6. Preferred Infrastructure Report

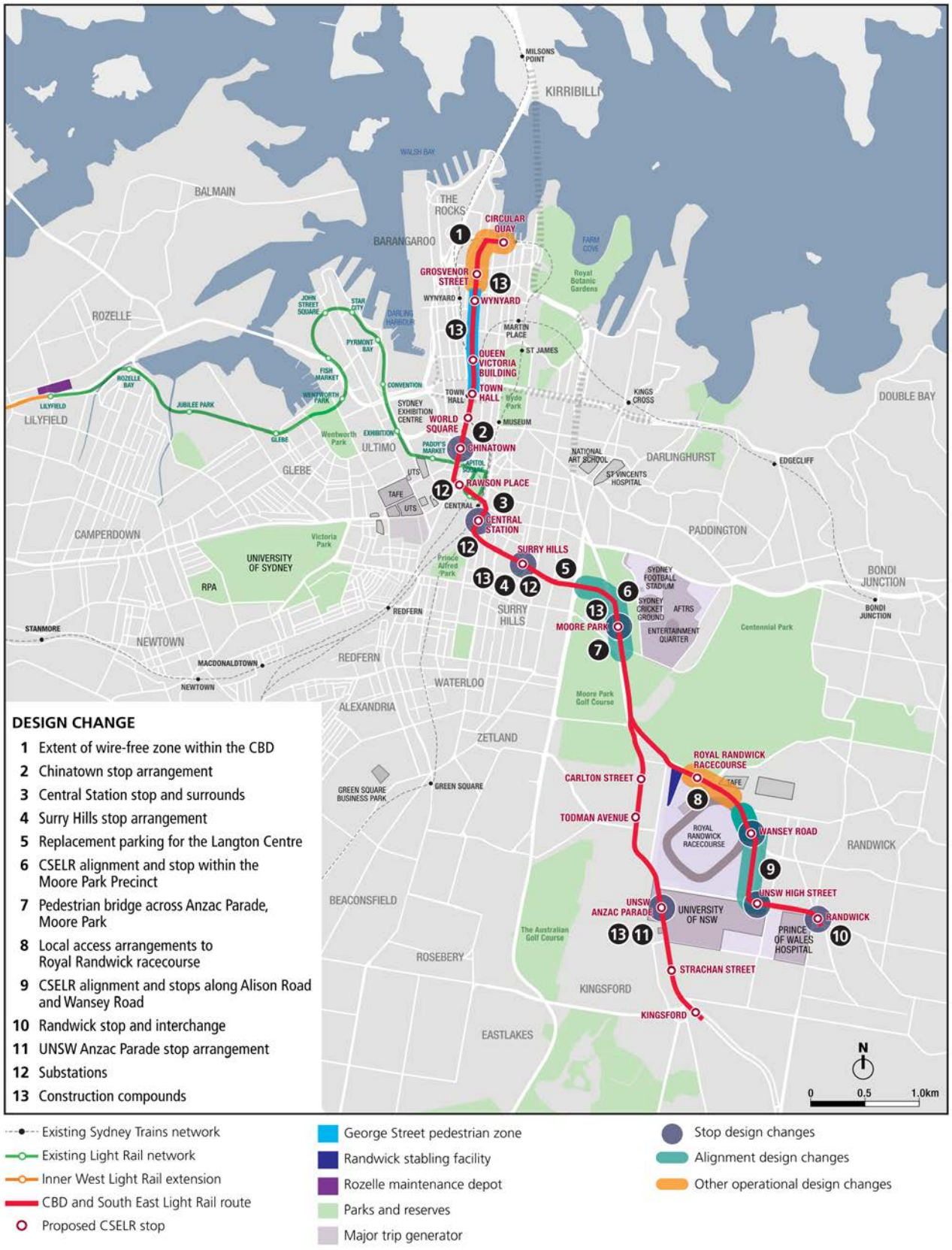
This chapter documents and assesses 13 design changes that Transport for NSW proposes to make to the CBD and South East Light Rail (CSELR) proposal since the public exhibition of the Environmental Impact Statement (EIS). These design changes were identified as a result of ongoing design development, issues raised by stakeholders and the community during the EIS exhibition period, as well as further refinement of the constructability of the proposal. An assessment of the difference in environmental impact for each design change demonstrates that, collectively, they would represent a positive outcome for the proposal or can be adequately managed through the application of suitable environmental management measures (refer to Chapter 8 of this Submissions Report).

6.1 Overview

Section 115Z(6) of the *Environmental Planning and Assessment Act 1979* (EP&A Act) enables the preparation of a Preferred Infrastructure Report that outlines any proposed changes to the State significant infrastructure (SSI) to minimise its environmental impact or to deal with any other issue raised during the assessment of the application concerned. The proposed design changes that are assessed include:

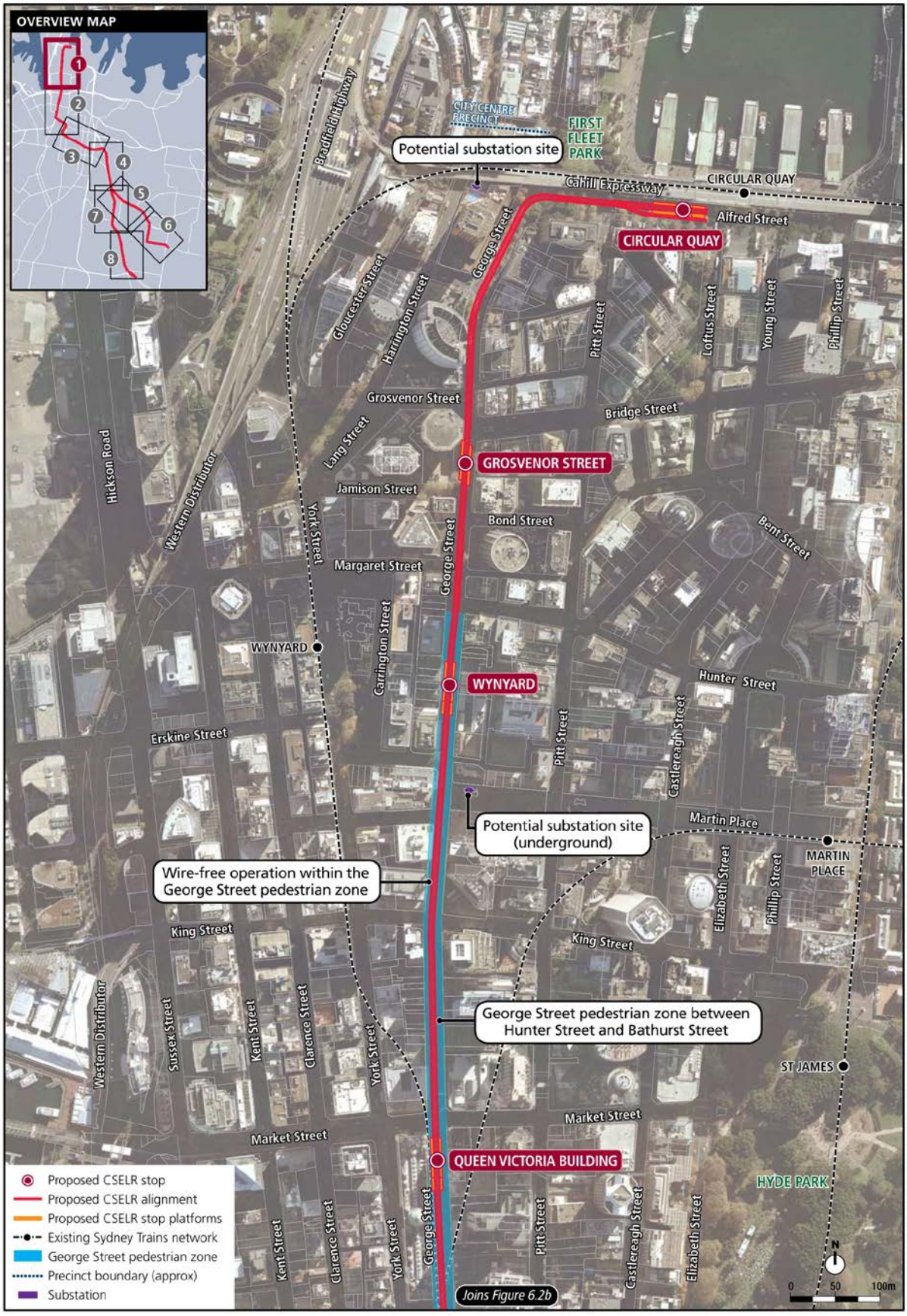
- extent of wire-free zone within the CBD (section 6.3 of this Submissions Report)
- Chinatown stop arrangement (section 6.4 of this Submissions Report)
- Central Station stop and surrounds (section 6.5 of this Submissions Report)
- Surry Hills stop arrangement (section 6.6 of this Submissions Report)
- replacement parking for the Langton Centre (section 6.7 of this Submissions Report)
- CSELR alignment and stop within the Moore Park Precinct (section 6.8 of this Submissions Report)
- Pedestrian bridge over Anzac Parade, Moore Park (section 6.9 of this Submissions Report)
- local access arrangements to Royal Randwick racecourse (section 6.10 of this Submissions Report)
- CSELR alignment and stops on Alison and Wansey Roads (section 6.11 of this Submissions Report)
- Randwick stop and interchange (section 6.12 of this Submissions Report)
- UNSW Anzac Parade stop arrangement (section 6.13 of this Submissions Report)
- substation locations (section 6.14 of this Submissions Report)
- construction compounds – location and extent (section 6.15 of this Submissions Report).

The locations of the above design changes are shown in Figure 6.1. An overview of the key features of the revised CSELR proposal is provided in Figure 6.2a to Figure 6.2h. These figures show the overall proposed design and key features of the CSELR including the design changes identified in this section of the Preferred Infrastructure Report.



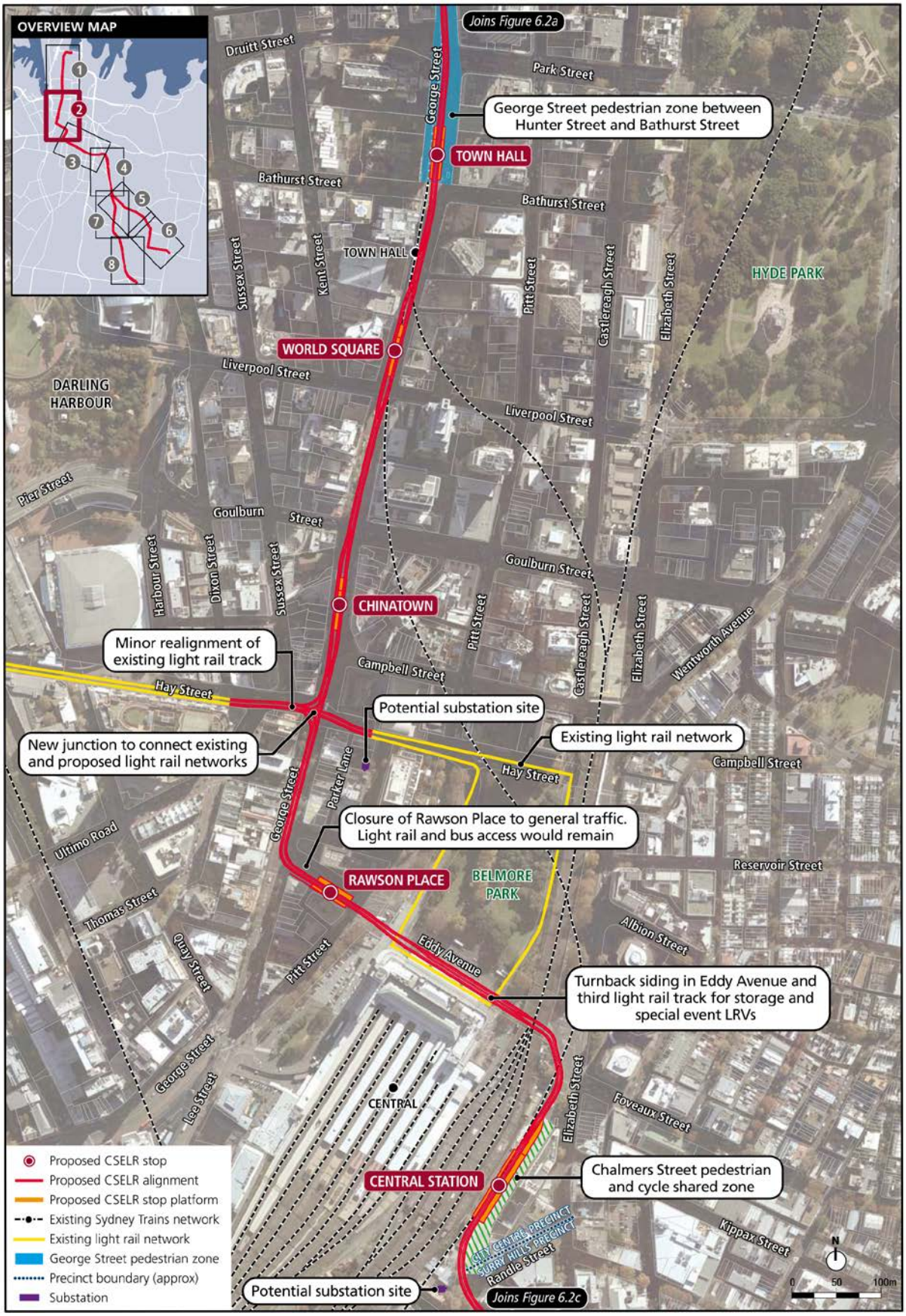
Note: Indicative only. Subject to detailed design

Figure 6.1 Proposed design changes



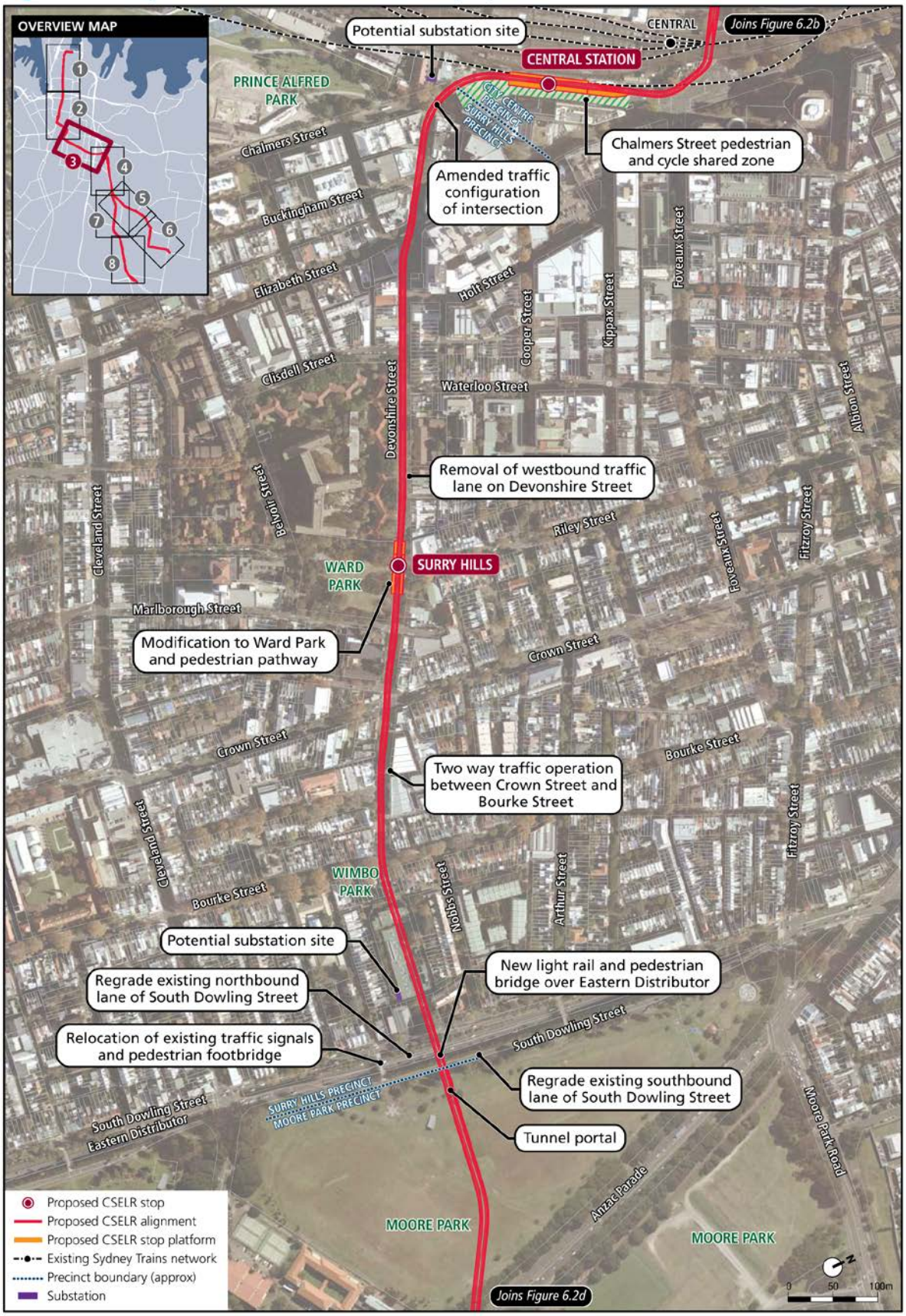
Note: Indicative only. Subject to detailed design

Figure 6.2a Key features of the revised CSELR proposal



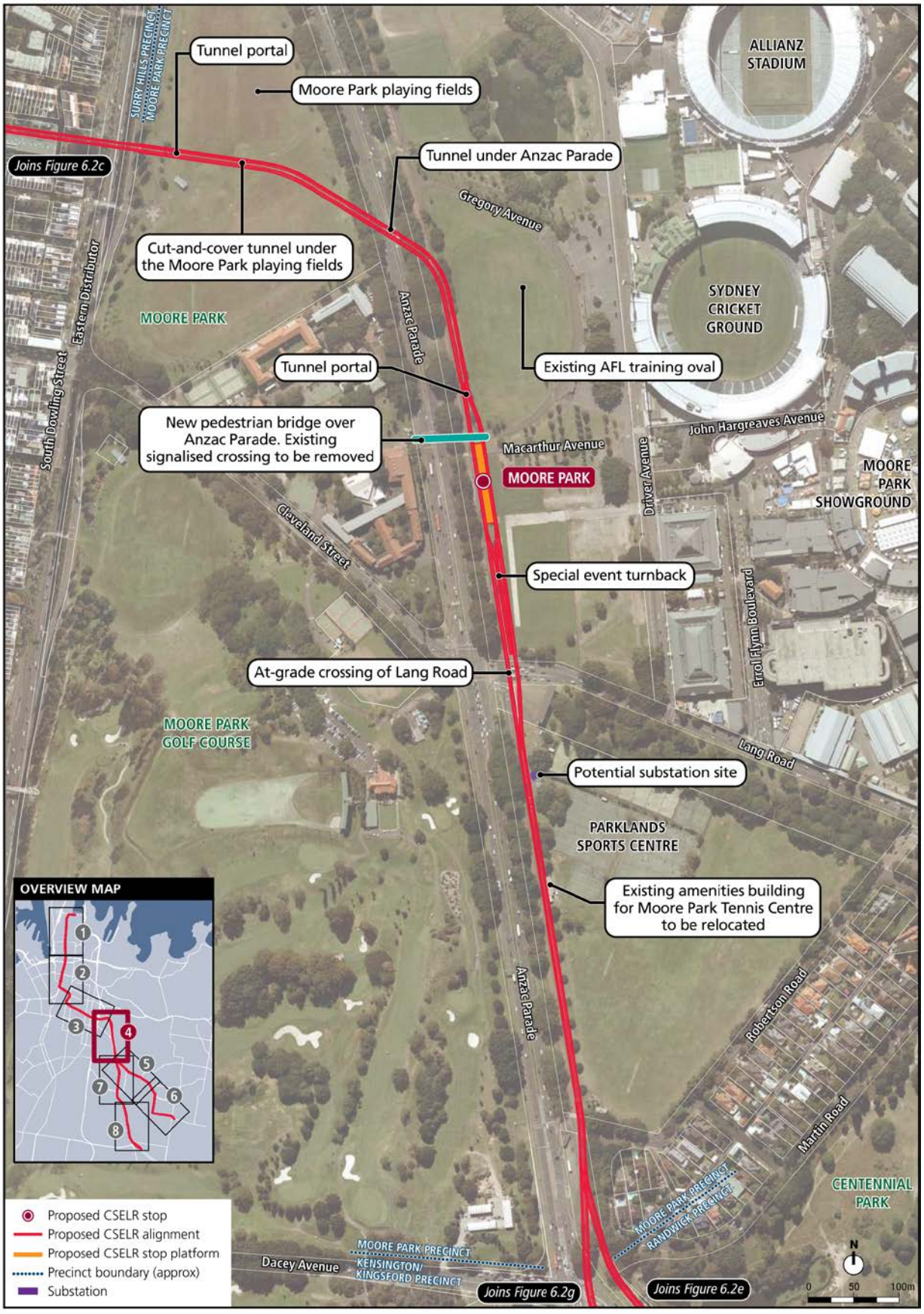
Note: Indicative only. Subject to detailed design

Figure 6.2b Key features of the revised CSELR proposal



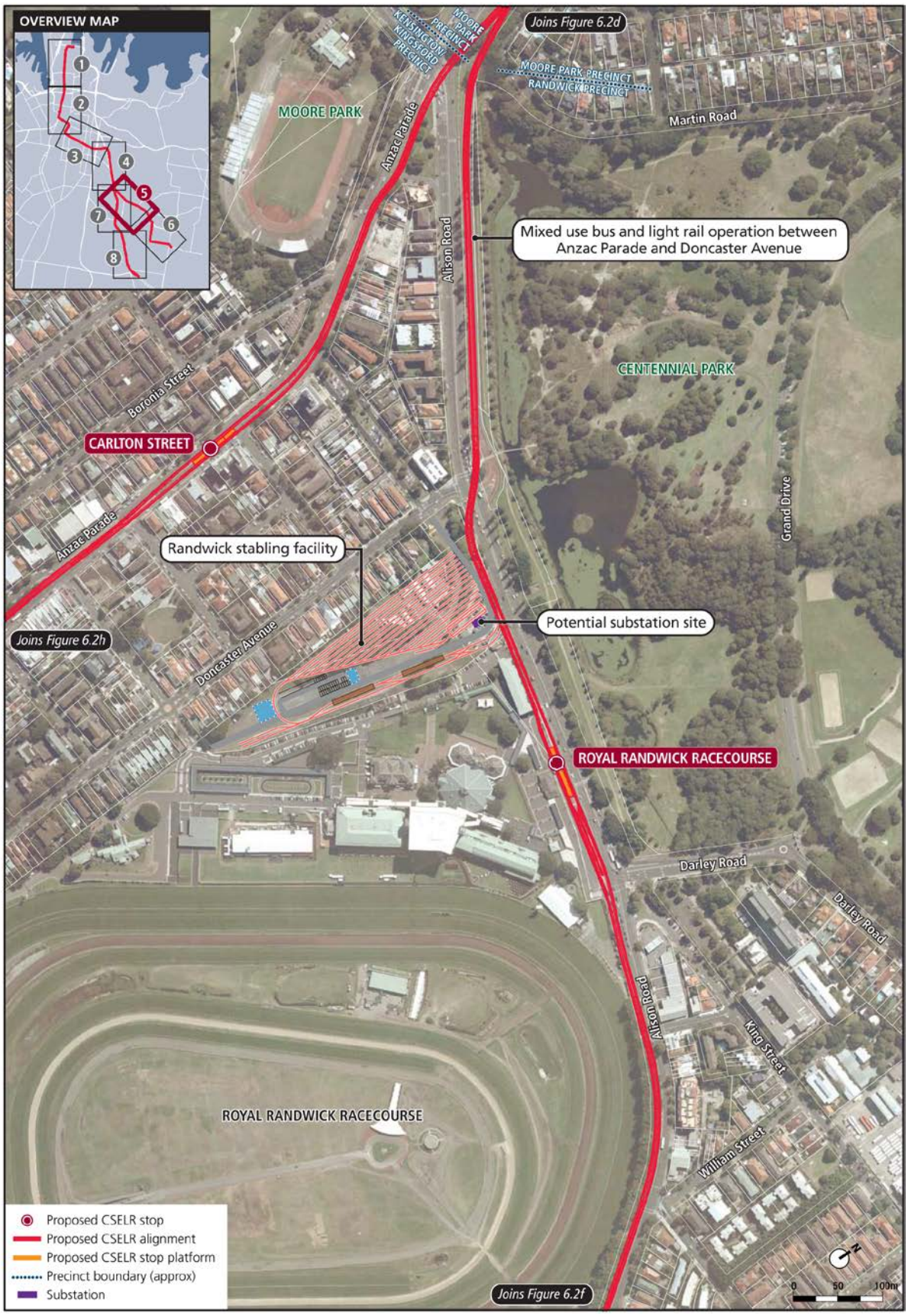
Note: Indicative only. Subject to detailed design

Figure 6.2c Key features of the revised CSELR proposal



Note: Indicative only. Subject to detailed design

Figure 6.2d Key features of the revised CSELR proposal

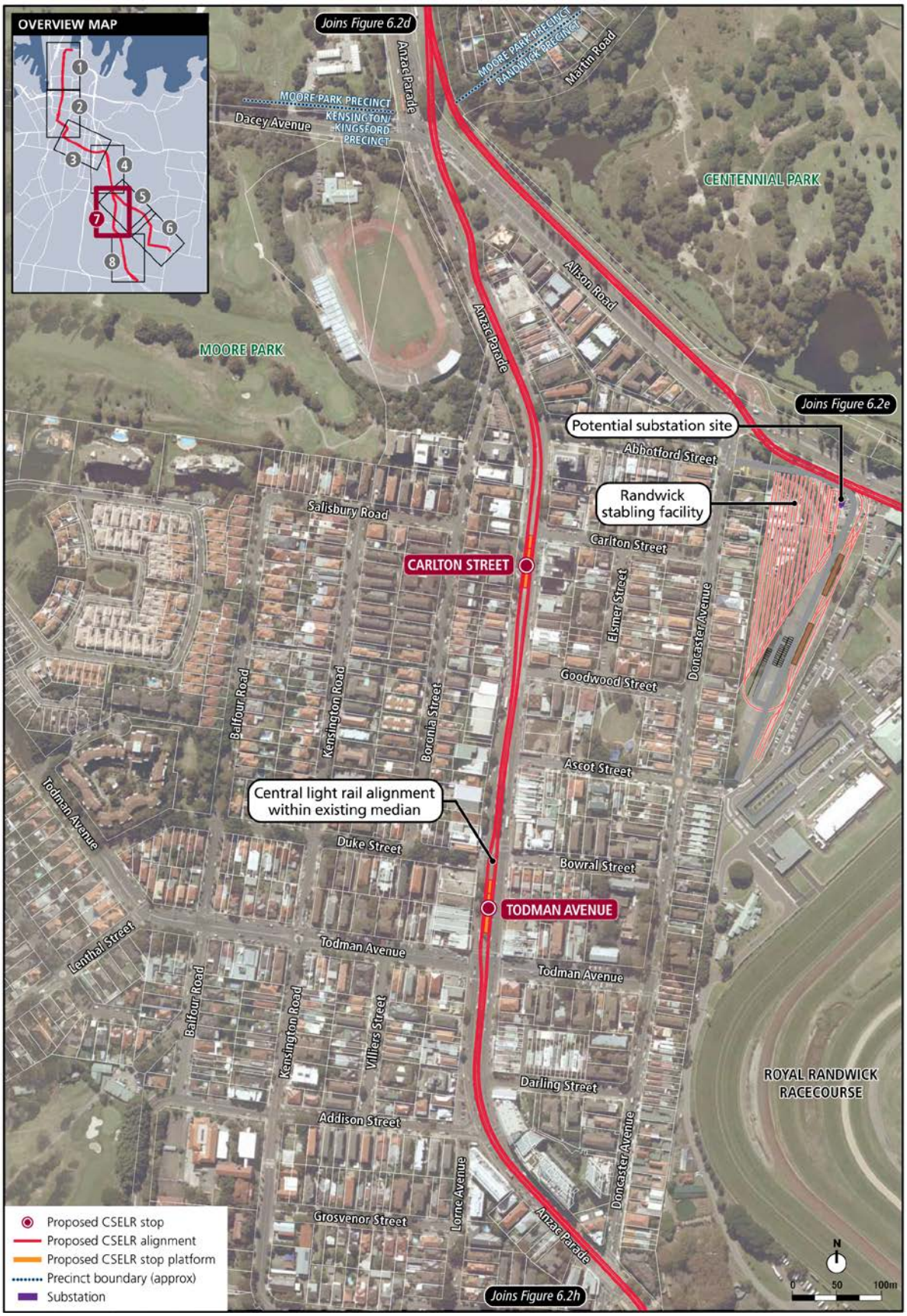


Note: Indicative only. Subject to detailed design

Figure 6.2e Key features of the revised CSELR proposal

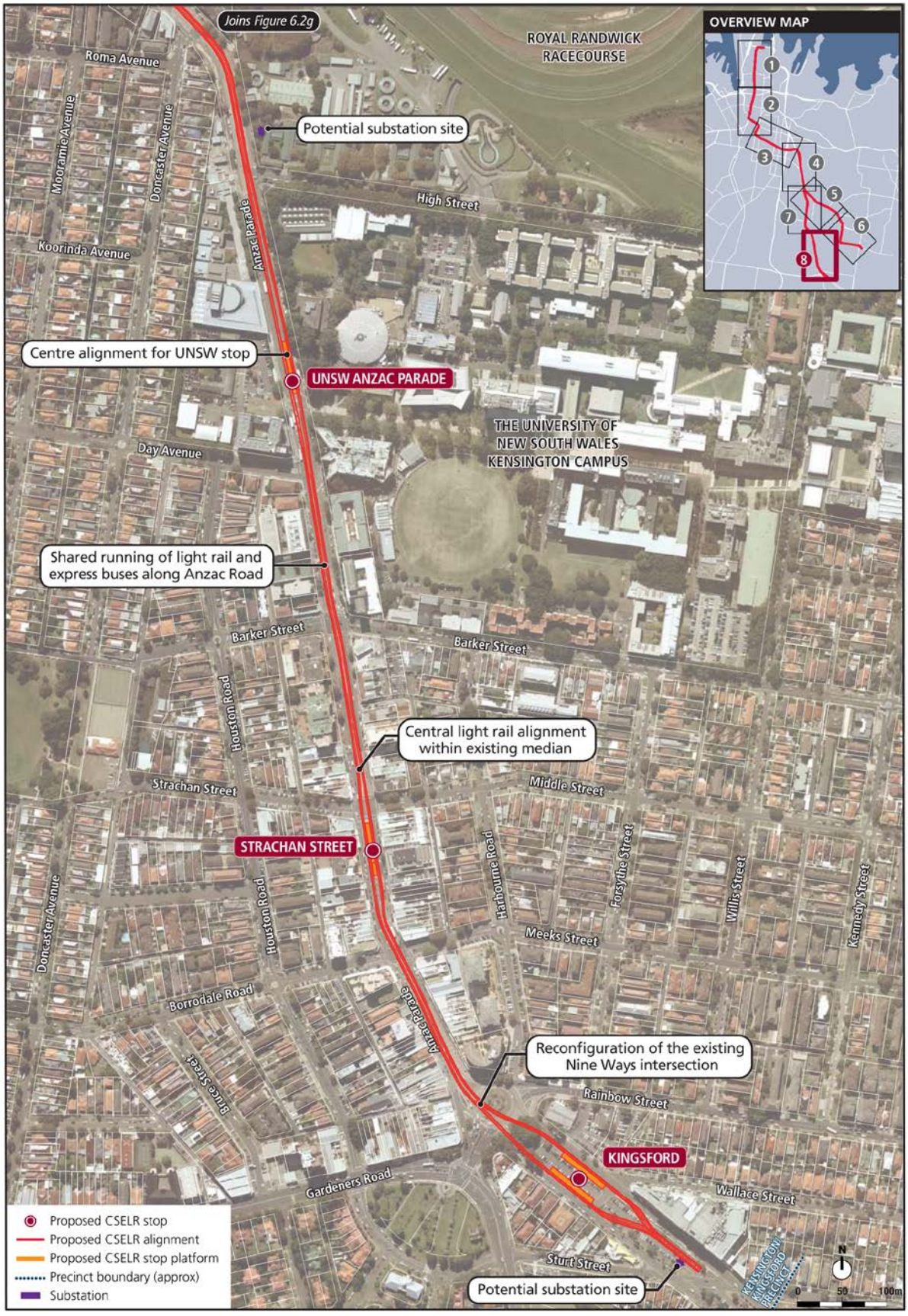
Note: Indicative only. Subject to detailed design

Figure 6.2f Key features of the revised CSELR proposal



Note: Indicative only. Subject to detailed design

Figure 6.2g Key features of the revised CSELR proposal



Note: Indicative only. Subject to detailed design

Figure 6.2h Key features of the revised CSELR proposal

A majority of the proposed design changes would reduce the overall environmental impact of the CSELR proposal compared to the design that was presented in the EIS. The following sections provide a description of each proposed design change and an assessment of the change in impacts. These assessments demonstrate that the proposed changes in impact would either result in improved environmental outcomes or, in some instances minor additional impacts which would be adequately managed through application of suitable environmental management measures (refer to Chapter 8 of this Submissions Report).

6.2 Assessment approach

An environmental assessment of each proposed design change was undertaken as part of the development of these changes. Consideration of key and non-key environmental, social and economic issues was undertaken and an assessment made of the potential changes to the environmental impacts described and discussed in the EIS. Evaluation of the proposed design changes for the CSELR proposal also provided an opportunity to identify potential reduction in environmental impact and other benefits.

A summary of the potential environmental issues affected by each of the proposed design changes is provided in Table 6.1. Only the issues selected were assessed, as impacts associated with other issues would be unchanged from those assessed in the EIS.

Table 6.1 Summary of environmental issues potentially affected by the proposed design changes

DESIGN CHANGE	ENVIRONMENTAL ISSUE																
	Traffic and transport	Visual and landscape character	Planted trees	Property and land use	Noise and vibration	Non-Indigenous heritage	Socio-economic	Hydrology, drainage and surface water	Soil and contamination	Groundwater	Aboriginal heritage	Biodiverstiy	Air quality	Utilities and services	Greenhouse gases	Hazards and risks	Privacy
Extent of wire-free zone within the CBD		✓	✓			✓					✓						
Chinatown stop arrangement	✓			✓	✓												
Central Station stop and surrounds	✓	✓	✓	✓	✓	✓					✓						
Surry Hills stop arrangement	✓			✓	✓												
Replacement parking for the Langton Centre	✓			✓			✓										
CSELR alignment and stop within the Moore Park Precinct		✓	✓	✓	✓	✓					✓						
Pedestrian bridge over Anzac Parade	✓	✓	✓	✓	✓	✓	✓				✓						
Local access arrangements to Royal Randwick racecourse	✓				✓												
CSELR alignment and stops on Alison Road and Wansey Road	✓	✓	✓	✓	✓	✓										✓	
Randwick stop and interchange	✓	✓	✓	✓	✓	✓					✓						
UNSW Anzac Parade stop arrangment	✓	✓	✓	✓	✓	✓					✓			✓			
Substations		✓	✓	✓	✓	✓					✓						
Construction compounds		✓	✓	✓	✓	✓					✓						

6.3 Extent of wire-free zone within the CBD

6.3.1 Description of the EIS design

The wire-free zone, as described in section 5.2.6 of the EIS (Volume 1A), extended between the Circular Quay and Town Hall stops, with short lengths of overhead conductor at each of the stops within this section to recharge the energy storage on-board the light rail vehicles (LRVs). The proposed extent of the wire-free zone as described in section 5.2.6 of the EIS (Volume 1A) would be amended to improve reliability of the operation of the CSELR (based on the current wire free system and design) within the City Centre Precinct.

6.3.2 Description of the proposed design change

The revised length of the wire-free zone within the CBD would be reduced to extend between the Wynyard and Town Hall stops. The charging station at the Queen Victoria Building stop would continue to be maintained as described in the EIS.

The purpose of the proposed design change to the extent of the wire-free zone is to maximise the reliability of the light rail within the City Centre Precinct. Energy-storage on-board LRVs allow for a limited range between charging points (i.e. each of the proposed stops). If, for any reason, an LRV leaves one charging point but cannot continue to the next one, its energy supply would eventually become exhausted and it would be unable to continue to operate. The risk of an LRV taking a long time to travel between stops, and hence becoming stranded, is greater where:

- LRV signal priority at intersections is inconsistent or absent
- other vehicles can use the light rail track
- there are gradients in the area (i.e. running uphill takes more energy)
- the LRV uses a lot of power when stationary because the air-conditioning load is high.

All of these conditions would apply towards the northern end of the proposal between the Circular Quay and Wynyard stops. Therefore, the reduction in the wire-free zone is proposed to reduce these risks in this location. The proposed design would be subject to the final wire-free technology available and adopted by the final CSELR design at the time of construction. Depending on the technology chosen there may be further scope to extend the extent of the wire-free area by the selected contractor/operator.

6.3.3 Change in impact

Visual and landscape character impacts

Two viewpoints assessed in section 12.7 the EIS (Volume 1B) would be potentially impacted by the proposed changes to the extent of the wire-free zone within the City Centre Precinct. These are:

- Alfred Street, Circular Quay (View 1-1)
- George Street, view north near the corner with Jamison Street (View 1-2).

The assessment of the potential impacts to the landscape characters and viewpoints as a result of the proposed design change during construction and operation are described below.

Construction assessment

The proposal including this design change is not expected to result in any change to the visual impact previously identified in the EIS.

Operational assessment

Alfred Street, Circular Quay

During operation, traffic would be removed from this view and between George Street and Loftus Street would be pedestrianised. As described in the EIS, the Circular Quay stop would be visible in the centre of the view, with LRVs, platforms and a canopy structure. New trees would replace the trees removed during construction, although these would be of smaller size and maturity to the existing trees seen currently in this view, with the trees taking several years after planting to reach the height of the trees they would replace (noting that some trees would be required to be trimmed during operation to allow for the required clearances to the overhead wiring).

With the proposed design change, there would be additional poles visible on either side of the tracks, and overhead wires running in-line with the tracks supported by span wires or cantilevered beam structures attached to the poles. The overhead wire poles would generally be of a material and appearance similar to that of the existing ‘Smartpoles’ on Alfred Street, with two wider diameter ‘tensioning poles’ located at the eastern end of the light rail platform that would be visually prominent in this view. To reduce the visual clutter of additional poles, the existing street lighting could be co-located on the new overhead wire poles which would reduce the need for duplicated light poles, lessening the visual impact.

The inclusion of these additional poles and overhead wires would add visual clutter at street level to the existing character of Alfred Street. Therefore, this design change — together with the overall inclusion of light rail with the Alfred Street corridor — would result in a moderate adverse visual impact during operation. This represents an overall change in impact from the high beneficial visual impact assessed in the EIS.

George Street, view north near the corner of Jamison Street

As a result of the proposed design change, overhead wires would be seen running overhead and in-line with the tracks, with joining span wires connecting to multifunction street poles adjacent to the footpath kerb. The inclusion of overhead wires may require some dedicated supporting poles in addition to the overall number of street lighting poles. Beyond the Grosvenor Street stop, the overhead wires would be seen continuing into the background of the view.

The design change would bring a minor increase to the amount of visual clutter at street level in this view. It is expected that the overall impact of this together with the introduction of light rail to the streetscape, would be a moderate adverse visual impact during operation. This represents an overall change in impact from the negligible visual impact assessed in the EIS.

Planted tree impacts

The alignment and design for the CSELR proposal as described in the EIS was identified as potentially requiring the removal of up to approximately 110 planted trees within the whole of the City Centre Precinct, or approximately 45 per cent of the trees within the tree study area. The majority of impacted trees would be located along the length of George Street and at Chalmers Street. The EIS also identified that there would be a minor loss of trees along Alfred Street, Rawson Place and Eddy Avenue. The trees in Martin Place would not be impacted.

The proposed addition of overhead wires between Circular Quay stop and Wynyard would not result in any additional tree impacts compared to those assessed in the EIS. However, some trees would be required to be trimmed during operation to allow for the required clearances to the overhead wiring.

Additionally, as previously described in the EIS, no trees would be removed from within the proposed construction compound at Circular Quay.

Aboriginal and non-Indigenous heritage impacts

Built heritage/landscape

The reduction of the wire-free zone would result in an increase of new infrastructure, including catenary wires and supporting poles along George Street north of Hunter Street and in along Alfred Street at Circular Quay. This new infrastructure is likely to result in an additional minor adverse visual impact on the linear streetscape of George Street and the various State and locally significant heritage items that define the George Street corridor. These potential impacts would result from the cumulative impact of additional infrastructure in the public domain, increasing visual clutter within the streetscape and reducing views of important heritage buildings.

Historical archaeology

The increase in the required number of catenary support poles and associated infrastructure would require increased ground disturbance within the George Street North Heritage Archaeological Management Unit (HAMU), Alfred Street/Herald Square HAMU and the Tank Stream HAMU. These HAMUs have been defined as Zone1 (State significant archaeological resource). Installation of catenary support poles within the three metre buffer around the Tank Stream would be avoided. The proposed new infrastructure would increase the likelihood of moderate to major adverse impacts on the historical archaeological resource in these HAMUs.

Aboriginal archaeology

The increase in the required number of catenary support poles would lead to increased ground disturbance between the Wynyard and Circular Quay stops. This area was defined in the EIS as Zone 3, as follows:

- Aboriginal archaeological evidence may be present; however, due to the nature and extent of modern land use, it is likely to be disturbed. It may be present in isolated pockets, truncated soil profiles or in historical/modern layers of activity.
- The location and depth of such deposits is not able to be accurately predicted.

The increased infrastructure, such as catenary support poles, related to the reduction in the wire-free zone may impact on Aboriginal archaeological evidence where excavation is proposed. These impacts represent a slight increase in potential impact to that which was described in the EIS.

6.3.4 Additional or changed management and mitigation measures

An additional management and mitigation measure is proposed as a result of the proposed changes to the extent of overhead wiring within the City Centre Precinct relating to the management of visual and landscape character impacts. With respect to this design change, services, poles and wires would be grouped and rationalised, where practicable, to minimise visual clutter to items of built heritage within the impacted part of the City Centre Precinct.

With respect to the other environment issues discussed above, the existing management and mitigation measures detailed in Chapter 8 of this Submissions Report are considered to be sufficient to manage the potential impacts of the proposed design change.

6.4 Chinatown stop arrangement

6.4.1 Description of the EIS design

The proposed Chinatown stop, as described in section 5.2.3 of the EIS (Volume 1A), identified a side platform arrangement located to the north of the George Street/Campbell Street intersection.

6.4.2 Description of the proposed design change

Additional pedestrian modelling undertaken after the exhibition of the EIS has identified that a side platform arrangement (in particular the northbound platform), would become overcrowded for a short period of time during the morning peak period.

Changing the stop configuration to an island platform would increase passenger capacity in this location. The platform would also be moved approximately 15 metres to the north of the previous stop location. The movement of the stop is required to accommodate the increased distance between the CSELR tracks and the required curves and transition curves between the amended platform configuration and the junction of the CSELR and Inner West Light Rail tracks at the intersection of Hay Street and George Street.

The existing signalised pedestrian crossing to the south of the stop would remain, with an additional crossing provided to the north of the relocated platform. As with the design described in the exhibited EIS, a single northbound and southbound traffic lane configuration would be provided along George Street as part of the proposal.

The EIS design for the stop was shown in Figure 5.18 of the EIS (Volume 1A) and the revised stop location and arrangement is shown in Figure 6.2b of this this Submissions Report.

6.4.3 Change in impact

Potential traffic and land use impacts associated with the change of platform arrangement for the Chinatown stop were considered as part of the overall assessment of the proposed design change and it was concluded that there would not be a change to the proposed traffic operation along George Street or the land required in comparison to that identified in the EIS.

An assessment of the potential noise impacts of the revised Chinatown stop has identified that there would be minor changes to the operational noise and vibration predictions, as a result of the movement of the stop location and the increased separation of the tracks (i.e. the tracks would be slightly closer to the sensitive receiver locations) to fit the central island platform between them. However, since LRV speeds at the stop location are low, the impacts of this change would be minimal. Technical Paper 11 (*Noise and Vibration Impact Assessment*) in Volume 6 of the EIS predicted compliance with the operational noise and vibration levels at this location. It is not expected that this change would affect the ability to meet the operational noise and vibration levels.

The proposed design change would therefore not result in any significant adverse impacts, relative to those previously described in the EIS. The existing management and mitigation measures identified in Chapter 8 of this Submissions Report are considered to be sufficient to manage the potential impacts of the revised design change.

6.5 Central Station stop and surrounds

6.5.1 Description of the EIS design

The proposed platform configuration of the Central Station stop, as described in the section 5.2.3 of the EIS (Volume 1A), identified a single side platform and a central island platform arrangement. The easternmost track and platform was designated for use by LRVs during special events and by buses outside of special event times. The design of the stop also allowed for a single northbound traffic lane along Chalmers Street to the east of the stop between Devonshire Street and Elizabeth Street. The EIS identified that, to compensate for the loss of a northbound traffic lane on Chalmers Street, the traffic direction of Randle Street would be reversed from one-way southbound to one-way northbound together with an additional northbound lane in Elizabeth Street.

6.5.2 Description of design change

As part of ongoing design development in this sub-precinct, as well as the outcomes of additional consultation with relevant stakeholders (including the City of Sydney and Roads and Maritime Services), further consideration of the stop requirements and overall functionality of the Central Station stop and surrounding area (the Chalmers Street sub-precinct) has been undertaken. This included the consideration of the competing transport demands within Chalmers Street including the use of this area for LRVs, public transport, private vehicles, cyclists and pedestrians.

The refinement of the Chalmers Street sub-precinct was developed based on a series of design principles including:

- *Safety* — including the provision of a safe and secure environment for all users and which provides appropriate access for emergency vehicles.
- *Efficiency and priority* — including the creation of legible, fast and efficient transfer for all customers of the transport system that is simple for customers to navigate.
- *Property access and special events* — including provision to maintain property access and adequate contingency and flexibility to accommodate major incidents and special events.
- *Managing Competing Demands* — including where practicable, segregating conflicting or incompatible transport modes, or their interaction prioritised and managed.

Further analysis and review of the operational requirements of the Central Station stop has also concluded that the special event track and platform identified in the EIS would no longer be required. The proposed turnback siding in Eddy Avenue (as identified on Figure 5.1b of the EIS) would provide sufficient capacity for special event operations without the need to provide a third track and stop platform within Chalmers Street.

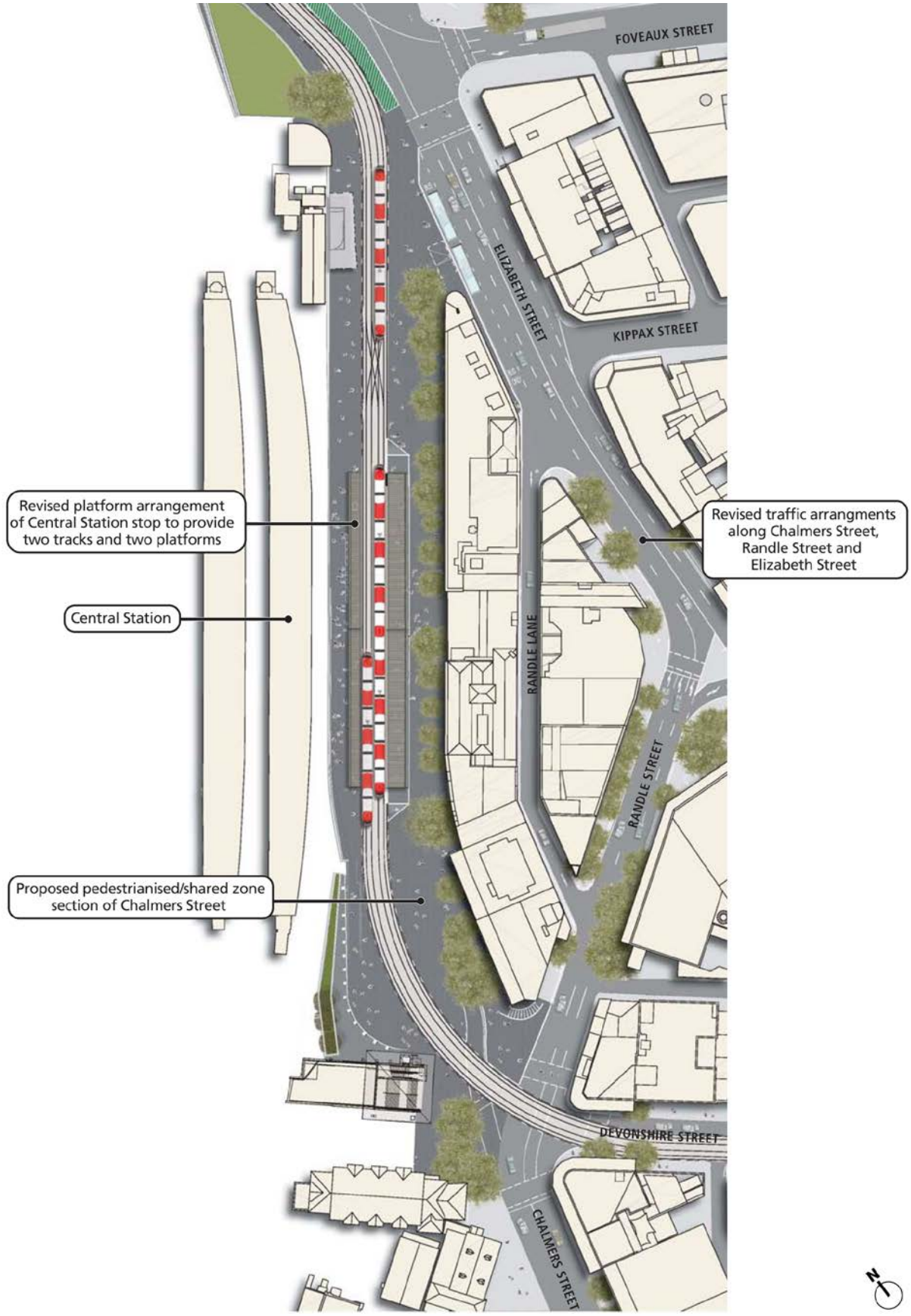
The revised design for the Central Station stop would remove the previously identified special event track and platform resulting in only two tracks and two platforms. In addition, the existing traffic lanes along Chalmers Street between Randle Street and Elizabeth Street would be removed and converted into a shared zone, allowing pedestrians, cyclists and vehicles access to properties in Chalmers Street in a low speed environment, resulting in no general traffic along this section of Chalmers Street, other than minimal access for local vehicles to existing accesses such as the Dental Hospital and residential properties.

