing situation.	Localised flooding may still occur following heavy rainfall events and interfere with LRV operations.	Possible	Major	High
Potential for the proposal to result in exacerbation of existing localised stormwater flooding events during operation	Almost certain	Moderate	High	Design of proposal to ensure no worsening of the existing situation.	Localised flooding may still occur following heavy rainfall events.	Unlikely	Moderate	Moderate
Groundwater								
Localised drawdown of the water table, resulting in a change in groundwater flow direction due to groundwater intersection and dewatering (particularly during construction of the proposed Moore Park tunnel)	Possible	Moderate	Moderate	Detailed mitigation measures to address potential groundwater impacts are described in section 10.4.4.	Groundwater impacts during construction are anticipated to be manageable through the application of the mitigation measures described in section 10.4.4.	Unlikely	Minor	Low

Table 18.4 cont.

ISSUE	INITIAL RISK RATING			KEY MITIGATION MEASURES	RESIDUAL ADVERSE IMPACTS	RESIDUAL RISK RATING		
	LIKELIHOOD	CONSEQUENCE	RATING			LIKELIHOOD	CONSEQUENCE	RATING
Ground settlement risks to existing buildings and infrastructure due to groundwater drawdown during construction	Possible	Major	High	Groundwater modelling would be undertaken to determine the extent of the drawdown and the potential for settlement. The construction sequence described in section 10.4.4 may be used to reduce the volume of dewatering required for deeper sections of the Moore Park tunnel. A condition assessment of existing buildings and infrastructure in the vicinity would be undertaken to monitor the risk of settlement from groundwater drawdown.	Settlement risks to existing buildings and infrastructure are anticipated to be manageable through the application of the mitigation measures described in section 10.4.4.	Unlikely	Minor	Low
Changes to aquifer permeability due to minor sealing of the ground surface and piling, particularly for works proposed within the Botany Sands aquifer	Likely	Insignificant	Low	Risks to groundwater impacts are likely to be relatively low, as the area to be sealed is relatively small compared to the recharge area of the Botany Sands aquifer. Therefore, no mitigation measures are considered necessary to manage potential impacts due to sealing of the ground surface.	Area to be sealed is relatively small compared to the recharge area of the Botany Sands aquifer. Therefore, the risks to groundwater recharge are likely to be relatively low.	Likely	Insignificant	Low
Impacts to bores	Almost certain	Moderate	High	A field survey would be undertaken to confirm the existence, usage and condition of any bore located within the construction footprint of the CSELR proposal, or potentially affected by the CSELR proposal (e.g. those located in the vicinity of proposed excavations).	Bores located within the construction footprint of the CSELR alignment may be destroyed during construction. Drawdown of groundwater levels during proposed dewatering activities associated with the construction of the Moore Park tunnel has the potential to limit the use of nearby bores.	Almost certain	Minor	Moderate

Table 18.4 cont.

ISSUE	INITIAL RISK RATING			KEY MITIGATION MEASURES	RESIDUAL ADVERSE IMPACTS	RESIDUAL RISK RATING		
	LIKELIHOOD	CONSEQUENCE	RATING			LIKELIHOOD	CONSEQUENCE	RATING
Environmental issues associated with the disposal of groundwater during construction and operational phases of the proposal	Almost certain	Moderate	High	All groundwater encountered during the construction of the proposal would be managed in accordance with the requirements of the *Waste Classification Guidelines* (DECCW 2009) and Transport for NSW's (2012) *Water Discharge and Re-use Guideline*.	Risks associated with the encountering and disposal of potentially contaminated groundwater are not anticipated to be significant, provided that the mitigation measures documented in section 10.4.4 are implemented.	Unlikely	Minor	Low
Altered groundwater flow regimes around the proposed Moore Park tunnel	Almost certain	Moderate	High	The construction of diaphragm walls or secant pile walls for the Moore Park tunnel would be considered during design development to minimise potential drawdown.	Groundwater impacts are anticipated to be manageable through the application of the mitigation measures described in section 10.4.4.	Likely	Minor	Moderate
Contamination of groundwater aquifers due to accidental chemical spills or leakage from construction and maintenance plant, vehicles, equipment and storage areas	Likely	Major	High	Hazardous material procedures (including procedures for managing spills, and the refuelling and maintenance of vehicles/equipment) would be developed and implemented.	Potential contamination risks to groundwater aquifers are anticipated to be manageable through the application of the mitigation measures described in section 10.4.4.	Unlikely	Moderate	Moderate
Land stability and contamination								
Mobilisation of existing known or unknown contamination in the environment	Likely	Moderate	High	Targeted investigation to determine presence and extent of any existing sources of contamination within the proposal alignment.	Potential contamination risks are anticipated to be manageable through the application of the mitigation measures described in section 10.3.	Remote	Moderate	Low

Table 18.4 cont.

ISSUE	INITIAL RISK RATING			KEY MITIGATION MEASURES	RESIDUAL ADVERSE IMPACTS	RESIDUAL RISK RATING		
	LIKELIHOOD	CONSEQUENCE	RATING			LIKELIHOOD	CONSEQUENCE	RATING
Localised failures in unconsolidated geological strata (Botany Sands formations), where present during construction of the proposal	Likely	Major	High	Design and selection of appropriate construction techniques to avoid risk of failure. Monitoring of adjacent receptors to provide early warning of off-site effects.	Successful management of potential impacts anticipated to be achievable through the application of the mitigation measures described in section 10.3.	Remote	Moderate	Low
Increased wind erosion of exposed unconsolidated strata during construction	Possible	Major	High	Design and selection of construction techniques to minimise exposure. A dust management plan would be developed and implemented as part of the CEMP, incorporating the mitigation measures listed in section 10.7.4.	Successful management of potential impacts anticipated to be achievable through the application of the mitigation measures described in sections 10.3 and 10.7.	Remote	Moderate	Low
Air quality								
Reduction in ambient air quality due to particulate (dust) and gaseous emissions during construction	Almost certain	Major	Major	A dust management plan would be developed and implemented as part of the CEMP, incorporating the mitigation measures listed in section 10.7.4. Air quality management measures to address gaseous and fugitive emissions would be developed and implemented during the construction of the CSELR proposal as part of the CEMP. Measures to be included are described in section 10.7.4.	Particulate (dust) and gaseous (vehicle exhaust and fugitive emissions) emissions are considered to be manageable through the implementation of standard environmental management measures, as outlined in section 10.7.4.	Unlikely	Minor	Low

Table 18.4 cont.

ISSUE	INITIAL RISK RATING			KEY MITIGATION MEASURES	RESIDUAL ADVERSE IMPACTS	RESIDUAL RISK RATING		
	LIKELIHOOD	CONSEQUENCE	RATING			LIKELIHOOD	CONSEQUENCE	RATING
Reduction in ambient air quality during operations due to particulate (dust) emissions from entrainment of surface particles, wheel and rail wear, and traction sanding	Possible	Insignificant	Low	Street sweeping of the CSELR alignment would be undertaken where an excessive build-up of material has occurred.	Particulate emissions are expected to be relatively minor and would not significantly affect local air quality along the CSELR alignment.	Possible	Insignificant	Low
Reduction in ambient air quality during operations due to gaseous emissions from maintenance vehicles and fuel/ chemicals stored at the Rozelle maintenance depot and Randwick stabling facility (e.g. liquid petroleum gas (LPG), diesel, lubricant oils, cleaning chemicals)	Likely	Minor	Moderate	Ancillary maintenance service vehicles and equipment would be kept maintained and operated in accordance with the manufacturer's requirements. Unnecessary release of air pollutants would be avoided from the Rozelle maintenance depot and Randwick stabling facility.	Fugitive emissions from fuel and chemicals stored on-site are anticipated to be minor and would not significantly affect local air quality.	Unlikely	Insignificant	Low

Table 18.4 cont.