The revised design for the surrounding street network would maintain Randle Street as northbound-only providing three lanes of traffic, including a single bus-only lane. Buses would not use the shared pedestrian and cycle zone along Chalmers Street. The revised design recognises the significant role of incoming buses delivering passengers to rail services at Central Station, and would maintain a northbound bus stop on Chalmers Street just south of Devonshire Street. The revised design would also provide a northbound bus stop on Elizabeth Street (south of Foveaux Street), adjacent to the existing southbound bus stop, providing easy access to Central Station via an existing lift on Chalmers Street.

The use of Elizabeth Street as a traffic bypass route is consistent with the approach to the broader road network within the city centre (as outlined in the *Sydney City Centre Access Strategy* (NSW Government 2013a)).

Overall, the revised design would provide a safe environment for all users, accommodate emergency vehicles and provide a low speed limit (approximately 10 kilometres per hour) in the shared zone to provide access to existing private properties. It also allows for legible, fast and efficient interchange for all modes and prioritises the highest pedestrian flows and the modes carrying the most people.

A plan of the revised stop layout plan of the functional use of the surrounding area is provided in Figure 6.3.



Note: Indicative only. Subject to detailed design

Figure 6.3 Revised Central Station stop arrangement and revised functional use of the Chalmers Street sub-precinct

6.5.3 Change in impact

Traffic and transport impacts

The primary impact of the proposed design change would be the relocation of northbound general traffic and bus movements on Chalmers Street to Elizabeth Street via Randle Street as a result of the removal of all general traffic lanes from Chalmers Street. Only minimal access for local vehicles would be permitted within the shared pedestrian and cycle zone. Other key impacts associated with the proposed design changes within the Chalmers Street sub-precinct would include:

- the partial removal of general parking and special kerbside uses within Randle Street
- the dual left turn movement from Elizabeth Street into Eddy Avenue would be reduced to a single lane to accommodate the two-way cycleway through the second arch of the Eddy Avenue rail bridge
- the traffic movements from Elizabeth Street and Foveaux Street into Eddy Avenue would be reduced to a single lane
- the traffic signal phasing of the Elizabeth Street/Foveaux Street intersection would be simplified to four traffic phases.

Under the proposed design changes, the following intersection performances are predicted:

- a level of service D intersection performance at the Elizabeth Street/Foveaux Street intersection during the morning peak period under the forecast demand in 2021
- a level of service C intersection performance at the Elizabeth Street/Foveaux Street intersection during the afternoon peak period under the forecast demand in 2021.

This represents comparable performance to the EIS design as assessed in Technical Paper 1 (*Transport Operations Report*) in Volume 2 of the EIS which identified Level of Service (LoS) D (somewhat below acceptable intersection performance) and LoS B (reasonable intersection performance) during the morning and afternoon peaks respectively. The slight reduction in traffic performance in the afternoon peak is as a result of the reduction in the number of traffic lanes on approach to the intersection required to accommodate the segregated cycleway, although this configuration would provide some benefit to pedestrians and cyclists.

It is anticipated that the increased traffic demand that would be generated along Randle Street (due to the conversion of the proposed northbound general traffic lane and bus lane in Chalmers Street as proposed in the EIS to a pedestrianised zone as part of the design changes) would be able to be accommodated through the proposed additional lane along Randle Street (as part of the design change). Additionally, the ability to simplify the Chalmers Street/Elizabeth Street/Foveaux Street intersection as a result of the proposed design changes would also assist in managing traffic flows within this area during operation.

Visual and landscape character

One viewpoint assessed in the EIS would be potentially impacted by the proposed design changes within the vicinity of Central Station. This viewpoint would be the Central Station view along Chalmers Street (View 1-10). The assessment of the potential impacts to this design change during construction and operation are described below.

Construction assessment

With this design change, the impacts during construction within this view would remain largely the same, as traffic is removed from Chalmers Street, pedestrian access is diverted, the Central Station entry (at the intersection with Elizabeth Street) is closed, and the construction work site is established. Several existing mature trees (mostly Plane Trees) would be removed due to utility relocations, civil works and the stop and track construction. The design change may enable the retention of a number of mature trees on the eastern side of Chalmers Street due to the reduction in the number of tracks, and traffic lanes.

Overall, the design change would result in a similar (high adverse) visual impact during early works and civil construction, as assessed in the EIS.

Operational assessment

During operations, two light rail tracks would be located parallel with the street; with one side platform adjacent to the Central Station boundary wall, and another side platform on the eastern side of the tracks. Traffic lanes would be removed from Chalmers Street completely; creating a wide pedestrianised area that would include a shared path for cyclists, as well as a service vehicle lane for access the Dental Hospital and adjacent buildings. New street tree planting is proposed for the corner of Randle and Chalmers streets as appropriate. These changes would result in a substantial improvement in the visual amenity of Chalmers Street at street level.

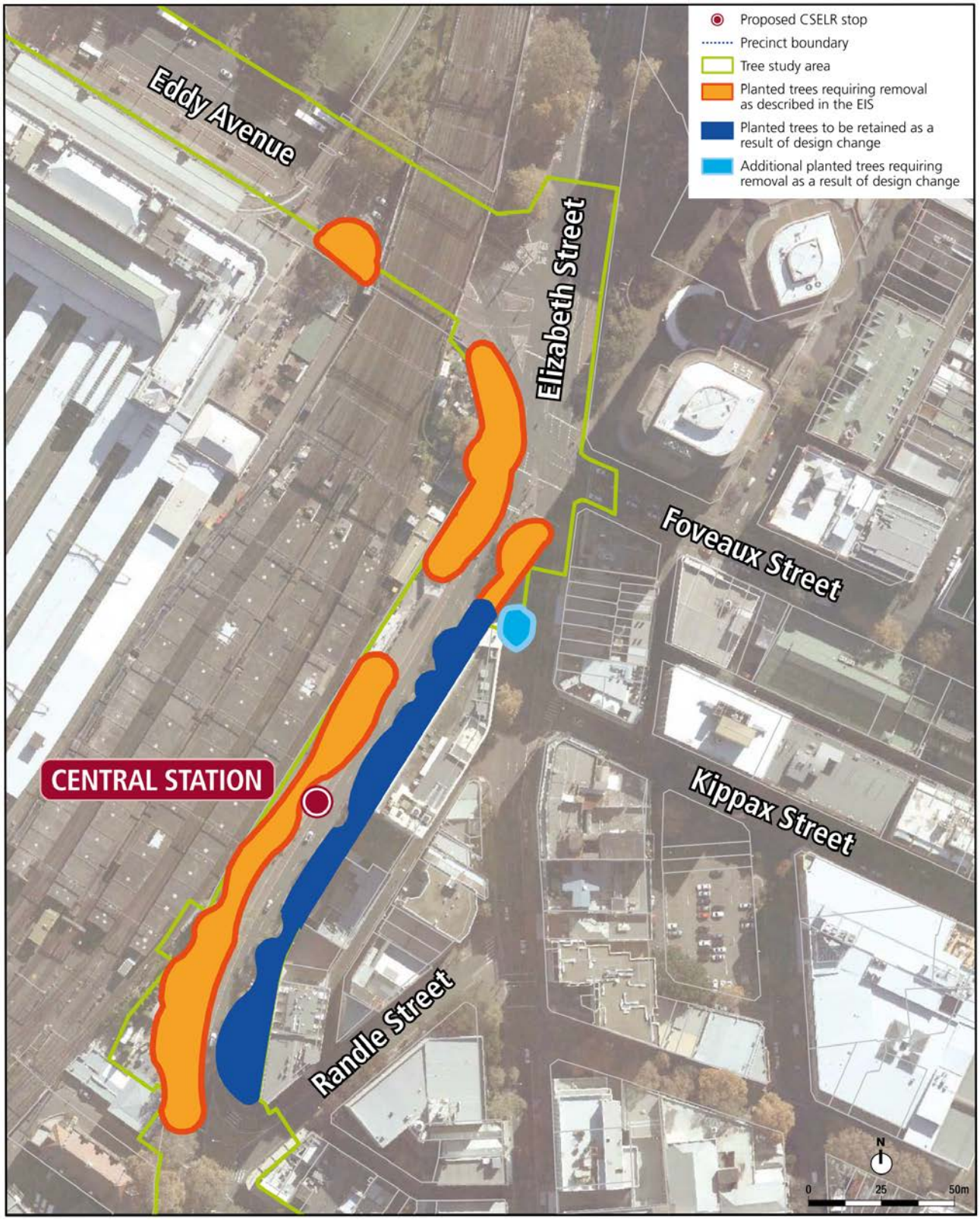
It is considered that there would be an overall improvement to the amenity of views within Chalmers Street as a result of the proposed design changes. Therefore it is expected that there would be a moderate beneficial visual impact overall during operation. This represents an overall positive change from the negligible visual impact assessed in the EIS.

Planted tree impacts

The alignment and design for the CSELR proposal as described in the EIS (Volume 1A and 1B) was identified as potentially requiring the removal of up to approximately 110 planted trees within the whole of the City Centre Precinct. The majority of impacted trees would be located along the length of George Street and at Chalmers Street. Planted trees impacted along Chalmers Street would generally comprise deciduous Plane Trees of varying health and condition.

The proposed design changes along Chalmers Street are anticipated to provide an overall reduction in the number of impacted trees within this section of the City Centre Precinct. The proposed design change to the Chalmers Street sub-precinct would allow for the retention of approximately 17 trees along Chalmers Street within the new pedestrian and cycle zone in comparison to the design presented in the EIS. However, due to the relocation of the existing northbound bus stop within Chalmers Street onto Elizabeth Street, two additional trees along Elizabeth Street (near the intersection with Chalmers Street) would be required to be removed.

The change in impact to planted trees resulting from the currently proposed design changes within the City Centre Precinct at Chalmers Street are shown in Figure 6.4.



Note: Indicative only. Subject to detailed design

Figure 6.4 Potential change in impact to planted trees resulting from the changes within the Chalmers Street sub-precinct

Property and land use impacts

The proposed design changes to the Central Station stop and surrounding area would occur within the same design footprint assessed in the EIS. There would therefore not be any additional land use and property impacts to adjoining properties as a result of the proposed design changes on existing land uses.

The proposed closure of Chalmers Street between Devonshire Street and Elizabeth Street and conversion to a shared pedestrian and cycling zone would, however, result in a minor change to the existing land use, albeit from a main transport corridor (used by both general vehicle traffic and buses) to a light traffic zone only for pedestrians and cyclists. The proposed design change would not impact on access to the stop for light rail customers or limit access to existing properties within this area.

The proposed design change to the Central Station stop and surrounding area would not result in any changes to impacts on future land use beyond those identified in the EIS.

Noise and vibration impacts

At Central Station, the proposed changes to the stop platform arrangement from three platforms (as presented in the EIS) to two platforms would not affect the construction noise or vibration impacts as identified in the EIS. Additionally, the offset distance between the sensitive receivers on Chalmers Street and the nearest track would increase slightly resulting in a minor decrease in operational noise and vibration impacts on these receivers from that identified in the EIS.

The closure of Chalmers Street to traffic between Randle Street and Elizabeth Street to create a shared pedestrian/cyclist and light rail zone has the potential for changes in road traffic noise impacts due to the diversion of road traffic up Randle Street to Elizabeth Street. There would likely be increased road traffic noise impacts on receivers in Randle Street.

Peak hourly traffic numbers on the affected streets for the existing and future (modelled for 2021) scenarios are shown in Table 6.2, along with estimates of the overall traffic numbers. These estimated overall numbers have been derived from the weekday peak overall flows by scaling with reference to hourly traffic volumes through the Elizabeth Street/Chalmers Street/Foveaux Street intersection.

Table 6.2 Road traffic flows – Chalmers Street, Elizabeth Street and Randle Street

Scenario	Location	Weekday Peak Hourly Flows[1]		Estimated Overall Traffic Flows[2]		
		Morning	Afternoon	Daytime 7 am to 10 pm	Night-time 10 pm to 7 am	Total
Existing 2013	Randle Street	N/A	N/A	N/A	N/A	N/A
	Chalmers Street	1,153	1,082	14,097	2,426	16,524
	Elizabeth Street (Northbound)	N/A	N/A	N/A	N/A	N/A
	Elizabeth Street (Southbound)	1,044	1,418	17,338	2,984	20,321

Scenario	Location	Weekday Peak Hourly Flows[1]		Estimated Overall Traffic Flows[2]		
		Morning	Afternoon	Daytime 7 am to 10 pm	Night-time 10 pm to 7 am	Total
Future 2021	Randle Street	1,552	1,204	18,976	3,266	22,242
	Chalmers Street	2,069	1,303	25,297	4,354	29,651
	Elizabeth Street (Northbound)	1,461	1,174	17,863	3,074	20,938
	Elizabeth Street (Southbound)	877	1,254	15,332	2,639	17,971

Note 1: Peak hourly flows from traffic modelling for the existing and future scenarios, provided by AECOM.

Note 2: Estimated by scaling peak hourly flows by factors derived from data from the Elizabeth Street/Chalmers Street/Foveaux Street intersection.

Preliminary calculations of road traffic noise impacts on receivers on Randle Street and Elizabeth Street have been used to estimate the potential impacts. The following key impacts have been identified:

- Randle Street is classified as an existing local road. The number of vehicles proposed to use Randle Street in future, and the close proximity of residential façades to the street, mean that it is likely that the average (L_{Aeq}) external noise assessment criteria identified in the NSW *Road Noise Policy* (RNP) would be exceeded at existing residential properties.
- There is potential for increased sleep disturbance impacts at residential land uses on Randle Street, arising from the increased number of heavy vehicles on Randle Street.
- Elizabeth Street is classified as an existing arterial road. The estimated traffic volumes indicate an approximate doubling of traffic numbers on Elizabeth Street between Randle Street and Foveaux Street (due to the addition of northbound traffic to the southbound traffic). This change would result in an increase in road traffic L_{Aeq} noise levels of around 3 dB. It is likely that the L_{Aeq} external noise assessment criteria identified in the NSW *Road Noise Policy* (RNP) would be exceeded at existing residential properties. Maximum road traffic noise levels would not change.

The majority of the adversely affected premises on Randle Street are commercial buildings. Some residential land uses have been identified as follows:

- the south and east façade of the hotel at 17 Randle Street, at the Chalmers Street end
- residential apartments at 1–5 Randle Street
- the east façade of residential apartments at 38 Chalmers Street (backing on to Randle Lane, near the intersection with Randle Street)
- the hotel at 362 Elizabeth Street
- the hotel at 356–358 Elizabeth Street.

The change would result in an operational noise benefit to premises on Chalmers Street, including commercial receivers and the following other sensitive receivers:

- the west façade of the hotel at 17 Randle Street, at the Chalmers Street end
- the west façade of residential apartments at 38 Chalmers Street
- the hotel at 20–28 Chalmers Street
- the Sydney Dental Hospital at 2–18 Chalmers Street.

The impacts of this change would need to be assessed in accordance with the RNP in the detailed design stage to determine the extent of impacts and reasonable and feasible mitigation measures if required. The RNP states that 'for isolated residences in industrial or commercial zones, the external ambient noise levels can be higher than those is residential areas. Internal noise levels in such residences are likely to be more appropriate in assessing any road traffic noise impacts,' and that suitable internal noise level targets should be determined by taking guidance from Australian Standard 2107:2000 *Acoustics – Recommended design sound levels and reverberation times for building interiors*.

To take account of the existing noise environment in this largely commercial and heavily trafficked area, it is recommended that the determination of appropriate internal noise levels and detailed design of mitigation measures (if required) for affected residences considers the existing noise environment and also internal noise levels, with reference to Australian Standard 2107:2000. The RNP recognises that mitigation options are generally limited for noise control on existing roads, and that strategies need to take into account what is feasible and reasonable. Property treatments, such as upgraded glazing, would be likely to be the only feasible mitigation measure available on Randle Street, in the event that noise mitigation is required.

Aboriginal and non-Indigenous heritage impacts

The proposed design changes to the Central Station stop and surrounding Chalmers sub-precinct would generally occur within the same footprint as assessed for the previous design. There would therefore not be any additional heritage impacts as a result of the proposed design change on existing heritage, including Central Station and other heritage buildings within the local vicinity to those previously assessed in the EIS.

6.5.4 Additional or changed management and mitigation measures

One additional management and mitigation measure is proposed as a result of the proposed design change for the Central Station stop platform arrangement. The mitigation measure relates to potential noise and vibration impacts. During the detailed design of the CSELR proposal, further assessment of the impacts on sensitive receivers along Randle Street would be undertaken. This would include determination of the existing components and condition of the façade and the noise attenuation provided by the building. If required, additional noise modelling and monitoring would be undertaken to determine whether additional building façade treatments would be required at sensitive receivers.

The existing management and mitigation measures relating to the environment issues identified above as detailed in Chapter 8 of this Submissions Report are considered to be sufficient to manage the other potential impacts of the revised design change.

6.6 Surry Hills stop arrangement

6.6.1 Description of the EIS design

The proposed platform configuration of the Surry Hills stop, as described in the section 5.2.3 of the EIS (Volume 1A), identified an island platform arrangement opposite the Devonshire Street/ Riley Street intersection.

6.6.2 Description of the proposed design change

The revised platform configuration would provide two, approximately 2.8 metre wide, 45 metre long side platforms. Similar to the design described in the EIS, the revised platform configuration would provide a pedestrian crossing at each end of the stop and would be compliant with the *Disability Discrimination Act 1992* (DDA). A single eastbound traffic lane in Devonshire Street to the north of the proposed stop would also be maintained as previously described in the EIS. The proposed change to a side platform configuration would require the reduction in the width of the proposed pedestrian footpath along the southern side of the stop from approximately 4.5 metres to 3.5 metres for the length of the proposed stop.

The proposed design change was developed to provide an improved overall outcome for residents within the Surry Hills Precinct in addition to reducing some of the previously identified impacts assessed in the EIS. The proposed design change from an island to a side platform configuration would result in the following benefits:

- the side platform arrangement would provide improved access to Ward Park without the need to cross the light rail track from the central island platform arrangement
- the side platform arrangement would result in a slightly reduced overall proposal footprint at the eastern and western ends of the stop due to the straightened track alignment
- the straightened track alignment would provide improved operation for the light rail along this section of the track.

6.6.3 Change in impact

Traffic and transport impacts

The proposed design change would not alter the construction traffic impacts identified in the EIS, as the overall construction footprint previously assessed would not change. Likewise, the operational traffic and transport impacts would not be altered given the retention of one lane of traffic eastbound along Devonshire Street as previously described in the EIS.

Property and land use impacts

The proposed design change of the Surry Hills stop from an island platform to a side platform would occur within the same footprint as the previous design. There would therefore not be any additional land use and property impacts as a result of the proposed design change on existing land uses (including Ward Park) to those previously assessed in the EIS. The proposed footpath width to the south of the stop would be reduced by approximately one metre (for the length of the proposed stop), to accommodate the design change within the same proposal footprint. This change is not anticipated to impact on access to the stop for light rail customers, or limit the capacity of the existing footpath for general pedestrian movements within the local area.

The proposed design change to the Surry Hills stop would not result in any changes to impacts on future land use beyond those identified in the EIS.

Noise and vibration impacts

The proposed design change would not alter the construction noise and vibration impacts identified in the EIS, as the overall construction footprint assessed would not change. Likewise, the operational impacts would not be noticeably altered. The light rail tracks would be moved slightly closer together as a result of the removal of the island platform, and hence would be slightly further from the adjacent receivers; however, this would result in a negligible decrease in operational noise impacts since the speeds at the stop are low. The EIS predicted compliance with the operational noise and vibration goals at this location. The design change to the Surry Hills stop platform arrangement would not affect the ability to meet the operational noise and vibration goals previously identified.

6.6.4 Additional or changed management and mitigation measures

No additional management and mitigation measures are proposed as a result of the proposed design changes to the Surry Hills stop. The existing management and mitigation measures relating to the environment issues identified above as detailed in Chapter 8 of this Submissions Report are considered to be sufficient to manage the potential impacts of the design change.

6.7 Replacement parking for the Langton Centre

6.7.1 Description of the EIS design

The alignment of the CSELR proposal through the Surry Hills Precinct, as described in section 5.2.1 of the EIS (Volume 1A), would pass through the current Langton Centre car park, resulting in the loss of the existing parking spaces associated with this facility. Section 13.3.2 of the EIS (Volume 1B) also noted that the affected Langton Centre car parking would be relocated within the general vicinity of the Langton Centre as part of the CSELR proposal. The existing car parking area provides for approximately 20 car parking spaces between South Dowling Street and Parkham Place. This parking is currently restricted to employees and visitors associated with the Langton Centre.

6.7.2 Description of design change

Following exhibition of the EIS and discussion with the Langton Centre regarding the loss of parking, further design refinement for the replacement of this parking has been undertaken to mitigate the loss of the existing Langton Centre car parking spaces between Parkham Place and South Dowling Street. The refined design would provide for replacement parking with an opportunity to potentially provide up to approximately 30 spaces on the northern side of the alignment of the proposal (accessed via Nobbs Lane). Additionally, up to approximately 10 spaces could be provided to the south of the alignment (accessed via Parkham Lane) adjacent to the new Wimbo Park. The indicative location of the proposed car parking is shown in Figure 6.5.

The alignment of the light rail through this area would be the same as described in the EIS and would retain the proposed shared use path to the north of the alignment, allowing pedestrian and cycle movement to connect from Bourke Street to South Dowling Street without crossing the light rail. An area of green open space would also be retained to the south of the alignment.

Note: Indicative only. Subject to detailed design

Figure 6.5 Indicative car parking arrangement to replace the existing car parking for the Langton Centre

6.7.3 Change in impact

Traffic and transport impacts

The additional parking proposed to be provided on Nobbs Lane is intended to replace the existing off-street parking for the Langton Centre which is impacted by the light rail alignment and would provide an improved parking outcome to that which was identified in the EIS. A number of the spaces allocated along Nobbs Lane would be restricted (through sign-posting or similar methods) for employees and visitors associated with the Langton Centre to replace the existing parking that is proposed to be removed by the CSELR proposal. The number of replacement parking spaces that would have restricted uses would be the same as is currently available.

Property and land use impacts

The refined design is not anticipated to have any additional land use or property impacts than those previously assessed in the EIS for the proposal.

Socio-economic impacts

The refined design would provide an increased benefit for the community over the design presented in the EIS. The replacement car parking would provide an overall increased number of available spaces to clients of the Langton Centre and surrounding residential areas.

6.7.4 Additional or changed management and mitigation measures

No additional management and mitigation measures are proposed as a result of the design change for the replacement car parking along Nobbs Lane and Parkham Place. The existing management and mitigation measures as detailed in Chapter 8 of this Submissions Report are considered to be sufficient to manage the potential impacts of the revised design change.

6.8 CSELR alignment and stop within the Moore Park Precinct

6.8.1 Description of the EIS design

The alignment of the CSELR proposal through the Moore Park Precinct, as described in section 5.2.1 of the EIS (Volume 1A) and shown on Figure 5.1d of the EIS (Volume 1A), identified that the proposal would cross the existing Moore Park playing fields in a tunnel continuing under Anzac Parade before turning south, and surfacing to the east of the existing busway. The EIS identified that the stop at Moore Park would be located adjacent to the existing AFL training oval to the east of the Sydney Cricket Ground.

The location of the Moore Park stop as identified in the EIS would require that the existing AFL training oval be relocated to the east of its current location and would require additional works within the Moore Park Precinct to elements such as the existing bus loop and pedestrian pathways adjacent to the Sydney Cricket Ground. Additional impacts to the training oval would also occur during construction under the design presented in the EIS.

6.8.2 Description of design change

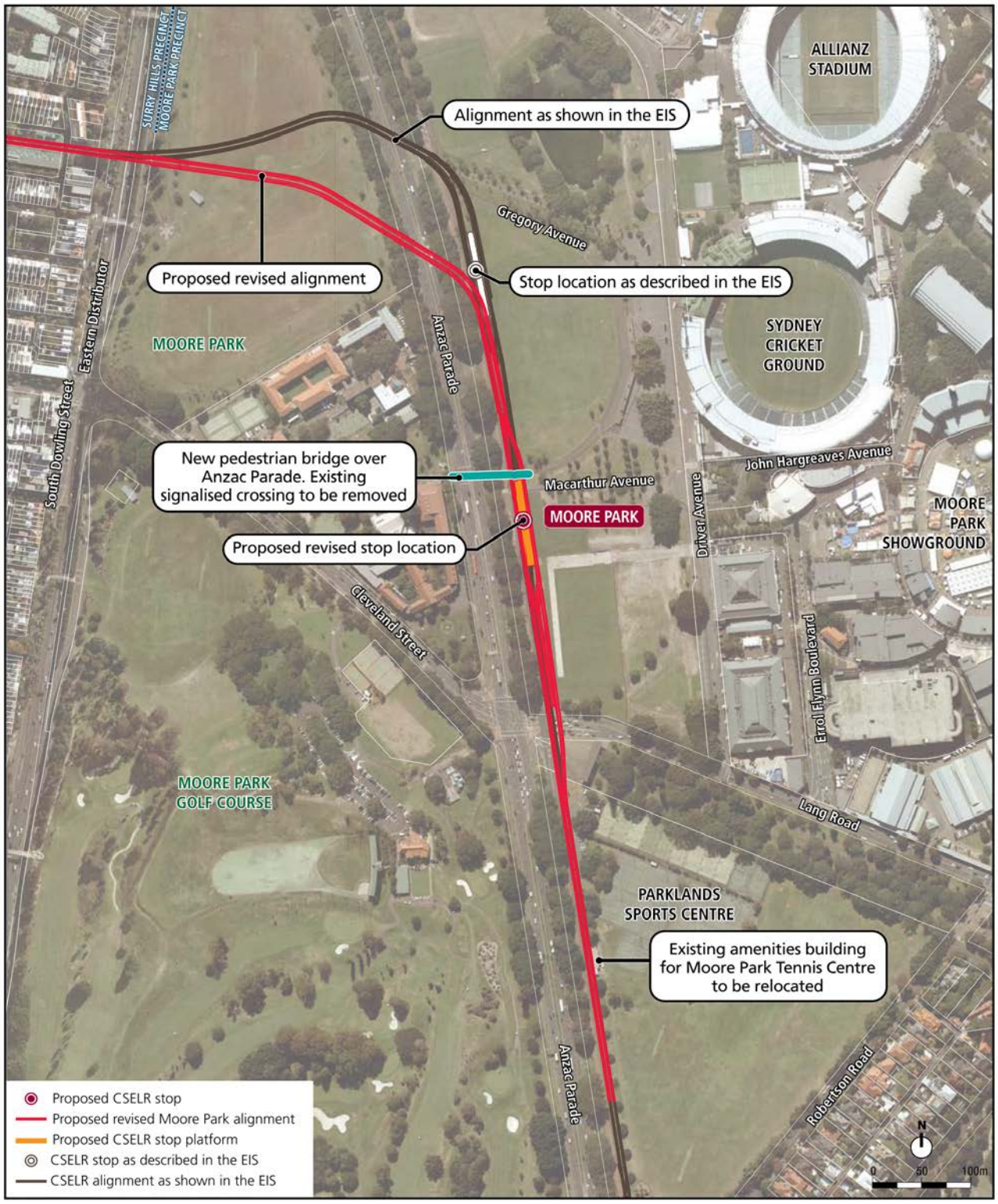
Following discussions with the Centennial Park and Moore Park Trust and ongoing design refinement, a revised location for Moore Park stop was identified to reduce the impacts on the existing AFL training oval during construction and operation of the CSELR. As a result of the relocation of the Moore Park stop, the alignment of the Moore Park tunnel has also been optimised.

The revised Moore Park stop would be located approximately 250 metres south of the previously identified stop location, to the south of the existing AFL training oval. The revised Moore Park stop would have a similar design to that described in the EIS and would continue to be configured to accommodate a 90-metre long island platform with a number of vertical access points to an above-ground mezzanine level for use during major events as a central marshalling area. A plan of the revised stop location is provided in Figure 6.6 and a plan of the proposed Moore Park stop layout is provided in Figure 6.7. The revised stop location would have a substantially reduced impact on the existing AFL training oval (which would be widened to the east by approximately five metres to allow for an increased player run-off area on the western side of the field) and would continue to provide access to the Sydney Cricket Ground and Sydney Football Stadium, whilst also providing improved access to other attractors in the local area including the Entertainment Quarter.

A centre turnback siding would also be provided to the south of the revised Moore Park stop for LRVs, during special event operations. The revised stop location would continue to serve as a key stop for the surrounding land uses including the Sydney Cricket Ground, the Sydney Football Stadium, the Entertainment Quarter (which includes various entertainment venues such as the Hordern Pavilion) and the Sydney Boys and Sydney Girls High Schools.

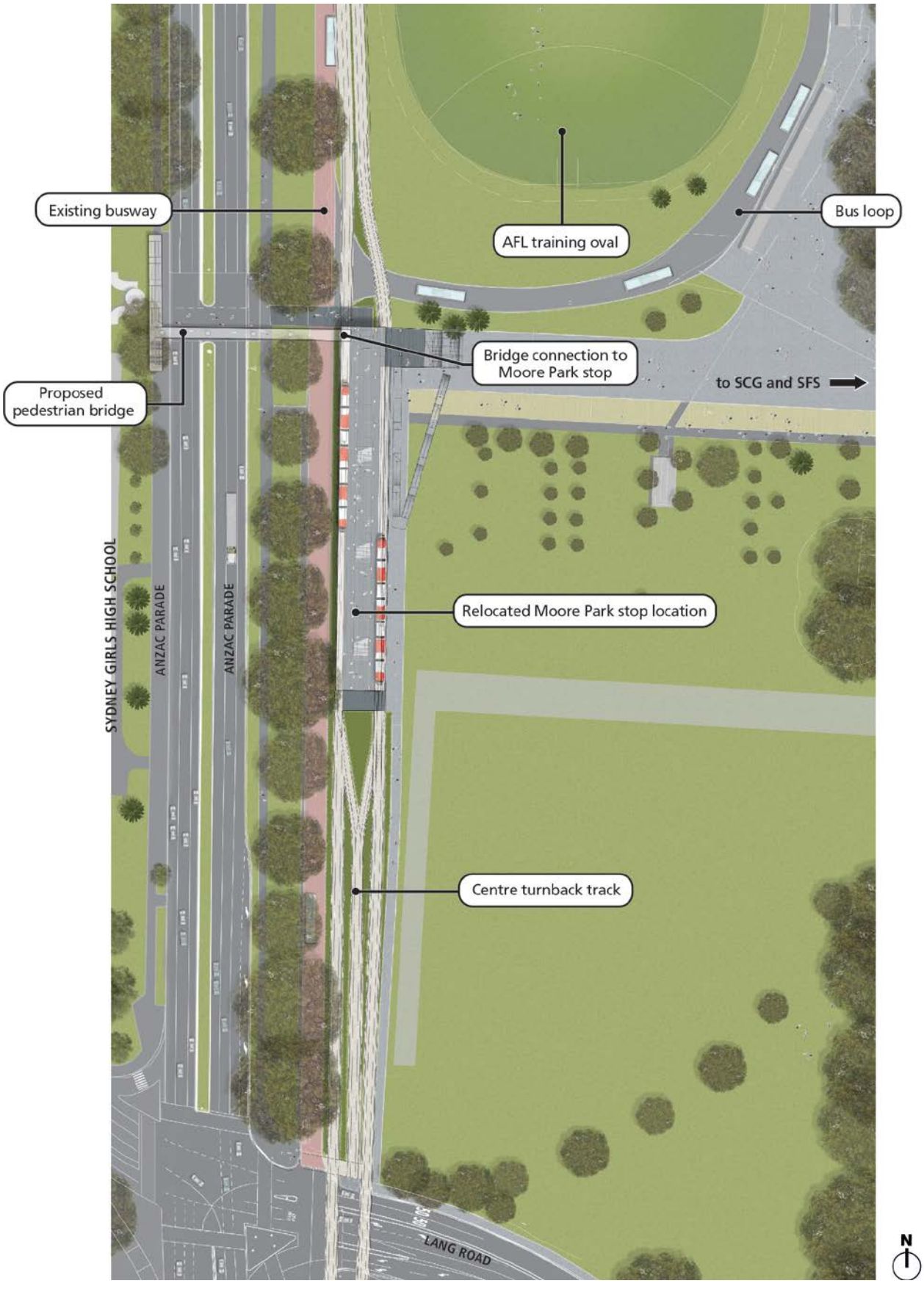
Additionally, as a result of the changed location of the Moore Park stop, the tunnel alignment under Moore Park and Anzac Parade has also been refined to optimise the track design and minimise the overall distance between stops in this location. The alignment would be straightened to provide a more direct route to the relocated Moore Park stop. Overall, the tunnel alignment would be shifted approximately 90 metres to the south of the previous alignment, crossing South Dowling Street in the same location as previously proposed and turning south towards Anzac Parade before rising to the surface through a relocated eastern tunnel portal to the east of Sydney Boys High School. The revised alignment through Moore Park, including the revised Moore Park stop location is shown in Figure 6.6.

As a result of the proposed design changes to the tunnel alignment and Moore Park stop location, some additional minor works would be required to the existing bus loop around the existing AFL training oval. Construction of the tunnel, portal and dive structure between the busway and the Swans' training oval would require the section of the main busway to be closed between Macarthur and Gregory avenues. Buses would be diverted on a temporary basis via the events bus loop which would be temporarily made two way. The southern end of the bus loop (near Macarthur Avenue) would be modified to provide a turning circle to allow for buses to continue to utilise the events bus stops during construction and allow buses to return to the city via the event loop. Following construction, the two way main busway would reopen and, the turning circle would be removed and access from the bus loop to the Moore Park busway would return to one way, clockwise operation for events only (refer to Figure 6.7).



Note: Indicative only. Subject to detailed design

Figure 6.6 Revised alignment and stop location within the Moore Park Precinct



Note: Indicative only. Subject to detailed design

Figure 6.7 Revised Moore Park stop arrangement

Whilst not noted in the EIS, as part of the overall works within this precinct, the amenities building associated with the Parklands Sports Centre would be rebuilt (refer to Figure 6.6). The revised alignment and stop location would also result in a need to modify the location of some of the construction compounds within the Moore Park Precinct. These changes are described in further detail in section 6.15 of this Submissions Report. In addition to the proposed design changes for the location of the Moore Park stop, a new pedestrian bridge is proposed to connect the revised Moore Park stop and the Sydney Boys and Sydney Girls High Schools on the western side of Anzac Parade. Further details regarding this design change are provided in section 6.9 of this Submissions Report.

6.8.3 Change in impact

Visual and landscape character impacts

Three areas of landscape character and one viewpoint assessed in the EIS would be potentially impacted by the proposed design changes within the Moore Park Precinct. These are:

- Fig trees on Anzac Parade
- Moore Park West
- Moore Park East and Centennial Parklands
- View from the SCG Entry Forecourt at Driver Avenue, Moore Park (View 3-1).

The assessment of the potential impacts to these areas of landscape character and viewpoints as a result of the proposed design change during construction and operation are described below.

Construction assessment

Fig trees on Anzac Parade

As part of the proposed design change, the direct impacts to the Fig trees in the location of the tunnel alignment would be greater than the design presented in the EIS, as the revised tunnel alignment would affect more large and mature Fig Trees than the previous design. Overall, during construction it is expected that there would be a reduction in landscape quality of this landscape feature resulting from the loss of these trees, and therefore there is still expected to be a high adverse landscape impact during construction as previously assessed in the EIS.

Moore Park West

The design change would include the relocation of the main construction compound to the south of the alignment, which would directly impact upon the playing fields in that location, causing significant impact and disruption during construction (refer to section 6.15 of this Submissions Report for details). There would be minimal impact to the playing fields to the north of the light rail alignment and these fields would remain operational during construction (due to the changes to the construction compounds associated with the realigned tunnel). These impacts are generally consistent with the impacts previously assessed. During construction it is expected that there would be a considerable reduction in the landscape quality of this landscape feature. This results in a high adverse landscape impact during construction as previously assessed in the EIS.

Moore Park East and Centennial Parklands

The design change would require the clearing of land in the proposed stop location adjacent to the Showground Field to provide areas for the tracks and platform to be constructed. This would require the removal of a number of mature trees in this location (approximately 17 trees, refer below). A construction compound would be located on the eastern side of the proposed stop location. During construction it is expected there would be a noticeable reduction in the quality of the landscape in this location. This results in a high adverse impact during construction. This represents an increase in impact from the moderate adverse visual impact assessed in the EIS.

View from the SCG Entry Forecourt at Driver Avenue, Moore Park

During construction this view would change as several existing trees in the rear of the view are removed. This would include the row of semi-mature Fig trees on the eastern side of the existing busway, and a considerable number of trees on the eastern side of the stop within Moore Park between the stop and Driver Avenue to accommodate the associated pedestrian pathway and plaza area around the light rail stop (refer to section 6.9 of this Submissions Report).

There would also be a number of mature trees, including Figs (approximately 17 trees) removed on Anzac Parade (refer below for details) where the revised tunnel alignment crosses Anzac Parade at the eastern portal location. Beyond this, construction sites for the alignment and stop would be located in the background of the view. These changes to the view are not visually consistent with the character of the surrounding landscape of Moore Park. It is considered that these elements would be visually prominent as they contrast with the surrounding landscape. It is expected that there would be a considerable reduction in the visual amenity of this view. This would result in a high adverse visual impact during construction. This is consistent with the impact identified for the previous stop location, as described in the EIS, albeit in a location to the south of the previously assessed northern stop design.

Operational assessment

Fig trees on Anzac Parade

During operation it is expected that there would be a noticeable reduction in landscape quality to this landscape feature from that assessed in the EIS due to the impact to larger and more mature Fig trees. This would result in a high adverse landscape impact. This represents an increase from the moderate adverse visual impact assessed in the EIS.

Moore Park West

Consistent with the EIS, the functionality of the playing fields in Moore Park West is expected to be restored and improved during operation as the park would be reinstated over the cut-and-cover section of the alignment. This would allow for pedestrian permeability through the park and result in minimal intrusion on the amenity and function of this space.

It is expected that there would be no noticeable reduction or improvement in the quality of this landscape. This results in a negligible landscape impact during operation, as was previously identified in the EIS.

Moore Park East and Centennial Parklands

The new stop location would affect the area south of the existing AFL training oval, reducing the size of the open space as well as the functionality of the adjacent playing fields in this location. As with the design assessed in the EIS, the proposed design changes to relocate the Moore Park stop would result in a noticeable reduction to the landscape quality in this part of Moore Park East, particularly around the eastern portal south of Gregory Avenue and the proposed stop location south of the existing AFL training oval. The required removal of several significant mature trees would also continue to impact on the existing landscape.

There would be a noticeable reduction to the landscape quality to the area, which would result in a moderate adverse impact during operation. This represents an increase from the negligible visual impact assessed in the EIS due to the closer proximity of the proposed Moore Park stop to this area.

View from the SCG Entry Forecourt at Driver Avenue, Moore Park

During operation the stop location would be seen in the rear of this view with the platform mezzanine level and high canopy visible in front of the large mature Fig trees. The stop design would provide a similar structure to that assessed in the EIS and would include a wide pedestrian pathway which would be visible in the middle ground of the view, providing the main connection to the relocated light rail stop from Driver Avenue. Adjacent to this pathway, the existing AFL training oval would be maintained during operation.

The trees that were removed as a part of the construction stage would be replaced in accordance with Transport for NSW's *Vegetation Offset Guide* (Transport for NSW 2013a) and in consultation with the relevant stakeholders in the parkland as appropriate. This planting would initially, however, be smaller specimens so that the gaps in these avenues would be seen against the horizon, opening up views to the landscape beyond. Overall, it is considered that there would be a noticeable negative visual impact in views from the SCG forecourt. This results in a moderate adverse visual impact during operation, as was previously identified within the EIS.

Planted tree impacts

The alignment and design for the CSELR proposal as described in the EIS was identified as potentially requiring the removal of up to approximately 70 planted trees within the Moore Park Precinct. This would include some semi-mature Fig trees within Moore Park (to facilitate the construction of the western and eastern portals of the Moore Park tunnel) and the more recent planting of semi-mature Figs located adjacent to the large mature Fig trees on the eastern side of the Anzac Parade busway, within Moore and Centennial Parks. Under the original CSELR proposal, the majority of impacted trees would be located adjacent to the eastern side of Anzac Parade (i.e. the semi-mature Figs). As also noted in the EIS, there would be the potential for additional semi-mature Fig trees to be impacted south of Lang Road as a result of excavation to provide adequate batters for the CSELR tracks (this location currently contains an earth mound that would need to be excavated to accommodate the CSELR proposal).

The revised alignment and stop location would not result in a substantial change in impacts to the number of trees potentially affected by the proposal due to the movement of the proposed stop and the realignment of the tunnel and eastern tunnel portal. The revised proposal would result in the removal of up to approximately 17 planted trees. However, as a result of the shift of the tunnel alignment to the south, approximately 17 to 18 planted trees within the northern part of the Moore Park Precinct would be retained which would have been impacted under the previous tunnel alignment.

Additionally, up to 13 additional planted trees along Anzac Parade within the vicinity of the relocated Moore Park stop have been identified as potentially being able to be translocated from their current position to a new location as part of the proposal, resulting in an overall benefit to the Moore Park Precinct in comparison to the assessment presented in the EIS. The potential for translocating tree plantings would be investigated during detailed design by a suitably qualified arborist. Additional opportunities for translocating other planted trees within the Moore Park Precinct would be investigated during detailed design.

The change in impacts to planted trees resulting from the proposed design changes within the Moore Park Precinct are shown in Figure 6.8. As identified in the EIS, where the loss of trees is unable to be mitigated, Transport for NSW would replace trees removed as a result of the CSELR, in accordance with Transport for NSW's *Vegetation Offset Guide* (Transport for NSW 2013a). Selection of tree species, size and planting locations would be undertaken in close consultation with relevant stakeholders such as City of Sydney and the Centennial Park and Moore Park Trust and with reference to the *CSELR Landscape Strategy* (Appendix F in Volume 1C of the EIS) which provides a recommendation of tree species to be used for replacement planting.

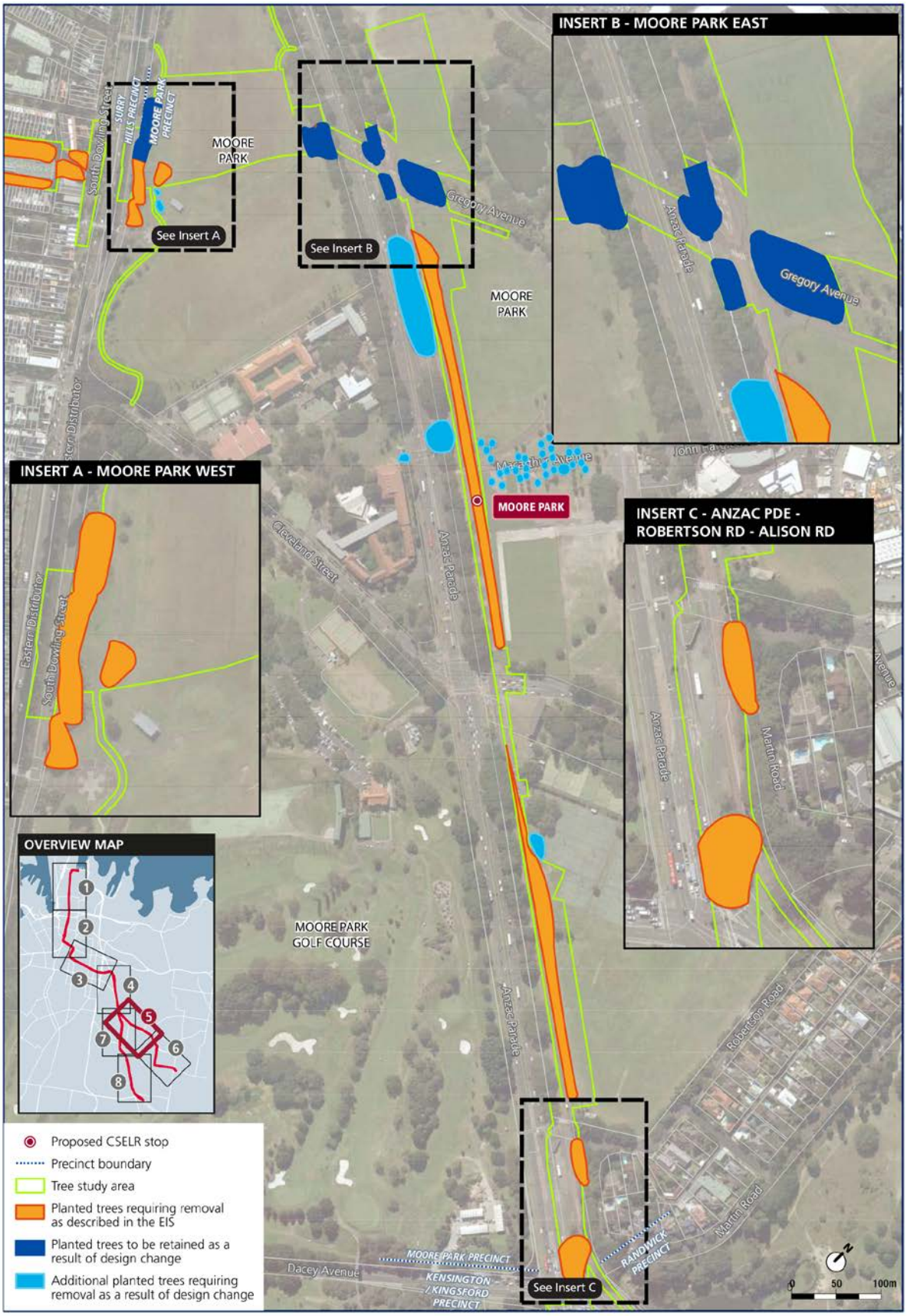
As previously described in the EIS, the revised construction compounds within Moore Park would continue to, as far as possible, be configured so as to not directly impact on planted trees that would not already be directly impacted by the construction of the Moore Park tunnel, light rail stop or other permanent works. Where trees are located within construction compound boundaries, exclusion fencing would be erected to protect these trees from construction activities.

Property and land use impacts

The proposed design change would not result in a substantial change to the existing property and land use impacts during operation to those previously described in the EIS. The proposed relocation of the Moore Park stop to the south of the previously proposed location would result in a substantially improved outcome for the existing AFL training oval. The revised stop location would not impact on the oval and would not require the relocation of the oval to the east of its current location (as would be required as part of the design presented in the EIS).

The proposed design changes would result in some minor changes to existing land uses during construction, in particular the location for the required compounds associated with the construction of the Moore Park tunnel. The revised design would result in increased impacts to the existing playing fields adjacent to Sydney Boys High School, and would result in reduced impacts to the northern playing fields. Further details regarding the potential impacts as a result of the amended construction compound for construction of the Moore Park tunnel are provided in section 6.15 of this Submissions Report.

The proposed design changes to the alignment of the Moore Park tunnel and the location of the Moore Park stop would not result in any changes to impacts on future land use beyond those identified in the EIS.



Note: Indicative only. Subject to detailed design

Figure 6.8 Potential change in impact to planted trees resulting from the changes within to the Moore Park tunnel and Moore Park stop

Noise and vibration impacts

Construction noise and vibration impacts

For construction, the key impact of the design change would be the relocation of the tunnel to a location closer to the Sydney Boys High School buildings. The shift in the stop location would also shift construction impacts associated with stop construction activities to the south, with the most affected school buildings now being the adjacent Sydney Girls High School, whereas previously the construction of the Moore Park stop had a greater impact on Sydney Boys High.

However, since the distance from the stop construction works to the nearest sensitive school building is approximately the same, there would be only a minor change of around 2 dB in the magnitude of the quantitative construction noise impacts presented in the EIS.

Operational noise and vibration impacts

Operational noise impacts in the vicinity of the revised alignment at Moore Park are generally considered to be reduced from those presented in the EIS. At Sydney Boys High School the revised location of the eastern tunnel portal would be approximately adjacent to the northern most building of the school. Therefore, the majority of the revised alignment would be screened from view due to being in tunnel or cutting, whereas the previous alignment was typically at grade at this location.

At Sydney Girls High School, speeds of passing LRVs would be reduced as a result of the shift in the Moore Park stop to be adjacent to the school, with a corresponding decrease in operational noise impacts.

Aboriginal and non-Indigenous heritage impacts

Built heritage/landscape

Relocating the Moore Park tunnel and stop to the south would have similar impacts on the heritage values of Moore Park as the EIS alignment. The enlarged construction compound in Moore Park West (refer to section 6.15 of this Submissions Report) would extend to just north of the locally-significant Sydney Boys High School group and would be a large element in its immediate setting. This compound would have an adverse impact on the setting of group, albeit temporary (refer to section 6.15 of this Submissions Report for details).

Historical archaeology

Works associated with the construction of the tunnel, stop and use of the construction compound were previously assessed in the EIS as having a minor to moderate adverse impact, depending on the extent and nature of the ground disturbance. The proposed realignment falls partially within the above HAMU's.

Overall, the proposed realignment of the Moore Park tunnel and stop is likely to have a minor to moderate adverse impact on the potential historical archaeological resource. This is consistent with the impact of the proposal as assessed in the EIS (refer to section 14.8 of the EIS, Volume 1B).

Aboriginal archaeology

The proposed relocation and realignment of the Moore Park tunnel and stop falls partially within areas defined as Zone 1 (State significant archaeological resource – known or potential) in Technical Paper 5 (*Heritage Impact Assessment*) in Volume 4 of the EIS. Given that excavation would be required for construction, the proposed relocation and realignment is likely to impact on potential Aboriginal objects. This impact is consistent with the impacts described in the EIS.

6.8.4 Additional or changed management and mitigation measures

No additional management and mitigation measures have been proposed as a result of the proposed design changes to the Moore Park tunnel alignment and location for the Moore Park stop. The existing management and mitigation measures relating to the environmental issues identified above and as detailed in Chapter 8 of this Submissions Report are considered to be sufficient to manage the potential impacts of the revised design change.

6.9 Pedestrian bridge across Anzac Parade, Moore Park

6.9.1 Description of the EIS design

As part of the EIS, the existing at-grade pedestrian crossing of Anzac Parade in front of the Sydney Boys and Sydney Girls High Schools was proposed to be retained. It was intended as part of the EIS that this crossing would provide access for students accessing to the two high schools from the CSELR proposal.

6.9.2 Description of design change

Following ongoing design refinement and ongoing discussions with the Sydney Boys and Sydney Girls High School, it has been identified that the majority of students travel to school via school bus services from Central Station and that these bus routes are arranged so that students do not have to cross Anzac Parade to travel to school or to Central Station. As part of the operation of the CSELR proposal, these bus services are proposed to be discontinued and for students to travel to school via light rail. Furthermore, following the exhibition of the EIS, several submissions were received that requested the construction of a footbridge across Anzac Parade at the schools, on the basis of safety.

To allow students to safely access the schools from the Moore Park stop on the eastern side of Anzac Parade, a new pedestrian bridge across Anzac Parade would be provided as part of the CSELR proposal. The proposed pedestrian bridge would connect the relocated Moore Park stop (refer to section 6.8 of this Submissions Report) with the western side of Anzac Parade allowing access for general pedestrians as well as access to the Sydney Boys and Sydney Girls High School campus.

The Anzac Parade bridge would span approximately 55 metres over Anzac Parade, providing a grade-separated connection between the northern end of the Moore Park stop and the Sydney Boys and Sydney Girls High School campus (refer to Figure 6.7). The bridge would provide an approximately six metre-wide pedestrian walkway and a 5.5 metre height clearance to Anzac Parade. The final design of the bridge would be determined during detailed design.

The eastern bridge landing would provide an interface with, and access to, the mezzanine level of the revised Moore Park stop in addition to stairs providing access to the Moore Park sports and entertainment complex to the east of the stop. The western bridge landing and associated stairs and ramp configuration would be located adjacent to or partially within the grounds of the Sydney Boys and Sydney Girls High School campus (subject to detailed design). The western bridge landing would generally be located similar distances from the main entrances of the Sydney Boys and Sydney Girls High School to the north and south of the bridge respectively. Once the pedestrian bridge has been constructed, the existing signalised pedestrian crossing of Anzac Parade would be removed.

The final design and materials used for construction of the Anzac Parade bridge would be determined during detailed design; however, overall, the design and materials would provide for a structure that is modern, but also provides a lightweight appearance, including use of glass or other visually lightweight materials. The design of the Anzac Parade pedestrian bridge would continue to be developed in consultation with the City of Sydney and the Transport for NSW Design Review Panel to ensure best practice urban design principles are applied and visual impacts reduced. In addition, a full review and assessment in accordance with the crime prevention through environmental design (CPTED) principles would be undertaken for the pedestrian bridge during detailed design. Measures that would be considered at a minimum include:

- aligning stairs and ramps to maximise surveillance from adjoining public areas and roads
- anti-throw or other protective screens.

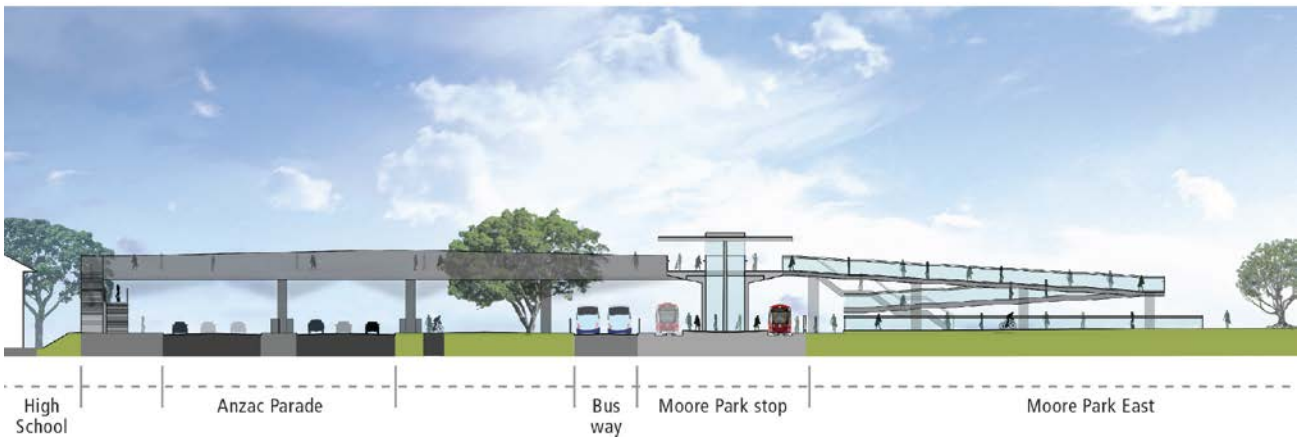
Construction of the bridge is anticipated to include a reinforced concrete supporting structure with a prefabricated deck structure consisting of either structural steel or concrete. The piers for the bridge structure would be supported on piled foundations. The ramps and stairs at each end of the bridge would be either constructed as prefabricated sections or cast in-situ.

The methodology for the bridge construction would be determined during detailed design; however, would generally consist of the following key stages:

- piling and installation of piling caps
- installations of ramps and platform concourse connecting to the Moore Park stop
- Installation of the bridge span structures with the structural elements for each span being installed by crane
- additional, non-structural works such as railings, screens and other bridge design elements.

For the installation of the prefabricated bridge spans over roadways, some road closures/partial road closure of Anzac Parade may be required in addition to undertaking works at night and outside of other peak traffic periods. For the installation of any piers or piling works required within the vicinity of existing traffic lanes, some localised lane closures may also be required.

An indicative plan of the proposed bridge arrangement and proposed integration with the Moore Park stop and Sydney Boys and Sydney Girls High Schools has been provided previously in Figure 6.7. An indicative elevation of the proposed Anzac Parade pedestrian bridge is shown in Figure 6.9.



Note: Indicative only. Subject to detailed design

Figure 6.9 Elevation of the proposed pedestrian bridge over Anzac Parade (looking north)

6.9.3 Change in impact

Traffic and transport impacts

Creation of a grade separated pedestrian crossing of Anzac Parade would reduce both traffic and pedestrian delay as a result of the removal of the existing at-grade pedestrian crossing facility. Removal of the at-grade crossing would also reduce pedestrian and traffic conflicts, providing an enhanced road safety outcome. Given the high number of school children that would have utilised this crossing under the EIS option, this represents a significant safety benefit.

During construction of the pedestrian bridge, short term lane closures and temporary diversion routes are likely to be required to allow the bridge structure to be lifted into place above Anzac Parade. Any such closures would be detailed in the site specific Construction Traffic Management Plans to be produced by the selected contractor and would subject to further consultation with RMS, the Traffic Management Centre and the City of Sydney.

No significant change to performance of the network is expected to that presented in Technical Paper 1 (*Transport Operations Report*) in Volume 2 of the EIS. Removal of the pedestrian crossing would provide a slight reduction to traffic and pedestrian delays, but as the crossing does not act as a constraint to corridor capacity these benefits would be minor.

Visual and landscape character impacts

Views along Anzac Parade would be potentially impacted by the proposed addition of a new pedestrian bridge over Anzac Parade. This viewpoint was not previously assessed in the EIS. This viewpoint currently provides extensive tree planting, dominated by mature Fig trees of varying species, maturity and size dominates the streetscape in this view. The viewpoint also shows the buildings associated with the Sydney Girls High School, as well as a heritage listed structure as part of the former first zoo in Australia on the site of the school.

The assessment of the potential impacts to this viewpoint as a result of the proposed design change during construction and operation are described below.

Construction assessment

With this design change, the impacts during construction would require extending the existing construction compound to accommodate the bridge's construction, as well as the creation of a worksite on the western side of Anzac Parade as well as the eastern side.

Approximately one to two existing mature trees may be removed, together with the pruning of several trees (of mixed species, including some Palms) on the western side of Anzac Parade due to civil works for the ramps and stairs of the pedestrian bridge on both sides of Anzac Parade (subject to detailed design of the pedestrian bridge). The footpath on the western side would be narrowed to cater for the construction works, requiring the narrowing of the footpath with the required hoardings to prevent egress and to minimise the visual impact of the construction.

On the east side of Anzac Parade, additional construction works would be required with the pedestrian bridge deck structures, piers and other elements creating a larger visual impact. Extending the provisions for the construction hoarding and signage arrangements for the worksite would be required.

The alterations within this view at street level would not be visually consistent with the character of this area and therefore it is expected that the proposal would create a reduction in the visual amenity of the view. This would result in a high adverse visual impact during construction.

Operational assessment

During operation, the new bridge would be the visually dominant element in this view. Currently there are no other elevated and grade separated elements that cross Anzac Parade in the area, and the proposed bridge would be a new and significant visual element that would significantly alter this view. The pedestrian bridge would largely sever the view corridor along Anzac Parade and remove the focus on the significant avenue of Fig trees, which are the prevailing, dominant character of the locale.

The proposed pedestrian bridge would include the provision of accessible ramps and stairs, which on the western side would create a significant visual impact, especially as the ramps are required to 'switch back' on each other to allow for the accessibility grades required. The visual impact on the school buildings would also be significant.

The eastern structural elements would be partially screened in this view from the existing Fig tree to be retained, and would extend the structure over the tracks and the landscaped area between the tracks and the traffic lanes of Anzac Parade.

On balance, it is considered that there would be an overall reduction to the amenity of views within Anzac Parade at this location. Therefore, it is expected that there would be a high adverse visual impact overall during operation.

Planted tree impacts

As noted in section 6.8 of this Submissions Report, the proposed design changes to the Moore Park stop and tunnel alignment would result in some changes to the potential tree impacts within the Moore Park Precinct. The addition of the proposed pedestrian bridge over Anzac Parade would result in the potential removal of an additional four to five planted trees (subject to detailed design of the pedestrian bridge).

A figure of the proposed planted tree impacts resulting from the proposed design changes assessed in this report has previously been provided in Figure 6.8.

Property and land use impacts

The proposed addition of a pedestrian bridge connecting the Moore Park stop to the western side of Anzac Parade would occur generally within the same design footprint assessed in the EIS. Some minor acquisition of land from the Sydney Boys and Sydney Girls High School property would be required on the western side of Anzac Parade; however, this is anticipated as only being a small strip of land adjacent to the open space area between the Sydney Boy's and Sydney Girls campuses. The additional land is required as there is currently insufficient space on the footpath outside the schools to allow for the landing of the western end of the bridge, whilst maintaining to required footpath width along the western side of Anzac Parade.

The bridge would generally be located above the existing pedestrian crossing of Anzac Parade. The existing property and pedestrian access routes in this location would therefore be generally maintained, including existing desire lines to the Moore Park sports and entertainment complex. There would therefore not be any additional land use and property impacts the adjoining properties as a result of the proposed design change on existing land uses.

The proposed pedestrian bridge would not result in any changes to impacts on future land use beyond those identified in the EIS.

Noise and vibration impacts

The noise and vibration impact of the proposed pedestrian bridge would be limited to the construction phase. The noise and vibration assessment provided for this design change has assumed the construction scenarios outlined in Table 6.3. Construction of a pedestrian bridge is anticipated to require the use of hydraulic breaker, small excavator, jackhammer, piling rig (bored), mobile crane, hand-tools and concreting/pavement plant.

Table 6.3 Summary of airborne construction noise scenarios considered

Construction activity	Location	Scenarios	Scenario sound power level (dBA)	Approximate duration of works
Footbridge Construction	Moore Park Precinct	Site preparation	118	To be confirmed during detailed design
		Piling works	108	
		Delivery of pre-cast structure, assembly and installation of lighting	105	
		Pavement works	110	

Noise impacts

The noise impacts during the footbridge construction works are expected to be limited to the educational receivers immediately adjacent to the works. The nearest noise-sensitive receiver is the Sydney Girls High School with buildings located approximately 15 metres from the closest section of the proposed footbridge works. The predicted worst-case noise impacts (during times of use of the school) are shown in Table 6.4.

Table 6.4 Construction noise predictions – Anzac Parade pedestrian bridge

Scenario	Noise catchment area	Receiver type	Noise Level – $L_{Aeq(15minute)}$ (dBA)		
			Worst-case predicted at nearby receivers	NML (when in use)	Exceedance
Anzac Parade pedestrian bridge works	NCA03.1	Other (Educational)	68–81	55	13 to 26

Due to the close vicinity of the works to receptors, the predicted noise levels at the Sydney Girls School indicate moderate to high exceedances of the Noise Management Levels (NML) of 13 to 26 dB during the works. The most noise intensive activity considered in the assessment is rock breaking during the site preparation works.

Vibration impacts

The separation distance(s) between the proposed works and the nearest receptors would generally be sufficient so that nearby buildings are unlikely to be at risk of 'cosmetic damage' for most of the proposed construction equipment. However, based on the proposed design, there is potential for rock breaking of the existing footpath to occur within 20 metres of the Sydney Girls High School buildings and within the recommended safe working distances. The required locations for vibration intensive equipment would be reviewed during detailed design when more specific information is available. Vibration impacts during construction could be mitigated by careful equipment selection and monitoring, if required.

In relation to human comfort, the safe working distances relate to continuous vibration and apply to residential receptors. For most construction activities, vibration emissions are intermittent in nature and for this reason, higher vibration levels, occurring over shorter periods are permitted (as discussed in BS 6472-1). Vibration at the nearest receptors is likely to be perceptible at times during the works.

Aboriginal and non-Indigenous heritage impacts

Built heritage/landscape

The proposed pedestrian bridge would include ramps and steps very close to the former bear pit (within the grounds of Sydney Boys High School), one of the few remaining elements from the zoological gardens located in Moore Park West from 1879–1916. The bear pit is included within the Sydney LEP listings for Sydney Girls High School Group (item no. I959) and Sydney Boys High School Group (item no. I958), as an element of local significance. Constructing the ramp and steps in this location has the potential to require demolition or partial demolition of the bear pit, which would be a major adverse heritage impact. The pedestrian bridge may also require removal of significant trees along Anzac Parade in addition to those proposed to be removed for the Moore Park tunnel.

While Anzac Parade is not listed as a heritage item in its own right, Moore Park, which is located on both sides of the road and the trees along its edges are listed as heritage items. The proposed bridge would interrupt views along the roadway defined by the significant tree avenues and Moore Park, altering the strong, linear character of this part of Anzac Parade. This would be a moderate adverse heritage impact.

Historical archaeology

The proposed location of the pedestrian bridge would be very close to the former bear pit and associated remnants of the zoological gardens (within the grounds of Sydney Boys High School). This area falls beyond the original assessment boundary of Technical Paper 5 (*Heritage Impact Assessment*) in Volume 4 of the EIS, but it has been identified as an item of archaeological interest. This archaeological resource may be considered Zone 2 (Locally significant archaeological resource), subject to further archaeological assessment. Construction of the bridge may have a moderate to major adverse impact on any historical archaeological evidence associated with the former bear pit and/or zoological gardens.

Aboriginal archaeology

The site of the proposed pedestrian bridge is located partially within areas defined as Zone 1 in Technical Paper 5 (*Heritage Impact Assessment*) in Volume 4 of the EIS. Given its location and that excavation would be required for the construction, the proposed bridge is likely to also be considered within Zone 1, and is likely to impact on Aboriginal archaeological evidence.

Socio-economic impacts

Key social impacts of the proposed design change during operation of the CSELR would be generally positive and include:

- *Improved access* — provision of the pedestrian bridge would provide improved access to the Sydney Boys and Sydney Girls High Schools from the proposed Moore Park stop.
- *Improved safety* — the pedestrian bridge would allow an improvement of safety, accessibility and operation within the precinct through the provision of a grade separated link to reduce surface vehicle and pedestrian conflicts, in particular for school students accessing the Sydney Boys and Sydney Girls High Schools from the CSELR proposal. The proposed pedestrian bridge would incorporate accessibility design elements for people who are less mobile through the provision of both ramps and steps at each end of the proposed bridge.
- *Improved health and wellbeing* — the proposed design change, as part of the overall provision of the CSELR proposal would provide increased opportunities for students to walk and travel via public transport. This would provide a minor overall benefit in health and wellbeing.

6.9.4 Additional or changed management and mitigation measures

A series of additional management and mitigation measures have been identified for the proposed design change to incorporate a pedestrian bridge over Anzac Parade which connects with the Moore Park stop. These management and mitigation measures are outlined below in Table 6.5.

Table 6.5 Proposed additional mitigation measures for the pedestrian bridge over Anzac Parade

Environmental impact	Proposed management and mitigation measure
Visual and landscape character	The detailed design of the Anzac Parade pedestrian bridge would be referred to the Urban Domain Reference Group for the project to ensure best practice urban design principles are applied and visual impacts reduced. (refer to new mitigation measure C.11).
	A full review and assessment in accordance with the crime prevention through environmental design (CPTED) principles would be undertaken for the pedestrian bridge during detailed design (refer to mitigation measure E.1).
Noise and vibration mitigation	During construction, careful equipment selection and scheduling of noise intensive work to less sensitive periods would be undertaken as much as possible. This would be undertaken in consultation with the adjacent schools to identify potential periods where reduced noise activities may be required (refer to mitigation measure O.5).
	Noise and vibration mitigation measures are to be confirmed during the preparation of a Construction Noise and Vibration Management Plan for the construction of the pedestrian bridge during the detailed design stage once the construction method and equipment have been confirmed (refer to mitigation measure S.1).
Aboriginal and non-Indigenous heritage	The detailed design of the bridge would seek to retain the former bear pit in the grounds of the Sydney Boys High School, as well as minimise the number of significant trees to be removed along Anzac Parade. If the bear pit can be retained, it would be protected during construction works. The pedestrian bridge should be designed to be as light and streamlined as possible to minimise its impact on the setting of the Anzac Parade significant trees (refer to new mitigation measure D.16).

All other existing management and mitigation measures relating to the environment issues identified above and as detailed in Chapter 8 of this Submissions Report are considered to be sufficient to manage the additional potential impacts of the revised design change.

6.10 Local access arrangements to Royal Randwick racecourse

6.10.1 Description of the EIS design

The design for the CSELR as presented in the EIS proposed a side running light rail alignment adjacent to the Royal Randwick racecourse along Alison Road and Wansey Road, with a shared pedestrian and cycle path on the racecourse side of the light rail. The EIS design provided for generally two through traffic lanes on Alison Road in both directions, with a short dedicated right turn lane from Alison Road westbound onto Darley Road. Additionally, the existing left slip lane from Alison Road eastbound onto Darley Road northbound would be retained. The existing left slip lane from Darley Road and left only out of King Street onto Alison Road outbound also would be maintained as part of the design described in the EIS.

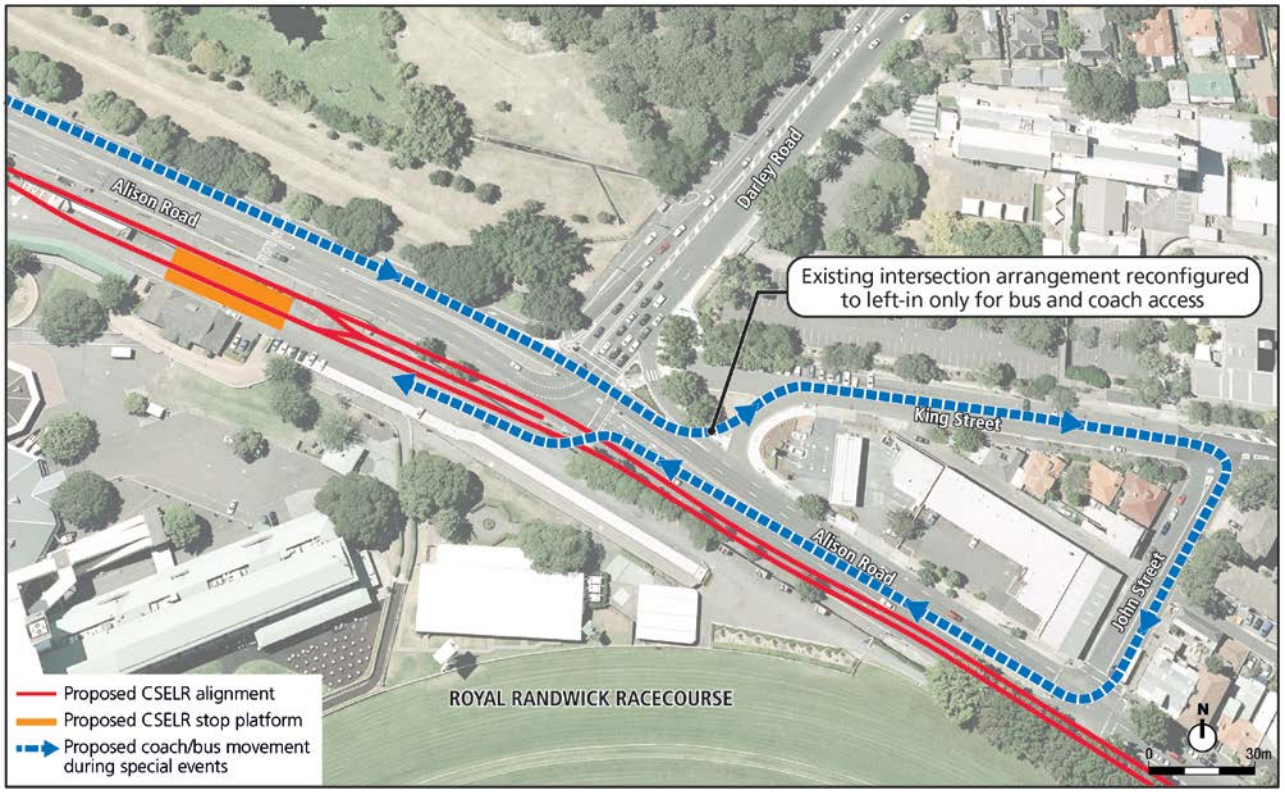
As part of the design, no eastbound right turning lane into the Royal Randwick racecourse site was proposed to be provided.

6.10.2 Description of design change

Following discussions with the Royal Randwick racecourse as part of the exhibition of the EIS, it was identified that eastbound access to the Royal Randwick racecourse from Alison Road for event buses and coaches would be required. To accommodate this requirement, the refined design would provide a slightly reconfigured intersection at Alison Road and Darley Road to accommodate a new eastbound, bus-only slip lane from Alison Road onto King Street. Buses and coaches accessing the Royal Randwick racecourse would then travel in a loop along King Street and John Street and access the racecourse in a westbound direction from Alison Road. The slip lane would be marked and sign-posted as bus-only to restrict use by general traffic.

The design change is proposed to remove the need for buses to use the Darley Road roundabout (at the Randwick Gates access to Centennial Park) to perform a U-turn manoeuvre during special events when accessing the Royal Randwick racecourse. The size of this roundabout makes this manoeuvre difficult to perform and reduces the operational capacity of the roundabout during racecourse events. The provision of the bus only connection between Alison Road and King Street would also remove the need for special event bus staging in Darley Road. This has the benefit of increasing capacity of the Darley Road approach during special events as the kerbside lane would no longer contain parked buses.

The proposed local access arrangements to Royal Randwick racecourse are shown in Figure 6.10.



Note: Indicative only. Subject to detailed design

Figure 6.10 Revised local access arrangements to Royal Randwick racecourse

6.10.3 Change in impact

Traffic and transport impacts

The proposed design changes would result in eastbound buses travelling in the section of King Street west of John Street. This would equate to approximately 70 bus trips during an average race day and 470 during future music festival events (this is based on existing special event bus volumes which may reduce following the introduction of CSELR proposal). These trips would be spread across the entire day with localised peaks experienced during the arrival and departure periods. This would result in a slight reduction in performance at the John Street intersection due to the additional buses exiting John Street, but this would be offset by improved performance at the more critical Darley Road approach to the Alison Road/Darley Road intersection, which would no longer need to accommodate the turning movements into and out of Darley Road.

No significant change to the performance of either the John Street or Darley Road intersections from that described and assessed in the EIS are anticipated as a result of the proposed design change.

Noise and vibration impacts

Minimal impacts from construction works are anticipated as a result of this design change given the significant distance to the nearest receivers surrounding the location. Residents may notice an increase in the numbers of buses on special event days; however, given existing use of these streets for buses accessing the King Street depot, the impacts are not anticipated to be significant or require mitigation.

6.10.4 Additional or changed management and mitigation measures

No additional management and mitigation measures are proposed as a result of the proposed design change to the local access arrangements to Royal Randwick racecourse. The existing management and mitigation measures relating to the environmental issues identified above and as detailed in Chapter 8 of this Submissions Report are considered to be sufficient to manage the potential impacts of the revised design change.

6.11 CSELR alignment and stops along Alison Road and Wansey Road

6.11.1 Description of the EIS design

The design for the CSELR as presented in the EIS for the section of the CSELR between Darley Road and Botany Street within the Randwick Precinct included the following key characteristics:

- a side running light rail alignment (including a shared pedestrian/cycle path) along the southern side of Alison Road and western side of Wansey Road, and then continuing as a centre running alignment following transition into High Street
- two traffic lanes along the length of Wansey Road with the loss of all existing parking spaces along Wansey Road

- two stops along Wansey Road including Wansey Road stop at the northern end and UNSW High Street stop at the southern end.

6.11.2 Description of design change

Following further detailed design to minimise environmental impacts, ongoing consultation with relevant stakeholders (including Randwick City Council, Royal Randwick racecourse and Australian Turf Club (ATC)), and submissions received from local residents and community groups (such as the Wansey Road Action Group and the Need Alison Road Parking Group) during the exhibition of the EIS, a series of design refinements for the CSELR proposal between Darley Road and Botany Street within the Randwick Precinct have been identified.
These design refinements include the following:

- realignment of a portion of the light rail alignment along Alison Road
- amendments to the traffic configuration of Wansey Road
- relocation of the Wansey Road and UNSW High Street stops into Alison Road and High Street respectively.

These design changes are described in greater detail below. Additional discussion regarding parking along Alison Road and Wansey Road is provided in section 5.8.11 of this Submissions Report.

Alignment along Alison Road

As part of the ongoing refinement of the design of the CSELR proposal and the reduction of environmental impacts, the alignment of the light rail along Alison Road has been amended slightly to reduce the impacts on the existing mature Fig trees to the south of Alison Road along the boundary of the Royal Randwick racecourse.

The refined design would move the previously proposed alignment approximately three to four metres to the north of its current position away from the boundary of the Royal Randwick racecourse. The shift in the alignment would occur for a length of approximately 200 metres generally between John Street and Cowper Street. In order to achieve the revised alignment, the existing right hand turn (westbound) into John Street (from Alison Road) would be removed. As part of the revised proposal, buses would still be permitted to turn right into John Street from the right hand traffic lane of Alison Road in order to access the existing King Street bus depot. The shared pedestrian and cycle path to the south of the light rail alignment would be retained as part of the refined design. Other vehicles wishing to access this precinct from Alison Road (westbound) would turn right at the existing Prince Street right turn bay.

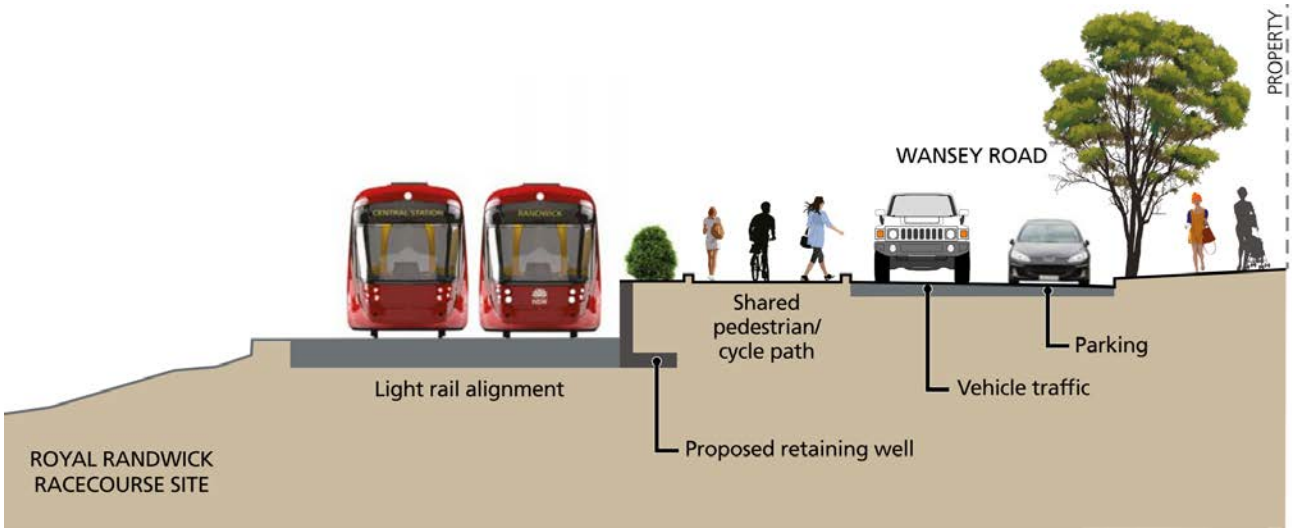
The proposed design change to the alignment along Alison Road would allow for the retention of approximately 20 trees in comparison to the light rail alignment presented in the EIS (refer to section 6.11.2 of this Submissions Report for details).

Changes to the configuration of Wansey Road

Following ongoing consultation with Randwick City Council and submissions received from local residents during the exhibition of the EIS, the traffic configuration along Wansey Road has been amended from the design presented in the EIS.

The revised design for Wansey Road would include the following:

- The proposed traffic configuration would be amended to allow for one lane of traffic (southbound) and retention of one lane of existing parking (along the eastern side of Wansey Road) between Gate 10 of the Royal Randwick Racecourse (near Alison Road) and Arthur Street.
- Between Arthur Street and High Street, the design presented previously in the EIS would be retained to include the provision of two traffic lanes, with one lane in each direction.
- The shared pedestrian and cycle path would be relocated to the eastern side of the proposed light rail alignment, between the light rail tracks and traffic lane on Wansey Road. The shared path would be separated from the light rail alignment by a buffer planting zone and small retaining wall. Access to the northern end of the shared path from the existing shared path along Alison Road would occur via a new crossing to be provided at the intersection of Alison Road and Wansey Road to the east of the revised stop location.
- The proposed light rail alignment along Wansey Road would be lowered vertically below the previously proposed level (generally proposed to be level with Wansey Road) to provide a more even gradient along this section of the alignment and to assist in reducing potential noise and visual impacts of the proposal. The section of lowered alignment would generally extend from about 80 metres south of the intersection of Alison Road and Wansey Road to about 80 metres north of the intersection of High Street and Wansey Road. At the maximum lowered level, the light rail alignment would be approximately two metres below the existing ground level. A new retaining wall would be constructed along this length of the light rail alignment. An indicative example of the lowered alignment along Wansey Road is shown in Figure 6.11.



Note: Indicative only. Subject to detailed design

Figure 6.11 Proposed lowering of the light rail alignment along Wansey Road

Stop changes

Wansey Road stop

The design for the Wansey Road stop as exhibited in the EIS provided for a location to the south of the intersection of Alison Road and Wansey Road. This design provided for an island platform configuration on the western side of Wansey Road. As part of the exhibited design, a shared path would be provided along the western side of the light rail alignment, between the light rail tracks and the Royal Randwick racecourse site.

Ongoing discussion with the Australian Turf Club (ATC – operator of the Royal Randwick racecourse site) noted that the ATC has an approved development application for a new horse stable complex near the previously proposed Wansey Road stop, within the north-east corner of the racecourse site. This development would require driveway access to existing ATC buildings as well as to the new horse stable complex.

Under the proposal described in the EIS, this access would require vehicles to cross the light rail tracks near the southern end of the Wansey Road stop. While this access could be accommodated with the stop in Wansey Road, the stop position would require southbound vehicles to turn sharply across the tracks in a U-turn motion, which would not represent a safe operational option for the light rail.

In addition, changes to the configuration of Wansey Road to allow for one lane of parking along Wansey Road (refer above for details) also resulted in the consideration of an alternative location for the Wansey Road stop as part of the ongoing refinement of the design.

The revised design of the Wansey Road stop would relocate the proposed stop to the southern side of Alison Road, approximately 30 metres to the west of the intersection of Alison Road and Wansey Road. The revised platform configuration would provide an approximately 4.4 metres wide, 45 metre long island platform arrangement. Similar to the design described in the EIS, the revised platform configuration would provide a shared pedestrian and cycle path along the southern side of the stop adjacent to the Royal Randwick racecourse site.

A new pedestrian crossing would be provided at the intersection of Alison Road and Wansey Road, including a small pedestrian island for safe queuing at this location. The stop would also continue to be DDA compliant and continue to maintain two traffic lanes in each direction along Alison Road, as previously described in the EIS.

The revised stop location and arrangement of the Wansey Road stop is shown in Figure 6.12.

UNSW High Street stop

The design for the UNSW High Street stop as exhibited in the EIS provided for a stop in Wansey Road to the north of the intersection of High Street and Wansey Road. This design provided for two side platforms along the western side of Wansey Road. As part of the exhibited design, the existing shared path would continue to be provided along the eastern side of the light rail alignment, between the light rail tracks and the Royal Randwick racecourse site.

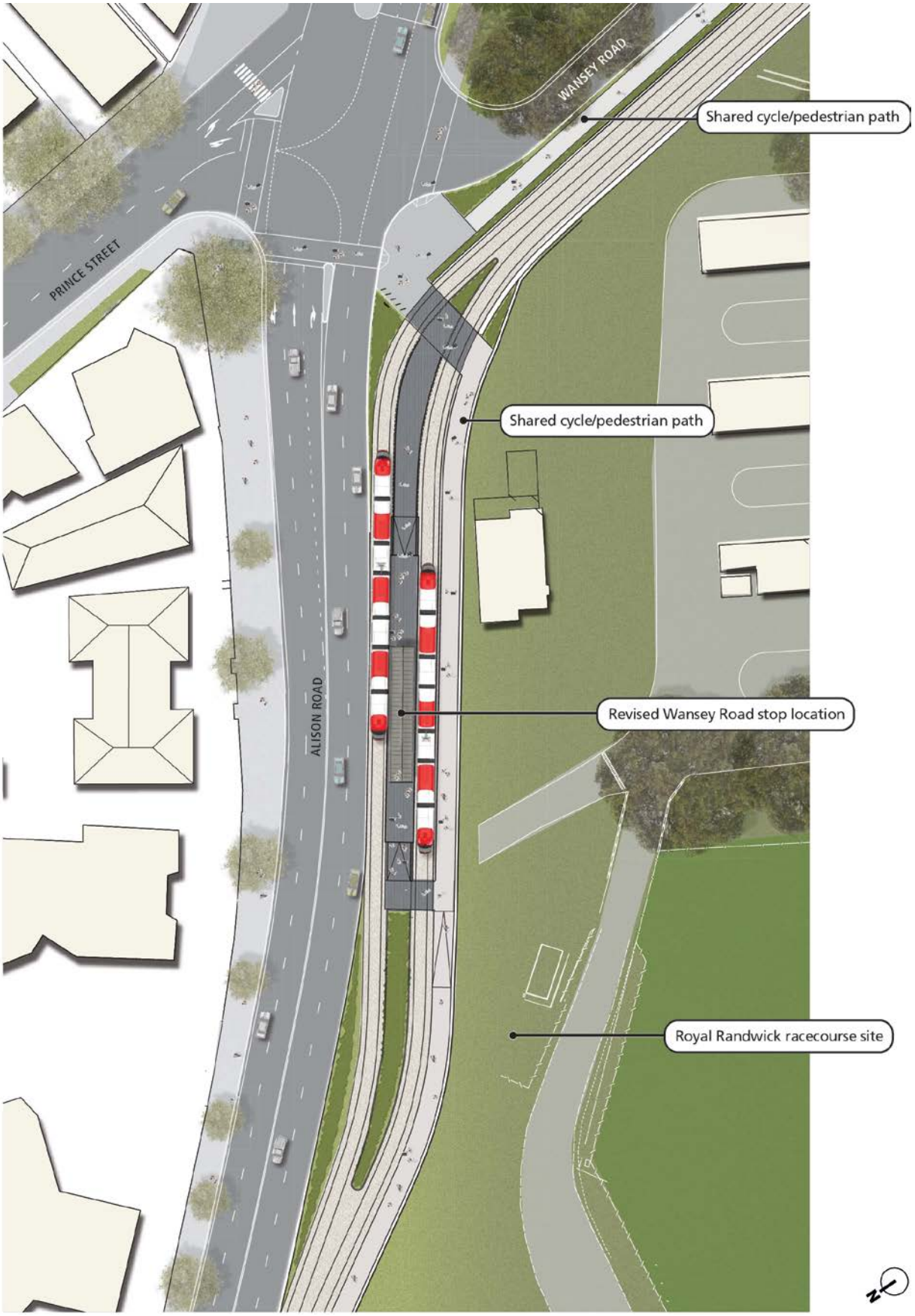
During recent discussions with ATC, it was identified that the provision of the UNSW High Street stop within Wansey Road would require land to be acquired from ATC and would also require the relocation of a large water tank and at least one horse stable building at the corner of Wansey Road and High Street. Alternatively, the relocation of the UNSW High Street stop into High Street would reduce the amount of private land that is required to be acquired and would reduce the impact of the proposal on the existing racecourse facilities (i.e. the water tank and horse stable(s)). In addition, the relocation of the UNSW High Street stop into High Street would provide improved and safer access for the main passenger catchment of the stop, UNSW and closer, more convenient access to the medical and hospital precinct to the east.

The revised design of the UNSW High Street stop would relocate the proposed stop in the centre of High Street, approximately 40 metres to the east of the intersection of High Street and Wansey Road. The revised platform configuration would provide an approximately 6.4 metres wide, 45 metre long island platform arrangement. The proposed platform width is slightly wider than the previous platform widths to allow for sufficient platform capacity for the anticipated passenger patronage at this stop.

A single east and westbound traffic lane along High Street would be maintained between Wansey Road and Botany Street on either side of the island platform. The intersection of High Street and Wansey Road would be signalised with the existing signals at the intersection of High Street and Botany Street retained. The existing pedestrian path along the southern side of High Street would also be moved south to accommodate the platform, whilst retaining footpaths on both sides of High Street.

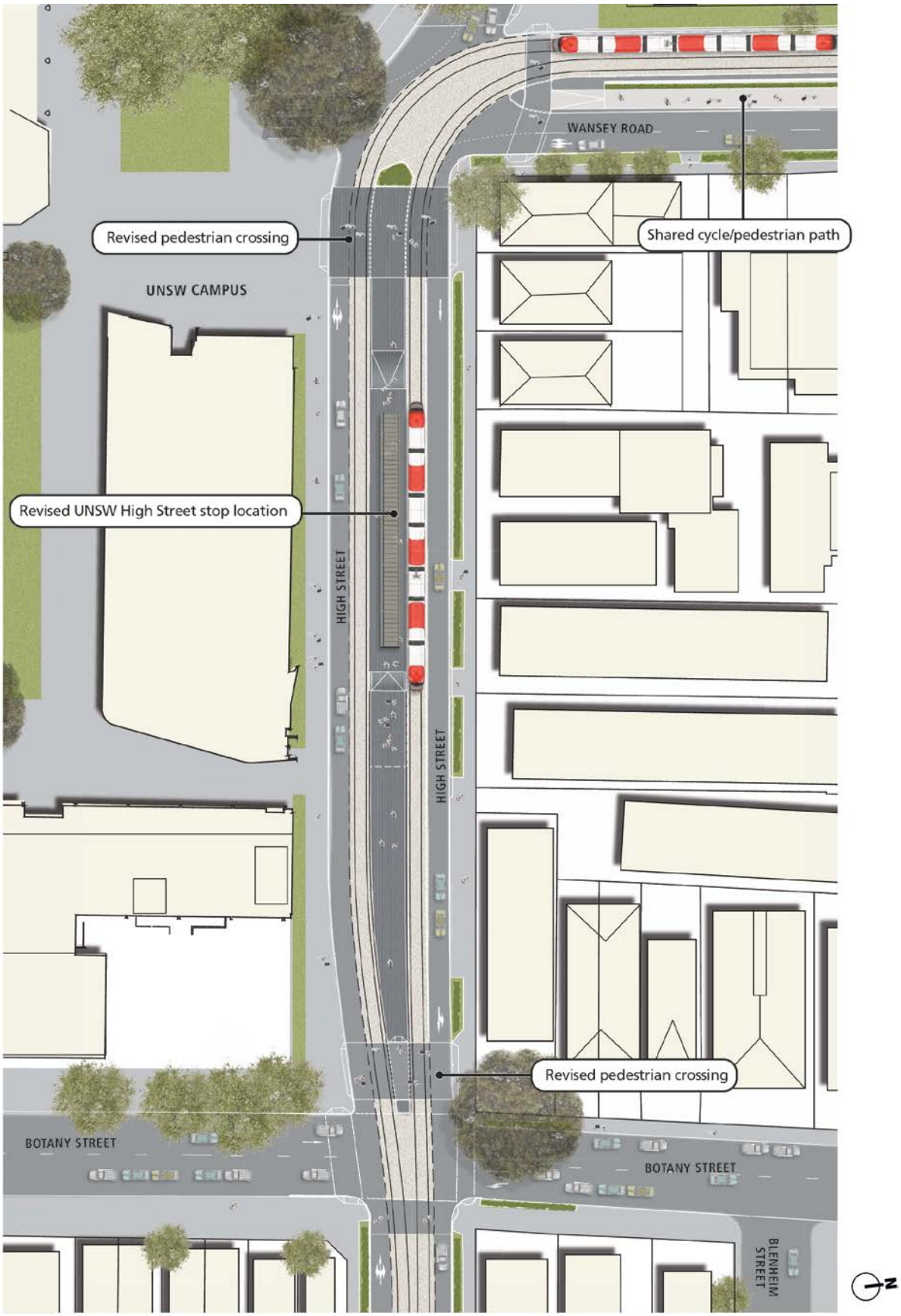
Similar to the design described in the EIS, the revised platform configuration would provide new, signalised pedestrian crossings at both the western and eastern ends of the platform near the intersections of High Street with Wansey Road and Botany Street respectively. The stop would also continue to be DDA compliant.

The revised stop location and arrangement of the UNSW High Street stop is shown in Figure 6.13.



Note: Indicative only. Subject to detailed design

Figure 6.12 Revised Wansey Road stop



Note: Indicative only. Subject to detailed design

Figure 6.13 Revised UNSW High Street stop

6.11.3 Change in impact

Traffic and transport impacts

Impacts to Alison Road

The John Street right turn bay from Alison Road is currently used by approximately 50 vehicles in each of the morning and afternoon peak hours. The design change would retain the right turn movement by allowing the innermost westbound lane of Alison Road to operate as a shared through and right turn lane. To reduce the volume of vehicles undertaking this right turn, (and thus improving intersection capacity and minimising the risk of rear end collisions) this turn would be designated as a bus-only right turn.

General traffic that currently makes this right turn would be diverted via the newly signalised right turn into Princes Street and then westbound on King Street. This represents a short detour and the low traffic volumes of less than 50 vehicles per hour would have a minimal effect on traffic operations in Princes Street and King Street. Traffic analysis (using the SIDRA intersection traffic modelling tool) undertaken using 2021 forecast traffic demands has identified that the Alison Road/John Street intersection would operate at LoS C (moderate/stable intersection performance) and Los B (reasonable intersection performance) in the morning and afternoon peak periods respectively. This represents comparable performance to the design presented in the EIS.

In addition to the removal of the John Street right turn, the Wansey Road stop would move into Alison Road immediately west of the Wansey Road intersection. This would result in no significant change to the design presented in the EIS with respect to the functionality of the road corridor, with two traffic lanes retained in both directions on Alison Road. The changes to the design are expected to result in similar levels of performance to that presented in the EIS along Alison Road.

Impacts to Wansey Road

The proposed changes to the Wansey Road configuration demonstrate a significant reduction in traffic volumes on Wansey Road. Therefore traffic impacts are expected to be reduced from those stated in Technical Paper 1 (*Transport Operations Report*) in Volume 2 of the EIS. It is anticipated that the small volumes of traffic that would be diverted onto the surrounding road network as a result of the removal of the northbound traffic lane as presented in the EIS would be able to be accommodated with minimal adverse impact.

Impacts to High Street

During construction of the UNSW High Street stop, it is anticipated that only one lane of traffic would be available between Wansey Road and Botany Street. Traffic flows along this section of High Street during construction would likely be managed with appropriate traffic control arrangements in accordance with the overall Construction Traffic Management Plan which would be developed prior to construction works commencing.

As shown in Figure 6.13, during operation, one eastbound traffic lane and one westbound traffic lane would be provided in High Street east of Wansey Road with light rail centre running as part of the revised design. The proposed design changes to UNSW High Street stop are expected to result in similar levels of traffic performance to those assessed and presented in the EIS.

Impacts to pedestrians

The relocation of the Wansey Road stop into Alison Road would better address the main catchment for this stop (i.e. the residential buildings along the northern side of Alison Road). Access to the stop would be maintained through the provision of signalised pedestrian crossings, similar to the previously exhibited design. Similarly, the relocation of the UNSW High Street stop into High Street from Wansey Road would also result in better service the main catchment of this stop. By locating the UNSW High Street stop within High Street, students of the university, as the main catchment for the stop, would be able to better access the stop without the need to cross the full width of High Street and/or Wansey Road, providing a safer outcome for pedestrians. The relocated stop would also be in closer walking distance for people accessing the medical and hospital precinct, generally to the north of the stop.

Planted tree impacts

The alignment and design for the CSELR proposal as described in the EIS was identified as potentially requiring the removal of up to approximately 280 planted trees within the whole of the Randwick Precinct. The majority of impacted trees that were identified within the EIS were located along Alison Road, Wansey Road and High Street, and would include the significant trees located adjacent to Royal Randwick racecourse and High Cross Park, as well as the large Live Oak adjacent to the busway on Alison Road (opposite the Doncaster Avenue intersection).

The significant trees on Alison Road and adjacent to Royal Randwick racecourse were identified as being significantly impacted by the CSELR alignment and the associated shared path, which would encroach into the structural root zone or into the tree protection zone, resulting in the removal of these trees.

The proposed design changes along Alison Road and Wansey Road are anticipated to provide an overall reduction in the number of impacted trees within the Randwick Precinct. The proposed design change to the alignment along Alison Road would allow for the retention of approximately 20 of the significant Fig trees along Alison Road in comparison to the light rail alignment presented in the EIS. Further testing of the root zones of the existing trees along Alison Road (as identified in section 15.6.3 of the EIS, Volume 1B) would also assisting in determining additional trees that may potentially be retained along this section of the proposal. This testing would be undertaken by a suitably qualified arborist during detailed design.

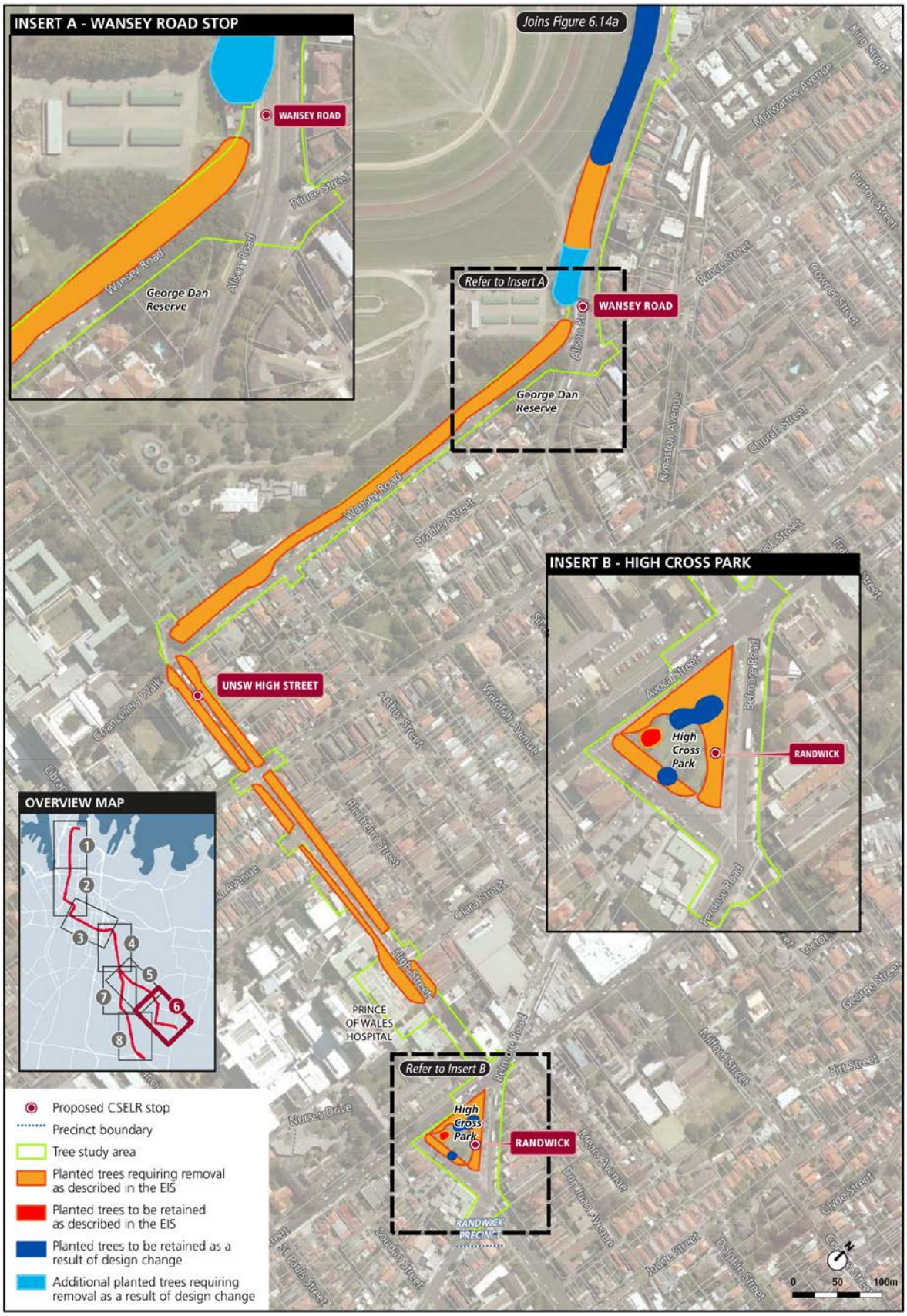
The revised design for the Wansey Road stop would, however, result in the removal of approximately five additional trees along Alison Road to the west of the intersection of Alison Road and Wansey Road to accommodate the revised location of the Wansey Road stop. These trees were identified as previously being retained as part of the EIS.

Additionally, the planted trees within George Dan Reserve, as noted in the EIS, would continue to be retained as part of the revised design.

The change in impact to planted trees resulting from the proposed design changes within the vicinity of the CSELR alignment and stops along Alison Road and Wansey Road are shown in Figure 6.14a and Figure 6.14b.