ISSUE	INITIAL RISK RATING			KEY MITIGATION MEASURES	RESIDUAL ADVERSE IMPACTS	RESIDUAL RISK RATING		
	LIKELIHOOD	CONSEQUENCE	RATING			LIKELIHOOD	CONSEQUENCE	RATING
Greenhouse gases								
Generation of greenhouse gas emissions during construction and operation, contributing to climate change	Almost certain	Minor	Moderate	The environmental management measures documented in section 10.9.4 would be implemented to reduce energy and resource usage (and any associated greenhouse gas emissions).	Operation of the CSELR proposal is estimated to generate 18,418.4 tonnes of $CO_{2\text{-}e}$ in 2020/2021, with the consumption of electricity to power light rail vehicles and infrastructure accounting for 95.4 per cent of these emissions. The CSELR proposal is estimated generate 70,182.9 tonnes of $CO_{2\text{-}e}$, with embodied emissions in construction materials making up 70.6 per cent of these emissions. Opportunities to reduce the intensity of these emissions would be investigated during detailed design and procurement.	Almost certain	Minor	Moderate
Climate change adaptation								
Flooding of light rail tracks and other CSELR infrastructure; loss of access due to disruptions to CSELR services; and foundation instability, due to a predicted increased frequency and severity of extreme rainfall events	Almost certain	Major	Major	Possible design responses to address climate change risks would be considered during detailed design. The environmental management measures documented in Table 7.5 would be implemented (where appropriate) to reduce climate change risks to the CSELR proposal.	Risks are anticipated to be manageable through the application of the environmental management measures documented in Table 7.5.	Possible	Major	High

Table 18.4 cont.

ISSUE	INITIAL RISK RATING			KEY MITIGATION MEASURES	RESIDUAL ADVERSE IMPACTS	RESIDUAL RISK RATING		
	LIKELIHOOD	CONSEQUENCE	RATING			LIKELIHOOD	CONSEQUENCE	RATING
Track movement/ cracking, increased ventilation/air conditioning costs; and failure of signalling and communication equipment, due to a predicted increased frequency, severity and duration of extreme temperature (days exceeding 35°C)	Unlikely	Major	Moderate	Possible design responses to address climate change risks would be considered during detailed design. The environmental management measures documented in Table 7.5 would be implemented (where appropriate) to reduce climate change risks to the CSELR proposal.	Risks are anticipated to be manageable through the application of the environmental management measures documented in Table 7.5.	Low	Moderate	Low
Damage to CSELR infrastructure caused by debris, fallen trees and branches; as well as damage to wind-exposed infrastructure, due to a predicted increased frequency and severity of extreme wind events	Possible	Major	High	Possible design responses to address climate change risks would be considered during detailed design. The environmental management measures documented in Table 7.5 would be implemented (where appropriate) to reduce climate change risks to the CSELR proposal.	Risks are anticipated to be manageable through the application of the environmental management measures documented in Table 7.5.	Unlikely	Minor	Low
Impact of extreme weather events (e.g. intense rainfall) on the effectiveness of adopted environmental controls (e.g. erosion and sediment control measures)	Possible	Major	High	Adequate measures to manage environmental impacts during extreme weather events to be considered by construction contractor. Monitor weather conditions. Do not schedule critical works during predicted extreme weather events. Refer to section 7.3.4.	Risks are anticipated to be manageable through the application of standard mitigation measures.	Improbable	Major	Moderate

Table 18.4 cont.

ISSUE	INITIAL RISK RATING			KEY MITIGATION MEASURES	RESIDUAL ADVERSE IMPACTS	RESIDUAL RISK RATING		
	LIKELIHOOD	CONSEQUENCE	RATING			LIKELIHOOD	CONSEQUENCE	RATING
Hazard and risks								
Injury or fatality due to undertaking construction works in close proximity to sensitive receivers (e.g. schools), major arterial/ regional roads and highly pedestrianised areas in the CBD	Likely	Critical	Major	The mitigation measures described in section 10.10.3 would be implemented.	Manageable through the application of standard mitigation measures, which would be developed by the construction contractor prior to construction. Refer to section 10.10.3.	Remote	Major	Moderate
Damage to private property due to undertaking construction works in close proximity to vibration sensitive structures, or due to ground settlement risks to existing buildings from groundwater drawdown during construction	Likely	Major	High	Condition surveys for potentially affected structures to be undertaken prior to construction. Vibration monitoring to be undertaken during vibration intensive works. Groundwater management measures would be implemented, as outlined earlier in this table (refer to the groundwater sub-section of this table for details).	Risks are anticipated to be manageable through the application of standard mitigation measures, which would be developed by the construction contractor prior to construction.	Remote	Moderate	Low

Table 18.4 cont.