Note: Indicative only. Subject to detailed design

Figure 6.14a Potential change in impact to planted trees resulting from the changes to the alignment of Alison Road and stops along Wansey Road (west)



Note: Indicative only. Subject to detailed design

Figure 6.14b Potential change in impact to planted trees resulting from the changes to the alignment of Alison Road and stops along Wansey Road (east)

Visual and landscape character impacts

One landscape character and two viewpoints assessed in the EIS would be potentially impacted by the proposed design changes within the CSELR alignment and stops along Alison Road and Wansey Road. These are:

- Alison Road alignment
- View along Wansey Road
- View north along High Street to the UNSW High Street stop (note this is a new view point to the EIS due to the revised location of the stop)

The assessment of the potential impacts to the landscape character and viewpoints as a result of the proposed design change during construction and operation are described below.

Construction assessment

Alison Road alignment

The proposed design changes would not be visually consistent with the existing character of the surrounding Racecourse landscape, as was previously identified in the EIS. The design change to shift the alignment away from the existing trees would result in reduction of the overall impact to a moderate adverse visual impact during both early works and civil works stages. This represents an overall positive change from the high adverse visual impact assessed in the EIS.

View along Wansey Road

With this design change, this viewpoint of Wansey Road and the corner of Alison Road, would change during construction as some of the trees, which define and frame views to the Racecourse, are removed along the western boundary of the Racecourse to accommodate the light rail alignment site works and stop on Alison Road. However, as the proposed alignment along Alison Road has been refined to allow the retention of some trees along Alison Road west of the relocated Wansey Road stop, the overall impact would be reduced somewhat. As previously assessed in the EIS, the proposed changes to the view would not be visually consistent with the character of the surrounding landscape of residential streets and adjacent Racecourse landscape.

Overall, it is expected that these elements would continue to be visually prominent as they contrast with the surrounding landscape, creating a considerable reduction in the visual amenity of this view during both early works and civil works stages. This would result in a high adverse visual impact during construction which is consistent with the assessment presented in the EIS.

View north along High Street to the UNSW High Street stop

During construction this view would change as the trees located along the eastern side of High Street in front of the University Lowy Building are removed (as was previously assessed in section 15.6 the EIS, Volume 1B) to accommodate the road/footpath widening. This view would be focused on the stop site which would be established in the centre of the road and footpath area in front of the Lowy Building, with the corridor works extending progressively across the view to the High Street/Botany Street intersection. These changes to the view would not be visually consistent with the character of the surrounding landscape of this residential street and adjacent University landscape.

It is expected that these elements would be visually prominent as they contrast with the surrounding landscape, creating a considerable reduction in the visual amenity of this view during both early works and civil works stages. This would result in a high adverse visual impact during construction.

Operational assessment

Alison Road alignment

The light rail corridor would run along the southern edge of Alison Road (in the vicinity of the existing footpath) with catenary structures and wires overhead. In this area, Alison Road would be reduced from six lanes to four. Approximately 20 existing Fig trees (of exceptional significance) would be retained as part of the proposed design change (refer below), and would remain as a prominent element in this view. The design change would therefore result in a reduction of the overall impact to a negligible visual impact during operation. This represents an overall substantial positive change from the high adverse visual impact assessed in the EIS.

View along Wansey Road

With the Fig trees removed this view would open up to the Royal Randwick racecourse and Alison Road. In the rear of this view the relocated light rail stop on Alison Road would be visible. With the introduction of elements such as the stop canopy, platform, overhead wires, there would be additional visual clutter at street level on Alison Road which was not previously the case. This would not represent a substantial change to that previously identified for the previous Wansey Road stop location; however, the potential receivers of these impacts would be somewhat changed.

The loss of vegetation, together with the introduction of the relocated stop infrastructure, is expected to create a noticeable reduction in the visual amenity of this view. The proposed lowering of some of the alignment along Wansey Road would provide a minor benefit; however, LRVs would still be seen within the view, resulting in adverse impacts. From views in this area it is expected that there would be a high adverse visual impact during the operation of the proposal. This represents an overall change from the moderate adverse visual impact assessed in the EIS (as the Visual Impact Assessment contained within the EIS was undertaken on the incorrect assumption that some trees along Wansey Road would be able to be retained).

View north along High Street to the UNSW High Street stop

During operation, the dedicated light rail corridor and stop/platform structure with associated elements would be visible in the centre of the roadway; positioned centrally in the foreground of the view. The southbound traffic lane and eastern side footpath would be moved closer to the University Lowy building reducing its offset from the street. The introduction of the stop/platform elements and overhead wires would create visual clutter at street level.

The loss of trees on the eastern side of the street would open views to the University Lowy building in the foreground and the Wallace Worth School of Medicine building in the background, although new street tree plantings would be provided following the road widening to soften this view. These changes would create a noticeable reduction in the amenity of this view and it is expected that there would be a high adverse visual impact during operation.

Property and land use impacts

The proposed design changes to the alignment of the CSELR along Alison Road, Wansey Road and the relocation of the Wansey Road and UNSW High Street stops would generally occur within the same footprint as the previous design assessed in the EIS. There would therefore not be any substantial additional land use and property impacts as a result of the proposed design change on existing land uses.

While relocating the Wansey Road stop into Alison Road would continue to require some land acquisition of the Royal Randwick racecourse site (as previously identified in the EIS), driveway access for the existing buildings and the proposed new horse stable complex (a development application for which has been approved) would be improved.

Additionally, the movement of the UNSW High Street stop from Wansey Road into High Street would reduce the overall required land acquisition to the Royal Randwick racecourse site and the impact on the facilities in the vicinity of the previously proposed UNSW High Street stop site (i.e. water tank and horse stable). The revised design would, however, require some additional land acquisition of the UNSW site to accommodate the proposed track and realigned footpath on the southern side of High Street (near the Lowy Cancer Research Centre). This acquisition would be undertaken in consultation with UNSW.

The proposed design changes to the alignment of the CSELR along Alison Road, Wansey Road and the relocation of the Wansey Road and UNSW High Street stops would not result in any changes to impacts on future land use beyond those identified in the EIS. The revised stop locations for the Wansey Road and UNSW High Street stops are still considered to be appropriate for meeting any future demands for public transport associated with the planned Randwick Urban Activation Precinct currently being assessed by the Department of Planning and Infrastructure.

Noise and vibration impacts

Alignment along Alison Road

The shift in the alignment along Alison Road is anticipated to be less than five metres and, as such, this alteration is not anticipated to result in a noticeable change to the EIS construction noise and vibration impacts as the overall construction footprint assessed is generally similar to that assessed as part of the EIS. The worst-case prediction of ‘Highly Intrusive’ impacts at the receivers on Alison Road, adjacent to this location (during mainline construction works), is consistent with that presented in the EIS.

In terms of operational impacts, the proposed movement of the alignment by up to five metres closer to the sensitive receivers on Alison Road, may result in an apparent increase of around 1-2 dB in the operational noise predictions at the most affected locations, assuming no changes in speed or LRV numbers.

The EIS predicts compliance with the operational noise and vibration goals at this location. It is not expected that the design change proposed along Alison Road and resulting minor increase in operational impacts would affect the ability to meet the operational noise and vibration goals at this location.

Changes along Wansey Road (including relocation of stops)

Construction noise and vibration impacts

During construction, the key change to that assessed in the EIS would be the shift in construction noise impacts to receivers which are adjacent to the revised Wansey Road and UNSW High Street stops, and away from the previously affected locations during stop construction.

The new stop locations would be slightly closer to residential receivers than the locations assessed in the EIS (due to the previous separation between Wansey Road stop and the closest residential receivers being separated by George Dan Reserve). The predicted noise impacts during stop construction at the revised most affected receivers are therefore higher than identified in the EIS, with a predicted increase in the Noise Management Level exceedances of around 5 dB compared to the EIS predictions for the stop construction scenarios. In terms of subjective impacts, the stop construction works are predicted to be 'Highly Intrusive' at times, which is, overall, consistent with the subjective impacts identified in the EIS assessment.

Operational light rail noise and vibration impacts

Minor changes in operational noise impacts are anticipated from this design change, in locations where LRV speeds would alter due to the stops being shifted. Increases in the predicted noise and vibration impacts are anticipated for receivers adjacent to the original location of Wansey Road stop and UNSW High Street stop, due to LRVs now passing these locations at slightly increased speeds.

Conversely, decreases in operational noise and vibration would be apparent for receivers near to the relocated stops due to reductions in LRV speeds when approaching and departing the stops, in particular receivers along Alison Road.

The EIS predicted compliance with the operational noise and vibration goals throughout this area. Whilst some locations are anticipated to experience increases in operational noise and vibration levels, it is not expected that the proposed design changes along Wansey Road would affect the ability to meet the operational goals. Lowering of some of the light rail alignment along Wansey Road would be expected to reduce noise impacts on some receivers, particularly at ground level, but would not result in any changes to noise impacts for elevated receivers that would maintain a line of sight to the light rail alignment.

Operational road traffic noise impacts

The alteration of road traffic operations along Wansey Road from two-way to one-way is unlikely to result in adverse noise impacts, as the design change would not result in vehicles being any closer to the receivers along Wansey Road. The conversion of the road to one-way is unlikely to result in noticeable noise impacts on receivers either along Wansey Road or on other roads that would carry the displaced Wansey Road traffic.

The impacts of this design change would need to be assessed against the NSW *Road Noise Policy* (RNP) criteria during the detailed design stage once information on the existing and future traffic numbers along Wansey Road and other nearby local roads becomes available. In the event that exceedances of the RNP criteria are identified, feasible and reasonable mitigation measures would be considered.

Aboriginal and non-Indigenous heritage impacts

Built heritage/landscape

The relocated Wansey Road stop would intrude into the boundary of the Royal Randwick Racecourse Heritage Conservation Area and would continue to require removal of 15 significant trees in the north-eastern corner of the conservation area (as previously identified in the EIS). The proposed cycleway and boundary wall along the southern side of the route would pass within approximately 0.5 metres of the north-eastern corner of Wansey Cottage, an element of moderate heritage significance in the conservation area. The new alignment and relocated Wansey Road stop would have a major adverse impact on the setting of Wansey Cottage. The risk of impact on the significant trees in George Dan Reserve would be lessened by the proposed design change.

Overall, the proposed relocation would add an adverse heritage impact on Wansey Cottage, compounding the existing major adverse impact of the CSELR on the Royal Randwick racecourse heritage conservation area assessed in the EIS. The proposed design changes would however have a reduced risk of impact on significant trees of George Dan Reserve and a reduced impact to the Figs that are proposed to be retained along Alison Road as a result of the proposed movement of the light rail alignment.

The relocation of the UNSW High Street stop may allow retention of the Southeast Stables group, an item of moderate/little heritage significance in the Royal Randwick Racecourse Heritage Conservation Area. The impact of the CSELR on the significant trees along Wansey Road would not change to that assessed previously in the EIS. There are no heritage items in the vicinity of the relocated stop on High Street.

Historical archaeology

The proposed new Wansey Road stop location would fall within the Royal Randwick Racecourse HAMU (Zone 2 – Locally significant archaeological resource). Similarly, the UNSW High Street Stop would fall within the High Street HAMU (Zone 2) with both sites having the potential for moderate adverse impacts on historical archaeological resources.

Construction of the CSELR track slab for the relocated stops would require excavation to at least 750 millimetres below the grade of the track. Excavation for the stop shelters and associated infrastructure would involve deeper excavation. These works would continue have a moderate adverse impact on the potential historical archaeological resource of each of these locations.

Aboriginal archaeology

Given its location and the level of ground disturbance that would be required, construction of the revised Wansey Road stop within Zone 1 (State significant archaeological resource) is likely to continue to have potential impact on Aboriginal archaeological evidence where excavation is proposed.

The proposed relocation of the UNSW High Street stop would be located within a section of Zone 1 on remnant high dunes with Aboriginal archaeological potential. Given its location and the level of ground disturbance that would be required, construction of the UNSW High Street stop within Zone 1 would to continue to potentially impact on Aboriginal archaeological evidence where excavation is proposed.

Hazard and risk impacts

Potential issues relating to electromagnetic fields (EMF) associated with the CSELR were previously identified in section 10.10.1 of the EIS (Volume 1A). The proposed relocation of the UNSW High Street stop into High Street has been identified as potentially resulting in some adverse effects to adjoining properties due to stray EMFs (such as the University of NSW Lowy Cancer Research Centre).

As identified in the EIS, targeted consultation with identified sensitive receivers for EMF (such as the UNSW and Prince of Wales Hospital) would be undertaken to inform the detailed design. Any issues identified would be resolved on a case by case basis with solutions such as monitoring and, if necessary, protective screening at the site of the sensitive equipment. This consultation would continue to be undertaken as part of the proposed design presented as part of this design change.

6.11.4 Additional or changed management and mitigation measures

One additional management and mitigation measure has been proposed as a result of the proposed design changes to the CSELR alignment and revised stop locations along Alison and Wansey Roads (refer to new mitigation measure D.15). The additional mitigation measure relates to the management of non-Indigenous heritage impacts as a result of the relocated Wansey Road stop onto Alison Road. With respect to this design change, further investigation of the design of the relocated Wansey Road stop would be undertaken during detailed design with the aim of reducing or avoiding impacts on Wansey Cottage and significant trees in the racecourse.

With respect to the remaining environment issues identified above, the existing management and mitigation measures detailed in Chapter 8 of this Submissions Report are considered to be sufficient to manage the potential impacts of the revised design changes.

6.12 Randwick stop and interchange

6.12.1 Description of the EIS design

The proposed Randwick stop would provide a terminus and interchange with existing eastern suburbs buses. It would also service the retail precinct on Belmore Road and Avoca Street, the Sydney Children's Hospital, the Prince of Wales Hospital, the Royal Randwick Hospital and the broader residential area of Randwick and the coastal inner south-eastern suburbs.

The design of the Randwick stop, as described in section 5.2.3 of the EIS (Volume 1A), would provide two 45-metre long side platforms and would allow for interchange with buses in both the morning and afternoon peak periods, providing efficient transfer of passengers at this location. The design of High Cross Park, as described in the EIS, also provided for large, paved areas to allow for pedestrian movements between bus and light rail services.

6.12.2 Description of design change

During the exhibition of the EIS, a number of submissions from the community and other stakeholders raised concerns regarding the overall impact of the proposal on High Cross Park. These issues have been previously identified in section 5.9.16 of this Submissions Report. In response to these submissions, amendments to the proposed Randwick stop and High Cross Park have been made following the exhibition of the EIS.

The key concerns of the community and other stakeholders regarding the design presented in the EIS included the loss of vegetation and the loss of open space used by the general public as well as hospital patients, visitors and staff (refer to section 5.9.16 of this Submissions Report). The changes to the Randwick stop and High Cross Park described below have responded to the concerns raised by the community and other stakeholders.

To reduce the overall impact of the CSELR within High Cross Park as a result of the submissions received, the light rail stop has been moved approximately three metres north towards Belmore Road (approximately one lane width) relative to the design presented in the EIS. The movement of the Randwick stop has been achieved by removing the existing southbound kerbside traffic and parking lane adjacent to High Cross Park. The removal of this lane allows the Randwick stop to provide an increased amount of parkland within High Cross Park, whilst also maintaining three lanes of traffic along Belmore Road including a single southbound lane for general traffic and two northbound bus only lanes (one for stopped buses to allow passengers to interchange to/from light rail and one permitting buses to pass). To accommodate this lane configuration, the existing northern parking lane would be replaced by the southbound traffic lane.

In addition to the movement of the stop, the revised design would also provide a larger turfed area within the park for local residents and workers than that proposed as part of the design presented in the EIS. It would also provide for an increased open setting of the existing RSL memorial in the centre of the park (relative to the EIS design), in order to retain the existing setting for the memorial.

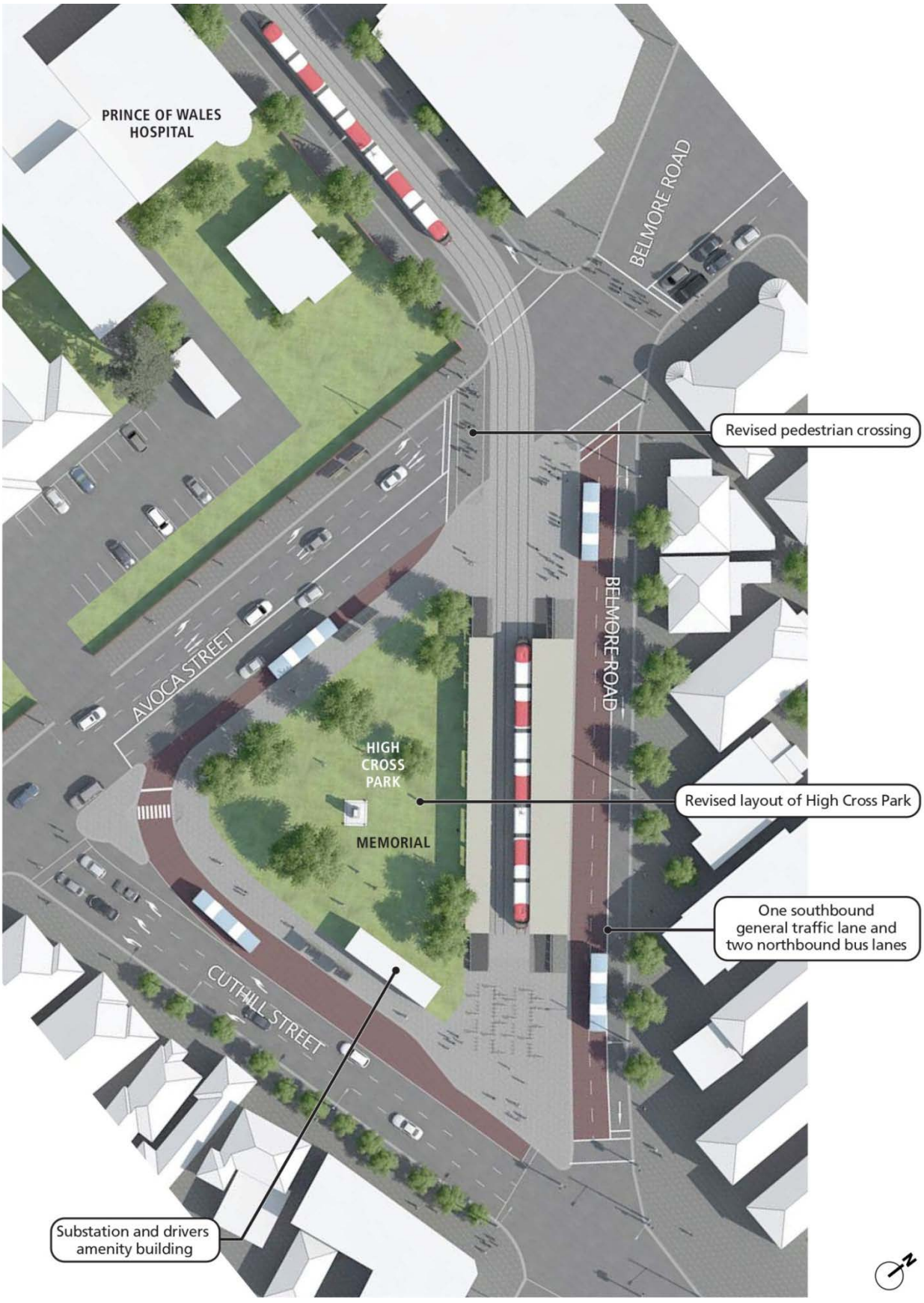
Pathways within the park would be significantly narrowed and removed from the centre of the park, so as to maximise the amount of green space available. The pathways would also be repositioned to capture the primary pedestrian movements for interchange between the proposed bus stops and the light rail platform. The required bicycle storage facilities have been positioned to the end of the Randwick stop so as to minimise the impact on the open space of the park and provide a suitable interchange with the light rail.

The substation and driver amenities building would also be slightly reconfigured within the south-eastern corner of the park, which is considered the optimal location for this facility to maximise the functionality and minimise intrusion into the park.

The proposed bus interchanges would be retained on Belmore Road servicing the morning peak period, and on Avoca Street and Cuthill Street servicing the afternoon peak services as part of the revised design.

Further measures would be considered during detailed design to further mitigate impacts to High Cross Park and its amenity as an area of public open space in response to other community concerns regarding the proposed impacts to High Cross Park.

The revised Randwick stop arrangement and revised proposal for High Cross Park are shown in Figure 6.15.



Note: Indicative only. Subject to detailed design

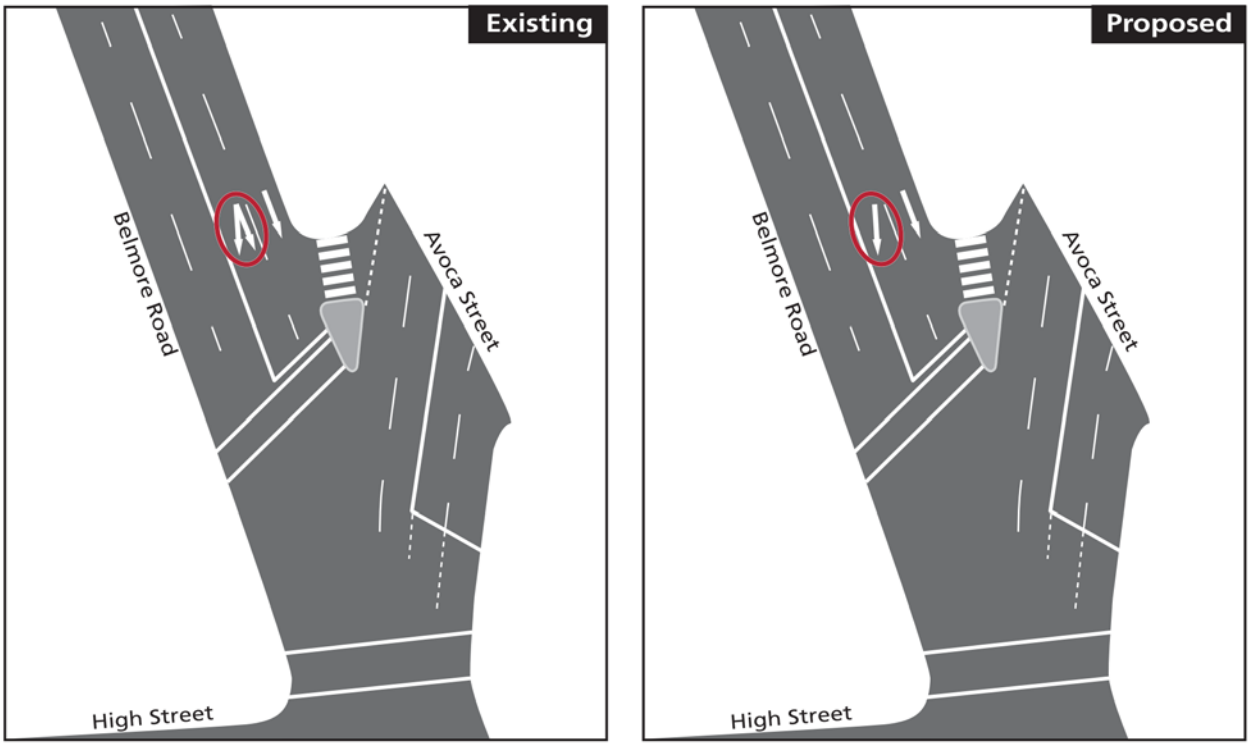
Figure 6.15 Revised layout of High Cross Park

6.12.3 Change in impact

Traffic and transport impacts

As described above, the proposed traffic configuration along Belmore Road (south, adjacent to High Cross Park) would result in one southbound general traffic lane and two northbound bus lanes. As a result of the reduction in the width of Belmore Road (south) the crossing time for pedestrians would be reduced as would the respective pedestrian clearance time required for the movement. The reduced crossing distance would reduce traffic delays associated with left turning traffic having to give way to these pedestrian movements.

With respect to the left turning traffic (from Belmore Road (north) to Belmore Road (south)), the proposed phasing of the intersection of Belmore Road/Avoca Street/High Street would remain unchanged from the EIS proposal. However, due to the reduction of a southbound traffic lane along the section of Belmore Road adjacent to High Cross Park the northern Belmore Road approach lanes would be reconfigured to remove the left hand permissible traffic movement from the inner lane of Belmore Road (refer to Figure 6.16).



Note: Indicative only. Subject to detailed design

Figure 6.16 Changes to configuration of the Belmore Road approach at the intersection of Belmore Road/ Avoca Street/High Street

This change in lane configuration would result in a reduction in traffic capacity for the movement from Belmore Road north into Belmore Road south. In comparison to the design presented in the EIS, the removal of the second southbound traffic lane would prevent any opportunity for the introduction of off peak parking on Belmore Road adjacent to High Cross Park. This would results in a loss of approximately five off-peak parking spaces when compared to the proposed EIS design. The design of the southbound traffic lane would also need to permit safe access and egress to property driveways on Belmore Road that currently benefit from a degree of protection provided by parked cars in the existing northern kerbside parking lane. Any required mitigation measures would be identified and developed as part of the detailed design process.

Traffic modelling undertaken indicates that traffic volumes undertaking the movement from Belmore Road north to Belmore Road south for the morning and afternoon peak periods respectively are 102 vehicles per hour and 74 vehicles per hour. Under the design presented in the EIS, traffic travelling from Belmore Road north to Belmore Road south could utilise either of the two approach lanes. However, given the similar volumes undertaking this through movement and the right turn movement into Avoca Street, the inner lane of Belmore Road would operate more like a dedicated right turn lane. As such no significant change to the operation of the intersection is expected to that reported in Technical Paper 1 (*Transport Operations Report*) in Volume 2 of the EIS.

At the intersection of Belmore Road/Cuthill Street/Coogee Bay Road, the reduction from two to one southbound lane would result in the Level of Service (LoS) changing from LoS B in the morning peak and LoS A in the afternoon peak to LoS C during both peak periods. This is based on initial analysis and is subject to further assessment during detailed design, but demonstrates an acceptable level of performance at this intersection.

Visual and landscape character impacts

Construction assessment

The design change would require construction zones within the park, effectively requiring the park to be closed to the public during construction, which could be for up to five to six years duration. The construction compounds within High Cross Park would be arranged so as not to preclude community events such as Anzac Day ceremonies. This provision would be finalised as part of the final arrangement of the construction compound sites during detailed design. A number of trees would continue to be removed to enable the construction of the light rail stop, as well as catering for the bus stops for the interchange, as previously assessed in the EIS. The construction impacts associated with the park would be similar to those previously assessed in the EIS.

Operational assessment

The design change would enable up to seven existing trees to be retained, consolidating paved areas and creating larger turfed areas for the protection of the existing RSL memorial. As previously identified in the EIS, new tree planting is proposed to compliment and replace lost trees, as well as creating a more ‘park’ like environment. However, this would not replace the character of the vegetation lost within the park. Whilst the proposed design changes would result in the retention of additional trees, the overall proposed design would be expected to continue to have a high adverse visual impact during operation.

Planted tree impacts

As noted previously in section 6.11 of this Submissions Report, the alignment and design for the CSELR proposal as described in the EIS was identified as potentially requiring the removal of up to approximately 280 planted trees within the whole of the Randwick Precinct. The EIS also noted that at High Cross Park, the CSELR proposal would result in the loss of a substantial amount of the trees within this park. This would include all of the significant trees listed on Randwick City Council’s (2007) *Register of Significant Trees* within this park. The trees within High Cross Park would also be impacted by the kerb realignment to accommodate the associated bus interchange at the Randwick stop.

The proposed design changes to Randwick stop and High Cross Park are anticipated to provide an overall reduction in the number of impacted trees within the Randwick Precinct. The design change would enable up to seven existing trees to be retained. Additional existing trees within High Cross Park may also be able to be retained as part of the proposal, and further investigations during detailed design would be undertaken to identify any additional trees (refer to mitigation measures N.1, N.3 and N.4 in Chapter 8 of this Submissions Report). As previously identified in the EIS, new tree planting is also proposed to be undertaken as part of the development of the Randwick stop to compliment and replace lost trees, as well as creating a more 'park' like environment as part of the operation of the CSELR proposal.

The proposed design change would provide a larger turfed area within the park for local residents and workers, in addition to retaining three planted trees which were expected to be removed as part of the design presented in the EIS.

The revised design would still, however, continue to impact on approximately 33 trees within High Cross Park. As noted in the EIS, trees that are removed as a part of the CSELR proposal would be replaced in accordance with Transport for NSW's *Vegetation Offset Guide* (Transport for NSW 2013a) and in consultation with the Randwick City Council. A figure of the proposed planted tree impacts resulting from the proposed design changes assessed in this report has previously been provided in Figure 6.14a and Figure 6.14b.

Property and land use impacts

The proposed design change to Randwick stop would result in a positive impact to the existing land use impacts on High Cross Park during operation to those previously described in the EIS. The proposed design change to the location of the stop would provide a greater amount of open space, retention of some additional trees and retained green space around the RSL memorial than the design which was presented in the EIS (refer to Figure 6.15). The proposed design change to the Randwick stop would not result in any changes to impacts on future land use beyond those identified in the EIS.

Noise and vibration impacts

Construction noise and vibration impacts

For construction, the key change would be the slight shift in construction noise impacts closer to the residential receivers on Belmore Road. The new stop location would closer to residential receivers than the locations assessed in the EIS. The predicted noise impacts during stop construction at the most affected receivers are therefore higher than identified in the EIS, with a predicted increase in the Noise Management Level exceedances of around 1-2 dB compared to the EIS predictions for the stop construction scenarios. In terms of subjective impacts, the stop construction works are predicted to be 'Highly Intrusive' at times, which is consistent with the subjective impacts identified in the EIS assessment.

Operational rail noise and vibration impacts

There would be minor changes to the operational noise and vibration predictions resulting from the shift in the stop location to be slightly closer to the sensitive receiver locations. However, since the LRV speeds at the stop location are low the impacts of this change would be minimal. The EIS predicted compliance with the operational noise and vibration goals throughout this area. It is not expected that this design change would affect the ability to meet the operational goals.

Operational road traffic noise impacts

The alteration of Belmore Road traffic operations may result in a slight increase in road traffic noise impacts, as the design change would result in the nearest traffic lane being closer to the receivers along Belmore Road (i.e. replacing the northern parking lane with the southbound traffic lane). There may also be a change in the mix of road traffic resulting from bus network changes once the light rail is operational. The impacts of this change on road traffic would be reviewed in the detailed design stage once information on the existing and future traffic numbers along Belmore Road and other nearby local roads becomes available.

Aboriginal and non-Indigenous heritage impacts

Built heritage/landscape

The proposed realignment of the Randwick stop would result in a larger area of green space being reinstated within High Cross Park following construction works, including a greater area of green space around the cenotaph. However, the significant trees in the park would still be removed and the historic character of the park would be diminished by the works, the stop and the above-ground substation, which would be located in the south-eastern corner of the park.

Historical archaeology

The previous alignment of the Randwick stop was assessed as having a moderate to major adverse impact on the potential historical archaeological resource. The realignment is also located within the High Cross Park HAMU, defined as Zone 2 (Locally Significant Archaeological Resource). The construction of the realigned Randwick stop would continue to have a moderate to major adverse impact on the potential historical archaeological resource.

Aboriginal archaeology

The previous location of the Randwick stop was assessed as Zone 1 due to the potential for Aboriginal objects to be present and the level of ground disturbance proposed. Given its location and the level of ground disturbance that would be required for the construction of the stop, the proposed relocation is also considered to be within Zone 1 and is anticipated to have the same potential impacts on Aboriginal archaeology as identified in the EIS.

6.12.4 Additional or changed management and mitigation measures

One additional management and mitigation measures has been proposed as a result of the proposed design changes to the Randwick stop and High Cross Park. The additional mitigation measure relates to potential traffic impacts of the proposed design change on the Belmore Road and Avoca Street intersection (refer to new mitigation measure A.16). To further reduce the extent of queuing on Belmore Road, the final design of the Belmore Road and Avoca Street intersection would be reviewed to determine if an additional short approach lane is required and can be incorporated on Belmore Road to manage traffic at this intersection.

The existing management and mitigation measures relating to the environment issues identified above as detailed in Chapter 8 of this Submissions Report are considered to be sufficient to manage the remaining potential impacts of the revised design change.

6.13 UNSW Anzac Parade stop arrangement

6.13.1 Description of the EIS design

The proposed design of the UNSW Anzac Parade stop, as described in the section 5.2.3 of the EIS (Volume 1A), was positioned on the eastern side of Anzac Parade along the existing footpath to the university and would primarily serve the lower campus of UNSW, as well as the National Institute of Dramatic Art (NIDA) on the western side of Anzac Parade. The UNSW Anzac Parade stop, as previously described, was located adjacent to the University Mall which is the main pedestrian axis through the UNSW campus.

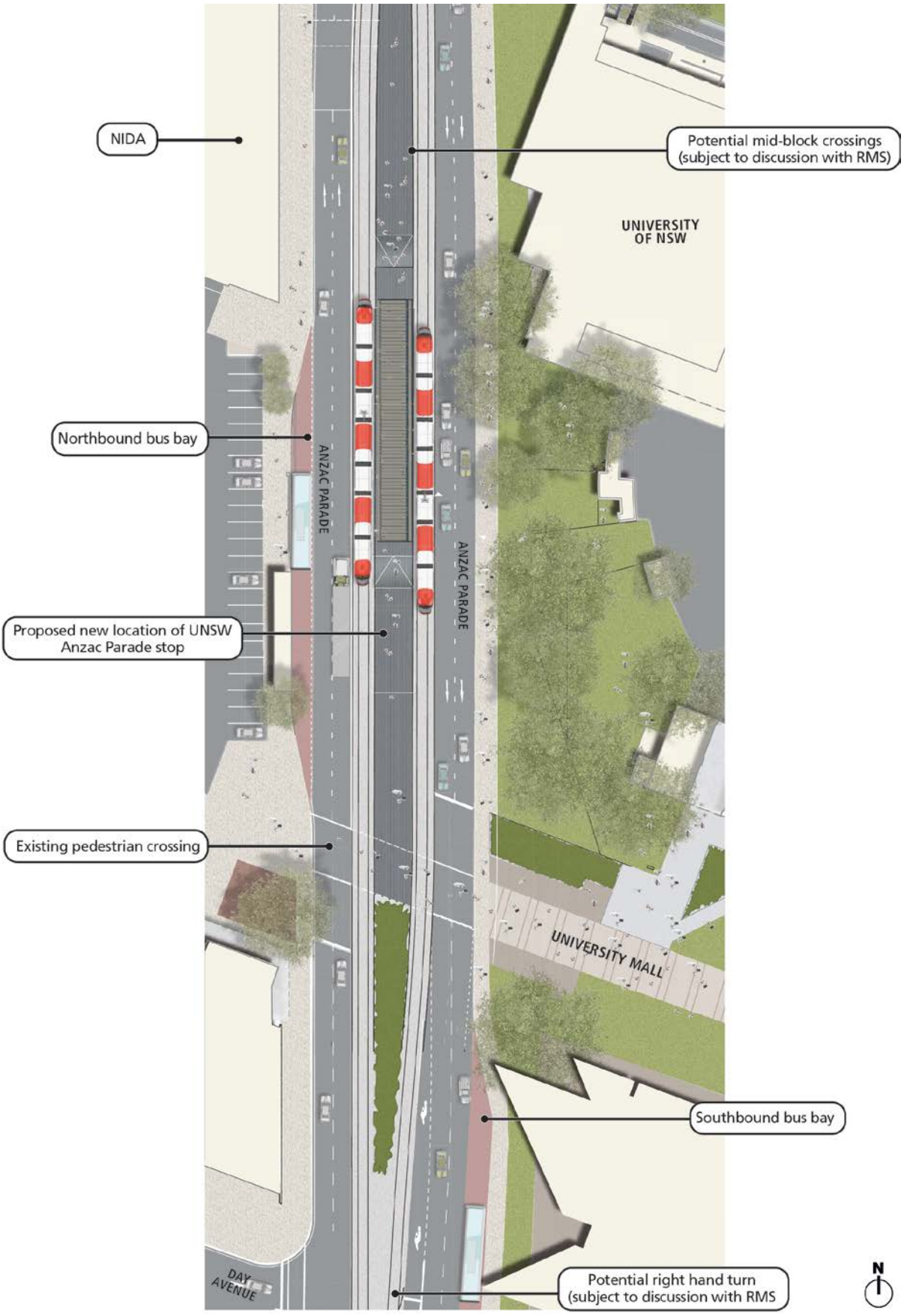
The rational for the location of the stop design presented in the EIS was to minimise the number of students crossing Anzac Parade to access the stop. However, following a master planning exercise of the lower campus conducted by UNSW and through ongoing consultation between UNSW and Transport for NSW, it has been identified that the stop would be better positioned as a centre island platform along of Anzac Parade to provide increased pedestrian safety.

6.13.2 Description of design change

The revised design for the stop would locate the new stop in the centre of Anzac Parade as an island stop, just north of the University Mall crossing. The stop would consist of an approximately 6.4 metre wide island platform and single canopy shelter over the platform. The Anzac Parade roadway would be required to be widened on both sides, with footpaths encroaching into the University boundaries on both sides. A new northbound, indented bus bay would also be located with a similar location to the current bus stop (adjacent to the NIDA car park) to minimise traffic during operation. A new bus stop is also proposed on the eastern side of Anzac Parade, in front of the existing Tyree Building (located on the southern side of the University Mall, the Tyree Building is a major building fronting Anzac Parade). The indented bus bay is proposed to the immediate south of the existing pedestrian crossing, requiring some encroachment into the university campus.

A central island pedestrian walkway would be provided between the stop platform and the existing pedestrian crossing of Anzac Parade at the University Mall, providing an access point for passengers boarding the light rail platform from either side of Anzac Parade, at the southern end of the stop. A potential mid-block pedestrian crossing at the northern end of the stop may potentially be able to be accommodated. The provision of this crossing would be subject to consultation with RMS during detailed design. Fencing would prevent pedestrians from accessing the stop outside of the existing pedestrian crossing at University Mall. The revised stop location and arrangement of the UNSW Anzac Parade stop is shown in Figure 6.16.

The proposed central island light rail stop design would also provide benefits for public transport and would simplify traffic operations by removing the two dedicated LRV traffic light phases at the intersection of Anzac Parade with High Street and University Mall respectively. Furthermore, the retention of a centre running alignment would provide the potential to collocate express buses north of UNSW, which otherwise would need to return to kerbside lanes. The location north of UNSW where the express buses would re-join the general traffic lanes along Anzac Parade would be determined during detailed design following further traffic and intersection modelling. This would allow some of the on-street parking along Anzac Parade to be retained during off-peak periods.



Note: Indicative only. Subject to detailed design

Figure 6.17 Plan of the revised UNSW Anzac Parade stop platform arrangement

As part of the proposed design change, a right hand turn from Anzac Parade (southbound) into Day Avenue would be maintained.

This design change also includes the relocation of the construction worksite from the University boundary on the eastern side of Anzac Parade, to the existing University car park adjacent to the NIDA building (refer to section 6.15 of this Submissions Report for details).

6.13.3 Change in impact

Traffic and transport impacts

Traffic

Retaining the Anzac Parade alignment within the median would remove the requirement for light rail to transition from the median to the eastern kerbside at High Street and then back from the eastern kerbside to the median at the UNSW Mall pedestrian crossing. As a result, the additional light rail phases that were required in the EIS design configuration (side platform within the UNSW campus) to permit these movements at the signalised Anzac Parade/High Street intersection and UNSW pedestrian crossing are no longer required. Removal of these phases would improve operational efficiency of these intersections, particularly at High Street which experiences high volumes of right turning traffic. In addition, the Anzac Parade/High Street intersection would benefit from reduced interphase clearance times as the stop lines at the intersection can be bought forward under the median design option.

Provision of the right turn into Day Avenue would require an additional set of traffic signals compared to that identified in the EIS option. These signals would require close coordination with Anzac Parade/High Street and the UNSW Mall crossing and would need to be designed to ensure a light rail vehicle can be safely stored between each set of signals without blocking traffic entering and leaving the side roads.

Pedestrians

Given the majority of pedestrian demand would cross from the median to the eastern side of Anzac Parade to access the main university campus, the large median allows the opportunity to stagger the UNSW crossing and improve further the operational efficiency of these signals. Provision of a stagger crossing may also provide the opportunity for the crossing to be double cycled to provide increased pedestrian capacity and reduced waiting times.

Relocation of the stop into the median would require all passengers to cross at least half of Anzac Parade. Whilst this would cause an increase in crossing movements at the UNSW Mall crossing when compared to the EIS design, safety is improved by having intuitive light rail movements operating with increased segregation from the eastern footpath. It also allows improved control and management of passenger movements to and from the platform during the acute periods of peak demand generated by UNSW.

Express buses

With the retention of a centre running alignment it would provide the potential to collocate express buses north of UNSW, which otherwise would need to return to kerbside lanes. The location north of UNSW where the express buses would re-join the general traffic lanes along Anzac Parade would be determined during detailed design following further traffic and intersection modelling. As with the EIS design, the northbound morning peak hour bus lane would be retained along sections of Anzac Parade for non-express services that are required to stop at the kerb. Outside of the morning peak period, these sections of bus lane would act as off-street parking.

No significant change to performance of the network is expected to that presented in the EIS and Technical Paper 1 (*Transport Operations Report*) in Volume 2 of the EIS. Additional traffic capacity and reduced delays at the Anzac Parade/High Street intersection and the UNSW Mall crossing that result from the reduction in the number of phases, is likely to be offset by the additional set of traffic signals at Day Avenue and the need to closely coordinate traffic movements between the three sets of traffic signals in this section of the corridor.

The length of the right turn bay into Day Avenue is limited by the proximity to the University Mall crossing, so has the potential to spill out and effect southbound traffic on Anzac Parade. As such, the design of this intersection would be dependent upon additional modelling to be undertaken during detailed design development to ensure this potential issue is managed. Dependent upon the outcomes of this analysis, restrictions on time periods and vehicle types permitted to make the right turn may be considered in consultation with RMS and Randwick City Council.

Visual and landscape character impacts

The viewpoints within the vicinity of the UNSW Anzac Parade stop are characterised by the University buildings set within landscaped grounds. The University Mall runs perpendicular to Anzac Parade in the middle ground of the view. The ground plane is visually active with four lanes of traffic and two bus lanes, light poles, traffic lights, central fence and bollards delineate the busy footpaths. The assessment of the potential impacts to the landscape character and viewpoints as a result of the proposed design change during construction and operation are described below.

Construction assessment

As part of the proposed design change, a worksite would be required within the existing University car park adjacent to the NIDA building during construction. The primary site works for the light rail tracks and stop would be in the centre of Anzac Parade where the platform would be constructed. The footpaths adjacent to the stop would need to be realigned during time of construction, which would impact upon the existing University boundary fence and hedge on the eastern side of Anzac Parade. This may require the removal of some existing trees within the University boundary (south of University Mall) adjacent to the footpath.

Existing landscape areas associated with the Tyree Building forecourt would also be removed for the bus stop, and would create an area of congestion during construction, which would need to be managed in the appropriate manner.

Operational assessment

With this design change the roadway would be widened, the footpaths realigned (with a loss of amenable open space), the loss of a landscaping associated with the Tyree Building, a reduction in the footpath widths in front of the Tyree Building, a number of trees removed, and the inclusion of an island platform within the centre of the roadway.

It is expected that the combined impact of these changes would result in a reduction to the landscape amenity at street level which is of regional sensitivity. However, the central location of the stop would reduce the loss of many existing and significant trees along the university's east side of Anzac Parade frontage as was proposed in the EIS, which would represent a significant overall benefit. The design change would result in a negligible adverse landscape impact during operation, resulting in an overall beneficial outcome from the previously assessed design at this location which was identified as having a moderate adverse impact.

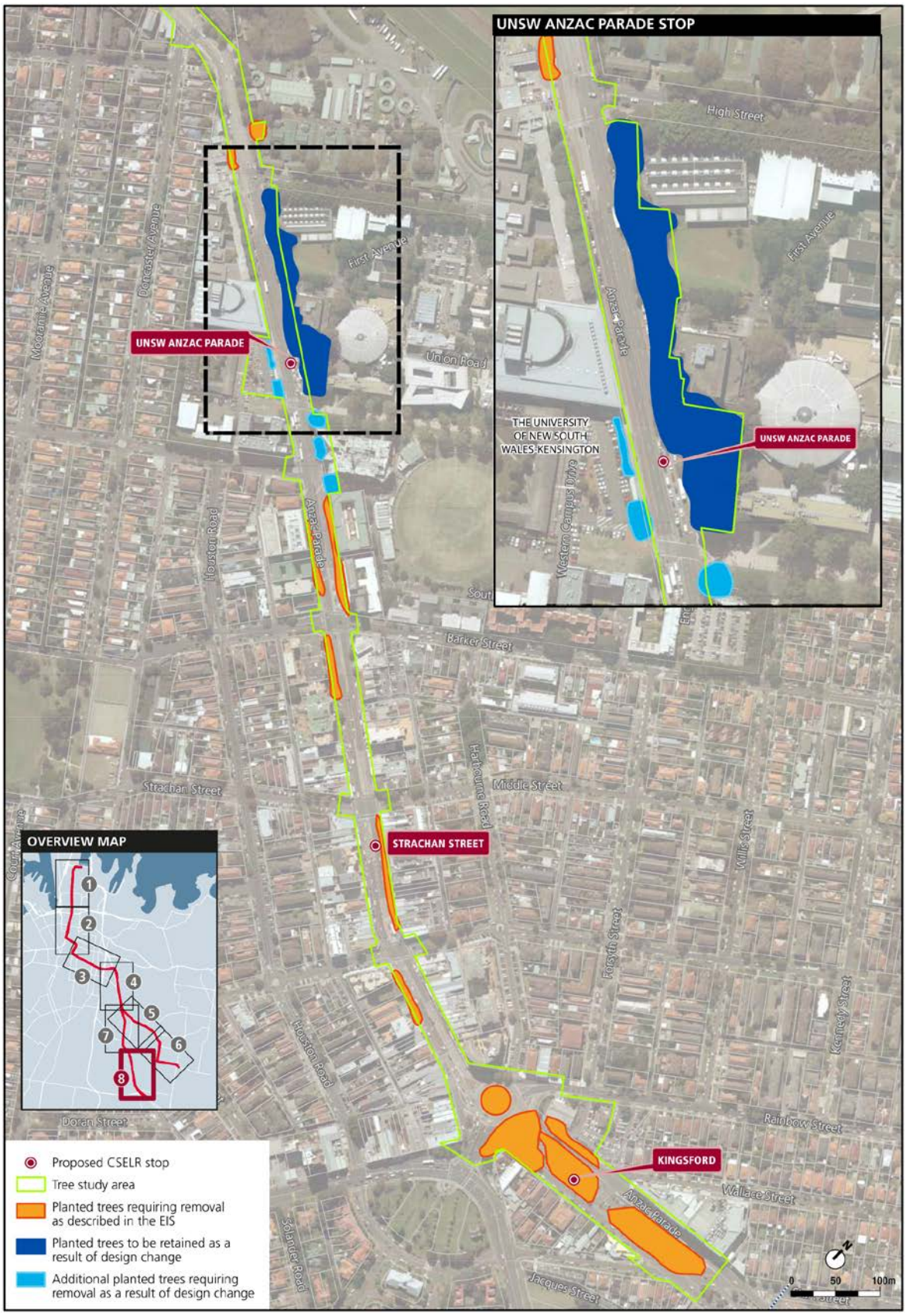
Planted tree impacts

The alignment and design for the CSELR proposal as described in the EIS was identified as potentially requiring the removal of up to approximately 160 planted trees within whole of the Kensington/Kingsford Precinct. With respect to the proposed design change for the UNSW Anzac Parade stop, the EIS noted that the mature trees at the proposed UNSW Anzac Parade stop (as part of the EIS design) would be directly impacted by the proposed UNSW stop and associated construction footprint.

The change in impact to planted trees resulting from the proposed design changes within the vicinity of the UNSW Anzac Parade stop are shown in Figure 6.17.

The movement of the CSELR proposal alignment and UNSW Anzac Parade stop into the centre of Anzac Parade and further assessment of the proposed alignment between High Street and Day Avenue would provide an overall reduction in the number of impacted trees within the Kensington/Kingsford Precinct. The proposed design change to the alignment along Alison Road would allow for the retention of approximately 23 significant trees along Anzac Parade within the UNSW campus in comparison to the light rail alignment presented in the EIS. This would provide a significant overall benefit to the retention of planted trees in this area and would assist in continuing to providing screening of the UNSW campus from Anzac Parade.

The revised design for the UNSW Anzac Parade stop would, however, result in the removal of approximately two additional trees from within the NIDA car park to the west of the Anzac Parade to accommodate the revised construction compound location. These trees were identified as previously being retained as part of the EIS; however, are not as significant as the previously proposed trees to be removed on the eastern side of Anzac Parade.



Note: Indicative only. Subject to detailed design

Figure 6.18 Potential change in impact to planted trees resulting from the changes within the vicinity of the UNSW Anzac Parade stop

Noise and vibration impacts

Construction noise and vibration impacts

For construction, the key change would be the shift in construction noise impacts closer to NIDA and other UNSW buildings to the west of Anzac Parade. The new stop location is at a similar distance to the closest educational receivers as the locations assessed in the EIS; however, the specific building which would be subject to the worst-case impacts would now be those to the west of Anzac Parade. The predicted noise impacts during stop construction at the most affected receivers are therefore similar to those identified in the EIS. In terms of subjective impacts, the stop construction works are predicted to be 'Highly Intrusive' at times, which is consistent with the subjective impacts identified in the EIS assessment.

Operational light rail noise and vibration impacts

There is potential for corresponding changes to the operational noise and vibration predictions, resulting from the shift in the alignment. The EIS predicts potential exceedances of the operational airborne and ground-borne noise trigger levels at NIDA with the alignment assessed in the EIS. With regard to exceedances of the airborne noise trigger levels, it is noted that existing road traffic noise is above the predicted light rail noise levels and mitigation of airborne noise is unlikely to be required, even with the proposed alignment change.

The EIS identified that further investigations were required during the detailed design stage to establish the sensitivity of NIDA to ground-borne noise. This would continue to be the case as a result of the proposed design change, despite LRV speeds at the stop location being low, due to the stringent ground-borne noise trigger level adopted in the EIS assessment. This requirement for further work would remain with the design change to enable selection of an appropriate vibration-attenuating track-form in the vicinity of NIDA if required.

Operational road traffic noise impacts

The design change would require the Anzac Parade roadway to be widened on both sides, moving road traffic and buses slightly closer to University buildings. It is assumed that there would not be a change in the numbers of road traffic, except for the removal of some bus services which would be replaced by the light rail. Overall, it is expected that adverse operational road traffic noise impacts of the change would be minimal. Mitigation of operational noise from road traffic due to the changes to the Anzac Parade stop is unlikely to be required.