ISSUE	INITIAL RISK RATING			KEY MITIGATION MEASURES	RESIDUAL ADVERSE IMPACTS	RESIDUAL RISK RATING		
	LIKELIHOOD	CONSEQUENCE	RATING			LIKELIHOOD	CONSEQUENCE	RATING
Injury or fatality due to undertaking construction works in the vicinity of services/utilities (e.g. high voltage power lines, gas mains)	Likely	Critical	Major	Environmental management measures would be developed and implemented as part of the CEMP to address: chemical spills/leaks; surface water quality; groundwater quality; disposal of contaminated materials and/or groundwater; traffic, transport and access issues; and the management of services and utilities.	Risks are anticipated to be manageable through the application of standard mitigation measures.	Remote	Major	Moderate
Environmental hazards and risks associated with the transport, use and storage of chemicals and hazardous materials on-site	Likely	Major	High			Unlikely	Minor	Low
Injury or fatality due to collisions between LRVs and pedestrians within highly pedestrianised areas	Likely	Critical	Major	Hazards and risks are considered to be manageable during operations through design (e.g. incorporating adequate safety provisions into the design of CSELR infrastructure), the application of community education programs (e.g. advertisement of potential project related safety risks — such as the risk of injury due to pedestrian movements within the defined CSELR corridor — to build community awareness and resilience of such risks), and standard mitigation measures and plans (e.g. emergency response plans).	Risks are anticipated to be manageable through design, application of community education programs and standard mitigation measures and plans (e.g. emergency response plans).	Possible	Major	High
Injury or fatality due to collisions between road and LRVs at signalised crossings and locations where road traffic would be maintained adjacent to the CSELR proposal	Likely	Critical	Major			Possible	Major	High

Table 18.4 cont.

ISSUE	INITIAL RISK RATING			KEY MITIGATION MEASURES	RESIDUAL ADVERSE IMPACTS	RESIDUAL RISK RATING		
	LIKELIHOOD	CONSEQUENCE	RATING			LIKELIHOOD	CONSEQUENCE	RATING
Waste, energy and resources								
Environmental hazards associated with the disposal of construction waste, including potentially hazardous/ contaminated materials (e.g. asbestos, contaminated spoil)	Likely	Moderate	High	All waste assessed, classified, managed and disposed of in accordance with the *Waste Classification Guidelines* (DECCW 2009). Standard mitigation measures to be prepared by the construction contractor(s). Refer to section 7.4.3.	Risks associated with the disposal of contaminated waste would be insignificant.	Unlikely	Minor	Low
Increased demand on resources (e.g. electricity, fuel, concrete, steel, water), such that they would become in short supply	Unlikely	Moderate	Moderate	Mitigation measures to be developed by the construction contractor(s) to reduce demand on resources. Refer to section 7.4.3.	Resources would still be required to be consumed for the construction and operation of the proposal; however, demand on such resources would be reduced, where possible.	Remote	Moderate	Low
Cumulative impacts – during construction of CSELR								
Cumulative impacts on sensitive receivers associated with overlapping construction of CSELR and other surrounding major developments, including 'construction fatigue' associated with an overall increased duration of disturbance on sensitive receivers, particularly residents	Almost certain	Moderate	High	Potential cumulative construction impacts to be further considered during detailed design and detailed construction planning, in consultation with proponents of these projects. Activities would be coordinated to minimise potential impacts and addressed in appropriate construction management plans. Refer to section 11.3.	Cumulative impacts would be expected to occur for some sensitive receivers that are impacted by more than one project – with the City Centre Precinct the most likely to be affected.	Almost certain	Moderate	High

Table 18.4 cont.