Property and land use impacts

The proposed design change to UNSW Anzac Parade stop would result in a positive impact to the existing land use impacts on the UNSW campus during operation to those previously described in the EIS. The proposed design change to the location of the stop would retain a greater amount of open/green space within the lower campus and would retain all of the existing trees on the eastern side of Anzac Parade between High Street and the University Mall.

The proposed design change to the UNSW Anzac Parade stop would not result in any changes to impacts on future land use beyond those identified in the EIS.

Aboriginal and non-Indigenous heritage impacts

Built heritage/landscape

The previous location of the UNSW Anzac Parade stop was assessed as having a major adverse impact on the existing group of heritage significant trees along Anzac Parade within the UNSW campus. Relocating the UNSW Anzac Parade stop would allow the UNSW significant trees along Anzac Parade to be retained. This would remove the adverse heritage impact arising from the side platform design assessed in the EIS and provide a substantial overall heritage benefit in this location.

Historical archaeology

The previous location of the UNSW Anzac Parade stop was assessed as having a moderate adverse impact on the potential historical archaeological resource. There was some potential for historical archaeological evidence of the former Kensington Racecourse to be impacted by the construction of the UNSW Anzac Parade stop in this location.

As with the design presented in the EIS, the proposed new stop location in the centre of Anzac Parade also falls within the University of New South Wales HAMU (Zone 2 – Locally Significant Archaeological Resource). The proposed relocation of the UNSW Anzac Parade Stop is likely to also have a moderate adverse impact on the potential historical archaeological resource. The proposed relocation is likely to avoid historical archaeological evidence of the former Kensington Racecourse. However, other historical archaeological evidence may be impacted by the relocation, such as evidence of earlier alignments of Anzac Parade or of nineteenth and early twentieth-century services.

As with the construction for the previously proposed stop location, construction of the CSELR track slab for the UNSW Anzac Parade Stop would require excavation to at least 750 millimetres below the grade of the track. Excavation for the stop shelter and associated infrastructure would involve deeper excavation. These works would continue to have a moderate adverse impact on the potential historical archaeological resource.

Aboriginal archaeology

The previous location of the UNSW Anzac Parade stop was assessed as Zone 1 due to the potential for Aboriginal objects to be present and the level of ground disturbance proposed. Given its location and the level of ground disturbance that would be required, construction of the UNSW Anzac Parade stop is likely to continue to potentially impact on Aboriginal archaeological evidence where excavation is proposed.

6.13.4 Additional or changed management and mitigation measures

Three additional management and mitigation measures are proposed as a result of the proposed design change to the UNSW Anzac Parade stop. These relate to potential traffic impacts and are identified below in Table 6.6.

Table 6.6 Proposed additional mitigation measures as a result of the proposed design change to the UNSW Anzac Parade stop

Environmental impact	Proposed management and mitigation measure
Traffic and transport	The location north of UNSW where the express buses would re-join the general traffic lanes along Anzac Parade would be determined during detailed design following further traffic and intersection modelling (refer to new mitigation measure A.17).
	Coordination of the Anzac Parade/High Street and the UNSW Mall crossing would need to be undertaken during detailed designed to ensure a light rail vehicle can be safely stored between each set of signals without blocking traffic entering and leaving the side roads (refer to new mitigation measure A.18).
	The length and design of the right turn bay into Day Avenue would be investigated during detailed design, subject to additional modelling to be undertaken (refer to new mitigation measure A.18).

All other existing management and mitigation measures relating to the environment issues identified above as detailed in Chapter 8 of this Submissions Report are considered to be sufficient to manage the remaining potential impacts of the revised design change.

6.14 Substation locations

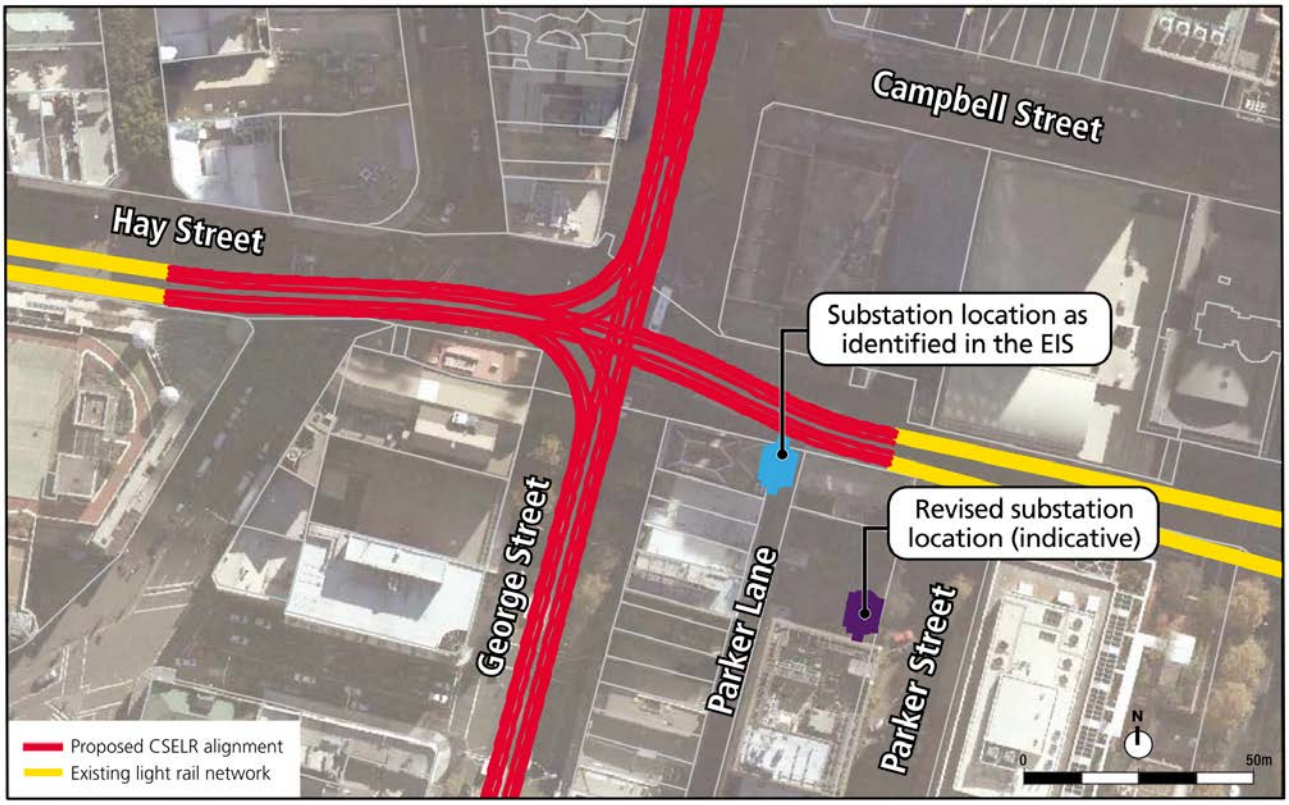
6.14.1 Description of the EIS design

As part of the EIS, it was noted that 12 substations and one sectioning hut would be required for the CSELR proposal (inclusive of proposed substations within the Randwick stabling facility and the Rozelle maintenance depot). The locations of the substations were shown on Figure 5.1a to Figure 5.1h of the EIS (Volume 1A).

6.14.2 Description of design change

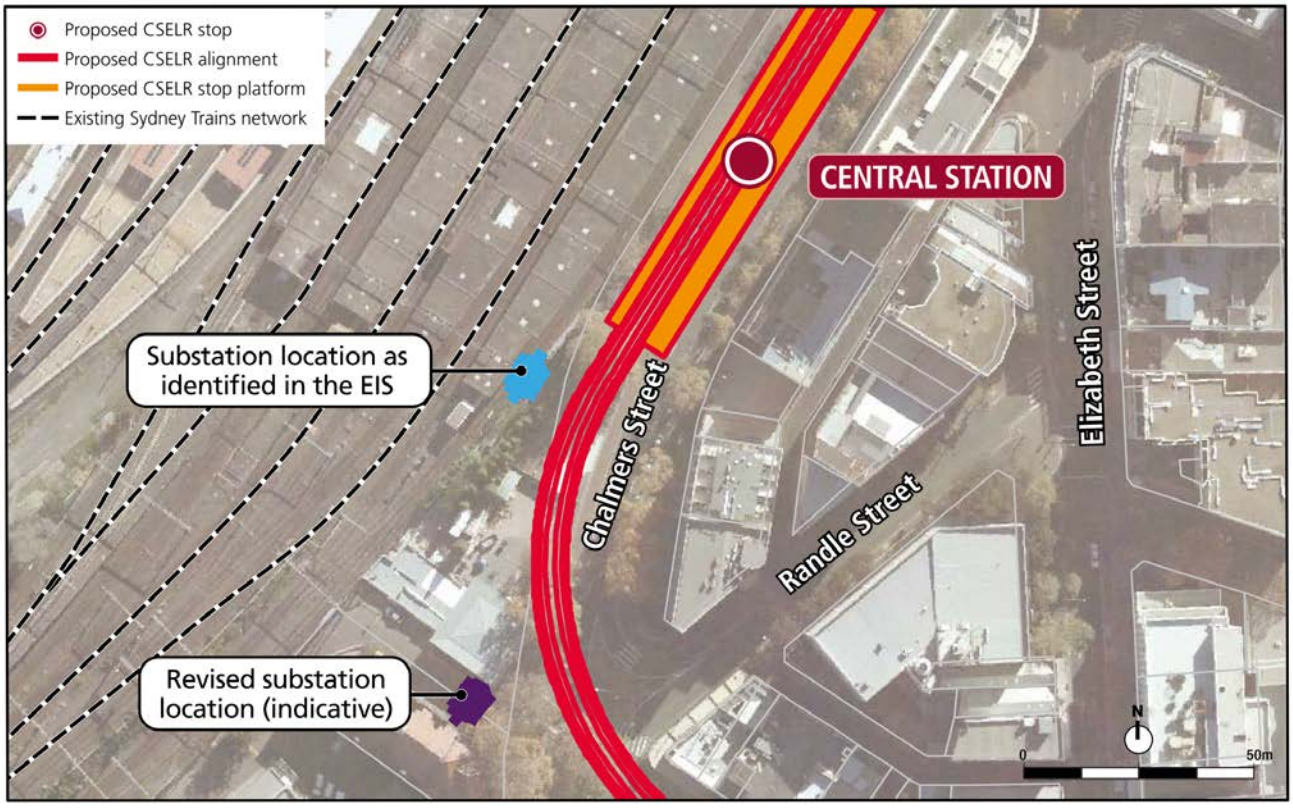
Following the exhibition of the EIS the proposed substations have been refined as part of the ongoing development of the proposal design to improve reliability of the electrical supply for the proposal. The changes to these locations are shown in Figure 6.19 to Figure 6.21 and are described in Table 6.7.

The precise location for each of the substations would be further refined during the detailed design of the proposal.



Note: Indicative only. Subject to detailed design

Figure 6.19 Revised location for the Parker Lane substation



Note: Indicative only. Subject to detailed design

Figure 6.20 Revised location for the Central Station substation

Note: Indicative only. Subject to detailed design

Figure 6.21 Revised location for the Surry Hills substation (previously Ward Park substation)

Table 6.7 Proposed changes to the CSELR substation locations and potential impact

Substation location and current location	Proposed revised location
Parker Lane substation The EIS identified this substation would be located within Parker Lane, near the intersection of Parker Lane and Hay Street, located above ground.	Following refinement of the design, the Parker Lane substation is proposed to be relocated to an adjoining car park area between Parker Lane and Parker Street (refer to Figure 6.19). The substation would be located above ground and access to this site would be via the existing car park access point on Parker Street.
Chalmers Street substation The EIS identified this substation would be located within property owned by Sydney Trains, near the Ibero-American Plaza, located above ground.	Following refinement of the design, the Chalmers Street substation is proposed to be relocated to an existing, disused building within Sydney Trains land to the south of the previously proposed location (refer to Figure 6.20). This building has been identified as a former Sydney Trains radio workshop. Access to this site would be via an existing laneway access point which currently provides access to the Sydney Trains Prince Alfred substation.
Surry Hills substation (previously Ward Park substation) The EIS identified this substation would be located within Ward Park, to the south of the proposed stop, located below ground.	Following refinement of the design, the Ward Park substation is proposed to be relocated to an area within the new Wimbo Park site, at the south-eastern corner of the park, near the intersection of Parkham Lane and Parkham Place (refer to Figure 6.21). The substation would be located above ground. Access to the substation would be via Parkham Street and Parkham Lane.

6.14.3 Change in impact

Visual and landscape character impacts

Parker Place substation

The relocated above ground substation would be located within the existing car park between Parker Lane and Parker Place. The substation would be positioned adjacent to the existing Ausgrid substations in the same site; therefore, the visual impact of the proposed substation would be in keeping with the existing surrounding infrastructure in this location.

Chalmers Street substation

The proposed Chalmers Street substation would be relocated to within an existing building, located behind the existing heritage Railways Institute building off Chalmers Street. This location would have minimal visual impact as it would be contained within an existing building and would not be visible from the street level.

Surry Hills substation

The proposed Surry Hills substation (former Ward Park substation) would be relocated from Ward Park to be within the new Wimbo Park site. The substation would be located above ground within the proposed parkland area following the demolition of the Olivia Gardens apartment complex. The substation would be set back from existing properties on Parkham Lane and Parkham Place, and would be screened from view. The substation would be clad with a material that is visually consistent with the existing materials and character of the area, to minimise its visual impact within the parkland setting.

Property and land use impacts

The potential property and land use impacts associated with the revised substation locations are provided in Table 6.8. The proposed design changes to the location of the identified substations would not result in any changes to impacts on future land use beyond those identified in the EIS.

Table 6.8 Proposed changes to the CSELR substation locations and potential impact

Substation	Revised impact
Parker Lane substation	The EIS identified this substation to be located within an existing laneway which would impact on the use of the laneway and access to and from some properties located along Parker Lane. The revised substation location within the existing car park along Parker Street would improve the accessibility to existing properties within Parker Lane.
Chalmers Street substation	The revised location of the Chalmers Street substation would result in minimal impacts to land use and property compared to those assessed in the EIS. The revised location would continue to utilise existing Sydney Trains land and would not impact on private property. Access to this site would be via an existing laneway access point which would not impact on access to other Sydney Trains or private properties in the immediate vicinity of the substation.
Surry Hills substation	The revised location for the Surry Hills substation would be within the new Wimbo Park and would have similar impacts to those assessed in the EIS for the previous Ward Park location. The revised location would continue to utilise open space and would not impact on private property.

Noise and vibration impacts

Construction noise and vibration impacts

For construction, the impact of the changes would include a slight increase in construction noise impacts at receivers which are now adjacent to the revised substation locations (as the construction impacts would be increased to include construction of the substations in these locations, rather than just the light rail), and a decrease in impacts at locations where substations have moved away from sensitive receivers (due to reduced construction activities in these locations). The change in noise impacts compared to the EIS scenario varies in each precinct and in some cases is predicted to reduce at certain receiver types (where a substation is no longer close to the receiver).

A qualitative construction noise assessment of the potential impacts of the proposed substations was previously undertaken as part of the EIS. This assessment qualitatively assessed each of the potential impacts of the proposed substations in each precinct for daytime, evening and night-time periods relative to the background noise levels in each area during each period. The results of this assessment were presented in section 12.5.2 of Technical Paper 11 (*Noise and Vibration Impact Assessment*) in Volume 6 of the EIS. A revised qualitative construction noise assessment of the potential impacts of the revised substation sites has been undertaken. A comparison of the potential impacts of the revised substation locations is presented in Table 6.9.

Table 6.9 Qualitative construction noise assessment resulting from revised substation locations by precinct

Activity	Qualitative assessment (as presented in EIS)			Qualitative assessment of refined substation locations		
	Day	Evening	Night	Day	Evening	Night
City Centre Precinct						
Excavation	Clearly audible	Moderately Intrusive	Moderately Intrusive	**Noticeable**	**Clearly audible**	**Clearly audible**
Foundation preparation	Clearly audible	Clearly audible	Clearly audible	**Noticeable**	**Noticeable**	**Noticeable**
Delivery and placement of substation	Noticeable	Noticeable	Clearly audible	**Below RBL**	**Below RBL**	**Noticeable**
Surry Hills Precinct						
Excavation	Highly Intrusive	Highly Intrusive	Highly Intrusive	Highly Intrusive	Highly Intrusive	Highly Intrusive
Foundation preparation	Moderately Intrusive	Moderately Intrusive	Highly Intrusive	**Highly Intrusive**	**Highly Intrusive**	Highly Intrusive
Delivery and placement of substation	Moderately Intrusive	Moderately Intrusive	Moderately Intrusive	Moderately Intrusive	Moderately Intrusive	**Highly Intrusive**

Note 1: Locations with an increase in the predicted subjective impact category from that identified in the EIS are shown in red text.
Locations with a reduction in the in the predicted subjective impact category from that identified in the EIS are shown in green text.
At locations where the subjective impact has not changed, text is not coloured.

Note 2: The qualitative descriptions are related to the quantitative predicted noise levels as follows:

- Below RBL LAeq(15minute) noise levels below the background
- Noticeable LAeq(15minute) noise levels within 10 dB of the background
- Clearly audible LAeq(15minute) noise levels 10 dB to 20 dB above the background
- Moderately intrusive LAeq(15minute) noise levels 20 dB to 30 dB above the background
- Highly intrusive LAeq(15minute) noise levels more than 30 dB above the background

Operational noise impacts

The substations are considered to be fixed facilities and as such noise levels are required to be assessed in accordance with the *Industrial Noise* Policy (INP) (EPA 2000). The INP sets two separate noise criteria to meet environmental noise objectives: one to account for intrusive noise and the other to protect the amenity of particular land uses. The more stringent of these two criteria usually defines the proposal specific noise levels. For both amenity and intrusiveness, night-time criteria are typically more stringent than daytime or evening criteria.

The revised locations of substations are shown in Table 6.10 along with the nearest sensitive receptors. The operation of the light rail would span all time periods to be assessed under the INP (daytime, evening and night), the night-time would be the controlling period for residential receptors. For other receptor types, the controlling time period is determined by the times of use of the receptor.

Table 6.10 Revised substation locations and sensitive receptors

Substation	Nearest sensitive receptor	Receptor type	Controlling time period	Distance to receptor boundary
Parker Lane substation	4 Parker Street	Commercial	Day	5 metres
Chalmers Street substation	101 Chalmers Street	Commercial	Day	5 metres
Surry Hills substation	Parkham Street/South Dowling Street	Residential	Night	10 metres

Since the transformer noise emissions associated with the operation of traction substations are reasonably continuous, the $L_{Aeq(15minute)}$ and the $L_{Aeq(period)}$ noise criteria are essentially the same and the more stringent of the intrusiveness or the amenity criteria sets the noise goals. The resulting noise criteria for the relocated substations are shown in Table 6.11.

Table 6.11 Noise goals for substations

Substation	Monitoring location	Receptor type	Existing night-time noise levels (dBA)		Operational noise goals (dBA)	
			RBL	LAeq	$L_{Aeq(15min)}$ Intrusive	$L_{Aeq(Period)}$ Amenity [1,2]
Parker Lane substation	BG12	Commercial	52	66	n/a	**65**
Chalmers Street substation	BG12	Commercial	52	66	n/a	**65**
Surry Hills substation	BG04	Residential	39	46	44	**37**

Note 1: For the outer precincts, the Suburban acceptable amenity levels are used. For areas of recreation, the amenity criterion is an external level.

Note 2: Controlling criteria indicated in **bold**.

Predicted noise impacts

The major noise sources at substations are electric transformers, which operate continually throughout the day and night. The proposed transformers are rated at 11 kVA. The sound power level for a single transformer is 80 dBA. A correction factor of 5 dB has been applied to the modelling to account for tonal and low frequency noise. The predicted substation L_{Aeq} noise impacts at the nearest sensitive receptors are shown in Table 6.12.

Table 6.12 Substation predicted noise impacts

Substation	Receptor type	Operational noise (dBA)		Comments
		L_{Aeq} controlling noise goal	Predicted L_{Aeq} noise level	
Parker Lane substation	Commercial	65	63	Complies with the noise goal
Chalmers Street substation	Commercial	65	63	Complies with the noise goal
Surry Hills substation	Residential	37	57	Exceeds the noise goal – mitigation required

Note: Predictions include a 5 dB penalty for tonality/low frequency and do not include any shielding of the transformers.

Discussion of substation noise impacts and mitigation measures

It is considered that the substations at all these locations can be designed to meet the noise goals by provision of shielding or an enclosure of the noise source. Compliance is predicted at all but one of the new proposed substation locations. A 20 dB exceedance of the night-time amenity goal is predicted at the relocated Surry Hills substation. This results from the close proximity of the substation to the nearest residential receivers. For the revised Surry Hills substation, the required mitigation is likely to include enclosure of the substation, as well as locating the transformers (which are typically the main source of noise at substations) within the substation building away from the nearest sensitive receivers.

Aboriginal and non-Indigenous heritage impacts

The potential impacts on aboriginal and non-Indigenous heritage with respect to the proposed design changes to the substations for the CSELR proposal are outlined in Table 6.13 below.

Table 6.13 Predicted heritage impacts on the revised substation locations

Substation	Built heritage/landscape	Historical archaeology	Aboriginal archaeology
Parker Lane substation	The previous location for the proposed above-ground Hay Street substation, in Parker Lane, was assessed as having a moderate adverse impact on views to three heritage items in the vicinity: the Palace Hotel Complex, Haymarket Library and the Corporation Building. The relocation of the proposed substation into the car park between Parker Lane and Parker Street would avoid these heritage impacts and would not result in any new adverse impact, providing an overall beneficial impact.	These works would have a moderate to major adverse impact on the potential historical archaeological resource, depending on the extent and nature of the proposed ground disturbance works. This is consistent with the impacts identified in Technical Paper 5 (*Heritage Impact Assessment*) in Volume 4 of the EIS.	The proposed relocation site of the Parker Lane substation does not fall within any Aboriginal archaeological zoning as defined in Technical Paper 5 (*Heritage Impact Assessment*) in Volume 4 of the EIS. However, given its location and that excavation would be required for its installation, construction of the proposed substation may impact on Aboriginal archaeological and result in a similar impact to that assessed in the EIS.
Chalmers Street substation	The contributory significance of the former radio workshop was not assessed in the *Central Station Conservation Management Plan 1995*. The radio workshop is included within the State Heritage Register (SHR) curtilage of Central Station. The Railway Institute Building, next to the workshop, is listed on the SHR (item no. 01257) and Sydney LEP 2012. Overall, the proposed substation may have some potential adverse impact on the potentially significant former radio workshop building, subsequent to the detailed design of the proposed use of the radio workshop.	The previous location for the Chalmers Street substation was assessed as having a moderate to major adverse impact on the potential historical archaeological resource, depending on the extent and nature of the proposed works. The proposed substation is likely to have a moderate to major adverse impact on the potential historical archaeological resource, depending on the extent and nature of the proposed ground disturbance works. This is consistent with the impacts identified in Technical Paper 5 (*Heritage Impact Assessment*) in Volume 4 of the EIS.	The previous location for the Central Station substation was assessed as Zone 1 due to the potential for Aboriginal objects to be present and the level of ground disturbance proposed. The proposed substation does not fall within any Aboriginal archaeological zoning as defined in Technical Paper 5 (*Heritage Impact Assessment*) in Volume 4 of the EIS; however, given its location and that excavation would be required for its installation, the proposed substation is likely to also be considered as part of Zone 1 and is likely to impact on Aboriginal archaeological evidence where excavation is proposed.

Substation	Built heritage/landscape	Historical archaeology	Aboriginal archaeology
Surry Hills substation	Ward Park is not listed as a heritage item; however, it is likely to be of some social value to the local community. Relocation of the substation out of Ward Park would remove the minor adverse visual impact that this element would have on the aesthetic significance of the park. The proposed new location would be within the Bourke Street South Heritage Conservation Area, within the footprint of the Olivia Gardens construction site, facing Parkham Lane. No heritage items face onto the lane. While the proposed substation would be an above-ground element in the proposed new Wimbo Park, it would be considerably smaller than the present Olivia Gardens apartments and would not be a major new element in the conservation area.	Relocation of the Surry Hills substation (former Ward Park substation) would remove the moderate adverse impact from the Ward Park HAMU (Zone 2 – Locally Significant Historical Archaeological Resource). The proposed relocation within the footprint of the Olivia Gardens construction site falls within the Olivia Gardens HAMU, (defined as Zone 3 – No Historical Archaeological Resource Present in the EIS). The new site of the substation would therefore be unlikely to have an impact on any potential historical archaeological resource.	Relocation of the Ward Park substation would remove the potential for the construction of the substation to impact on Aboriginal archaeology. The proposed relocation site within the Olivia Gardens construction site was previously defined as Zone 4 (No potential archaeological potential) in the EIS and is therefore unlikely to impact on Aboriginal archaeology.

6.14.4 Additional or changed management and mitigation measures

Two additional management and mitigation measure are proposed as a result of the proposed design changes to the proposed substation locations. These management and mitigation measures are outlined below in Table 6.14.

Table 6.14 Proposed additional mitigation measures as a result of the proposed design change to the proposed substation locations

Environmental impact	Proposed management and mitigation measure
Visual and landscape character	The detailed design of the substation would determine the most appropriate cladding materials to ensure that the substation is visually consistent with the existing materials and character of the area and to minimise its visual impact within the parkland setting (refer to mitigation measure C.3).
Aboriginal and non-Indigenous heritage	The significance of the former radio workshop would be assessed to determine the impact of this design change on Central Station, and to guide the detailed design of works to install the proposed substation. If the existing radio workshop structure is found to be significant, the early/original form and fabric would be retained as far as practicable. Archival recording of the building would be undertaken prior to any works commencing (refer to new mitigation measure D.17).

With respect to the remaining environment issues identified above, the existing management and mitigation measures relating as detailed in Chapter 8 of this Submissions Report are considered to be sufficient to manage the remaining potential impacts of the revised design changes.

6.15 Construction compounds – location and extent

6.15.1 Description of the EIS design

A number of construction compound sites were identified in section 6.7 of the EIS (Volume 1A) and shown in Figure 6.2a to Figure 6.2h of the EIS (Volume 1A). These sites were selected as construction compounds due to the linear nature of the CSELR proposal and the limited land available to accommodate such construction facilities. Each site would be required for use as a construction compound for varying periods throughout construction of the CSELR proposal.

6.15.2 Description of design change

The construction impact area and proposed construction compound sites for the CSELR proposal, as shown in Figures 6.2a to 6.2h of the EIS (Volume 1A), have been amended in various locations based on a review of constructability requirements, design refinement and changes to the design of the proposal (such as the realignment and relocation of the proposed tunnel and Moore Park stop described in section 6.8 of this Submissions Report). An outline of the proposed changes in construction impact area and construction compound worksites is provided in Table 6.15. A summary of the potential change in impact of the CSELR proposal as a result of each change is also provided.

An assessment of the impacts likely to be associated with the proposed amendments to the construction compound areas is provided in the following sections. As demonstrated in the following sections, the proposed construction impact area amendments would not significantly alter the impact of the CSELR proposal, relative to those documented in the EIS. The revised construction impact area and construction compound sites for the CSELR proposal are shown in Figure 6.22a to Figure 6.22h.

Table 6.15 Proposed additional or reconfigured primary construction compounds

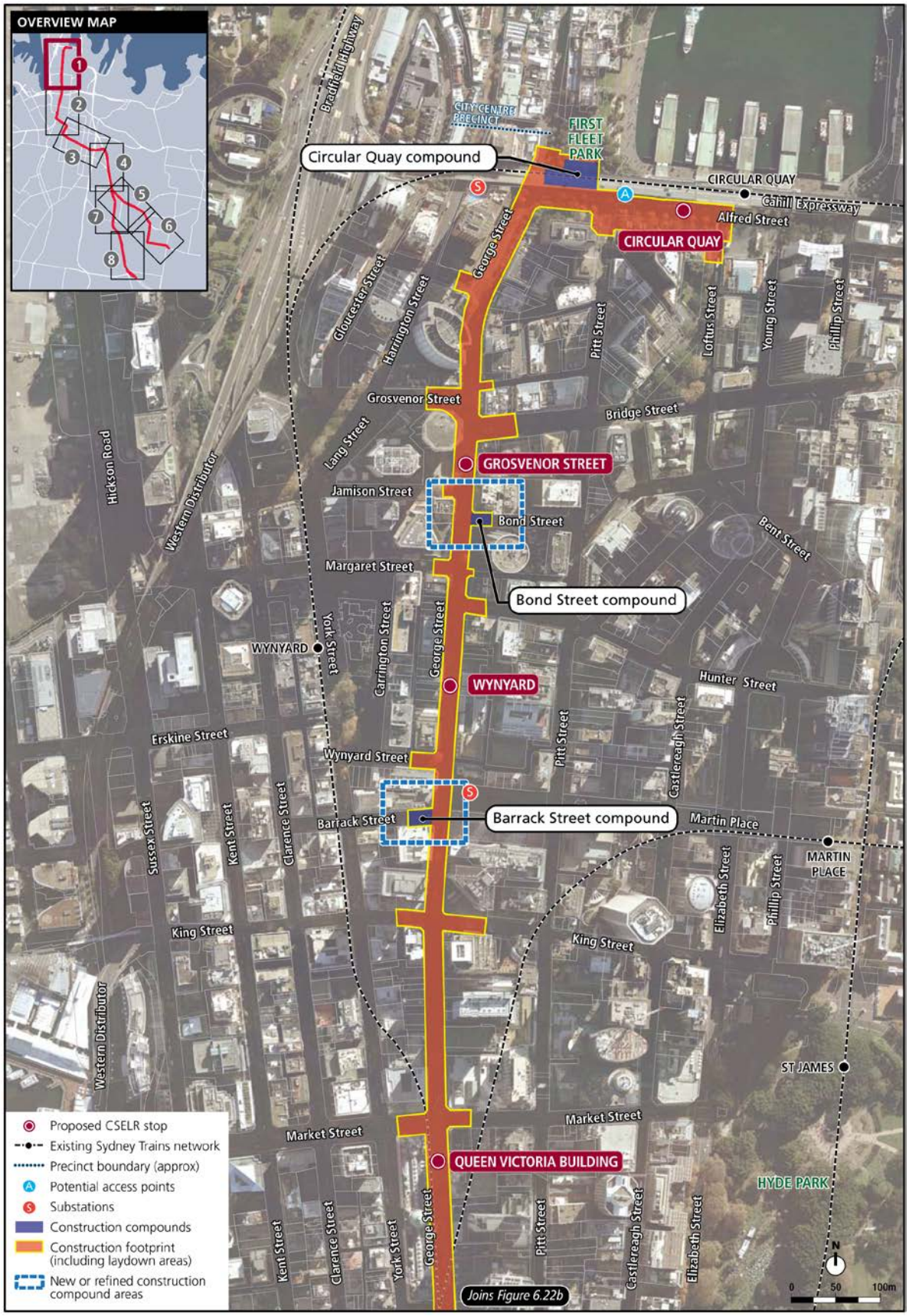
Compound	Proposed change		General location and description of proposed change [1, 2]
	New compound	Revised from EIS	
City Centre Precinct			
Bond Street	✓		The construction compound would be located in the north-western corner of Bond Street (refer to Figure 6.22a) and would be used as a laydown area to support construction activities within the City Centre Precinct. The construction compound boundary would be fenced off and secured from pedestrians using temporary fencing or hoardings. Pedestrian access at the Bond Street/George Street intersection would be maintained. The compound would generally accommodate a laydown area, toilets and a small site office or meal rooms. General parking for construction workers would not be provided at this site. Construction workers would be expected to use existing public transport. An alternative arrangement would be to provide remote parking on the proposed Randwick stabling facility site and shuttle transfer workers to the worksite, which would depend on demand for this facility and the shift hours. Access/egress to the construction compound would be via Pitt Street and Bond Street, while direct access to the George Street construction worksite would be provided via George Street.
Barrack Street	✓		The construction compound would be located in the north eastern corner of Barrack Street, adjacent to the George Street intersection (refer to Figure 6.22a) and would be used as a small amenities area for construction workers. The construction compound boundary would be fenced off and secured from pedestrians using temporary fencing or hoardings. Pedestrian access along the adjacent footpath on George Street would be maintained. The compound would generally accommodate a site office, lunch room and toilets. General parking for construction workers would not be accommodated at this site. Construction workers would be expected to use existing public transport. An alternative arrangement would be to provide remote parking on the proposed Randwick stabling facility site and shuttle transfer workers to the worksite, which would depend on demand for this facility and the shift hours.

Compound	Proposed change		General location and description of proposed change [1, 2]
	New compound	Revised from EIS	
Surry Hills Precinct			
Ward Park		✓	The location of the proposed Ward Park construction compound, as described in Table 6.4 of the EIS, is proposed to be refined to address issues raised by City of Sydney during the exhibition of the EIS. Council requested that the compound be relocated away from the eastern side of the park along the property boundary with Northcote Estate. Therefore, the construction compound would be located closer towards the north-western side of Ward Park, adjacent to Devonshire Street (refer to Figure 6.22c). The site would be situated within an existing grassed area that contains a number of planted trees (which would be retained as far as practicable) and would support construction activities proposed to be undertaken along Devonshire Street. The site would be generally the same size as the compound site identified in the EIS. Construction activities proposed at this location would be unchanged from those described in Table 6.4 of the EIS (Volume 1A).
Moore Park Precinct			
Moore Park tunnel – associated construction facilities east and west of Anzac Parade		✓	The locations of the proposed construction worksite for the cut-and-cover tunnel and associated construction facilities to the east and west of Anzac Parade are proposed to be reconfigured to accommodate the revised Moore Park stop location and associated tunnel re-alignment (as described in section 6.8 of this Submissions Report). The worksite on the western side of Anzac Parade is proposed to be relocated from the northern side of the Moore Park tunnel to the southern side of the tunnel, adjacent to the Sydney Boys and Sydney Girls High School (refer to Figure 6.22d). This site would be relocated to more closely relate to the realigned tunnel and to minimise the impact on the existing playing fields to the north of the proposed tunnel alignment. The location and size of the worksite on the eastern side of Anzac Parade would generally be amended to accommodate the revised Moore Park stop and eastern tunnel portal location. The worksite would temporarily encroach approximately two metres into the western sideline of the existing AFL training oval, situated between Macarthur Avenue and Gregory Street. Construction activities and facilities proposed at the construction worksite for the cut-and-cover tunnel and associated construction facilities would be unchanged from that described in Table 6.4 of the EIS (Volume 1A).

Compound	Proposed change		General location and description of proposed change [1, 2]
	New compound	Revised from EIS	
Moore Park – site office compound		✓	The proposed site office compound is proposed to be relocated from the eastern side of Anzac Parade (north of Gregory Avenue, as described in Table 6.4 of the EIS) to the western side of Anzac Parade, adjacent to the Sydney Boys and Sydney Girls High School (refer to Figure 6.22d). The location of this compound is proposed to reflect the revised Moore Park stop location and associated tunnel alignment (as described in section 6.8 of this Submissions Report), whilst also minimising the impact to the existing AFL training oval situated between Macarthur Avenue and Gregory Street. The compound would be accessed via the southbound lane of South Dowling Street, the northbound lane of Anzac Parade. Construction activities and facilities proposed at the office compound would be unchanged from that described in Table 6.4 of the EIS (Volume 1A).
Kensington and Kingsford Precinct			
NIDA car park (Anzac Parade)	✓		The location of the proposed UNSW compound within the lower campus of UNSW along Anzac Parade between High Street and the University Mall has been moved from its location as described in Table 6.4 of the EIS (Volume 1A). The compound site has been moved to accommodate the revised platform arrangement of the UNSW Anzac Parade stop from a side platform within the UNSW campus to an island platform stop within Anzac Parade. The revised compound site would be located within an existing car park on the opposite side of Anzac Parade to the previously proposed UNSW compound site (refer to Figure 6.22g). The revised compound site would require approximately half of the existing car parking area which is generally used by staff and students of the adjoining UNSW buildings, including NIDA. Consolidation and relocation of the UNSW worksites to the NIDA car park during construction would result in an impact to existing private off-street parking provision. Dependent upon the final layout and access arrangements for the worksite, up to 75 spaces may be affected during the construction period. Construction activities and facilities proposed at the revised UNSW compound location would be unchanged from that described in Table 6.4 of the EIS (Volume 1A).

Note 1: Layout of construction compounds would be subject to further refinement with respect to mitigating potential impacts to heritage items and trees during detailed design.

Note 2: As identified in the EIS, the number and locations of construction compounds may change during detailed design. Any new construction compound proposed would be subject to relevant additional environmental impact assessment to determine consistency with the planning approval of the CSELR proposal.

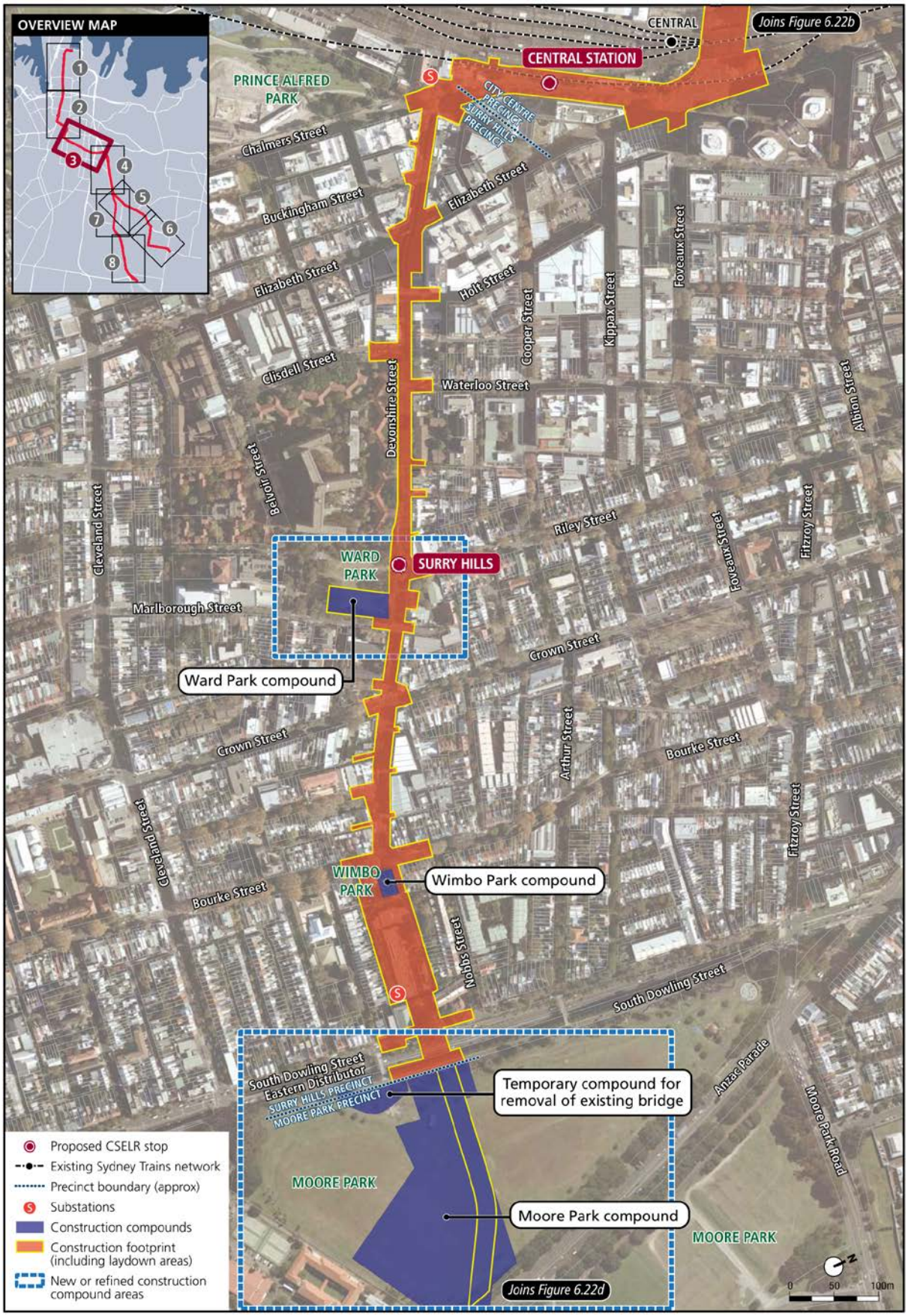


Note: Indicative only. Subject to detailed design

Figure 6.22a Revised construction compound locations

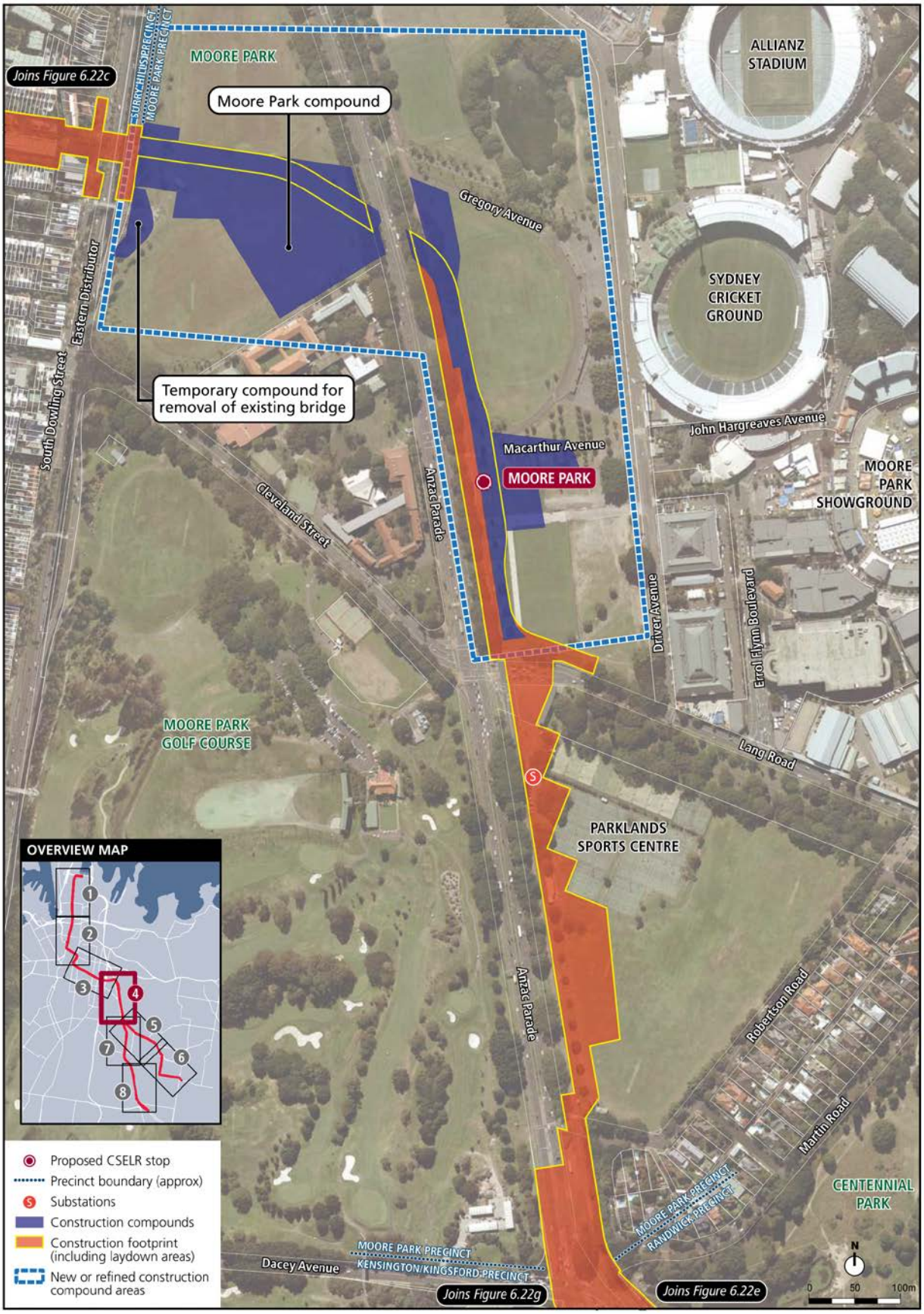
Note: Indicative only. Subject to detailed design

Figure 6.22b Revised construction compound locations



Note: Indicative only. Subject to detailed design

Figure 6.22c Revised construction compound locations



Note: Indicative only. Subject to detailed design

Figure 6.22d Revised construction compound locations

Note: Indicative only. Subject to detailed design

Figure 6.22e Revised construction compound locations

Note: Indicative only. Subject to detailed design

Figure 6.22f Revised construction compound locations

Note: Indicative only. Subject to detailed design

Figure 6.22g Revised construction compound locations

Note: Indicative only. Subject to detailed design

Figure 6.22h Revised construction compound locations

6.15.3 Change in impact

Visual and landscape character impacts

An assessment of the potential visual impacts of the changes to construction compounds identified that there would not be substantial additional visual impacts to those assessed in the EIS. The EIS identified a range of potential management and mitigation measures to assist with minimising visual and landscape character impacts of the proposal during construction of the CSELR proposal. The continued implementation of these measures as part of the revised construction compound layout would result in minimal impacts to those assessed previously in the EIS.

Planted tree impacts

The proposed change to the CSELR construction impact areas would generally not result in any new types of impacts on planted trees within the overall study area, compared to that already assessed in the EIS. However, the refinement of the proposed construction compound sites would alter the extent and magnitude of the CSELR proposal's impacts to a small degree, namely the extent of planted tree loss at some locations.

The change in impact to planted trees resulting from the proposed design changes, including changes to the proposed construction compound sites are shown in Figure 6.8, Figure 6.14a, Figure 6.14b, and Figure 6.17.

Property and land use impacts

Land directly affected by the amended construction impact area and revised construction compound sites is typically road reserve or public open space (local park etc.) and therefore owned by State or Local government agencies. However, two proposed construction site amendments would affect privately owned land.

Part of the refined compound site within the vicinity of the proposed Moore Park stop is also managed by the Centennial Park and Moore Park Trust. Additionally, the revised construction compound within the vicinity of the UNSW Anzac Parade stop would impact on land managed by UNSW. Transport for NSW is currently negotiating with UNSW and the Centennial Park and Moore Park Trust in regard to the temporary land acquisition/leasing requirements for the CSELR proposal.

No residential properties would be impacted by the revised construction compound sites. No additional property and land use impacts to those assessed in the EIS would occur as a result of the revised construction compound sites.

The proposed design changes to the location of the identified construction compounds would not result in any changes to impacts on future land use beyond those identified in the EIS.

Noise and vibration impacts

The refinement and relocation of various construction compounds along the proposal alignment (including some additional locations) is predicted to increase construction noise impacts at receivers which are now adjacent to the compound locations. The impact at some receivers has also been reduced in locations where construction compound sites have been moved further away from receivers.

A qualitative construction noise assessment of the potential impacts of the compounds and worksites was previously undertaken as part of the EIS. This assessment qualitatively assessed each of the potential impacts of the construction compounds in each precinct for daytime, evening and night-time periods relative to the background noise levels in each area during each period. The results of this assessment were presented in section 12.5.2 of Technical Paper 11 (*Noise and Vibration Impact Assessment*) in Volume 6 of the EIS. A revised qualitative construction noise assessment of the potential impacts of the revised compounds and worksites has been undertaken. A comparison of the potential impacts of the revised compounds and worksites is presented in Table 6.16 below.

Table 6.16 Qualitative construction noise assessment resulting from revised construction compounds by precinct

Activity	Qualitative assessment (as presented in EIS)			Qualitative assessment of new or refined construction compounds [1, 2]		
	Day	Evening	Night	Day	Evening	Night [3]
City Centre Precinct						
Establishment of construction compounds	Below RBL	Below RBL	Below RBL	**Noticeable**	**Noticeable**	**Clearly audible**
Deliveries of demountable office facilities	Below RBL	Below RBL	Below RBL	**Noticeable**	**Noticeable**	**Audible**
Installation of temporary boundary fencing	Below RBL	Below RBL	Below RBL	**Noticeable**	**Noticeable**	**Noticeable**
Establishing stockpiles and materials storage areas within the sites, and the delivery of construction plant and equipment	Below RBL	Below RBL	Noticeable	**Clearly audible**	**Clearly audible**	**Clearly audible**
Surry Hills Precinct						
Establishment of construction compounds	Moderately Intrusive	Moderately Intrusive	Highly Intrusive	Moderately Intrusive	Moderately Intrusive	Highly Intrusive
Deliveries of demountable office facilities	Moderately Intrusive	Moderately Intrusive	Highly Intrusive	Moderately Intrusive	Moderately Intrusive	Highly Intrusive
Installation of temporary boundary fencing	Moderately Intrusive	Moderately Intrusive	Moderately Intrusive	Moderately Intrusive	Moderately Intrusive	Moderately Intrusive
Establishing stockpiles and materials storage areas within the sites, and the delivery of construction plant and equipment	Highly Intrusive	Highly Intrusive	Highly Intrusive	Highly Intrusive	Highly Intrusive	Highly Intrusive
Moore Park Precinct						
Establishment of construction compounds	Below RBL	Noticeable	Clearly audible	Below RBL	Noticeable	Clearly audible
Deliveries of demountable office facilities	Below RBL	Noticeable	Clearly audible	Below RBL	Noticeable	Clearly audible
Installation of temporary boundary fencing	Below RBL	Below RBL	Noticeable	Below RBL	Below RBL	Noticeable
Establishing stockpiles and materials storage areas within the sites, and the delivery of construction plant and equipment	Noticeable	Noticeable	Clearly audible	Noticeable	Noticeable	Clearly audible

Activity	Qualitative assessment (as presented in EIS)			Qualitative assessment of new or refined construction compounds [1, 2]		
	Day	Evening	Night	Day	Evening	Night [3]
Randwick Precinct						
Establishment of construction compounds	Moderately Intrusive	Moderately Intrusive	Highly Intrusive	Moderately Intrusive	Moderately Intrusive	Highly Intrusive
Deliveries of demountable office facilities	Moderately Intrusive	Moderately Intrusive	Highly Intrusive	Moderately Intrusive	Moderately Intrusive	Highly Intrusive
Installation of temporary boundary fencing	Moderately Intrusive	Moderately Intrusive	Moderately Intrusive	Moderately Intrusive	Moderately Intrusive	**Highly Intrusive**
Establishing stockpiles and materials storage areas within the sites, and the delivery of construction plant and equipment	Highly Intrusive	Highly Intrusive	Highly Intrusive	Highly Intrusive	Highly Intrusive	Highly Intrusive
Kensington/Kingsford Precinct						
Establishment of construction compounds	Moderately Intrusive	Moderately Intrusive	Highly Intrusive	Moderately Intrusive	Moderately Intrusive	Highly Intrusive
Deliveries of demountable office facilities	Moderately Intrusive	Moderately Intrusive	Highly Intrusive	Moderately Intrusive	Moderately Intrusive	Highly Intrusive
Installation of temporary boundary fencing	Clearly audible	Clearly audible	Moderately Intrusive	Clearly audible	Clearly audible	Moderately Intrusive
Establishing stockpiles and materials storage areas within the sites, and the delivery of construction plant and equipment	Moderately Intrusive	Moderately Intrusive	Highly Intrusive	Moderately Intrusive	**Highly Intrusive**	Highly Intrusive

Note 1: Locations with an increase in the predicted subjective impact category from that identified in the EIS are shown in **red** text. Locations with a reduction in the in the predicted subjective impact category from that identified in the EIS are shown in **green** text. At locations where the subjective impact has not changed, text is not coloured.