ISSUE	INITIAL RISK RATING			KEY MITIGATION MEASURES	RESIDUAL ADVERSE IMPACTS	RESIDUAL RISK RATING		
	LIKELIHOOD	CONSEQUENCE	RATING			LIKELIHOOD	CONSEQUENCE	RATING
Cumulative impacts – during operation of CSELR								
Cumulative impacts on sensitive receivers associated with simultaneous operation of the CSELR and other surrounding major developments	Possible	Moderate	Moderate	Ongoing consultation with CSELR stakeholders that are proponents of other major developments – to ensure design integration.	No major impacts predicted, other than potential traffic and associated amenity impacts on CBD streets along which buses and road traffic are proposed to be diverted as part of *Sydney City Centre Access Strategy* and CSELR.	Possible	Moderate	Moderate

18.3 Proposed management and mitigation measures

This EIS, and associated technical studies, have identified a range of environmental and social impacts that are likely to occur as a result of the CSELR proposal. The environmental risk analysis contained in Table 18.4 has identified that the a number of issues would present a moderate to high perceived or actual risk for the CSELR proposal. Transport for NSW proposes to implement a range of environmental management measures to reduce the identified environmental and social impacts associated with the construction and operational phases of the proposal. These measures are summarised in Appendix I.

The environmental management measures listed in Appendix I may be revised in response to submissions received in response to the exhibition of the EIS and/or design changes made subsequent to exhibition.

Following project approval (if approved), the conditions of approval would guide the subsequent phases of the proposal. Any consortium or contractor selected to undertake further planning, detailed design, construction and/or operation of the proposal would be required to undertake all works in accordance with the specified environmental management measures and conditions of approval.

19. Proposal justification and conclusion

Chapter 19 provides overall justification and conclusions for the Environmental Impact Statement (EIS) for the CBD and South East Light Rail Project ('the CSELR proposal' or 'the CSELR'). This includes justification of the proposal in relation to its performance relative to the proposal objectives; its anticipated key impacts, benefits and costs; the objectives of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act); the principles of ecologically sustainable development (ESD); and the public interest.

19.1 Proposal justification

19.1.1 Alignment between the proposal need, objectives and benefits

The need for the CSELR is described in Chapter 3 of this EIS. In summary, the CSELR would transform the transport system within inner Sydney and provide a step change in transport capability and capacity. It would address the current challenges including:

- addressing CBD congestion through transfer from existing buses and private vehicles
- improving access for the inner South East suburbs to the CBD through improved reliability of travel and efficient connection to major trip generators including the Moore Park sports and entertainment complex, Royal Randwick racecourse, the University of NSW (UNSW), and the Prince of Wales and Sydney Children's Hospitals
- supporting continued population and employment growth in the region by providing up to 18,600 morning peak hour boardings in both directions in 2021 growing to around 23,400 peak hour boardings by 2036.

These challenges, which underlie the need for the CSELR, are directly related to the objectives of the proposal, as described in section 1.3. In turn, the objectives of the proposal are directly linked to its anticipated social, economic and environmental benefits, which comprise:

- *customer benefits* — improved and more reliable journeys for public transport users, a net reduction in congestion and accident costs for private vehicle users, and improved travel times and amenity for pedestrians
- *operating benefits* — delivering a savings in existing transport operator costs
- *broader community benefits* — through a reduction in environmental and health externalities such as air pollution and noise
- *wider economic benefits* — through opportunities for urban renewal and agglomeration.

19.1.2 Key biophysical, economic and social impacts of the proposal

There would be a number of impacts associated with the construction and operation of the CSELR. These have been described in detail in the preceding chapters and include:

- Parking and access impacts during construction and operation, including permanent removal of a significant number of on-street parking spaces along the CSELR alignment. The Surry Hills and Kensington/Kingsford precincts are predicted to have sufficient latent parking capacity to absorb displaced parking demand; however there is potential for parking demand to outstrip supply within the Randwick Precinct.
- Disruption to public space during construction, including roadways along the CSELR alignment, and proposed construction worksites at First Fleet Park, Belmore Park, Ward Park, Wimbo Park, Langton Centre car park, Moore Park, High Cross Park, Royal Randwick racecourse, UNSW and the Nine Ways intersection at Kingsford.
- Noise and other amenity impacts during construction and the associated social impacts and impacts on local businesses particularly in the City Centre, Surry Hills and Randwick precincts.
- Localised flooding impacts associated with changes to the stormwater drainage capacity, including areas along George Street and associated with existing flooding at the proposed Randwick stabling facility and Alison Road.
- Impacts on trees including the removal of up to 760 trees along the proposed CSELR alignment.