Note 2: Refer to Table 6.9 for rating descriptors.

Note 3: It should be noted that the night-time noise impacts are anticipated to only be short term impacts only.

The increase in noise impacts identified in the Table 6.16 would generally be as a result of construction compounds moving closer to residential receivers. The increased impacts within the City Centre Precinct would be a result of the proposed additional construction compounds in Bond Street and Barrack Street.

It is noted that whilst noise impacts can be fairly high (moderate to highly intrusive), the activities at construction compounds would be very short in duration from approximately half a day to a week. The site specific construction noise impact statements would take this into account when considering reasonable and feasible noise mitigation measures.

Management of the potential impacts of these sites would be undertaken in a similar manner to the management and mitigation measures previously presented in the EIS.

Aboriginal and non-Indigenous heritage impacts

The potential impacts on Aboriginal and non-Indigenous heritage with respect to the proposed design changes to the substations for the CSELR proposal are outlined in Table 6.17 below.

Table 6.17 Predicted heritage impacts on the revised construction compounds

Substation	Built heritage/landscape	Historical archaeology	Aboriginal archaeology
Bond Street	The construction compound would be next to Australia Square, (listed on Sydney LEP 2012) and is of potential State significance. The listing includes the public plaza around the two Australia Square buildings. The compound would have a minor, temporary adverse visual impact on the setting of Australia Square.	Use of the Bond Street construction compound as a works depot, laydown area and/or parking area — where it would not involve removal of the existing ground surface and/or excavation (such as for service installation) — is unlikely to have an impact on the historical archaeological resource.	Use of the Bond Street construction compound as a works depot, laydown area and/or parking area (where it would not involve removal of the existing ground surface and/or excavation such as for service installation) is unlikely to have an impact on Aboriginal archaeological resources.
Barrack Street	The construction compound would be located next to the former CBC Bank, 343 George Street, (listed on the State Heritage Register and Sydney LEP 2012) and in the vicinity of the Former Savings Bank of NSW, 11 Barrack Street (listed on Sydney LEP 2012). The compound would have a minor adverse visual impact on the setting and appreciation of the southern wall of the former CBC Bank and the Former Savings Bank of NSW in views from George Street and Barrack Street.	Use of the Barrack Street construction compound as a works depot, laydown area and/or parking area — where it would not involve removal of the existing ground surface and/or excavation (such as for service installation) — is unlikely to have an impact on the historical archaeological resource.	Use of the Barrack Street Construction Compound as a works depot, laydown area and/or parking area — where it would not involve removal of the existing ground surface and/or excavation (such as for service installation) — is unlikely to have an impact on the Aboriginal archaeological resource.
Ward Park	The relocation of the proposed construction compound site within Ward Park would not result in additional impacts to built heritage to those assessed in the EIS.	The relocation of the proposed construction compound site within Ward Park would not result in additional impacts to historical archaeology to those assessed in the EIS.	The relocation of the proposed construction compound site within Ward Park would not result in additional impacts to Aboriginal archaeology to those assessed in the EIS.
Moore Park tunnel – associated construction facilities east and west of Anzac Parade Moore Park – site office compound	Relocating the Moore Park tunnel and stop construction compounds to the south would have similar impacts on the heritage values of Moore Park as the EIS alignment.	Works associated with the construction of the tunnel, stop and use of the construction compound were assessed as having a minor to moderate adverse impact, depending on the extent and nature of the ground disturbance. The proposed realignment of the Moore Park Tunnel and associated stop is likely to continue to have a minor to moderate adverse impact on the potential historical archaeological resource.	Construction of the proposal would be within Zone 1 and is likely to impact on Aboriginal archaeological evidence where excavation is proposed. This would therefore result in similar impacts to those previously assessed in the EIS.
NIDA car park (Anzac Parade)	The proposed construction compound in the NIDA car park would not have an impact on any known heritage items or significant trees.	The relocation of the proposed construction compound site within the NIDA car park would not result in additional impacts to historical archaeology to those assessed in the EIS.	The relocation of the proposed construction compound site within the NIDA car park would not result in additional impacts to Aboriginal archaeology to those assessed in the EIS.

6.15.4 Additional or changed management and mitigation measures

No additional management and mitigation measures have been proposed as a result of the proposed design change to the construction compounds required for the CSELR proposal. The existing management and mitigation measures relating to the environment issues identified above as detailed in Chapter 8 of this Submissions Report are considered to be sufficient to manage the potential impacts of the revised design change.

6.16 Summary of overall change in impact due to design changes

The proposed design changes to the CSELR proposal would generally result in a positive overall outcome in comparison to the design presented in the EIS. However, some additional environmental impacts would also occur as a result of the proposed design changes. A summary of the potential beneficial and negative environmental impacts of the proposed CSELR proposal design changes are provided within this section.

Beneficial effects of the proposed design changes to the CSELR proposal would include:

- improved operational reliability through the increase in wired running of LRVs within the City Centre Precinct and improved passenger capacity of the Chinatown stop to meet required demand
- improved pedestrian and cyclist movement through the proposed creation of a new shared zone along Chalmers Street between Devonshire Street and Elizabeth Street
- replacement of parking along Nobbs Lane to replace the existing parking associated with the Langton Centre which was identified as being removed within the EIS
- reduced impacts on existing open spaces including the existing AFL training oval and High Cross Park
- improved pedestrian safety along Anzac Parade for school student accessing the Sydney Boys and Sydney Girls High Schools through the provision of a new pedestrian bridge which would connect with the Moore Park stop
- reduced noise impacts on the Sydney Boys and Sydney Girls High Schools as a result of the relocated Moore Park stop
- additional parking spaces for residents along Wansey Road resulting from proposed design changes to the traffic configuration of this street
- an overall reduction in the number of planted trees to be removed as part of the CSELR proposal (up to approximately 50 trees) resulting in reduced planted tree/biodiversity impacts and improved visual and heritage impacts, in particular along Chalmers Street, Alison Road, and at the Randwick and UNSW Anzac Parade stops (note: the number of trees to be retained may also increase following detailed arborist surveys during detailed design)

- an increase in the overall area of High Cross Park retained adjacent to the Randwick stop and interchange
- improved visual and landscape character outcomes for some viewpoints along the route of the CSELR proposal including views along Chalmers Street, Alison Road, and within High Cross Park.

These improvements would result in benefits to both the local community and operation of the overall light rail system in general. Some potential negative environmental impacts have also been identified as being likely to occur as a result of the proposed design changes. These include:

- temporary disturbance to additional residential receivers from the generation of noise and vibration during construction, in particular within some parts of the City Centre Precinct
- potential additional noise impacts to residents along Randle Street and/or Elizabeth Street resulting from the closure of Chalmers Street (between Devonshire Street and Elizabeth Street) and the movement of additional traffic onto these streets
- the additional clearing of mature vegetation within and adjacent to the proposed light rail corridor, particularly along Anzac Parade may increase the visibility of existing and proposed light rail infrastructure at various viewing locations along the length of the rail corridor
- the addition of some new design elements, such as the proposed pedestrian bridge over Anzac Parade, may result in some increased visual impacts to the existing landscape character along the proposed alignment
- slightly increased area of land for temporary lease or acquisition to allow for the revised proposal designs including the Anzac Parade pedestrian bridge, relocated UNSW High Street stop and revised construction compounds.

Implementation of the management and mitigation measures as detailed in Chapter 8 of this report are considered to be sufficient to manage the potential impacts of the design changes that have been made to the CSELR proposal following the exhibition of the EIS.

7. Additional investigations and clarification to the EIS

This section documents additional investigations that have been undertaken since the exhibition of the CBD and South East Light Rail (CSELR) Environmental Impact Statement (EIS). This section also provides clarifications to the EIS in response to feedback received from the community and other stakeholders during the exhibition period.

7.1 Parking surveys

A Project Parking Strategy was developed as part of Technical Paper 1 (*Transport Operations Report*) in Volume 2 of the EIS. Following the exhibition of the EIS, a supplementary parking assessment was undertaken in response to submissions made during the public exhibition process for the CSELR proposal to further refine the Project Parking Strategy.

As set out in Technical Paper 1 (*Transport Operations Report*) in Volume 2 of the EIS, the introduction of light rail through the CSELR corridor would require reallocation of road space between transport modes, kerbside uses and travel lanes. This would require some changes to kerbside access. The supplementary parking assessment assessed existing supply, turnover and user types of existing parking spaces within the suburbs of Surry Hills, Kingsford and Randwick.

The assessment sets out an appropriate parking policy response complementary to the preferred light rail alignment, balancing project design with corridor movement and access to land uses and for stakeholders along the corridor.

7.1.1 Context of the supplementary parking assessment

The supplementary parking assessment focused on three key areas:

- *Parking supply* — the variable nature of time restriction parking controls leads to a change in overall parking supply throughout the day. The quantum of parking spaces included unrestricted and time restricted spaces as well as special kerbside uses such as disability, taxi, mail and loading spaces.
- *Parking demand, occupancy and turnover* — the parking surveys documented the time, location and number plate of all vehicles within each precinct to determine average occupancy and turnover rates. For the purpose of the parking analysis, special kerbside uses were not included in the occupancy analysis with the quantum of demand being derived for general parking spaces only.
- *User types* — vehicles registered within the local area or vehicles that displayed a local resident vehicle permit were deemed a local user. Special kerbside uses were not included in the User Type analysis with the quantum of supply being derived for general parking spaces only.

7.1.2 Trends in parking analysis

Parking occupancy statistics were calculated on a discrete space basis and summarised into groups of common parking restrictions within each street block. The average turnover of parked vehicles per hour was calculated by determining whether a unique vehicle has remained within a parking space during the time period assessed ('average hourly turnover rate'). Turnover rate for each space was grouped by parking restriction on a block basis to provide an average hourly rate by time period. The key results for each of the assessed parking precincts are provided below.

Surry Hills Precinct

The parking area assessed for the Surry Hills Precinct included an area generally bounded by Chalmers Street to the west, Kippax Street and Foveaux Street to the north, South Dowling Street to the east and Cleveland Street to the south. The key results for the Surry Hills Precinct included:

- Across the day, parking occupancy rose from 58 per cent in the early morning to 80 per cent in the mid-afternoon and was consistently above 75 per cent throughout the day.
- The average hourly turnover rate varied from 27 per cent in mid-afternoon to 37 per cent in the evening. Apart from the mid-afternoon period, the turnover rate was above one-third throughout the day.
- The proportion of local users was highest in the early morning and evening, ranging from 40 per cent to 75 per cent. The proportion of local users was typically five per cent to 15 per cent lower during the day.

Randwick Precinct

The parking areas assessed for the Randwick Precinct generally comprised of two parts. The first parking assessment site included an area generally bounded by Alison Road to the north, Avoca Street to the east, High Street to the south and Wansey Road to the west. The second parking assessment site included an area generally bounded by Belmore Road and Coogee Bay Road to the north, Dudley Street to the east, Barker Street to the south and Avoca Street to the west. The key results for the Randwick Precinct included:

- Parking occupancy ranged from 70 per cent in the early morning to 87 per cent in the mid-morning period. Parking occupancy in Randwick is typically above 75 per cent throughout the day.
- The average hourly turnover rate varied from 44 per cent in the early morning to 23 per cent in the mid-afternoon.
- The proportion of local users was noted as being low. This was highest in the early morning and evening between 25 per cent and 45 per cent, typically falling by five per cent to 10 per cent during the day. It is therefore evident that there are a high proportion of users who are not locals, especially during the day.

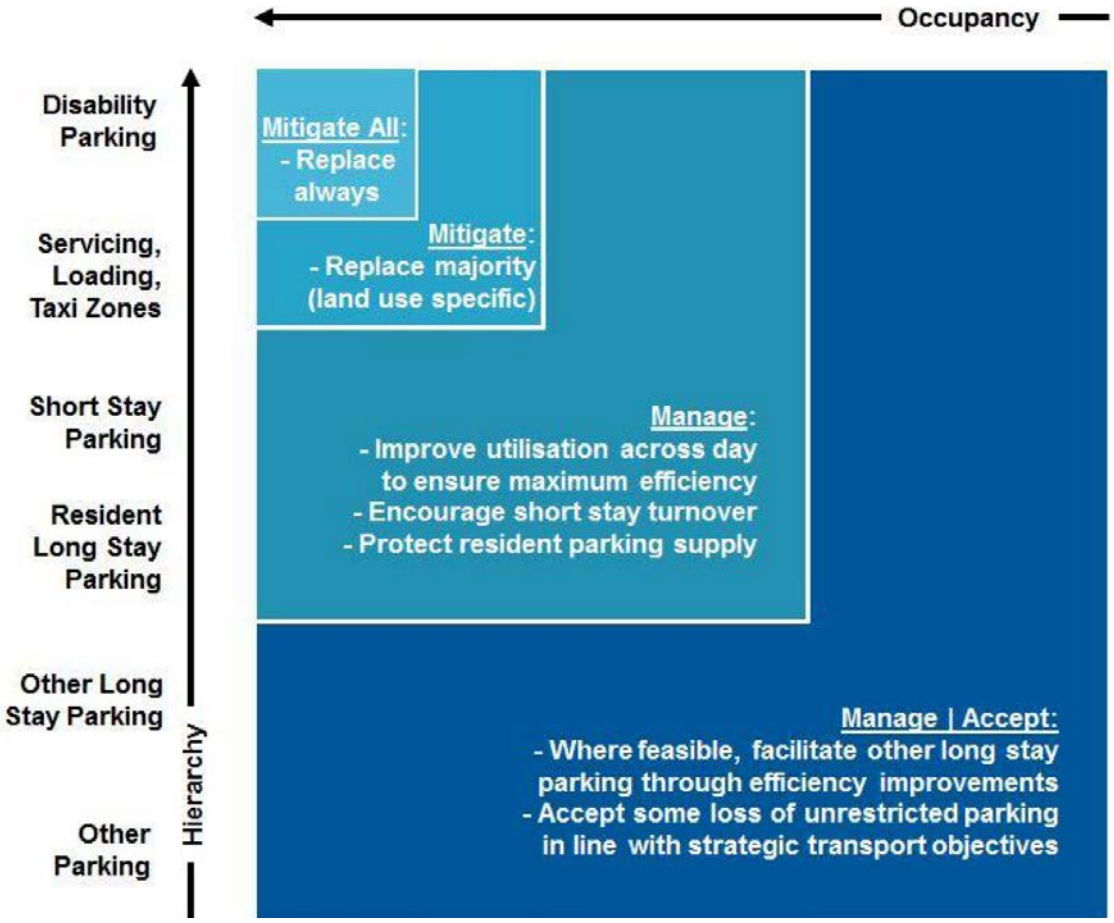
Kensington/Kingsford Precinct

The parking area assessed for the Kensington/Kingsford Precinct included an area generally bounded by Rainbow Street to the north, and Botany Street and Bunnerong Road to the east and west respectively. The key results for the Kensington/Kingsford Precinct included:

- Parking occupancy varied from 41 per cent in the early morning to 61 per cent in the mid-morning. The mid-morning and mid-afternoon periods saw parking occupancy remain above 60 per cent, while in the early morning and evening periods parking occupancy is less than 50 per cent.
- The average hourly turnover rate varied from 28 per cent in the early morning to 20 per cent in the mid-afternoon.
- The proportion of local users was low. Local use peaks in the early morning and evening at between 30 per cent and 40 per cent falling by 15 per cent during the day. Therefore use of kerbside capacity by non-locals was high, especially during the day.

7.1.3 Management and mitigation

The mitigation strategy for managing the loss of parking as a result of the CSELR proposal comprises of various layers to provide an appropriate response for the needs of local residents, businesses and visitors to access land uses, as shown in Figure 7.1 and Figure 7.2.



Source: Figure 6-1 of Technical Paper 1 (*Transport Operations Report*) in Volume 2 of the CSELR EIS

Figure 7.1 Kerbside access policy management framework

Kerbside access use class		Preferred mitigation strategy
1	**Disability parking**	Replace all existing spaces which need to be removed with 'like for like' provision as close as possible to existing provision.
2	**Servicing & loading**	Ensure adequate provision of servicing and loading to meet local land use requirements, notably for commercial premises and residential premises with no alternative servicing opportunities. This may require: new loading and servicing zone provision; new taxi zone provision; local consolidation of loading and servicing within precincts; and management of loading and servicing access i.e. time restrictions or localised access provision on the alignment (in limited circumstances).
3	**Short stay**	Provide replacement short term parking along the alignment, within the same precinct and consider additional opportunities outside the corridor, such as in the side streets in commercial zones (potentially as 'dual use' parking shared with residential parking)
4	**Long stay**	Consider alternative long term residential parking opportunities on adjacent streets within the same precinct.
5	**Other**	Provide adequate parking to meet access requirements as deemed necessary on a case by case basis. This category includes but is not limited to: motorbike and scooter parking; and parking for special land uses such as medical uses including emergency vehicles, doctors and nurses.

Source: Table 6-1 of Technical Paper 1 (*Transport Operations Report*) in Volume 2 of the CSELR EIS

Figure 7.2 Kerbside access hierarchy and preferred mitigation strategy

Further detail on the mitigation strategy is detailed below. The measures outlined below are summarised as mitigation measures AH.37 to AH.38 in Chapter 8 of this Submissions Report.

Replace 100 per cent of special kerbside uses impacted

All impacted special kerbside uses along the CSELR corridor would be replaced on a 'like for like' basis within the local vicinity of existing provision. The detailed implementation of this replacement would be undertaken in consultation with each local council (City of Sydney and Randwick City Council).

Local area parking management

Adjustments to local area parking controls are recommended within each precinct to meet the needs of key users. Local area parking management in the precincts surrounding the CSELR corridor should provide primarily for residents (particularly during the pre-morning and post-afternoon periods) and businesses (short term timed parking).

CSELR Infrastructure and operational management

The parking assessment focused on the current design for the CSELR which presents a worst case scenario in terms of parking and kerbside impact. Further potential operational strategies are still currently being investigated, such as clearways in general traffic lanes to increase the area for parking available. These would potentially have impacts to traffic and bus capacity on the road network; however, this needs to be investigated further to ensure this impact can be managed. The details of the operational management strategy would continue to be worked through by Transport for NSW in conjunction with RMS and both councils during the detailed design phase.

7.2 Energy efficiency measures for CSELR operations

As part of the assessment of the CSELR proposal, a Greenhouse Gas Assessment was undertaken (this assessment formed Technical Paper 8 in Volume 4 of the EIS). During the exhibition of the EIS, the media noted that the comparative greenhouse gas emissions intensity (by transportation type and unit of production) presented in Table 5.2 of Technical Paper 8 (*Greenhouse Gas Assessment*) in Volume 4 of the EIS showed various alternative transport modes as being comparatively more energy efficient than the CSELR proposal. In particular, the comparative greenhouse gas emissions between other examples of light rail systems and average city bus values with the CSELR proposal were identified on a grams of carbon dioxide equivalent per kilometre (g CO_2-e/passenger km) basis as being more efficient than the CSELR proposal. In addition, the need for use of renewable energy sources was highlighted by some submissions (refer to section 5.23 of this Submissions Report).

The results presented in the greenhouse gas assessment within the EIS did not take into account efficiency savings as a result of any energy efficient technologies that would be provided as part of the detailed design and operation of the CSELR proposal. For example, where regenerative braking systems are provided on LRV, as is proposed as part of the CSELR proposal, energy efficiency savings of between 15 and 20 per cent could be made across the overall light rail system, depending on factors such as the distance between LRVs. Regenerative breaking systems would also be potentially used for off-setting internal LRV systems such as air-conditioning and lighting through the use of the on-board storage capacity, further reducing the requirement for external power supply.

Furthermore, the addition of on-board energy storage (as is proposed for the CSELR to allow for the proposed wire-free zone within the City Centre Precinct) could potentially result in a further 10 to 15 per cent energy saving.

These figures are based on current technology assumed for commencement of operation. However, as LRV technology improvements continue prior to commencement of operations, it is expected that there would be additional increased energy efficiency savings across the wider CSELR proposal.

Additionally, as noted in Chapter 7 (Proposal sustainability) of the EIS (Volume 1A), Transport for NSW would strive to offset 100 per cent of operational energy requirements for the CSELR proposal through the purchase of renewable energy offsets. Figure 7.3 provides an indication of the relationship between the proportion of electricity purchased through renewable sources — such as Green Power — and greenhouse gas emissions (which are expressed as g CO_2-e/passenger km). Above approximately 31 per cent renewable energy use, the light rail system would have lower carbon emissions than an average city bus operating on the Sydney city network. In addition to the objective of offsetting operational energy requirements, the EIS also committed to offsetting 20 per cent of construction energy requirements for building the CSELR.

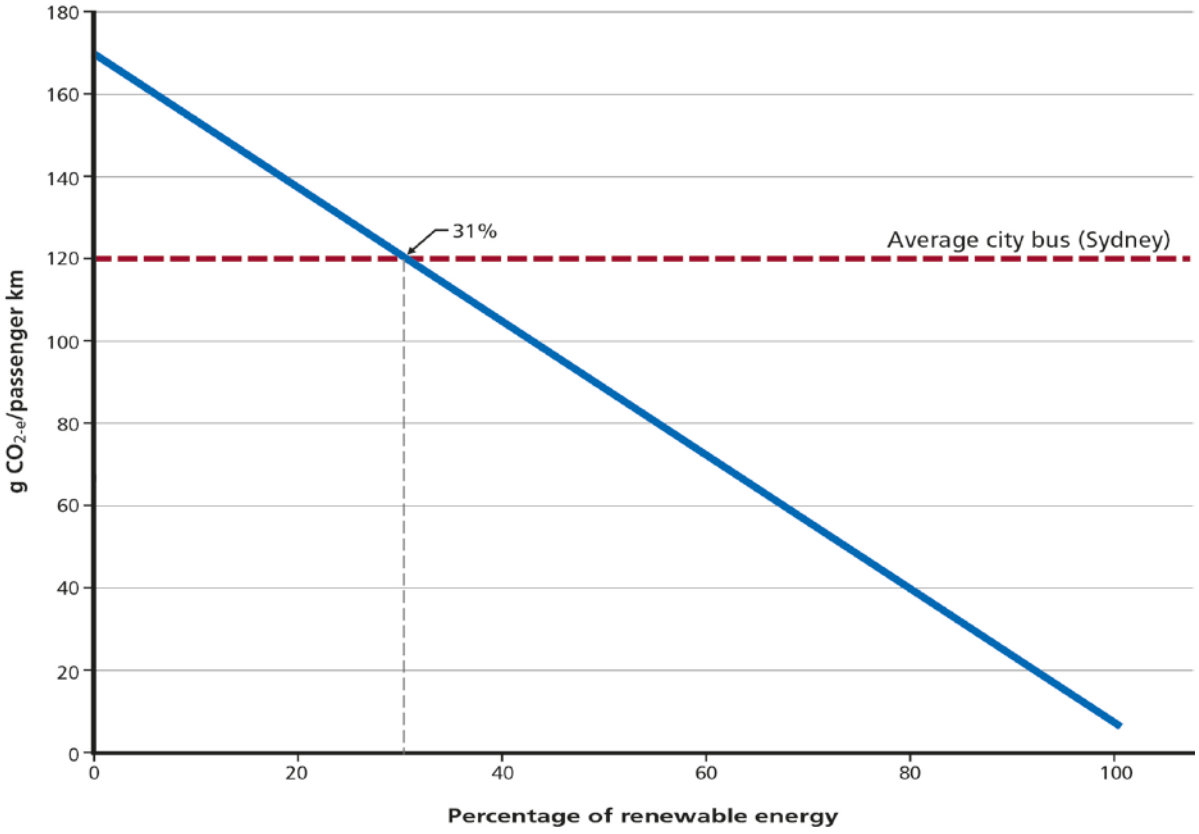


Figure 7.3 Relationship between the proportions of electricity purchased through renewable sources

In addition to the above, note 1 of Table 5.2 of the EIS (Volume 1A) states, '*demand modelling undertaken by Transport for NSW indicates that there will be 108 million annual passenger kilometres travelled on the CSELR network in 2021*'. The assessment of energy efficiency of the proposal was therefore based on this level of patronage. If the resultant patronage of the proposal is greater than this during operation, the CSELR would become more efficient on a per kilometre basis and the amount of g CO_{2-e}/passenger km would decrease.

7.3 Greenhouse gases clarification

Table 10.18 of the EIS incorrectly stated that the annual electricity consumption of the CSELR proposal during the operational phase would be 15,580,850 kilo Watt hours. This data was incorrectly transcribed from Table 4.2 of Technical Paper 8 (*Greenhouse Gas Assessment*) in Volume 4 of the EIS. This error is acknowledged and revised data is provided in Table 7.1 (revised numbers are indicated in red font). It is noted that the annual greenhouse gas emissions associated with the consumption of electricity remains unchanged from that documented in the EIS (17,575.7 tonnes of carbon dioxide equivalent). Therefore, the operation of the CSELR proposal is still estimated to generate 18,418.4 tonnes of carbon dioxide equivalent in 2020/2021, as stated in section 10.9.2 of the EIS (Volume 1A).

Table 7.1 Estimated annual greenhouse gas emissions from the operation of the CSELR

Activity[1]	Assumed annual quantity used[1]	Annual greenhouse gas emissions (tonnes CO_2-e)				per cent of total emissions
		Scope 1	Scope 2	Scope 3	Total	
Electricity consumption	16,580,850 kWh	0.0	14,425.3	3,150.4	17,575.7	95.42
Diesel fuel consumption in light and heavy maintenance vehicles	1.0 kL	2.6	0.0	0.2	2.8	0.02
Diesel fuel consumption in stationary maintenance vehicles	27.6 kL	73.9	0.0	5.6	79.6	0.43
Leakage of SF6 from electricity infrastructure	0.2 tonnes	22.9	0.0	0.0	22.9	0.12
Leakage of refrigerants (HFC) from air-conditioning	3.8 tonnes	656.6	0.0	0.0	656.6	3.57
Wastewater disposed at Municipal plant	40 people	0.0	0.0	7.8	7.8	0.04
Waste from operations	40 people	0.0	0.0	72.0	72.0	0.39
Construction worker commute to site	various (GJ)	0.0	0.0	0.9	0.9	0.01
Total	**—**	**756.1**	**14,425.3**	**3,263.9**	**18,418.4**	**100.0**
Per cent of total	**—**	**4.1**	**78.3**	**17.6**	**—**	**—**

Source: CSELR Preliminary Greenhouse Gas Assessment, Table 4.2, Technical Paper 8, Volume 4.

Note 1: kWh = kilo Watt hours; kL = kilolitres; CO_2-e = carbon dioxide equivalent; SF_6 = Sulphur hexafluoride; HFC = hydrofluorocarbons.

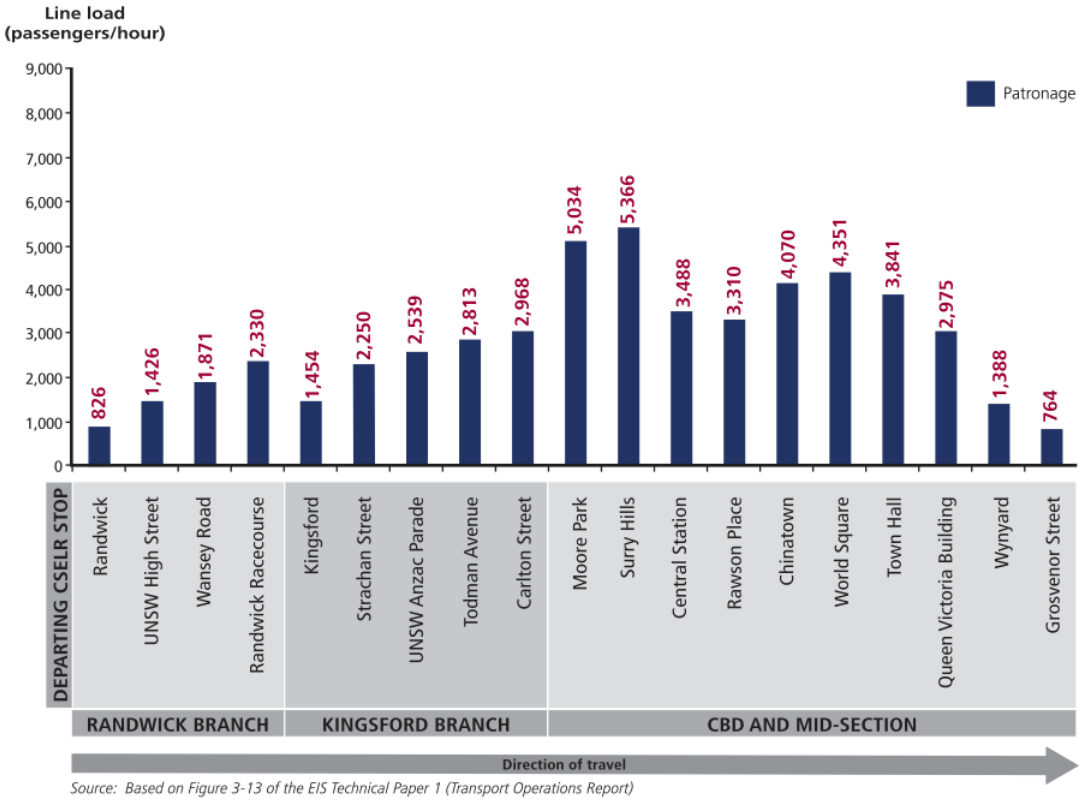
7.4 CSELR patronage and capacity

Figure 9.8 and Figure 9.9 of the EIS (Volume 1A) identified the anticipated inbound and outbound passenger line loadings and LRV capacity volumes during the morning peak at commencement of light rail operations. It has been identified that these figures could be interpreted to infer that the CSELR would be at close to 100 per cent capacity at some stops at commencement of operations. This interpretation of these figures is not correct and clarification of this issue is provided below.

Each of the figures presented in the EIS showed information for two different operational frequencies. The *percentage of CSELR capacity consumed* (right hand axis of Figure 9.8 and Figure 9.9 of the EIS; Volume 1A) was based on the estimated opening, lower, operational LRV frequency with a capacity of up to 6,000 passengers per hour. At this operational frequency some stops, such as the Carlton Street, Todman Avenue and Surry Hills stops are anticipated to be at between approximately 85 to 95 per cent capacity, at the commencement of operations.

However, following commencement of operations, the CSELR proposal has the capability to increase the frequency of LRVs to an operational capacity of up to 9,000 passengers per hour (left hand axis of Figure 9.8 and Figure 9.9 of the EIS; Volume 1A) if it is identified that there is sufficient demand for this level of service. Once the operational capacity of the CSELR proposal has been increased, LRVs would travel with a greater frequency and the overall percentage of the capacity consumed would be reduced.

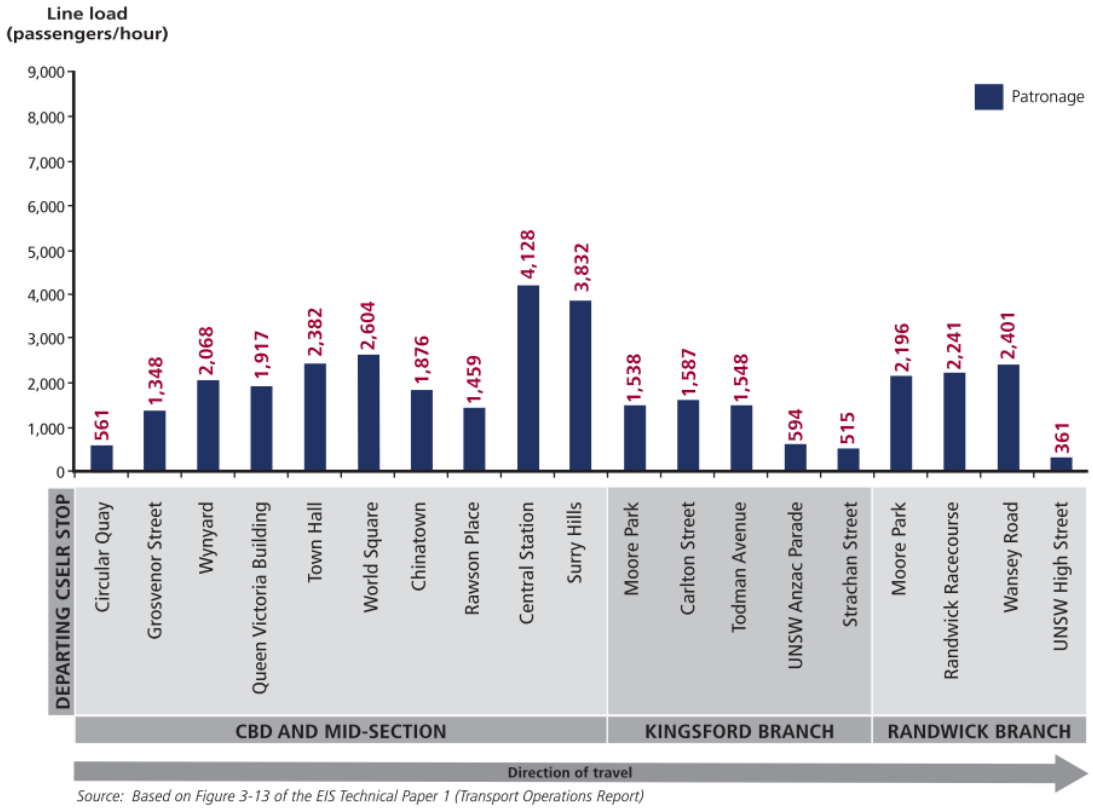
The revised graphs of the anticipated inbound and outbound passenger line loading of the CSELR during the morning peak period are shown in Figure 7.4 and Figure 7.5.



Source: Based on Figure 3-13 of the EIS Technical Paper 1 (Transport Operations Report)

Note: This is a revised version of Figure 9.8 from the CSELR EIS (Volume 1A)

Figure 7.4 2021 inbound morning peak CSELR line load



Note: This is a revised version of Figure 9.9 from the CSELR EIS (Volume 1A)

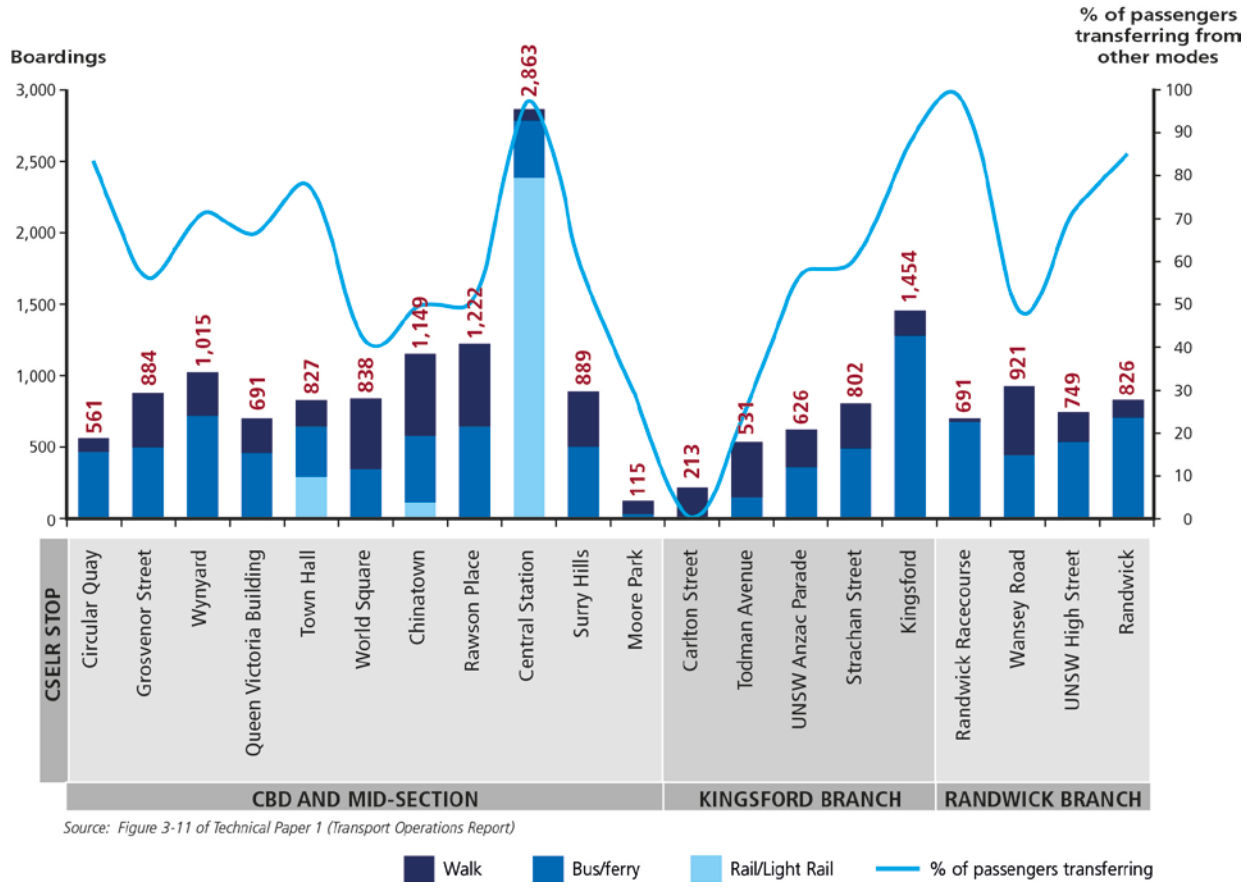
Figure 7.5 2021 outbound morning peak CSELR line load

7.5 CSELR boardings and mode of access

Figure 9.7 of the EIS (Volume 1A) identified the anticipated morning peak CSELR boarding and mode of access by light rail stop. It has been identified that the anticipated boarding figures for light rail at the Surry Hills stop appeared to be too large.

It is noted that an error does exist in the graph presented in the EIS (and corresponding Figure 3-11 of the Transport Operations Report, Technical Paper 1, Volume 2). A review of this figure identified that the anticipated boarding at the Surry Hills stop were incorrect and related to the Central Station stop, not the Surry Hills stop. The correct boarding and alighting figures for 2021 and 2036 were, however, presented in the Precinct Plan for Central Station (section 7.3.10 of the EIS *Transport Operations Report*, Volume 2).

The revised graph of the anticipated morning peak CSELR boarding and mode of access by light rail stop is shown in Figure 7.6.



Note: This is a revised version of Figure 9.7 from the CSELR EIS (Volume 1A)

Figure 7.6 2021 morning peak CSELR boarding and mode of access by light rail stop

7.6 First Fleet Park construction compound clarification

Page 48 of Technical Paper 10 (*Visual Impact Assessment*) incorrectly stated that the northern boundary of the First Fleet Park construction compound would be located approximately 17 metres from the Museum of Contemporary Art building. This statement is incorrect. The correct footprint for this construction compound was shown in Figure 6.2 of the EIS, whilst a description of the construction compound was provided in Table 6.4 of the EIS. The proposed construction compound would be approximately 55 to 60 metres from the Museum of Contemporary Art building.

7.7 Impact on Fig trees (Group F) within Royal Randwick racecourse

Table 15.30 of the EIS incorrectly omitted the Group F significant trees from the summary of historic heritage-listed items within Royal Randwick racecourse. Pages 333 to 334 of Technical Paper 5 (*Heritage Impact Assessment*) in Volume 4 of the EIS identified the group of three figs (Group F) and provided an analysis and level of impact based on their removal as part of the Randwick Racecourse group, concluding that '*the removal of the trees in particular would be a major adverse heritage impact*'.

While the Group F significant trees were omitted from Table 15.30 of the EIS (Volume 1B), Table 15.33 of the EIS (Volume 1B) included these trees in the impact assessment provided for the Racecourse Precinct Heritage Conservation Area/Significant Trees (Wansey Road Section).

This assessment concluded that the '*removal of the trees along Alison Road, Wansey Road and in the north-western area of the site would result in the loss of plantings of Exceptional and High significance that contribute to the aesthetic and historic significance of the racecourse…[t]his would be a major adverse impact on the conservation area.*'

7.8 EIS traffic design description inconsistencies

A review of the EIS during the exhibition period identified a series of minor inconsistencies between the description provided in the EIS and the proposed, intended design for the CSELR. The inconsistencies generally related to detailed traffic and transport elements such as specific traffic movements permissible at intersections along the CSELR alignment.

A summary of these inconsistencies and a clarification of the proposed design are provided in Table 7.2.

Table 7.2 Inconsistencies between the EIS and the proposed CSELR design

Location	Inconsistencies between the EIS and the proposed CSELR design	
	Description provided in the EIS	Proposed CSELR design
George Street/ Bridge Street intersection	A 'No Right Turn' sign was not marked for the movement from George Street onto Bridge Street in Figure 5.1 (Volume 1A).	A right turn from George Street onto Bridge Street is not proposed to be permitted.
Rawson Place	Figure 12.5b of the EIS (Volume 1B) identifies that Rawson Place would be for property access only whilst text in section 5.4.1 of the *Traffic Operations Report* (Technical Paper 1, Volume 2) notes this as bus only access.	Rawson Place would provide for bus access only in a westbound direction as part of the Rawson Place stop.
Elizabeth Street north of Chalmers Street	The Traffic Operations Report (Technical Paper 1, Volume 2) noted that all Chalmers Street northbound through traffic would be diverted to Elizabeth St via Randle Street (Table 5.4). The report also noted that only Elizabeth Street buses would remain on Chalmers Street north of the intersection with Randle Street. (Table 5.4).	The proposed design would allow for buses to be diverted along Randle Street to Elizabeth Street, with only local vehicle access permitted within Chalmers Street, via the proposed shared zone, to the Dental Hospital.
Devonshire Street/ Bourke Street intersection	Figure 13.6 of the EIS (Volume 1B) identified a signalised intersection at this location with all movements permitted. The Transport Operations Report also noted that uncontrolled priority intersections along Devonshire Street would be limited to left in/left out only. (Section 5.4.2).	This intersection would be signalised and all legal movements would be permitted.

Location	Inconsistencies between the EIS and the proposed CSELR design	
	Description provided in the EIS	Proposed CSELR design
High Street/ Wansey Road intersection	Right turn movements from High Street are only banned (Figure 5.17) whilst it is mentioned that right turning movements off High Street at the signalised intersection with Wansey Road would be undertaken from a short shared section of the light rail alignment on approach to this intersection (Section 5.4.5 of the EIS, Volume 1A).	Right turns into Wansey Road from High Street would be permitted to facilitate the proposed traffic configuration along Wansey Road.
High Street/ Clara Street/ Hospital access intersection	The EIS notes that right turn movements from High Street (eastbound) would be banned (Figure 15.6b) whilst it is also noted that right turning movements off High Street at the signalised intersection with Clara Street would be undertaken from a short shared section of the light rail alignment on approach to this intersection (Section 5.4.5 of the EIS, Volume 1A).	All right turn movements would be permitted.
High Street/ Hospital Road intersection	A signal control intersection was proposed at this intersection (Figure 15.6b of the EIS, Volume 1B). The EIS also noted that The introduction of signal control at Hospital Road would enable right-turn movements into and out of the side road to be maintained. The signals would ensure traffic movements in conflict with the proposed CSELR are controlled.	Left in/left out movements would only permitted to access Hospital Road.

7.9 Removal of the existing pedestrian bridge over the Eastern Distributor

Figure 5.1c of the EIS (Volume 1A) identified that the proposal would include 'relocation of the existing traffic signals and pedestrian footbridge' over the Eastern Distributor. Further clarification of the proposed removal and potential environmental impacts of this bridge are provided below.

7.9.1 Description of the proposed works

As noted above, the EIS stated that the existing bridge and intersection would be relocated as part of the CSELR proposal. This would include the removal of the existing bridge, following construction of the new pedestrian pathway and light rail bridge approximately 60 metres to the north (as described in section 5.2.5 of the EIS, Volume 1A).

The methodology for the bridge removal would be determined during detailed design; however, would generally consist of the following key stages:

- Initial preparation works (such as removal of the existing traffic lights and pre-cutting the existing bridge structure to allow for efficient removal).
- The bridge would be removed in sections via cranes and would be transported off-site. It is anticipated that removal of the bridge could be undertaken in either one or two nights.

- The existing abutments would be made good, and the existing retaining wall replaced.
- Additional, non-structural works such as a new fence at each end of the (current) bridge location, to remove the gaps that currently provide access to each end of the bridge.

It is anticipated that a majority of the works would be undertaken at night to limit the impacts to traffic along South Dowling Street and the Eastern Distributor (refer to section 7.9.2 of this Submissions Report) during removal of the bridge.

7.9.2 Potential impacts of the works

A majority of the potential impacts associated with the removal of the existing bridge would occur during the construction phase of the CSELR proposal. These impacts are described below.

Traffic and transport impacts

During removal of the existing the pedestrian bridge, short term lane closures and temporary diversion routes are likely to be required to allow the bridge structure to be lifted out of place above the Eastern Distributor.

For the initial pre-cutting and removing of the existing bridge, some road closures/partial road closure of both the Eastern Distributor and/or South Dowling Street may be required in addition to undertaking works at night and outside of other peak traffic periods. For the other ancillary works within the vicinity of existing traffic lanes, following removal of the main bridge structure, some localised lane closures may also be required.

Any such closures would be detailed in the site specific Construction Traffic Management Plans to be produced by the selected contractor and would subject to further consultation with RMS, the Traffic Management Centre and the City of Sydney.

No change to performance of the network is expected to that presented in Technical Paper 1 (*Transport Operations Report*) in Volume 2 of the EIS. However, pedestrians to the south of the existing bridge would be required to travel an additional distance of approximately 60 metres further north to access the new crossing. This would result in a potential impact to the Bourke Street Public School who utilise the existing pedestrian bridge to access the Moore Park West Playing fields.

Noise and vibration impacts

The noise and vibration impacts of these works would be limited to the construction phase. The demolition of the existing bridge would likely take place after completion of the new bridge, therefore the impacts of this activity have been assessed separately. The assessment has considered the construction scenario outlined in Table 7.3.

Table 7.3 Summary of airborne construction noise scenarios considered

Construction activity	Location	Scenarios	Scenario sound power level (dBA)	Approximate duration of works
Removal of pedestrian bridge	Existing pedestrian bridge at South Dowling Street	Pre-cutting the bridge structure	111	1–2 days for each scenario, to be confirmed during detailed design
		Craning out of the bridge sections	106	
		Works to make good the abutments and rebuild the retaining wall	118	
		Installation of a new fence	104	

Pre-cutting the bridge structure is anticipated to require the use of concrete saw cutters, other cutting equipment such as grinders and welding equipment. Craning out of the bridge sections is anticipated to require the use of mobile cranes and trucks. Abutment/retaining wall works are anticipated to require the use of a hydraulic breaker, small excavator, jackhammer, mobile crane and hand tools. Installation of a new fence is expected to require the use of hand tools and a truck.

It is anticipated that the works would be undertaken out-of-hours (night-time) due to the requirement for road closures during the works.

Noise impacts

The noise impacts during the footbridge demolition works are expected to be limited to the adjacent residential receivers on South Dowling Street (Surry Hills Precinct). The nearest commercial and other noise-sensitive receivers (Sydney Boys High School) are assumed to operate during daytime hours and therefore would not be in use at the times of the proposed noise-intensive works. The predicted worst-case noise impacts are shown in Table 7.4.

Table 7.4 Construction noise predictions – South Dowling Street pedestrian bridge demolition

Scenario	Noise Catchment Area	Receiver type	Noise Level – $L_{Aeq(15minute)}$ (dBA)		
			Worst-case predicted at nearby receivers	NML Night-time	Exceedance
Removal of the existing pedestrian bridge at South Dowling Street	NCA02.1-RES	Residential	70–85	44[1]	26-41

Note 1: Monitoring location is set back from the Eastern Distributor behind existing houses, and is expected to represent a conservative noise management level (NML) for the receptors immediately adjacent to the Eastern Distributor and South Dowling Street.

Due to the close vicinity of the works to receptors, the predicted noise levels at the adjacent residential properties on South Dowling Street indicate high exceedances of the night-time noise management level (NML) of 26 to 44 dB during the works. The most noise intensive activity considered in the assessment is rock breaking during the works to tidy up the abutments and rebuild the retaining wall.

These impacts would be qualitatively assessed as ‘Highly Intrusive'; however, it is noted that these works would likely be of relatively short duration.

Vibration Impacts

The separation distance(s) between the proposed works and the nearest receptors would generally be sufficient so that nearby buildings are unlikely to be at risk of 'Cosmetic Damage' for most of the proposed construction equipment. However, based on the proposed design, there is potential for rockbreaking to occur at around 20 metres from the buildings on South Dowling Street and within the recommended safe working distances for a large hydraulic hammer (nominally 1,600 kilogram), should the use of this equipment be required.

In relation to human comfort (response), the safe working distances relate to continuous vibration and apply to residential receptors. It is noted that in practice, rockbreaking is generally intermittent in nature and for this reason, higher vibration levels, occurring over shorter periods are permitted. Vibration at the nearest receptors would potentially be perceptible at times during the works.

The required locations for vibration intensive equipment should be reviewed during detailed design when more specific information is available. Vibration impacts during construction could be mitigated by careful equipment selection such as use of smaller equipment, and by vibration monitoring if required.

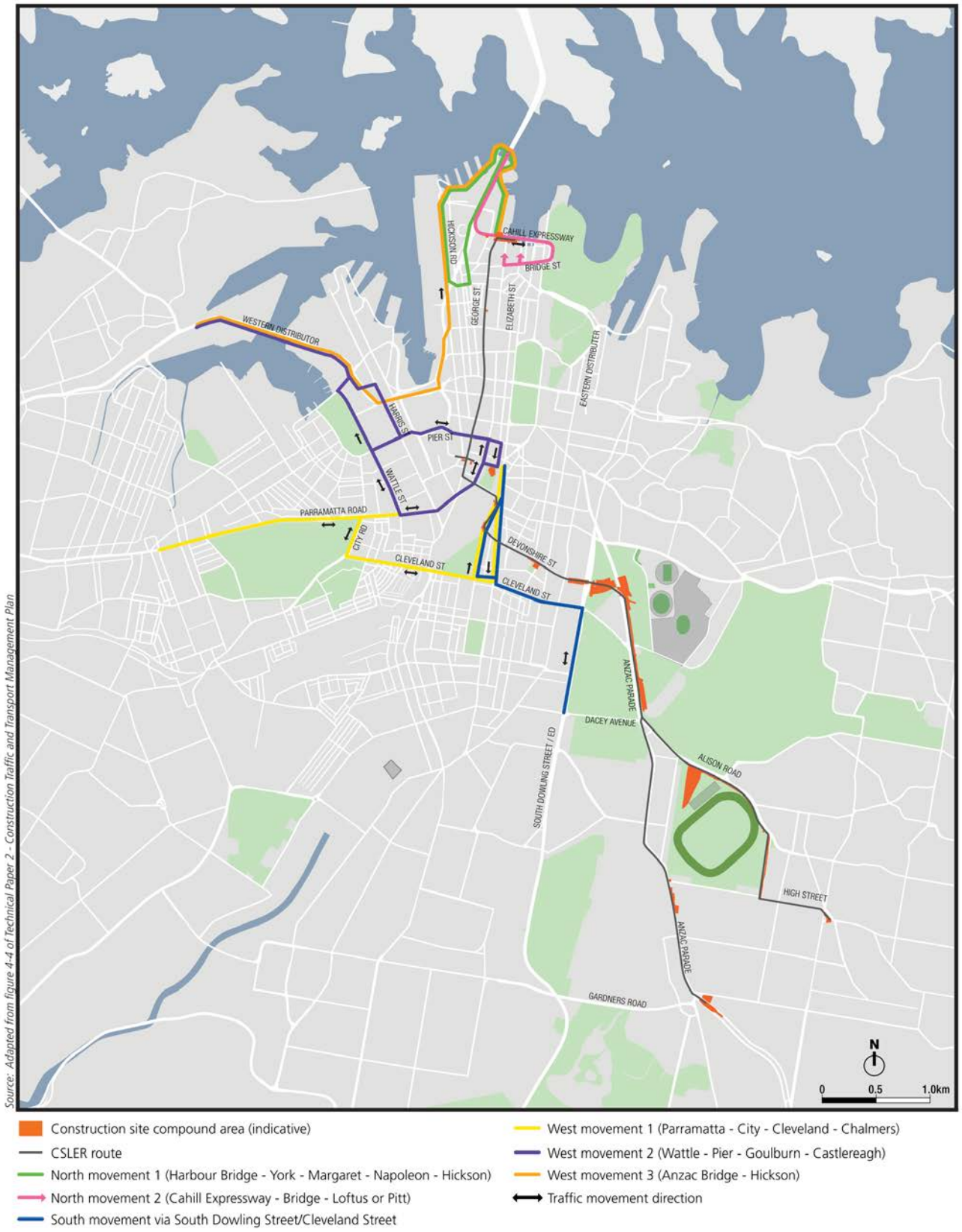
Noise and Vibration Mitigation

Noise and vibration mitigation measures for these works would include careful equipment selection and scheduling noise intensive work to less sensitive periods where reasonable and feasible. The mitigation measures would be confirmed during the preparation of a Construction Noise and Vibration Management Plan for this site, during the detailed design stage when the construction method and equipment is confirmed.

7.10 EIS editorial errors

A series of editorial errors have been noted in the EIS which are clarified below.

- Page 4-25 of the EIS (Volume 1A) — A reference to 'Option 4' was made in the second paragraph of Selection of preferred design option. This reference should have been to 'Option 1' as the preferred option as no 'Option 4' was presented for this design.
- Page 5-44 of the EIS (Volume 1A) — It was incorrectly stated that the design for the CSELR would require Wansey Road to become one way for vehicular traffic. This should have stated that vehicular traffic would be allowed for in both directions along Wansey Road.
- Page 6-32 to Page 6-37 of the EIS (Volume 1A) — Figure 6.3 to Figure 6.5 and Figure 6.7 incorrectly showed the proposed haulage routes and site compound areas for the south-east sector of the proposal. The alignment of the haulage routes and compound sites had been incorrectly transposed and were intended to line up with the existing road network. The revised maps are shown as Figure 7.7a to Figure 7.7d below.

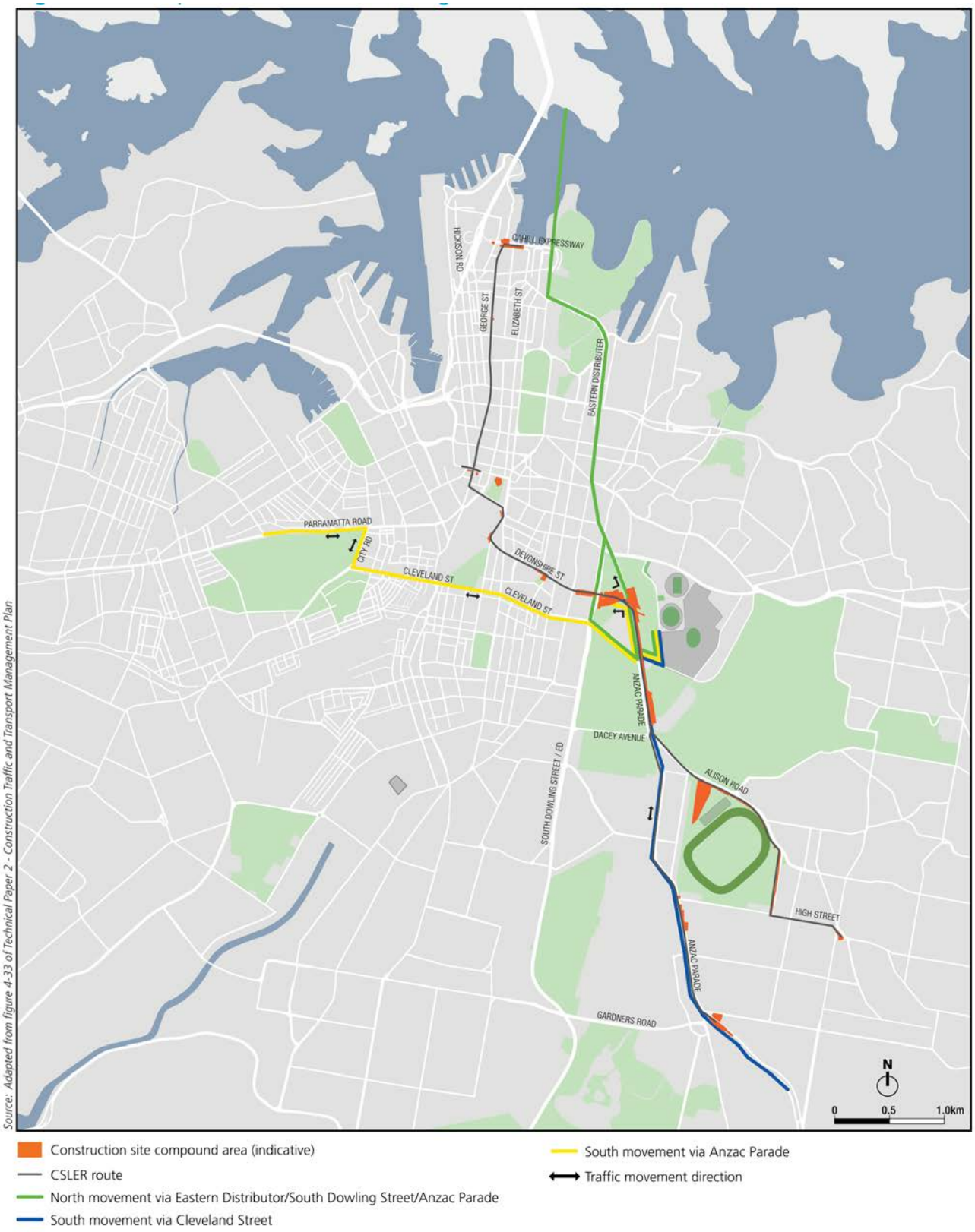


Note: This is a revised version of Figure 6.3 from the CSELR EIS (Volume 1A)

Figure 7.7a Proposed construction haulage routes for the City Centre Precinct

Note: This is a revised version of Figure 6.4 from the CSELR EIS (Volume 1A)

Figure 7.7b Proposed construction haulage routes for the Surry Hills Precinct



Note: This is a revised version of Figure 6.5 from the CSELR EIS (Volume 1A)

Figure 7.7c Proposed construction haulage routes for the Randwick Precinct

Note: This is a revised version of Figure 6.7 from the CSELR EIS Volume 1A

Figure 7.7d Proposed construction haulage routes for the Kensington/Kingsford Precinct

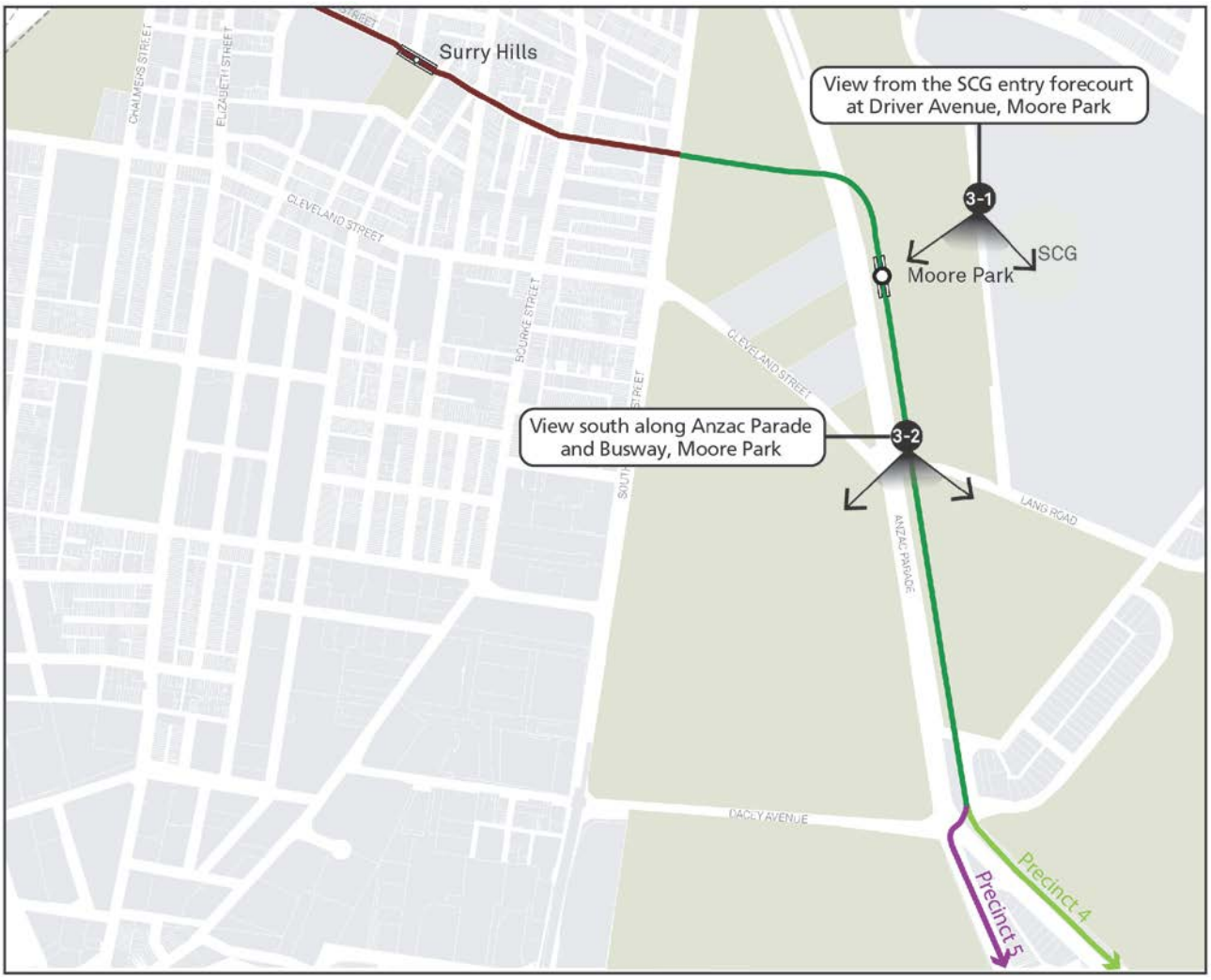
- Concern was raised regarding potential contradictory statements regarding the closure of the crossing for the Strand Arcade. As identified in section 6.10.8 and section 9.2.3 of the EIS (Volume 1A), the mid-block crossings at the Strand Arcade (along with the Queen Victoria Building and Event Cinemas on George Street) would be closed during the construction period.
- Page 13-4 of the EIS (Volume 1B) — Figure 13.2 incorrectly identified a property within the Surry Hills Precinct. The figure noted that the access point on the north-east corner of Devonshire Street and Riley Street was for the 'St. Patricks Business College'. This label should have showed the property as the 'St. Vincent's Children's Hospital Centre' (as it was correctly labelled in Figure 13.11 on Page 13-26 of the EIS).
- Page 13-26 of the EIS (Volume 1B) — Figure 13.11 incorrectly identified the existing residence at 242 Devonshire Street as part of the St. Vincent's Hospital Children's Centre. It is acknowledged that residence at 242 Devonshire Street is a separate and privately owned property and should have been identified as a residential land use on this figure.
- Page 13-26 of the EIS (Volume 1B) — Figure 13.20 incorrectly labelled the key landscape character areas for the Surry Hills Precinct. The correct image is provided in Figure 7.8 below.

Note: This is a revised version of Figure 13.20 from the CSELR EIS (Volume 1B)

Figure 7.8 Surry Hills Precinct – Key landscape character areas

- Page 14-14 of the EIS (Volume 1B) — The permanent acquisition area shown on Figure 14.5 to the west of South Dowling Street was incorrectly marked. The area of proposed permanent acquisition should have been identified approximately 50 metres further north in the location of the existing Olivia Gardens apartment building and car park adjacent to the Langton Centre.
- Page 14-39 of the EIS (Volume 1B) — Figure 14.15 incorrectly labelled the key viewpoints areas for the Moore Park Precinct. The correct image is provided in Figure 7.9 below.

- Page 16-71 of the EIS (Volume 1B) — The headings for the tables provided on page 16-71 were incorrectly labelled within the EIS. The table shown as Table 16.23 provides details regarding the proposed construction mitigation measures (previously labelled as operational measures) and the table shown as Table 16.24 provides details regarding the proposed operational mitigation measures (previously labelled as construction measures).



Note: This is a revised version of Figure 14.15 from the CSELR EIS Volume 1B.

Figure 7.9 Moore Precinct – Key viewpoints

8. Revised environmental management measures

This chapter presents the revised environmental management measures that Transport for NSW proposes to implement to reduce the identified environmental and social impacts associated with the construction and operational phases of the CBD and South East Light Rail (CSELR) proposal.

8.1 Overview

Appendix I of the CSELR Environmental Impact Statement (EIS) documented a range of environmental management measures that Transport for NSW proposes to implement to reduce the identified environmental and social impacts associated with the construction and operational phases of the proposal.

Subsequent to the public exhibition of the EIS, Transport for NSW proposes to amend the environmental management measures for the CSELR proposal in response to:

- issues raised in submissions received during the public exhibition period (as outlined in Chapter 4 and Chapter 5 of this report)
- the design changes proposed in Chapter 6 of this report
- additional investigations undertaken since the public exhibition of the EIS (as described in Chapter 7 of this report)
- further review and rationalisation of the environmental management measures presented in the EIS to remove duplication and inconsistencies between these measures.

Tables 8.1 to 8.3 outline the revised set of environmental management measures for the CSELR proposal. New measures that are proposed to be added to the environmental management measures (including any new additional text or clarifications to the existing measures) have been denoted in Tables 8.1 to 8.3 with underlined text, while any environmental management measure proposed to be removed (or have text deleted from the measure) has been shown with ~~strikethrough text~~.

The revised set of environmental management measures documented in Tables 8.1 to 8.3 of this report supersedes the measures that were documented in Appendix I of the EIS.

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.

8.2 Detailed design

The revised environmental management measures to be implemented during the detailed design phase of the CSELR proposal are listed in Table 8.1.

Table 8.1 Revised environmental management measures for the CSELR proposal – detailed design

ID No.	Environmental management measure – detailed design and pre-construction phase
Traffic, transport and accessibility	
A.1	Opportunities to consolidate the existing taxi zones along Devonshire Street (between Chalmers Street and Elizabeth Street) and Chalmers Street (adjacent to the Foveaux Street and Elizabeth Street intersection) into one location adjacent to Central Railway Station in Chalmers Street (south of Devonshire Street, as per the functional road network changes proposed for the operational phase of the CSELR proposal) would be investigated during detailed design in consultation with the City of Sydney.
A.2	The detailed streetscape design of the George Street pedestrian zone would include defined areas for pedestrians and light rail vehicles through visual cues, such as changing pavement types.
A.3	The key actions specified in the detailed access plans for each of the proposed light rail stops, included in section 7.3 of Technical Paper 1 (*Transport Operations Report*) of the EIS (addressing potential multimodal access, customer safety, or to improvements to access) would be further considered during detailed design.
A.4	Opportunities to relocate impacted loading and taxi zones from George Street to the additional kerb provided at the cross streets (for example, converting obsolete turning bays for movements onto George Street into parking) would be further investigated during detailed design (consistent with other changes proposed as part of the Sydney City Centre Access Strategy), in consultation with City of Sydney.
A.5	Parking management measures to improve the future balance between car parking supply and demand and to maintain effective spare capacity to meet varied demands would be investigated during detailed design. Transport for New South Wales would work through implementation of these measures to manage kerbside activity with City of Sydney and Randwick City Council.
A.6	For the Kingsford sub-precinct, controls on remaining parking spaces (to restrict parking to key uses and removing unrestricted parking) would be investigated during detailed design with the aim of maximising the benefit of available parking capacity for high priority users (including disabled, servicing and loading, short stay parking for local business and long stay for residents). Transport for New South Wales would work through implementation of these measures to manage kerbside activity with Randwick City Council.
A.7	Opportunities to relocate existing disabled parking space on High Street (between Clara Street and Hospital Road) to Clara Street (at the intersection with High Street) would be investigated during detailed design, in consultation with Randwick City Council.
A.8	Permanent changes to access arrangements and local traffic movement would be minimised during the detailed design phase, including the maintenance of existing accesses where possible. Any access restrictions required for the CSELR proposal would be subject to further consultation between the affected parties, Transport for NSW and the appropriate local council (City of Sydney or Randwick City Council). A case by case consideration of each affected property access would be undertaken during detailed design (in consultation with the affected parties) to determine the access restrictions required along the proposed CSELR route.
A.9	Parking permit schemes would be considered, particularly in predominately residential precincts surrounding the CSELR corridor. These would be designed to afford priority to local residents to park in the vicinity of their home with an allowance for short-term parking for visitors and for vehicle access to commercial land uses and other short-stay trip generators.
A.10	Opportunities to stage construction works on the Anzac Parade and Alison Road corridors would be investigated during detailed design to provide additional capacity during construction and reduce increases to travel time.

ID No.	Environmental management measure – detailed design and pre-construction phase
A.11	Opportunities to signpost and promote alternative road corridors in the south-eastern suburbs of Sydney would be investigated during detailed design and/or construction phases with the aim of lowering traffic volumes along the proposed construction corridor.
A.12	Tidal flow operation on Anzac Parade during construction would be considered, to provide a bus priority lane in the peak direction and protect bus journey time reliability along the corridor during construction works. This would involve further review by RMS, including traffic modelling, to assess the impacts and feasibility in more detail. The final bus priority measures to be implemented would be determined in consultation with Randwick City Council and Roads and Maritime Services.
A.13	A single lane would be retained along the entire length of the existing Anzac Parade Busway and complementary bus priority measures on Alison Road. Potential mitigation measures would be developed to allow bus priority lanes in the peak direction during peak hours together with bus priority measures at the intersection of Anzac Parade and Alison Road. These priority measures would be explored as part of the Traffic Management Plans in consultation with the bus operators and the relevant Road Authority.
A.14	Opportunities to implement time-restricted loading zones on Holt Street, Waterloo Street and Riley Street would be investigated during detailed design, in consultation with the City of Sydney, to facilitate access to the adjacent retail and commercial businesses.
A.15	Opportunity to relocate the existing taxi rank from Anzac Parade (south of the Nine Ways intersection and adjacent to the South Sydney Junior Leagues Club) to the Wallace Street frontage of the South Sydney Juniors Club would be investigated during detailed design, in consultation with Randwick City Council.
A.16	To further reduce the extent of queuing on Belmore Road, the final design of the Belmore Road and Avoca Street intersection would be reviewed to determine if an additional short approach lane is required and can be incorporated on Belmore Road to manage traffic at this intersection.
A.17	The location north of the University of NSW where express buses would re-join the general traffic lanes along Anzac Parade would be determined during detailed design following further traffic and intersection modelling.
A.18	The Anzac Parade/High Street and the UNSW Mall/Anzac Parade traffic signals/crossings would be designed to ensure a light rail vehicle can be safely stored between each set of signals without blocking traffic entering and leaving the side roads.
A.19	The length and design of the right turn bay into Day Avenue from Anzac Parade would be investigated during detailed design.
Noise and vibration	
B.1	The predicted noise and vibration levels in the EIS, and the determination of as-required noise and vibration mitigation, would be verified during the detailed design phase of the proposal. An Operational Noise and Vibration Review would be prepared to determine the final design of mitigation measures.
B.2	Where exceedances of 'other' (non-residential) sensitive receiver noise trigger levels have been predicted in the EIS (refer Table 14 in Technical Paper 11 (*Noise and Vibration Impact Assessment*)), this would be verified in the detailed design stage, including further investigation of whether these receivers have fixed glazing and do not rely on open windows for ventilation.

ID No.	Environmental management measure – detailed design and pre-construction phase
B.3	The final trackform design and associated operational ground-borne noise and vibration mitigation measures would be addressed in the detailed design of the track. Standard trackform would be employed through the majority of the George Street pedestrian zone and at other locations removed from particularly sensitive receptors. High-resilience trackform may be required to minimise ground-borne noise impacts at locations where sensitive receptors line the alignment. Very high attenuation track may be required at some locations, such as near the Randwick health precinct. Consultation with the receptors identified in Table 23 in Technical Paper 11 (*Noise and Vibration Impact Assessment*) of the EIS would be required during the detailed design phase to confirm the sensitivity of these locations to ground-borne operational noise. Investigations would establish the internal noise level achieved by these buildings at present, the location of sensitive spaces within each building and the level to which any theatres or recording studios are isolated. More detailed investigations would be conducted including measurement of existing internal and external noise and vibration levels, including ground-borne noise and vibration levels due to the existing road traffic and light and heavy rail in the CBD. These investigations would inform the required resilient trackform design in these locations and confirm the appropriateness of the ground-borne operational noise design goals.
B.4	Where potential exceedances of ground-borne operational vibration criteria have been identified in the EIS at locations with vibration sensitive equipment (refer to Chapters 12, 13, 15 and 16 of the EIS), ongoing consultation and collaboration with the owners and operators of vibration sensitive equipment along the proposed CSELR alignment would be undertaken throughout the detailed design stage to achieve appropriate vibration outcomes at the affected facilities.
B.5	Operational noise from new electrical substations would be controlled by inclusion of shielding or enclosures to comply with the NSW *Industrial Noise Policy* at all locations.
B.6	The detailed design of public address (PA) systems at light rail stops would include noise mitigation measures to minimise potential noise impacts at the nearest receptors to the stops to comply with the NSW *Industrial Noise Policy.*
B.7	During the detailed design stage, alternative noise mitigation options would be investigated for the Randwick stabling facility (refer measure AI.4 in Table 8.3) before determining the final solution to meet the NSW *Industrial Noise Policy* noise criteria.
B.8	The design of the maintenance building/workshop and mechanical equipment at the Rozelle maintenance depot would include noise mitigation measures (as required) to comply with the NSW *Industrial Noise Policy* criteria at the nearest noise sensitive receptors.
B.9	At the Rozelle maintenance depot, all audible alarm systems would be designed to be non-tonal and 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.
B.10	During the detailed design stage, construction ground-borne noise impacts would be revisited during preparation of the more detailed site-specific Construction Noise and Vibration Impact Statement for locations listed in Table 64 of Technical Paper 11 (*Noise and Vibration Impact Assessment*) of the EIS. This would include further assessment of the likely construction noise levels at the most affected recording rooms of all recording studios along the CSELR alignment and to establish receiver-specific noise goals, taking into account the type of recordings undertaken, and the existing external to internal noise insulation. Consultation with the owners/operators of these facilities would be undertaken as part of this process.
B.11	Additional assessment of construction road traffic noise impacts of night-time truck movements (if required) would be undertaken at detailed design stage when the finalised traffic plan is determined.
B.12	During detailed design, further assessment of the operational noise impacts on sensitive receivers would be undertaken in accordance with the NSW *Road Noise Policy*. This assessment would be limited to roads that result in increased traffic due to road closures or diversions directly as a result of the CSELR proposal.

ID No.	Environmental management measure – detailed design and pre-construction phase
Visual and landscape	
C.1	Detailed design would consider opportunities for siting mature Fig trees within the Royal Randwick racecourse grounds in the vicinity of the intersection of Wansey Road and Alison Road, and in the Wansey Road nature strip (between Arthur and High streets) to recreate the canopy of the lost street trees on the western side of Wansey Road in consultation with the Australian Turf Club.
C.2	Detailed design would consider the opportunity for a central pole catenary system to minimise visual impacts, in addition to consideration of opportunities to rationalise and/or group services, poles and wires to minimise visual clutter. The design of the overhead wiring system, including pole configuration would take into account, stakeholders views, operational requirements, best practice from other light rail systems, design and engineering constraints and environmental considerations.
C.3	Detailed design would consider opportunities to incorporate substations into other uses (such as ~~seating and~~ shade structures or built development), as well as opportunities to locate and/or design the substations to reduce their visual prominence and amenity impacts, in consultation with City of Sydney and Randwick City Council. Impacts would be minimised by: ▪ Identifying opportunities to locate substations below ground level would be investigated (where appropriate) during detailed design ▪ locating the substations away from sensitive receivers where possible (e.g. within existing buildings) ▪ planting appropriate vegetation (or other screening such as appropriate cladding) around the above ground substations to minimise visual impacts for adjoining properties and/or parkland settings.
C.4	The Surry Hills stop would be designed to incorporate a new frontage to Devonshire Street for Ward Park to replace the existing landscaped seating area and new tree planting that would be removed by the CSELR proposal. More detailed concepts for this interface would be developed during detailed design in conjunction with the City of Sydney.
C.5	Detailed design would consider opportunities for incorporation of public art into treatment of the site hoarding and enclosure, in collaboration with relevant stakeholders.
C.6	The light rail tracks and paving near the Federation Place forecourt, located south of Lang Road, would be designed to integrate with the existing paving.
~~**C.7**~~	~~Design of UNSW Anzac Parade stop to maintain clear lines of sight from the University Mall.~~ **Note: This mitigation measure has been removed as this work has been completed. Refer to section 6.13 of the Submissions Report.**
~~**C.8**~~	~~Opportunities to minimise the impact on significant trees at UNSW would be further investigated during detailed design (e.g. rationalising the design of the UNSW Anzac Parade stop to move it away from the significant trees).~~ ~~Where trees are required to be removed, detailed design would investigate opportunities for siting semi mature Fig trees within the UNSW grounds (in the vicinity of the proposed CSELR stop) to recreate the perimeter planting along the Anzac Parade frontage and reinforce campus boundaries in consultation with the University of NSW.~~ **Note: This mitigation measure has been removed as this work has been completed. Refer to section 6.13 of the Submissions Report.**
C.9	Detailed design would consider urban design and public domain improvements for the alignment and areas that would be impacted by construction of the CSELR. This would include reinstatement of parks and open space, for example Wimbo Park and High Cross Park and the associated war memorial, as well as creation of new open spaces where available, including at Olivia Gardens.
C.10	Ongoing consultation with the City of Sydney, Randwick City Council, the Sydney Harbour Foreshore Authority and other relevant stakeholders would continue to be undertaken throughout the detailed design phase to identify opportunities for revitalisation of existing public spaces and the public domain and to determine the most appropriate form or revitalisation for these areas.

ID No.	Environmental management measure – detailed design and pre-construction phase
C.11	The detailed design of the Anzac Parade pedestrian bridge would be referred to the Urban Domain Reference Group for the CSELR proposal to ensure best practice urban design principles are applied.
C.12	The detailed design of the Eastern Distributor bridge would be referred to the Urban Domain Reference Group for the CSELR proposal to ensure to ensure best practice urban design principles are applied.
C.13	Appropriate architectural and urban design treatments would be undertaken to minimise the visual impact associated with noise mitigation structures for the proposed Randwick stabling facility and achieve an appropriate design outcome for this facility and local residents. The principles for development of the noise mitigation would include minimising overshadowing and maximising the retention of boundary trees to properties along Doncaster Road. The design process would include consultation with landowners.
Built and non-indigenous heritage	
D.1	The detailed design of the proposed construction worksite in Circular Quay would minimise potential visual impacts on the setting of the Sydney Opera House. The construction compound would also be planned to retain significant elements of the park, including plantings, monuments and landscape features.
D.2	The detailed design of works in Regimental Square would aim to retain and conserve the memorial and associated significant plantings.
~~D.3~~	~~The design of the proposed above ground Parker Lane substation would be further investigated during detailed design with the aim of avoiding adverse impact on views of the lower section of the Palace Hotel from Parker Lane (which could include the consideration of a below ground substation option at this location).~~ **Note: This mitigation measure has been removed as this work has been completed. Refer to section 6.14 of the Submissions Report.**
D.4	The proposed shelter at the Rawson Place stop would be designed to minimise impacts on key views of the façade of Daking House and would be set back as far as possible from its awning. The regrading of the road and pavement levels would be detailed to avoid adverse impacts on the fabric of Daking House at ground level, and maintain the integrity of entry doors and shopfronts.
D.5	Detailed design of the Eddy Avenue alignment would retain and conserve the significant fabric of Central Railway Station and its underbridges.
D.6	Any fixings proposed to be attached to the underbridges of Central Railway Station would be to the concrete structure, not the sandstone.
~~D.7~~	~~Where feasible, service poles would be rationalised and services grouped to minimise clutter and minimise impacts on surrounding visually sensitive receivers.~~ **Note: This mitigation measure has been consolidated with mitigation measure C.2.**
D.8	The section of the CSELR alignment between Eddy Avenue and Chalmers Street would aim to minimise impacts on the Elizabeth Street Gardens.
D.9	The location and design of the Rawson Place stop would aim to minimise impact on key views of Central Railway Station east along Rawson Place.
D.10	The following measures would be implemented for the Randwick Precinct Heritage Conservation Area: ▪ ~~Where possible,~~ Detailed design of the CSELR alignment and the associated Royal Randwick racecourse stop would aim to retain (if possible) and avoid or minimise impacts on the significant built elements including the former racecourse gates and landscaping of the Racecourse Precinct Heritage Conservation Area. ▪ Detailed design of the light rail stabling facility in the north-western corner of the racecourse would investigate retention of remnant historic tram infrastructure to be integrated into the new stabling facility, where feasible. ▪ A photographic archival recording of the Alison Road and Wansey Road boundaries, the north-western area and the Swab Building would be undertaken prior to works commencing. Significant trees and structures to be demolished or altered would be recorded.

ID No.	Environmental management measure – detailed design and pre-construction phase
D.11	The detailed design of the CSELR would aim to retain as many as practicable of the significant trees along the route, where feasible without compromising rail safety, in particular at the Royal Randwick racecourse.
D.12	The following measures would be implemented for High Cross Park, including the High Cross Heritage Conservation Area and Significant Trees within High Cross Park: ▪ Detailed design of the proposed stop, ~~especially the large scale elevated canopy~~ the canopies, substation and associated infrastructure, would aim to minimise the land take in the reserve. The detailed design would aim to retain significant trees~~, where possible, and the war memorial~~. ▪ Where feasible, the proposed above ground substation would be changed to a below ground facility to reduce the extent of additional built infrastructure. ▪ Reinstatement of the remnant reserve landscaping. ▪ A photographic archival recording of the reserve would be undertaken prior to works commencing.
D.13	The following measures would be implemented for Tay Reserve: ▪ Detailed design of the CSELR proposal would minimise the area of Tay Reserve to be removed for the cross over at Anzac Parade. ▪ A photographic archival recording of Tay Reserve would be undertaken prior to works commencing.
D.14	~~The impact on the~~ The Rozelle maintenance depot would be designed to minimise impacts on the Historical Archaeological Management Units (HAMU) identified in Technical Paper 5 (Heritage Impact Assessment) in Volume 4 of the EIS. ~~would be revised during detailed design once more detailed information on the proposed Rozelle Maintenance Depot has been determined.~~
D.15	Further investigation of the design of the relocated Wansey Road stop would be undertaken during detailed design with the aim of reducing or avoiding impacts on Wansey Cottage and significant trees in the racecourse.
D.16	The detailed design of the Anzac Parade pedestrian bridge would seek to retain the former bear pit in the grounds of the Sydney Boys High School, as well as minimise the number of significant trees to be removed along Anzac Parade. If the bear pit can be retained, it would be protected during construction works. The pedestrian bridge would be designed to provide an appropriate aesthetic design to minimise its impact on the setting of the Anzac Parade significant trees.
D.17	The significance of the former radio workshop at Central Station (refer to section 6.14 of the Submissions Report) would be assessed to determine the impact of the proposed substation location at Central Station, and to guide the detailed design of works to install the substation. If the existing radio workshop structure is found to be significant, the early/original form and fabric would be retained as far as practicable. Archival recording of the building would be undertaken prior to any works commencing.
Safety and security and hazard and risk	
E.1	Detailed design would incorporate the principles of Crime Prevention through Environmental Design (CPTED). This would include, but not be limited to, a full review and assessment in accordance with the CPTED principles of the each of the proposed stops and the proposed pedestrian bridge over Anzac Parade.
E.2	~~Targeted consultation with identified sensitive receivers for EMF (e.g. UNSW and Prince of Wales Hospital) would be undertaken to inform the detailed design. Any issues identified would be resolved on a case by case basis with solutions such as monitoring and, if necessary, protective screening at the site of the sensitive equipment.~~ Monitoring of electromagnetic fields (EMF) and electromagnetic interference (EMI) would be undertaken at both the UNSW and the Randwick Hospitals precinct prior to commencement of CSELR operations. The monitoring requirements for EMF would include: ▪ Establishing monitoring points pre-construction to create a baseline for existing EMI emissions. ▪ Designing a system that does not materially impact equipment operated by the UNSW and Randwick Hospitals precinct. ▪ Measuring EMI emissions during pre-revenue operations (commissioning) to ensure no material adverse effect.

ID No.	Environmental management measure – detailed design and pre-construction phase
E.3	The detailed design for the proposed relocation of the Sydney Coach Terminal bays would include the provision of safe and suitable loading/unloading area(s) in addition to safe crossing from the coach stops to the pedestrian footpath on the southern side of Eddy Avenue. Pedestrian access to the proposed Eddy Avenue coach station island platform would be provided via the existing Eddy Square pedestrian crossing at the eastern end. A new crossing at the western end would be provided to allow pedestrian movement between the existing coach booking office and the coach platform.
Regional land use and community outcomes and property acquisition	
F.1	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.
F.2	Transport for NSW would consult with directly affected land owners during the detailed design of the CSELR proposal.
F.3	Transport for NSW would continue to liaise with users of the Moore Park facilities in relation to design and construction of the CSELR and potential impacts in relation to these facilities and their usage.
Hydrology, drainage and surface water quality	
G.1	For flood affected locations, the CSELR would be designed to ensure compliance with the *NSW Floodplain Development Manual* which includes a requirement to not increase flood levels above existing levels. Flood mitigation measures that could be considered include: ▪ increasing downstream drainage capacity ▪ diverting upstream flows around or under the track formation ▪ providing stormwater detention under or adjacent to the track formation.
G.2	All additional flow diversions and new drainage would not exceed the capacity of the existing downstream drainage network and receiving environments. This would be achieved by a range of the following methods: ▪ diverting the existing drainage and crossing the track formation at a location that allows it at a point up slope of the alignment ▪ providing new drainage parallel to the CSELR alignment and crossing the track formation at a location that allows it at a point down slope of the alignment ▪ providing new drainage to discharge to an alternative outlet downstream without crossing the track formation ▪ recycling of wash-down water at the Rozelle maintenance depot and Randwick stabling facility. These measures would aim to prevent increased flood risk and hazard for property and infrastructure.
G.3	Operational protocols would be developed to address CSELR operation and passenger safety in the event of flooding occurring along the alignment.
Groundwater	
H.1	Additional investigation/assessment of dewatering requirements for the construction of the Moore Park tunnel would be undertaken during detailed design and in consultation with the NSW Office of Water. Groundwater modelling would be undertaken to determine the potential impacts from the permanent interruption of groundwater flow, including the extent of the drawdown and the potential for settlement.
H.2	A dewatering system for excavations proposed in the Botany Sands aquifer would be developed. This could comprise the reinjection of groundwater back into the same aquifer to minimise the spatial extent of drawdown (and therefore settlement).
H.3	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). This would cover an area appropriate to identify potential dewatering impacts.
H.4	The design of embankments would incorporate adequate drainage to reduce compaction and/or sealing of the underlying aquifer.

ID No.	Environmental management measure – detailed design and pre-construction phase
H.5	Adequate drainage and runoff management would be incorporated into the design of the Rozelle maintenance depot and the Randwick stabling facility.
~~**H.6**~~	~~A condition assessment of existing buildings and infrastructure along and within the immediate vicinity of the Moore Park tunnel would be undertaken to monitor the risk of settlement from groundwater drawdown.~~ **Note: This mitigation measure has been consolidated with mitigation measure Y.2.**
Aboriginal heritage	
I.1	Information gathered from geotechnical investigations would be reviewed to further refine the areas of potential Aboriginal archaeological deposits identified in this EIS and the extent of impact on such deposits. This review would be undertaken for all areas of the CSELR corridor that have been designated as archaeological potential zones 1, 2 and 3.
I.2	A program of targeted test excavations would be undertaken for all areas of the CSELR corridor that have been designated as archaeological potential zones 1 and 2. This would follow on from the desktop review and site inspections of the CSELR proposal area which were completed for this EIS to assist in accurately determining areas of Aboriginal archaeological potential, and more accurately inform the impact assessment. This in turn would refine the nature and distribution of further mitigation measures, such as salvage excavation.
~~**I.3**~~	~~Where the allocation of archaeological potential zones is altered from those designated in this EIS, mitigation measures would be employed as relevant to the updated zoning.~~
I.4	Where required, local Aboriginal stakeholders would be involved and consulted with during Aboriginal archaeological works.
Greenhouse gas	
J.1	Transport for NSW would revise and update the greenhouse gas assessment undertaken for the CSELR proposal as part of this EIS during the detailed design phase. This would include the further identification of mitigation measures to reduce the volume of emissions generated during the construction and operational phases of the CSELR proposal. Evaluation and reporting on the feasibility of these mitigation measures would also be undertaken during detailed design as part of the greenhouse gas assessment.
J.2	Opportunities to reduce operational greenhouse gas emissions would be investigated during detailed design. These opportunities could include purchasing electricity derived from a renewable energy source (where available), the use of regenerative braking on rolling stock, promoting the selection of energy efficient rolling stock, the use of photovoltaic powered lighting at stops and undertaking a traction power assessment. The sustainability initiatives documented in Table 7.5 of the EIS (refer to Chapter 7 of the EIS) would be regularly reviewed, updated and implemented throughout the design development, construction and operational phases.
J.3	Undertake AS14064-2 (greenhouse gases – project level) compliant carbon footprinting exercise in accordance with Greenhouse Gas Inventory Guide for Construction Projects (Transport for NSW). The carbon footprint would be used to inform decision-making in design and construction. Use standard carbon coefficient values for construction material and fuel usage. Monitor and report the carbon footprint every six months during construction.
Utilities and services	
K.1	The proposed 12 substations for the CSELR proposal would be located so that they minimise amenity impacts along the CSELR alignment.
K.2	The extent of utility impacts and any works required to protect, relocate or replace services (including funding arrangements) would be confirmed during detailed design in consultation with the relevant utilities providers, including the City of Sydney and Randwick City Council. This consultation would also ensure that appropriate measures are taken regarding the potential integration of future utilities requirements along the alignment and to ensure that the CSELR proposal does not preclude the development or installation of these proposed utilities.

ID No.	Environmental management measure – detailed design and pre-construction phase
K.3	Should the location of any utilities be identified to be in conflict with the proposal, a review of the proposed works at these location(s) would be undertaken in consultation with the construction contractor. An alternative design or arrangements would then be determined to provide the most feasible and beneficial outcome for the community, service provider and proposal in terms of safety and constructability.
K.4	Consultation with services operators such as emergency services and other community services such as garbage collection services, would continue to be undertaken throughout the detailed design of the proposal in conjunction with the City of Sydney and Randwick City Councils.
Sustainability	
L.1	The detailed design of the CSELR proposal would aim to achieve an 'excellent' rating under the Infrastructure Sustainability Council of Australia (ISCA) infrastructure rating tool. Table 7.5 in Chapter 7 of the EIS outlines initiatives applicable to achieve a rating level of 'excellent'.
L.2	Sustainable design and construction of the ~~project~~ CSELR proposal would be in accordance with the *Sustainable Design Guidelines V3.0* (Transport for NSW 2013d). Table 7.5 in Chapter 7 of the EIS (Volume 1A) outlines applicable initiatives to achieve a rating level of 'Gold'.
Climate change	
M.1	Climate change risk and opportunity assessments would be undertaken during detailed design and would include identification and mitigation of the key climate change risks for the proposal.
Planted trees	
N.1	Proposed construction methods would be reviewed to reduce the construction footprint, where feasible.
N.2	The large mature Figs adjacent to Alison Road, Wansey Road, ~~and~~ within the George Dan Reserve and within the proposed Randwick stabling facility would be reviewed by a suitably qualified arborist during detailed design to confirm if these trees could be retained and/or relocated. This review could include root zone mapping of potentially impacted Figs to determine the likely extent of their tree roots adjacent to and beneath the road surface (This would be undertaken in conjunction with the mitigation measure identified in mitigation measure C.1). Where feasible semi-mature Figs directly impacted by the construction of the CSELR proposal would be transplanted to an alternative suitable location, in consultation with Centennial Park and Moore Park Trust and Roads and Maritime Services (where Fig trees are proposed to be planted within the Anzac Parade road corridor). A detailed relocation and maintenance strategy for the impacted trees would be developed during detailed design, in consultation with Centennial Park and Moore Park Trust, Randwick City Council and the Australian Turf Club where required.
N.3	Qualified arboricultural advice would be employed during detailed design and construction to confirm the expected impacts of the CSELR proposal on planted trees and to identify appropriate mitigation measures for such impacts. The advice would include root zone mapping of potentially impacted trees to determine the likely extent of their roots. This assessment would employ the most recent methods for assessing trees and impacts. The aim of this additional assessment would be to reduce the number of planted trees that would be impacted by the CSELR proposal.
Stakeholder engagement	
AN.1	Local business and community reference groups would be established and comprise independent representatives from the community to advise the proposal on community concerns related to the proposal. An Urban Domain Reference Group would be established to allow key partner stakeholders such as City of Sydney and Randwick City councils to review and comment on the proposed urban design elements. A Utilities Reference Group would also be established, which would comprise independent representatives from the utility owners to advise on utility concerns related to the proposal.

8.3 Construction

The revised environmental management measures to be implemented during the construction of the CSELR proposal are listed in Table 8.2.

Table 8.2 Revised environmental management measures for the CSELR proposal – construction

ID No.	Environmental management measure – construction phase
General environmental management measures	
O.1	Construction would be undertaken in accordance with Transport for NSW's ISO 14001 accredited environmental management system.
O.2	A construction environmental management plan (CEMP) would be prepared prior to construction, which would outline the construction conditions and temporary environmental protection measures to manage the impact of construction activities. The CEMP would be consistent with the environmental management measures documented in this EIS, conditions of approval and the conditions of any licences or permits issued by government authorities.
O.3	The CEMP would identify the auditing and inspection requirements and determine the framework for the management of key environmental issues for construction. To address site specific conditions, the CEMP would delegate particular management measures to be incorporated in discrete Environmental Control Maps.
O.4	The location of sensitive areas (e.g. heritage items and trees to be retained) would be clearly identified on Environmental Control Maps, which would be supplied to construction managers and workers.
O.5	All workers would be provided with an environmental induction prior to commencing work on-site. This induction would include information on the following: ▪ Environmental protection measures to be implemented to protect the quality of the surrounding environment, including weed control, erosion and sediment control, and water quality management and penalties for breaches. ▪ Noise and vibration management, including good working practices and measures for reducing the source noise levels of construction equipment by construction planning and equipment selection where practicable. ▪ Basic training in the recognition of Aboriginal cultural heritage material. This training would include information such as the importance of Aboriginal cultural heritage material and places to the Aboriginal and non-Aboriginal community, as well as the legal implications of removal, disturbance and damage to any Aboriginal cultural heritage material and sites.
O.6	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*. All waste requiring off-site disposal would be classified in accordance with the OEH's (2009) *Waste Classification Guidelines* prior to disposal.
O.7	Procurement of materials would be undertaken on and 'as needed' basis to reduce over-ordering and wastage, and exploring opportunities to reuse materials, where applicable.
O.8	The CSELR proposal would aim to achieve a diversion rate for construction waste from landfill of 95 per cent of waste by volume, with a minimum target of 90 per cent of waste by volume. The proposal would also aim to reuse 100 per cent of paving and other reusable materials or facilitate reuse of such materials.
O.9	Opportunities to minimise the use of potable water would be investigated during construction planning. These opportunities could include the use of alternative water sources, such as recycled water and/or rainwater capture.
O.10	The CEMP would include measures to manage the potential impacts of construction compound operations. This would include inputs into the traffic management plan to minimise impacts associated with vehicle movements to and from construction compounds on surrounding receivers.
O.11	The following environmental management measures would be implemented for the Circular Quay

ID No.	Environmental management measure – construction phase
	construction compound: ▪ No trees within First Fleet Park would be removed by the proposed construction compound. Exclusion fencing would be established around the drip lines of each tree to minimise the risk of impact to the viability of the trees. Where impact to the drip line area cannot be avoided (due to space constraints), opportunities to raise construction facilities (e.g. demountable) above the ground level would be investigated so as to avoid impacting the underlying tree roots, in accordance with Australian Standard AS 4970. ▪ Only light structures such as site sheds and light loads would be used in this area to prevent damage to subsurface archaeology. Where appropriate, ground surface protection measures such as geotextile would be considered. The advice of an appropriately qualified archaeologist would be sought in relation to measures to protect subsurface archaeology. ▪ No excavation would be undertaken within First Fleet Park to minimise the risk of impacting on potential subsurface archaeology. ▪ Potential opportunity to temporarily remove plantings under the Cahill Expressway to facilitate construction vehicle access to the construction compound would be further investigated during detailed design, in consultation with relevant stakeholders. Any removed plantings would be reinstated at the completion of construction. ▪ Adequate measures would be implemented to minimise the visual amenity impact of the construction compound on the surrounding area. ▪ Adequate water quality controls would be implemented to reduce the risk of chemical spills/leaks reaching Sydney Harbour (due to the small offset distance to this waterway).
O.12	The following environmental management measures would be implemented for the Belmore Park construction compound: ▪ No trees within Belmore Park would be removed by the proposed construction compound. Exclusion fencing would be established around the drip lines of each tree to minimise the risk of impact to the viability of the trees. Where impact to the drip line area cannot be avoided (due to space constraints), opportunities to raise construction facilities (e.g. demountable buildings) above the ground level would be investigated so as to avoid impacting on underlying tree roots, in accordance with Australian Standard AS 4970. ▪ Pedestrian access through Belmore Park would be maintained for the duration of construction.
O.13	The following environmental management measures would be implemented for the Ward Park construction compound: ▪ The layout of the construction compound would be designed to minimise impacts to significant trees within Ward Park. Exclusion fencing would be established around the drip lines of each tree to be retained to minimise the risk of impact to the viability of the trees. Where impact to the drip line area cannot be avoided (due to space constraints), opportunities to raise construction facilities (e.g. demountable) above the ground level would be investigated so as to avoid impacting on underlying tree roots, in accordance with Australian Standard AS 4970. ▪ Vehicle access would be designed so as to avoid significantly impacting on trees that would not already be impacted by the proposed permanent works (e.g. light rail stop and substation).

ID No.	Environmental management measure – construction phase
O.14	The following environmental management measures would be implemented for the Wimbo Park construction compound: ▪ The proposed construction vehicle access to Wimbo Park would be designed to avoid impacts to significant street trees along Bourke Street that would not already be removed to accommodate the proposed permanent works (e.g. light rail track and associated overhead wires). ▪ Opportunity to provide construction vehicle access to Wimbo Park via South Dowling Street (rather than via an extension of Devonshire Street) would be investigated during detailed design, in consultation with Roads and Maritime Services. ▪ The construction compound boundary would be rationalised to allow for the early provision of alternative car parking provisions for the Langton Centre along the southern side of Nobbs Lane (to mitigate impacts associated with the acquisition of the Langton Centre car park). ▪ ~~The community mural would be preserved and relocated within the redesigned Wimbo Park, where feasible.~~ **Note: This mitigation measure has been partly consolidated with mitigation measure V.18.**
O.15	The following environmental management measures would be implemented for the associated construction facilities east and west of Anzac Parade (at Moore Park): ▪ The final layout of the construction compound would be configured so as to retain as many of the sporting fields as possible. ▪ The construction compound boundary would be ~~rationalised~~ designed to avoid impacts to significant trees within Moore Park that would not already be impacted by the proposed permanent works (i.e. the cut-and-cover tunnel). Exclusion fencing would be established around the drip lines of each tree to be retained to minimise the risk of impact to the viability of the trees. Where impact to the drip line area cannot be avoided (due to space constraints), opportunities to raise construction facilities (e.g. demountable) above the ground level would be investigated so as to avoid impacting on underlying tree roots, in accordance with Australian Standard AS 4970. ▪ ~~Where feasible, the Moore Park construction compound would be located to the north of the proposed cut-and-cover tunnel to minimise impacts to the bottom grounds (which are currently being used by the adjacent schools).~~
	▪ The Moore Park construction compound would not impact on the Korean War memorial or children's play area, located towards the north-western corner of Moore Park. ▪ A temporary footpath would be provided through Moore Park, to maintain current pedestrian access during the construction of the Moore Park tunnel. ▪ Exclusion fencing would be installed around the drip lines of any tree fringing the proposed staff car park (with the potential to be adversely impacted) to avoid impacts to the viability of these trees. ▪ Where feasible, staff car parking at the site would not be permitted during special events at Moore Park, to avoid impacting on special event parking at this venue.
O.16	The following environmental management measures would be implemented for the High Cross Park construction compound: ▪ The construction compound boundary would minimise impacts to significant trees within High Cross Park that would not already be impacted by the proposed permanent works (i.e. the Randwick stop). Exclusion fencing would be established around the drip lines of each tree to be retained (and with the potential to be adversely affected) to minimise the risk of impact to the viability of the trees. Where impact to the drip line area cannot be avoided (due to space constraints), opportunities to raise construction facilities (e.g. demountable) above the ground level would be investigated so as to avoid impacting on underlying tree roots, in accordance with Australian Standard AS 4970. ▪ Where possible, the construction compound at High Cross Park would be constrained to the northern portion of the park to maintain access to public open space and the war memorial. ▪ The High Cross Park construction compound would not impact on the war memorial. ▪ The opportunity to remove on-street parking on Belmore Road would be investigated during detailed design to reduce the extent of High Cross Park that would be required for the construction compound.