- Operational amenity impacts as a result of the Randwick stabling facility in particular noise and visual amenity.
- Direct impact to and permanent changes to the setting, context and appreciation of various heritage items and heritage conservation areas along the alignment. Major permanent impacts predicted at the Palace Hotel complex (City Centre Precinct); Devonshire Street significant trees and Wimbo Park (Surry Hills Precinct); Martin Road significant trees, the Racecourse Precinct Heritage Conservation Area, Royal Randwick racecourse significant trees and High Cross Reserve and significant trees (Randwick Precinct); and Tay Reserve and UNSW significant trees (Kensington/Kingsford Precinct).
- Impact on the setting of, disturbance to or loss of significant (including State significant) archaeological resources predicted at some locations along the alignment. Moderate to major potential impacts predicted in the City Centre Precinct (e.g. First Fleet Park, Town Hall), and at High Cross Park (Randwick Precinct) and Tay Reserve (Kensington/Kingsford Precinct).

Details of the mitigation and management measures proposed to address the identified impacts are provided in Appendix I.

19.1.3 Identified benefit-cost ratio

An economic appraisal for the CSELR proposal indicates that the proposal's economic benefits significantly outweigh the proposal costs, with a benefit cost ratio (BCR) of 2.5 including wider benefits (pwc, AECOM, Booz, 2013).

19.1.4 Objectives of the EP&A Act

Table 19.1 identifies the objectives of the EP&A Act and summarises how the CSELR proposal has responded to and/or is in adherence with the relevant objectives.

Table 19.1 The proposal's adherence with and/or response to EP&A Act objectives

OBJECTIVE	CSELR PROPOSAL ADHERENCE/RESPONSE
To encourage the proper management, development and conservation of natural and artificial resources, including agricultural land, natural areas, forests, minerals, water, cities, towns, villages for the purpose of promoting the social and economic welfare of the community and a better environment	The CSELR proposal would result in significant social, environmental and economic benefits for the Sydney region, as discussed in section 19.1.1. No significant impacts on natural resources are anticipated, as the proposal is located in an urban environment, and largely along existing road corridors. Social, environmental and economic impacts of the proposal have been assessed in detail in this EIS, and detailed mitigation and management measures are proposed to ensure community and economic resources are properly managed, developed and conserved.
To encourage the promotion and coordination of the orderly and economic use and development of land	The CSELR proposal assists in meeting the aims of a number of NSW Government strategic planning and transport policies and plans, and is expected to have significant economic benefits as described in Chapter 3 of this EIS. The proposal is also mostly located on government-owned land, which has minimised the need for costly acquisition of private property.
To encourage the protection, provision and co-ordination of communication and utility services	The CSELR proposal requires protection and relocation of a substantial number of existing utilities, potential impacts on some planned utilities, and construction of some new utility infrastructure, as described in section 10.8 of this EIS. Consultation with utility and communication providers has commenced and is ongoing to ensure works to utilities are coordinated effectively. Further investigations would be carried out during the detailed design phase to ensure that all appropriate measures are in place to minimise the potential risks to existing utilities and services prior to commencement of construction works.
To encourage the provision of land for public purposes	The CSELR is proposed for a public purpose, and would significantly enhance the capacity and quality of public transport in Sydney's CBD and south-eastern suburbs. A number of public domain improvements are also proposed as part of the proposal.
To encourage the provision and co-ordination of community services and facilities	Impacts of the CSELR proposal on community services and facilities are discussed in Chapters 12–17 of this EIS. The proposal is also expected to improve access to community facilities in the CBD and south-eastern suburbs such as Moore Park, Centennial Park, the Randwick health precinct, the University of NSW (UNSW) and the Sydney Opera House/Circular Quay.

Table 19.1 cont.

OBJECTIVE	CSELR PROPOSAL ADHERENCE/RESPONSE
To encourage the protection of the environment, including the protection and conservation of native animals and plants, including threatened species, populations and ecological communities, and their habitats	The proposal would result in removal of a number of potential foraging and roosting (Powerful Owl only) trees for threatened biodiversity such as the Grey-headed Flying-fox, Eastern Bent-wing Bat and Powerful Owl. However, this is not expected to result in significant impacts on these species (refer Chapter 10).
To encourage ecologically sustainable development (ESD)	Chapter 7 of this EIS provides an outline of the manner in which sustainability considerations have been taken into account through the design development of the proposal and actions to be taken forward into detailed design and construction phases. Furthermore, the principles of ESD have been considered and implemented as part of the proposal, as described in section 7.1.
To encourage the provision and maintenance of affordable housing	Chapter 9 (section 9.4.2) of this EIS identifies that the CSELR may indirectly contribute to encouraging the provision and maintenance of affordable housing by providing improved access to/from areas identified for housing development as part of the NSW Government's Urban Activation Precinct (UAP) program (e.g. in Randwick and Anzac Parade South).
To promote the sharing of responsibility for environmental planning between different levels of government in the State	The CSELR proposal development and assessment has included consultation with a roundtable of key stakeholders, as determined by the NSW Minister for Transport. The Sydney Light Rail Round Table group includes both NSW Government and local government stakeholders, as described in Chapter 2 of this EIS.
To provide increased opportunity for public involvement and participation in environmental planning and assessment	The EIS has incorporated feedback from the community and other key stakeholders on issues of concern relating to the proposal. Details are described in Chapter 2 and Appendix E of this EIS. The community will also be encouraged to respond during exhibition of the EIS, and (subject to planning approval) would continue to be engaged in the proposal throughout the detailed design and construction phases.

19.1.5 Principles of ESD

ESD is development that improves the total quality of life, both now and in the future, in a way that maintains the ecological processes on which life depends. As described in Chapter 7, the principles of ESD have been an integral consideration for the CSELR proposal throughout its development. This includes the integration of economic, social and environmental considerations in decision-making processes to date.

Details of how the principles of ESD have been incorporated into the proposal are provided in section 7.1.1.

19.1.6 The public interest

The 'public interest' is generally defined as 'community wellbeing' or 'general welfare of the public'. The CSELR proposal is considered to be in the public interest considering the following:

- the anticipated significant transport, social and economic benefits for users of the CSELR, the broader community and the wider economy — as described in section 19.1.1
- the significant, adverse implications of not proceeding with the proposal — as described in section 3.5.4
- the fact that the proposal would assist in meeting the aims of a number of NSW Government strategic planning and transport policies and plans — as described in section 3.2.

Although the CSELR proposal has the potential for some significant local impacts on communities (as described in Chapters 12–17 of this EIS), overall, the anticipated benefits for the community and implications of not proceeding with the proposal are considered to outweigh these impacts. Furthermore, detailed management and mitigation measures are proposed to ensure the impacts are acceptable and manageable.

19.2 Conclusion

This EIS has been prepared in accordance with Part 5.1 of the EP&A Act and other relevant legislation. In particular, it addresses the requirements of the Director-General of the NSW Department of Planning and Infrastructure and the outcomes of an environmental risk assessment. The EIS also includes consideration of issues raised by the community and stakeholders during development of the proposal and preparation of the EIS.

There is strong justification for the CSELR proposal, as summarised in section 19.1 and supported by the high BCR of 2.5.

The approach for mitigation and management of the potential adverse impacts of the proposal is outlined in Chapter 18 and Appendix I of the EIS. These measures would be incorporated into the construction environmental management plan (CEMP) and subplans for the proposal and subsequently (if necessary), the future operator's environmental management system.

Provided the measures and commitments specified in this EIS are applied and effectively implemented during the design, construction and operational phases, the identified environmental impacts are considered to be acceptable and manageable.

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