ID No.	Environmental management measure – construction phase
O.17	Opportunities to reduce the size of the construction compound required at High Cross Park would be investigated during the detailed design, including the ~~accommodation~~ option of a smaller satellite construction compound in the vicinity of the Wansey Road light rail stop.
O.18	The Randwick stabling facility temporary construction compound would be configured so as to retain the large Moreton Bay Fig at the western end of the site, where feasible.
~~**O.19**~~	~~The following environmental management measures would be implemented for the UNSW construction compound:~~ ~~▪ The construction compound boundary would be rationalised to avoid impacts to significant trees within UNSW site that would not already be impacted by the proposed permanent works (i.e. the UNSW Anzac Parade stop). Exclusion fencing would be established around the drip lines of each tree to be retained (and with the potential to be adversely affected) to minimise the risk of impact to the viability of the trees. Where impact to the drip line area cannot be avoided (due to space constraints), opportunities to raise construction facilities (e.g. demountable) above the ground level would be investigated so as to avoid impacting on underlying tree roots, in accordance with AS 4970.~~ **Note: This mitigation measure is no longer required due to work that has been completed during the detailed design phase. Refer to section 6.13 of the Submissions Report.**
Stakeholder engagement	
P.1	A Community and Stakeholder Involvement Plan would be established prior to construction commencing. The Plan would identify: ▪ key stakeholders including each affected council ▪ methods to inform the community of the progress and performance of the proposal and issues of interest to the community ▪ processes to receive and manage complaints ▪ processes to consult with affected property owners, including property inspections, where appropriate ▪ protocols to notify stakeholders of relevant activities (e.g. out of hours work and traffic disruptions) and any incidents should they occur (e.g. unscheduled service interruptions).
P.2	Newsletters and other communication tools (such as the Sydney Light Rail website) would be distributed to keep the community informed of construction progress, activities and impacts. This would ~~especially~~ outline the need to undertake out of hours works and the process for the community to register complaints and enquiries in relation to the works.
P.3	Complaints during construction would be managed in accordance with Transport for NSW's Community Engagement Policy. A 24 hour toll free complaints and enquiries number would be established for the duration of construction (1800 775 465).
P.4	Place managers would continue to function in each of the identified proposal precincts including the CBD, Surry Hills, Moore Park, Randwick and Kensington and Kingsford and Rozelle. Place managers would provide a single point of contact for all residents and businesses in the area.
P.5	One on one stakeholder briefings and community information sessions would be held when appropriate to support the rollout of the program of works. The Transport for NSW Community Information Centre would also continue to operate Monday to Friday 9.00 am to 5.00 pm.
P.6	Where the construction of the CSELR in the George Street pedestrian zone affects existing awnings, (including clearances below awnings, pavement levels or access to properties) affected property owners would be consulted. Should any construction works be required to modify awnings, these works would be undertaken, or costs would be met, by the CSELR construction contractor.

ID No.	Environmental management measure – construction phase
Traffic, transport and accessibility	
Q.1	A construction network management plan would be developed during detailed design to identify key management measures during construction to minimise impacts to journey times and congestion levels. The plan would also establish a framework for coordinating the implementation of such management measures during the construction of the CSELR proposal. The construction network management plan would seek to align the peak period travel demand with the traffic capacity available during construction. The construction network management plan would comprise a live document that would be updated as a greater understanding of the required construction staging is developed and as new management measures are identified in response to unforseen events during construction and light rail operations.
Q.2	Site specific traffic management plans would be prepared for the construction of the CSELR in accordance with RMS construction specifications and RMS *Traffic Control at Work Sites Manual Version 4.0*.
Q.3	The contractor would comply with the relevant roads authority procedures in applying for road occupancy licences.
Q.4	An application to the NSW Roads and Maritime Services would be made for any proposed adjustment to speed limits whether they are temporary (such as those required for short-term road occupancies), longer term (such as for the duration of a construction stage) or permanent. No adjustments to speed limits would be undertaken without an approved speed zone authorisation.
Q.5	The indicative planned traffic management measures described in section 3.9.4 of Technical Paper 2 (*Construction Traffic and Transport Management Plan*) of the EIS would be considered and, where appropriate, implemented to manage a reduction in traffic capacity along the CSELR corridor. The traffic, transport and access management strategies described in section 6.10 of the EIS would also be adopted during the construction of the CSELR proposal.
Q.6	Where possible, existing longitudinal pedestrian movements (i.e. pedestrian movements running parallel to the CSELR alignment) would be maintained along the footpaths. Similarly, where possible, transverse pedestrian movement (i.e. pedestrian movements crossing the CSELR alignment) would be maintained at existing pedestrian crossing facilities either at signals or controlled by traffic controllers. Clearly defined pedestrian paths and fencing would be provided to separate the pedestrian path from the worksite and prevent random crossings.
Q.7	Where appropriate, traffic controllers would be used when undertaking construction works adjacent to footpaths with high volumes of construction vehicle movements to manage the conflict between construction vehicles and pedestrians.
Q.8	*Disability Discrimination Act 1992* requirements would be adopted (e.g. with drop kerbs, etc. provided at crossings). Footpath widths would allow two-way pedestrian traffic, with sufficient space provided to accommodate pushchairs and wheelchairs. Where high numbers of vulnerable users utilise a footpath, special provision and design consideration would be undertaken to minimise impacts to these pedestrians.
Q.9	Consideration would be given in design to the layout of any hoarding/fence lines to maximise sight lines for pedestrians, and design out hiding places and blind spots to improve pedestrian personal security. Any gantry arrangements or tunnels would have internal lighting. Any hoardings, or other fixed site boundaries would have lighting if required by current standards.
Q.10	Consideration would be given to relocating or supplementing existing closed-circuit television (CCTV) cameras if the worksite creates unacceptable blind spots.
Q.11	Footway lighting would be provided, where required. Any barriers and pedestrian screens adjacent to pedestrian footways would be designed so as to permit observation from the worksite and opposite footway.

ID No.	Environmental management measure – construction phase
Q.12	Emergency evacuation requirements would be agreed with emergency service providers (Fire Brigade). Depending on the stage of work this may require: ▪ temporary road plates to permit crossing of the work zone ▪ assistance of traffic controllers in restricting public access to the street block and facilitating access for emergency service vehicles ▪ protocols for managing emergency response, which would need to be agreed with service providers prior to the start of work ▪ protocols to manage the evacuation of occupants adjacent to the worksite, which would need to be agreed with the building owners and service providers prior to the start of work.
Q.13	Where required, alternative cycle routes would be reviewed by the local authority with input from local bicycle user groups.
Q.14	Existing cycle paths located within the construction corridor but not occupied by the worksite would be maintained during construction, where feasible.
Q.15	Access for emergency vehicles would be maintained at all construction-sites and emergency services would be advised of all planned changes to traffic arrangements prior to applying the changes.
Q.16	During project inductions, all heavy vehicle drivers would be provided with the emergency response plan for construction traffic incidents. An emergency response plan would also be developed for construction traffic incidents and provided to drivers as part of the induction. In the event of an emergency occurring during the construction of the CSELR proposal, Roads and Maritime Service's *Incident Response Plan Manual* would be consulted to determine the appropriate procedure and responses required to address the emergency.
Q.17	Heavy vehicles would be restricted to specified routes, with the aim of avoiding local streets, high pedestrian areas and school zones. Where feasible, route markers would be installed for heavy vehicles along designated routes.
Q.18	Off-site construction vehicle parking would be limited to designated areas. Areas of temporary on-street parking during peak construction events would be identified in the traffic management plans to minimise the impact on surrounding properties and businesses.
Q.19	The queuing and idling of construction vehicles in residential streets would be minimised.
Q.20	A pre and post construction assessment of road pavement assets would be conducted in areas likely to be used by heavy construction vehicles.
Q.21	Public communications would advise the community and local residents of vehicle movements and anticipated effects on the local road network relating to site works in accordance with the CEMP. Affected stakeholders, such as local government authorities, emergency services, utility providers, local schools, public transport operators, public transport users, road users, local businesses, local employees and residents, would receive advance notification of scheduled construction works to allow for planning of required journeys.
Q.22	Construction vehicle traffic movements would be undertaken outside of peak road traffic periods and outside of school peak periods where feasible.
Q.23	Appropriate information, road and traffic signage, pavement markings and line markings would be implemented to advise commuters, pedestrians and road users of changed conditions.
Q.24	The end state transport arrangements for the City Centre Precinct (e.g. traffic environment during the operational phase of the ~~project~~ CSELR proposal, as described in section 12.3.3 of the EIS) would be implemented prior to construction, where appropriate and compatible with construction requirements. This could include the diversion of bus services in accordance with the Sydney City Centre Access Strategy, closure of minor side road junctions and laneways (where access is proposed to be permanently removed), and enhancements to the east-west capacity of cross streets within the CBD (where possible).
Q.25	Intersection works within the City Centre Precinct would be undertaken on weekends and at night during weekdays.

ID No.	Environmental management measure – construction phase
Q.26	Works at major intersections within the City Centre Precinct would be staged to maintain key traffic movements (e.g. Grosvenor Street/Bridge Street and Pitt Street/Eddy Avenue). Works at other intersections would be undertaken during weekend and weekday night intersection closures, with traffic diverted to alternative routes. The closure of these intersections would be conditional on the alternate route remaining open (e.g. Hunter Street westbound would remain open while Bridge Street westbound is closed).
Q.27	Major disruptive works would be scheduled to occur during times of lower traffic movement (e.g. during the Christmas/New Year period). Measures required to manage pedestrian movements during such works would be reviewed to determine their adequacy in coping with increased pedestrian activity during the public holiday period.
Q.28	Property access within the City Centre Precinct would be maintained, based on the following hierarchy (corresponding to the current frequency of use) and subject to agreement with the affected property owners and business operators: ▪ properties with infrequent access requirements would be managed through the use of traffic controllers on an ad hoc basis and/or the scheduling of deliveries to occur outside of work hours ▪ access to properties with frequent deliveries (e.g. the Westfield loading dock) would be maintained via an access track ▪ where feasible, a lane would be retained for 24 hour property access. Where this is not feasible, a 24-hour traffic controller would manage property access.
Q.29	The local road network changes outlined in Table 12.17 of the EIS would be implemented to manage impacts to traffic.
Q.30	The coordination of construction activities at redevelopment sites without access to alternate street frontages to George Street would also need to be negotiated with the building owners and contractors prior to the start of work.
Q.31	Local bus diversions outlined in Table 12.19 of the EIS would be implemented to manage the CSELR proposal's impact on bus operations at Chalmers Street, Eddy Avenue, Rawson Place, and the Park Street/Druitt Street/George Street intersection. An assessment of bus stop capacity would be undertaken for those stops located on high-activity corridors to confirm that they do not exceed capacity during construction.
Q.32	Access to the key heavy rail interchange hubs of Wynyard, Town Hall and Central would be retained, with existing controlled crossing points through worksites being maintained.
Q.33	Traffic signal operation would be reviewed to identify turning movement conflicts with pedestrians crossing at intersections and vehicles on access lanes and accessing worksites.
Q.34	The number of traffic changes would be minimised (where possible) to maintain the legibility of the network for the public, businesses and emergency services to simplify network operations.
Q.35	Access corridors for emergency services would be maintained along the George Street worksite. Pull-off areas (between gaps in barriers) would be provided to allow construction vehicles to stand clear of the access lane. Where this is not feasible and delivery requirements dictate vehicles to stand for an extended time (e.g. while unloading track sections) these deliveries would be made outside business hours. Through traffic would be discouraged by public education, signs, traffic controllers and enforcement.
Q.36	The Elizabeth Street, Crown Street and Bourke Street intersections with Devonshire Street would remain open to traffic for the duration of construction. Construction works at these intersections would be staged to allow traffic to pass adjacent to the worksites and thus ensure property and network accessibility is maintained.
Q.37	Construction across South Dowling Street and the Eastern Distributor would be undertaken as staged night works and night works with some road closures.
Q.38	Vehicles access to all adjacent properties would be maintained during the closure of Devonshire Street. Waterloo Street and Riley Street would remain open during the closure of Devonshire Street. Traffic controllers would be used to guide private vehicles between their driveway and Waterloo Street when works are undertaken adjacent to Waterloo Street.

ID No.	Environmental management measure – construction phase
Q.39	Where feasible, all construction vehicles would be contained within the Ward Park worksite, while staff would utilise potential parking facilities located within designated construction compounds at Moore Park and the proposed Randwick stabling facility.
Q.40	Existing pedestrian footpaths along Devonshire Street would be retained and protected from the worksite with barrier protection, with the exception of during works undertaken adjacent to Ward Park, where pedestrians may need to be diverted to the northern footpath.
Q.41	During intersection staging works, pedestrian crossing facilities would be maintained either by providing an alternate crossing opportunity adjacent to the work zone or maintaining the existing pedestrian facilities.
Q.42	During construction, the reconfiguration of Randle Street would allow for two-way cycle movements, providing a connection from Cooper Street through to Prince Alfred Park (inner south) and Belmore Park (southern CBD).
Q.43	Construction of the CSELR proposal across Lang Road would be undertaken during night works over an approximate two week period. The proposed construction activities would avoid periods when major events are scheduled within Moore Park. Construction of the CSELR proposal across Lang Road would be undertaken during complete closure of the Anzac Parade/Lang Road intersection with traffic directed to the alternate access point of Driver Avenue and Moore Park Road, as shown in Figure 14.4 of the EIS.
Q.44	The proposed construction compound, bentonite plants and laydown facility proposed within the Moore Park Precinct would be positioned so as to minimise the effect on land use and parking provisions during special events, as negotiated with the Centennial Park and Moore Park Trust.
Q.45	Construction activities and traffic movements to and from the staff car park at the Moore Park construction compound would be minimised during major events to ensure that there is minimal construction traffic within the local area, to minimise the impact on the road network and in particular the localised congestion within the Moore Park Precinct.
Q.46	To ensure safety of the workers on-site, separation barriers would be installed along the borders of the worksites in the vicinity of the off-road busway, in locations where there is high speed traffic on adjacent lanes.
Q.47	Construction at the southern Gregory Avenue intersection with the busway would be undertaken in a staged manner to facilitate one directional bus movements at this location at all times, as far as practicable.
Q.48	An alternate path would be provided for pedestrians and cyclists at the location where the proposed CSELR route crosses over the existing shared pedestrian and cycle path located adjacent to the busway within Moore Park. This alternate path would be provided within the same segment of the intersection and would not require crossing of Anzac Parade or Alison Road.
Q.49	During intersection works at Lang Road, all existing pedestrian and bicycle crossing facilities would be maintained either by providing an alternate crossing opportunity adjacent to the work zone or maintaining the existing pedestrian facilities.
Q.50	A single traffic lane would be maintained in each direction along High Street within the Randwick Precinct at all times.
Q.51	The construction of the CSELR across Alison Road in the Randwick Precinct would be undertaken in stages to maintain a minimum of two lanes of travel in each direction during each works stage. A minimum of two traffic lanes would be retained along Anzac Parade in each direction within the Kensington/Kingsford Precinct. Where achievable, an additional city-bound lane would be provided which would operate as a peak period bus only lane and off-peak parking zone.
Q.52	Construction works at the Alison Road/Doncaster Avenue intersection would be staged, with works scheduled to occur during weekends when no major events are planned at Royal Randwick racecourse.
Q.53	Works at the intersections of High Street with Wansey Road and Botany Street would be undertaken in stages during off-peak periods (i.e. either during weeknights and/or weekends).
Q.54	The Belmore Road intersection works within the Randwick precinct would be staged during the weekend and nights.

ID No.	Environmental management measure – construction phase
Q.55	Where possible, only on-street parking spaces that would be permanently removed to accommodate the CSELR proposal would be impacted during the construction phase (other than those spaces required for construction compounds).
Q.56	Bus priority measures would be explored during detailed design at the intersection of Anzac Parade and Alison Road.
Q.57	A permanent bus diversion would be established for the bus routes 357, 400 and 410 via Blenheim Street, as shown in Figure 15.8 of the EIS. As part of this diversion, the affected High Street bus stops would be relocated to Clara Street (north of Blenheim Street), consistent with the changes proposed as part of the operational phase of the CSELR proposal. The existing taxi zone on High Street (outside of Prince of Wales Hospital) would be relocated to Clara Street, opposite the existing taxi zone (and adjacent to the bus stops), in consultation with Randwick City Council.
Q.58	Temporary passenger set-down and pick-up areas for special event buses and coaches accessing Royal Randwick racecourse would be established along Darley Road, adjacent to the TAFE Randwick campus, as shown in Figure 15.10 of the EIS, or nearby as feasible.
~~**Q.69**~~ **Q.59**	During events scheduled at Royal Randwick Racecourse, construction activities adjacent to the main entrance to the racecourse on Alison Road would be reviewed so as to not significantly impact on the roundabout operation at the intersection of Ascot Street and Doncaster Avenue, and to maintain safe pedestrian access across the worksite.
Q.60	The proposed signalisation of the Wansey Road/Alison Road intersection would be implemented as part of the early works so that pedestrians can safely cross Alison Road during the construction phase.
Q.61	During construction, to reduce any conflict between the bus operations associated with the bus stops outside the UNSW, adjacent to Gate 9, and construction activities, a westbound bus stop would be provided west of Wansey Road, as shown in Figure 15.9 of the EIS, as required.
Q.62	The existing bus stops located adjacent to Central Railway Station that currently service the university express services would remain operational throughout the construction phase.
Q.63	Alternate on-road cycle routes would be signposted during the construction phase to maintain suitable cycle access to UNSW and the southern Randwick Precinct. Existing Randwick City Council on-road cycle routes would be encouraged through signposting and line marking. Furthermore, directional signs would be installed at key locations to direct cyclists to the cycle route.
Q.64	Pedestrian crossing opportunities would be maintained during intersection works at Botany Street and Belmore Road either by maintaining the existing pedestrian facilities or providing alternate crossing opportunities at adjacent locations.

ID No.	Environmental management measure – construction phase
~~**Q.65**~~	~~A minimum of two lanes of traffic would be maintained along Anzac Parade (within the Kensington/Kingsford Precinct) in both directions during the day time.~~ **Note: This mitigation measure has been consolidated with mitigation measure Q.51.**
Q.66	CSELR construction works at the Alison Road/Anzac Parade intersection and within the wider Kensington/ Kingsford Precinct would be undertaken during week nights and weekends to minimise the impact on adjacent properties and the road network.
Q.67	Construction works at locations with proposed light rail stops in the Kensington/Kingsford Precinct would be undertaken during staged night and weekend works (where required) with traffic controls. Traffic controls would be removed before the morning peak.
Q.68	The closure of the median gaps at Abbotford Street, Carlton Street and Ascot Street in the Kensington/ Kingsford Precinct would be implemented during the construction phase.
Q.69	Multiple construction activities occurring concurrently at multiple sites along Anzac Parade would be managed so that accesses to adjacent properties are maintained.
Q.70	The High Street intersection works in the Kensington/Kingsford Precinct would be staged during the weekend and nights. Construction activities at the intersection would be avoided, wherever possible, during special events at the racecourse or the university during the weekends. The staging of the High Street intersection would maintain all existing movements at the intersection; however, the existing dual right turn from High Street would need to be restricted to a single lane during these weekend closures.
Q.71	The right-turn movement from Anzac Parade south to Rainbow Street would be permanently banned at the commencement of construction. Right turn movements would be accommodated at the downstream intersection at Barker Street or earlier upstream at adjoining roads and accessing Avoca Street.
Q.72	Overhead wiring works and changeovers between the intersection layouts at the Nine Ways intersection (to facilitate installation of signals, line marking, removal of kerb blisters and paving) would be undertaken during nightshifts and weekends to minimise the impact on traffic.
Q.73	End-state (i.e. during the operation of the CSELR proposal) right-turn opportunities along Anzac Parade intersections would be maintained wherever possible. Where such opportunities cannot be maintained during construction, alternative access routes would be provided, in conjunction with Roads and Maritime Services, to ensure sufficient capacity is maintained.
Q.74	Construction activities at Todman Avenue and Doncaster Avenue would be undertaken at separate times to minimise impacts to access.
Q.75	Intersection works at Strachan/Middle Streets and Borrodale/Meeks Streets in the Kensington/Kingsford Precinct would not coincide with works at Barker Street to minimise impacts to access.
Q.76	During construction, suitable alternative parking for the Langton Centre would be provided within the general vicinity of the Langton Centre. Access to this facility would be maintained at all times.
Property and land use	
R.1	Consultation would be undertaken with agencies such as the City of Sydney, utilities providers and other potential stakeholders (such as stakeholders associated with future developments within the vicinity of the CSELR proposal) throughout construction of the proposal to identify measures to minimise potential conflicts, potential land use impacts to community facilities such as Ward Park and Wimbo Park and opportunities for minimising impacts to existing land uses.
R.2	Consultation would be undertaken with the Centennial and Moore Park Trust as the key land holder for a majority of the land uses impacted by the CSELR proposal within the Moore Park Precinct.
R.3	For the Randwick precinct, consultation would be undertaken with agencies such as Randwick City Council, utilities providers and other potential stakeholders such as the UNSW, the ATC and the Prince of Wales Hospital throughout construction of the proposal to minimise ongoing impacts to existing land uses.

ID No.	Environmental management measure – construction phase
Noise and vibration	
S.1	A Construction Noise and Vibration Management Plan (CNVMP) would be developed to document all necessary measures to manage and mitigate potential noise and vibration levels during standard daytime and out of hours construction activities. In general this would include some or all of the following measures: ▪ For construction concentrated in a single area, such as at the stops, worksites, substation construction-sites, bridge sites and stabling / maintenance facility locations, temporary acoustic fencing/barriers around the site perimeter ~~should~~ would be considered where feasible and reasonable to mitigate off-site noise levels. ▪ Given the potentially high noise levels at residential receptors, adherence to daytime construction hours is recommended for excavation, demolition or rock breaking activities, and for activities concentrated in a single area (i.e. activities that do not move along the alignment, and do not require out of hours activities for safety reasons or to minimise disruption to road networks). ▪ Noise generating night works should be programmed to minimise the number of consecutive nights work impacting the same receptors. ▪ Consultation would be undertaken with nearby local schools prior to noise intensive works to ensure impacts are minimised during examination periods and/or other critical periods in the school calendar (where works are predicted to exceed the relevant construction noise management level for this receiver). Consultation with nearby childcare centres to be undertaken to potentially avoid noisy works during rest periods at the centres. ▪ Where feasible, simultaneous operation of noisy plant in close proximity to sensitive receptors would be avoided. ▪ Equipment which is used intermittently is to be shut down when not in use. ▪ Where possible, the offset distance between noisy plant items and nearby noise sensitive receptors should be as great as possible. ▪ Where possible, equipment with directional noise emissions should be oriented away from sensitive receptors. ▪ Regular compliance checks on the noise emissions of plant and machinery regularly used to determine whether such plant comply with predicted noise emissions or are higher than predicted. Compliance checks would also be used to identify defective silencing equipment on the items of plant. ▪ Ongoing noise monitoring during construction at sensitive receptors during critical periods to identify and assist in managing high risk noise events. ▪ Reversing of equipment should be minimised so as to prevent nuisance caused by reversing alarms. ▪ Loading and unloading should be carried out away from sensitive receptors, where practicable. ▪ Work should be scheduled to provide respite periods from the noisiest activities, and impacted residents should be communicated with to clearly explain the duration and noise levels for the works. ▪ Where all feasible and reasonable practices have been applied and noise would be more than 5 dB above the noise affected level, the proponent should negotiate with the community to determine the schedule for the works or provide respite to occupants where sleep disturbance is likely to occur.
S.2	Wherever reasonable and feasible, construction work on the proposal would be undertaken in the recommended standard hours for construction work: ▪ Monday to Friday 7.00 am to 6.00 pm ▪ Saturday 8.00 am to 1.00 pm ▪ No work on Sundays or public holidays.

ID No.	Environmental management measure – construction phase
S.3	Site specific CNVMPs would be developed. These would provide a detailed assessment of potential noise levels and site specific measures to control potential noise impacts and minimise the potential for disturbance at affected receptors. A range of feasible and reasonable construction noise mitigation measures would be provided. Within the Randwick Precinct, the CNVMP would include communication with the owners of the horse stables near the proposed works to clearly explain the timing, duration and likely noise levels for the works.
S.4	In the event of predicted exceedances of the noise goals (particularly during out of hours works), additional noise mitigation measures in the Transport for NSW *Construction Noise Strategy* would be included in the CNVMPs where reasonable and feasible. As noted in section 12.5.1 of this EIS, the option of alternative accommodation during highly intrusive noise impacts at night-time is unlikely to be reasonable and feasible in the City Centre Precinct. For other precincts, offers of alternative accommodation would only be considered in the event that more than two consecutive nights of highly intrusive noise works are required in any particular location.
S.5	For sensitive receptors that operate outside standard construction hours, for example hospitals which operate on a 24 hour basis, reasonable and feasible noise mitigation options and measures would be developed in consultation with the receptor.
S.6	During construction, attended measurements would be undertaken at the commencement of rockbreaking activities in the vicinity of the premises listed in Table 64 of Technical Paper 11 (*Noise and Vibration Impact Assessment*) of the EIS, to assist in evaluating and managing construction ground-borne noise impacts in conjunction with the premises operators. Alternative construction methods such as smaller rockbreakers, rock saws or respite periods would be considered if required to minimise noise impacts. In the event that lower impact equipment cannot be substituted, all efforts would be made to reschedule work to less sensitive times in consultation with affected communities.
S.7	Where vibration intensive construction activities are proposed within 100 metres of sensitive receptors, these works would be confined to the less sensitive daytime period where possible. The potential impacts from vibration are to be considered in the site-specific CNVMPs. In general, mitigation measures that would be considered include: ▪ Relocate vibration generating plant and equipment to areas within the site in order to lower the vibration impacts. ▪ Investigate the feasibility of rescheduling the hours of operation of major vibration generating plant and equipment. ▪ Use lower vibration generating items of excavation plant and equipment (e.g. smaller capacity rockbreaker hammers). ▪ Minimise consecutive works in the same locality (if applicable). ▪ Use dampened rockbreakers and/or ‘city’ rockbreakers to minimise the impacts associated with rockbreaking works. ▪ If vibration intensive works are required within the safe working distances, vibration monitoring or attended vibration trials would be undertaken to ensure that levels remain below the cosmetic damage criterion. ▪ Building condition surveys would be completed both before and after the works to identify existing damage and any damage due to the works. ▪ Measurements of existing ambient vibration levels would be undertaken at receptors with vibration sensitive equipment during the detailed design phase. This information would be used to inform the site-specific CNVMPs for works near these locations.

ID No.	Environmental management measure – construction phase
Planted trees	
T.1	Trees that would not be directly impacted by the proposed CSELR permanent works (e.g. overhead wires, substations, light rail stops, kerb realignments, service relocations, etc.) — or significantly impinge on required clearances to such infrastructure, such that the tree would need to be removed to allow for the safe operation of the CSELR — would be retained. All trees to be retained would be protected prior to the commencement of construction in accordance with AS4970 the Australian Standard for *Protection of Trees on Development Sites and Adjoining Properties*. Some trees would require one-off or ongoing maintenance, for example pruning of low branches that would interfere with the overhead wiring. Where pruning of trees is required, a qualified arborist would be engaged to assess the health and condition of the tree and to plan and undertake any pruning works.
T.2	Exclusion fencing would be established around the drip lines of each tree to be retained to minimise the risk of impact to the viability of the trees. Where impact to the drip line area cannot be avoided (due to space constraints), opportunities to raise construction facilities (e.g. demountable) above the ground level would be investigated so as to avoid impacting on the underlying tree roots, in accordance with Australian Standard AS 4970 Protection of Trees on Development Sites.
T.3	Where the loss of trees is unable to be mitigated, trees removed as a result of the CSELR would be offset in accordance with the Transport for NSW *Vegetation Offset Guide* (~~TfNSW~~ Transport for NSW 2013a), which includes a principle of replacing 'the amenity/visual landscape value of vegetation removed' even if the vegetation may not have significant ecological value. Replacement plantings would be agreed in accordance with the CSELR Landscape Strategy (Appendix F of the EIS) and consultation with relevant stakeholders. Replacement plantings would be maintained by the Operator (or as otherwise agreed with any relevant stakeholders) for a period no greater than two years.
T.4	Construction techniques that minimise impacts to tree root zones would be employed where practicable. This would include consideration of compaction and root bridging techniques, permeable paving, tunnel boring of services, hydro-excavation and careful root pruning). The use of low impact construction techniques (on existing tree roots) for installation of new services would also be considered, where appropriate and feasible.
T.5	The trees in Martin Place would not be impacted during the construction of the CSELR proposal. Design and siting of the underground substation in Martin Place would be undertaken so as to provide adequate clearance of the structure from the root zone of these trees. Exclusion fencing would be erected around these trees during construction.
T.6	Opportunities to translocate the four mature trees on Rawson Place to a suitable new location would be investigated during detailed design, where feasible. *Lophostemon confertus* (Brush Box) trees are also proposed in Rawson Place as part of landscaping.
T.7	~~Where feasible semi-mature Figs directly impacted by the construction of the CSELR proposal would be transplanted to an alternative suitable location, in consultation with Moore and Centennial Parks Trust and Roads and Maritime Services (where Fig trees are proposed to be planted within the Anzac Parade road corridor). A detailed relocation and maintenance strategy for the impacted trees would be developed during detailed design, in consultation with Moore and Centennial Parks Trust, Randwick City Council and the Australian Turf Club where required.~~ Fig species (consistent with existing plantings) and *Lophostemon confertus* (Brush Box) would generally be used along Anzac Parade as replacement trees. **Note: This mitigation measure has been partly consolidated with mitigation measure N.2.**
T.8	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. To minimise the potential impacts associated with dewatering activities on the viability of the surrounding Figs, 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.

ID No.	Environmental management measure – construction phase
T.9	The health of Fig trees within Moore Park would be monitored by a suitable qualified arborist both during and post construction. Appropriate management responses would be developed by a suitably qualified arborist, in consultation with Moore and Centennial Parks Trust so as to minimise impacts to any potentially affected trees.
~~**T.10**~~	~~Planted trees within George Dan Reserve and trees adjacent to the section of the CSELR route along the busway between Robertson Road and Doncaster Avenue would be retained.~~ **Note: This mitigation measure has been consolidated with mitigation measure N.2.**
T.11	The impacts associated with the Randwick stop would be managed through the development of a detailed landscape strategy for High Cross Park, which would incorporate improvements such as new tree planting, a public plaza and new landscaping. New trees would provide shade and would partly compensate for the loss of existing trees.
T.12	Where possible, trees would be planted within the same locality from which they are removed.
Visual and landscape	
U.1	Where feasible and reasonable, the elements within construction-sites would be located to minimise visual impacts e.g. materials and machinery would be stored back behind fencing.
U.2	Lighting of compounds and works sites would be restricted to agreed hours and security needs and in accordance with the CEMP.
U.3	Visual mitigation would be implemented as soon as feasible and reasonable, and remain for the duration of the construction period.
U.4	Minimise light spill from the light rail construction corridor into adjacent visually sensitive properties by directing construction lighting into the construction areas and ensuring the site is not over-lit. This includes the sensitive placement and specification of lighting to minimise any potential increase in light pollution.
U.5	Regular maintenance of site hoarding and perimeter site areas would be undertaken, including the prompt removal of graffiti.
U.6	On completion of construction, work sites and other land occupied temporarily would be reinstated to their existing condition.
U.7	Work sites and site access would be away from the forecourt of the Museum of Contemporary Art (MCA) and the Circular Quay area, where possible.
U.8	The CSELR proposal would be constructed in such a way that would ~~Avoid~~ avoid any negative impacts to the heritage listed Tank Stream Fountain in Alfred Street plaza.
U.9	Schedule works to minimise impacts on special events, such as Anzac Day, New Year's Eve and Vivid Festival events, where possible. This should include staging works to minimise impacts on areas including Circular Quay, Martin Place (Cenotaph), High Cross Park and Belmore Park where those works would clash with special events, where feasible.
U.10	Identify opportunities ~~for an artistic approach or~~ the incorporation of art, colours and materials that complement the surroundings as appropriate (for example parkland or University of NSW surroundings) to treatment of the site hoarding and enclosure, in consultation with councils and potentially local community groups and schools. This should include consideration of day and night time activation of the exterior of the site. Privacy considerations for adjacent residential properties or other sensitive receivers as a result of site hoardings would also considered.
U.11	At Circular Quay, identify opportunities for an artistic/historic harbour side narrative approach to the treatment of the site hoardings and enclosures, in collaboration with Customs House.
U.12	Position-site compounds and construction areas to avoid direct impacts on the structure or use of the Martin Place Cenotaph.
U.13	Position equipment and site access away from the Queen Victoria statue and Ibero-American Statue Plaza as far as practicable.

ID No.	Environmental management measure – construction phase
U.14	Consolidate site equipment and facilities to maximise the area of useable public green space, and maintaining pedestrian permeability where reasonable and feasible.
U.15	Maintain permeability or identify an alternative pedestrian route within Moore Park (to replace the key pedestrian route between Parkham Street and Driver Avenue affected by construction) by minimising encroachment onto the existing playing fields.
U.16	Reinstate planting, where removed for construction purposes, on the periphery of Centennial Park in the Randwick Precinct in accordance with the Centennial Parklands Conservation Management Plan.
U.17	Locate site equipment and facilities to minimise impact to the Parklands Sports Centre, maintaining access or providing alternative access to the existing sports facilities.
U.18	Where possible, site equipment and facilities would be consolidated to minimise the intrusion into the University campus grounds.
U.19	Maintain access or provide alternative pedestrian access to all existing University campus facilities.
Built and non-Indigenous heritage	
V.1	The mitigation measures for Historical Archaeological Management Units (HAMUs) listed in section 6.2.2 of Technical Paper 5 (*Heritage Impact Assessment*) of the EIS would be implemented, in accordance with the HAMU zones documented in Figures 4.4 to 4.12 of Technical Paper 5 (*Heritage Impact Assessment*) of the EIS.
V.2	The following mitigation measures would be implemented for the Tank Stream: ▪ Physical protection would be provided through construction of bridging structure to retain integrity of the Tank Stream, as required. ▪ Management would be implemented in accordance with policies in Sydney Water's Tanks Stream Conservation Management Plan. ▪ Consultation would be undertaken with Sydney Water, City of Sydney and NSW Heritage Division of OEH.
V.3	The following mitigation measures would be implemented for Alfred Street/Herald Square: ▪ Implementation of an archaeological testing program. ▪ Open area excavation and archival recording during site works.
~~**V.4**~~	~~The proposed construction compound in part of First Fleet Park would be planned to retain significant elements of the park, including plantings, monuments and landscape features and to minimise impacts on the setting of the Sydney Opera House.~~ **Note: This mitigation measure has been consolidated with mitigation measure D.1.**
V.5	The following mitigation measures would be implemented for First Fleet Park: ▪ The potential historical archaeological resource would be managed in accordance with the policies outlined in the *First Fleet Park Conservation Management Strategy*. ▪ Consultation would be undertaken with the Sydney Harbour Foreshore Authority. ▪ ~~Ground disturbance works within First Fleet Park HAMU would be avoided, where feasible.~~ ▪ No excavation would be undertaken within First Fleet Park to minimise the risk of impacting on potential subsurface archaeology. ▪ Services, if required, would be above ground or installed within existing service trenches. ▪ The subsurface archaeological remains within First Fleet Park would be protected from compaction or movement of vehicles over the park's ground surface. ▪ The scope of appropriate ground works within First Fleet Park HAMU would be developed in consultation with a suitably qualified archaeologist and Sydney Harbour Foreshore Authority to ensure the impact on the archaeological resource is as minor as possible. ▪ A photographic archival recording of First Fleet Park would be undertaken prior to works commencing.

ID No.	Environmental management measure – construction phase
V.6	Works in George Street north HAMU, Ward Park HAMU, Devonshire Street Central HAMU (particularly in the location of the proposed substation), Devonshire Street East HAMU, Kensington/Kingsford HAMU and the University of NSW HAMU are likely to require some open area excavation and archival recording during site works, and post-excavation analysis and reporting. The nature and intactness of the archaeological resource may warrant interpretation. Advice from an archaeological specialist would be obtained where these areas are affected.
V.7	In respect of HAMUs within the Surry Hills Precinct, in the unlikely event that remains associated with unrecorded activities of early land grants and estates are identified and assessed as of State significance, this archaeology would be managed in accordance with Zone 1 mitigation measures
V.8	Within the Olivia Gardens HAMU, mitigation measures for areas outlined as Zone 3 within the basement footprint of the Olivia Gardens building would apply.
V.9	The following mitigation measures would be implemented for the Moore Park West HAMU and Moore Park East HAMU: ▪ Works in this HAMU where air raid shelters were located are likely to require some open area excavation and archival recording during site works, as well as post excavation analysis and reporting (limited to the extent of the area affected by the CSELR proposal). The nature and intactness of the archaeological resource may warrant interpretation. ▪ Areas with nil archaeological potential would be managed in accordance with the outlined Zone 4 mitigation measures.
V.10	Mitigation measures, as outlined for Zone 2 in section 12.8.4 of the EIS, would be implemented for the Rozelle maintenance depot HAMU.
V.11	If human remains were to be discovered during any phase of works associated with the CSELR proposal, works would cease immediately in the surrounding area. Any finding would need to be reported immediately to the NSW Coroner's Office and/or the NSW Police. If the remains are suspected to be Aboriginal, the Office of Environment and Heritage would also need to be contacted. A specialist would also be consulted to determine the nature of the remains. If skeletal remains are identified at Town Hall, Eddy Avenue or Chalmers Street they would be managed in accordance with Zone 1 strategies and, at a minimum, managed in accordance with the Heritage Division guideline *Skeletal Remains: Guidelines for Management of Human Skeletal Remains*, and exhumed and reinterred at an appropriate location. If identified, consultation with the NSW Heritage Division of OEH would be required.
V.12	The following mitigation measures would be implemented for Belmore Park: ▪ The subsurface archaeological remains within Belmore Park would be protected from compaction or movement of vehicles over the park's ground surface. ▪ Significant trees and landscaping to be retained within Belmore Park would be protected from damage by vehicular or machinery movement. ▪ Significant landscape elements (such as sandstone kerbing) that are to be removed from Belmore Park for the construction compound would be salvaged, catalogued and stored for reinstatement following completion of construction works. ▪ A photographic archival recording of Belmore Park would be undertaken prior to works commencing.
V.13	The following mitigation measures would be implemented for Martin Place, the Cenotaph and General Post Office: ▪ The detailed design of any works in Regimental Square would retain and conserve the memorial and associated significant plantings. ▪ The memorial and significant associated landscaping would be retained and protected during construction works. ▪ A photographic archival recording of Regimental Square would be undertaken prior to any works commencing in this area. ▪ No new permanent above ground structures would be introduced into Martin Place, particularly in the vicinity of the Cenotaph.

ID No.	Environmental management measure – construction phase
	▪ The size and material of any required access hatches for the below ground substation in Martin Place would minimise visual impacts on the ground plane of Martin Place. ▪ The design of necessary substation ventilation shafts, access hatches, and other infrastructure would minimise visual impacts on the Cenotaph. ▪ The condition of the Cenotaph would be assessed prior to commencement of construction works for the proposed substation and monitored during construction. ▪ The planning of the works compound would ensure that access is provided to the Cenotaph for the groups who use the memorial.
V.14	A photographic archival recording of the principal elevations of Daking House would be undertaken prior to works commencing.
V.15	Significant fabric of the Elizabeth Street Gardens that is to be removed, such as the edging and the palms, would be salvaged, catalogued and stored for possible reinstatement (or partial reinstatement) following completion of construction works.
V.16	A photographic archival recording of the parts of Central Railway Station to be affected by the CSELR works, including the Elizabeth Street Gardens and the Chalmers Street boundary wall, would be undertaken prior to works commencing.
V.17	Replanting of trees would be undertaken along Devonshire Street where possible following completion of construction works in accordance with the Landscape Strategy (Appendix F of the EIS).
V.18	The mosaic mural and sandstone monument in Wimbo Park would be retained where feasible and conserved. If they cannot be retained in situ, relocation of these elements within the proposed new landscaping would be undertaken in accordance with a management plan or other approved document.
V.19	The design of necessary substation ventilation shafts, access hatches, and other infrastructure in Ward Park would minimise impacts on the spatial quality of Ward Park.
V.20	The following mitigation measures would be implemented for Centennial Park, Moore Park, Queens Park and the Moore Park Conservation Area: ▪ The area required for excavation would be minimised to reduce the impact of the works on Moore Park. ▪ The size and form of the tunnel portal structures would be as recessive as possible to reduce permanent visual impacts on the landscape of Moore Park. Any new structures/infrastructure would be recessive and allow the broader landscape to remain the dominant feature. ▪ The location and design of the Moore Park stop would minimise impacts on significant views of the Sydney Cricket Ground and former RAS buildings from Anzac Parade and within Moore Park. ▪ Where feasible, areas excavated for construction of the CSELR would be reinstated to the current condition on completion of construction. This includes areas to be used for construction compounds/laydown areas. ▪ A photographic archival recording of the areas of Moore Park that would be subject to impacts from construction of the CSELR, including the Anzac Parade avenue of trees, would be undertaken prior to works commencing.
V.21	Where significant trees must be removed in the Martin Road Conservation Area suitable replacements would be made, where possible, to screen the conservation area from the CSELR.
Socio-economic	
W.1	Alternate routes to public areas and open spaces areas and community facilities impacted by the construction of the proposal would be identified including The Rocks, Belmore Park, the Sydney Dental Hospital and other community services (churches, schools etc.).

ID No.	Environmental management measure – construction phase
W.2	The following mitigation measures would be implemented regarding 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 incorporate the principles of CPTED. ▪ *Disability Discrimination Act 1992* requirements would be adopted. ▪ Construction lighting standards would be met with the aim of minimising lighting impacts outside the construction corridor. ▪ 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. ▪ Safety and security impacts would be addressed as part of the CEMP.
W.3	The following mitigation measures would be implemented regarding health and wellbeing, in addition to measures to manage noise impacts (refer measures S.1–S.7) and air quality impacts (refer measures AC.1–AC.24): ▪ The CEMP is to identify risks to health and wellbeing on a site-by-site basis and would include appropriate mitigation measures. ▪ The CEMP would account for cumulative impacts of construction given concurrent works in the precinct. ▪ Health impacts would be addressed as part of the CEMP, including watering exposed areas to minimise dust impacts, using non-tonal reversing indicators, and fitting construction machinery with appropriate muffling devices.
W.4	Access management plans would be prepared in liaison with businesses and landowners to understand their servicing and delivery requirements. These plans would then identify and implement means of maintaining (and where possible enhancing) access to businesses for deliveries and servicing during both the construction and operational phases of the CSELR proposal.
W.5	A business landowner and engagement management plan would support the preparation and effective implementation of the access management plans. It would also identify and implement means by which to keep businesses informed of the CSELR proposal and methods to proactively support businesses through the construction phase.
W.6	Place managers would assist with ensuring needs of disadvantaged residents are accounted for, particularly as some residents may not have access to telephone or email facilities or may not speak English comfortably or as a first language.
Hydrology, drainage and surface water quality	
X.1	During construction any water collected from the worksites would be treated and discharged in accordance with current guidelines to avoid any potential contamination or local stormwater system impacts. These guidelines would include the Australian and New Zealand Environment and Conservation Council (ANZECC) (2000) *Guidelines for Fresh and Marine Water Quality* and Landcom's (2004) *The Blue Book – Managing Urban Stormwater: Soils and Construction*.
X.2	Where existing longitudinal pit and pipe drainage exists and needs to be reinstated or repaired, appropriate scour protection measures would be reinstated or improved at outlets to watercourses or drainage lines. Typical scour protection might include concrete energy dissipating structures or dumped stone rip rap.
X.3	During construction, the potential for localised flooding of excavation-sites would need to be managed. Water pumping facilities may be required at specific locations along the alignment to remove any water that would pool within or adjacent to construction areas. Temporary drainage pipes or channels would also be provided to drain any open excavation areas.
Land stability, soils and contamination	
Y.1	Construction of the cut-and-cover tunnel across Moore Park would employ construction techniques aimed at minimising the risk of settlement.

ID No.	Environmental management measure – construction phase
Y.2	Precondition surveys of building and structures in the vicinity of the Moore Park tunnel would be undertaken prior to the commencement of construction of the structure. Monitoring would continue for identified baseline buildings and structures throughout the construction period.
Y.3	As part of the detailed design, a Phase 2 Environmental Site Assessment (ESA) would be undertaken to further characterise the nature of potential contamination along the proposed CSELR alignment. The Phase 2 ESA would focus on the following: ▪ General contamination along the route. This would be assessed through a program of conventional field testing involving groundwater wells, soil cores and test pits and lab testing of collected samples. Test locations would be derived from a Sampling, Analysis and Quality Plan (SAQP) which would be developed based on the Phase 1 ESA discussed in Section 10.3.2 of the EIS. ▪ Building contamination (including asbestos and lead paint). This would include areas where demolition works are proposed (e.g. Olivia Gardens and at the Rozelle maintenance depot).
	▪ Contamination from existing underground services (e.g. pits, pipes and substations). This would involve a review of existing detailed utilities data including 'Dial-Before-You-Dig', survey and data provided by asset owners (e.g. hazard logs) to categorise the likelihood of contamination, followed by field testing to confirm the presence of contaminated materials.
Y.4	A remediation strategy would be developed (as part of the CEMP) based on the results of the Phase 2 ESA. This strategy would outline any measures required to manage contaminated materials during construction. The strategy would also include a protocol to manage any unexpected disturbance of potentially contaminated material (which was not identified during the Phase 2 ESA). The remediation strategy would identify opportunities for remediation of affected areas prior to or during construction where the Phase 2 ESA confirms the presence of contaminated materials in concentrations above the intended land use criteria, as specified in the following guidelines: ▪ *Contaminated Site Guidelines for Assessing Service Station Sites* (EPA 2004) ▪ *National Environment Protection (Assessment of Site Contamination) Amendment Measure 2013 (No. 1)* (NEPM) (National Environment Protection Council (NEPC, 2013) ▪ *Waste Classification Guidelines* (DECCW 2009).
Y.5	All contaminated materials disturbed during construction would be managed and either re-used or disposed of appropriately in accordance with all relevant legislation and guidelines, including the *Protection of the Environment Operations Act 1997*, the *Waste Avoidance and Resource Recovery Act 2001*, the NSW Department of Environment and Climate Change (DECC 2009a) *Waste Classification Guidelines* and the National Environment Protection Council (NEPC, 2013) *National Environment Protection (Assessment of Site Contamination) Amendment Measure 2013 (No. 1)* (NEPM).
Y.6	Segregated materials would be inspected and sampled, with samples submitted for analytical testing for contaminants of concern. Results would be compared to relevant assessment criteria to assess whether there is any potential health or environmental risk posed by re-using the material on-site. Where concentrations of contaminants are above the intended land or appropriate human/ecological health criteria, the assessment would identify opportunities for remediation of affected areas.
Y.7	Attempts would be made to re-use material on-site where assessment indicates that there is no risk, or where materials can reasonably and feasibly be remediated.
Y.8	Areas requiring remediation would be validated to confirm that the surrounding soil meets site land use criteria requirements.
Y.9	In the event of any previously unidentified contaminated materials being identified on-site during construction, works in the affected area would cease and would not recommence until sampling and remedial actions are instigated. This would be undertaken in accordance with the applicable EPA guidelines and statutory requirements. Work health and safety requirements and appropriate management measures would be followed for works that have the potential to contain contaminated soil.
Y.10	Fill material would remain on-site where possible and where contaminant concentrations meet the site assessment criteria.

ID No.	Environmental management measure – construction phase
~~**Y.11**~~	~~All material requiring off-site disposal would be appropriately tested and classified against the *Waste Classification Guidelines* (DECC 2009).~~ **Note: This mitigation measure has been consolidated with mitigation measure Y.5.**
Y.12	A hazardous material inspection would be undertaken of any areas where historical infrastructure is to be disturbed and/or demolished to assess the material to be disturbed for the presence of asbestos and/or lead paint. Appropriate management plans would be developed ~~(such as an Asbestos Management Plan)~~ to outline the management and handling of hazardous materials during construction.
Y.13	Where there is a potential for the presence of hazardous materials to be disturbed, for example during demolition activities or excavation of underground services, the works would be monitored by an occupational hygienist.
Y.14	An Asbestos Management Plan would be developed in accordance with the *Guidelines for the Assessment, Remediation and Management of Asbestos Contaminated Sites in Western Australia* (Western Australia Department of Health 2009) and included as part of the CEMP.
Y.15	Where suspected asbestos and/or lead paint containing materials are identified, work in the affected area would cease, and an investigation would be undertaken to determine the nature, extent and degree of contamination. A report would be prepared which would include a methodology for the removal, handling and disposal of the contaminated material. Works would only recommence upon receipt of a validation report from a suitably qualified occupational hygienist that the contaminated materials had been removed.
Y.16	Erosion and sediment control plans would be prepared for each worksite in accordance with Volume 2D of *Managing Urban Stormwater: Soils and Construction* (DECC 2008). The erosion and sediment control plans would be established prior to the commencement of construction and be updated and managed throughout as relevant to the activities during the construction phase. Clean water would be diverted around the work site in accordance with *Managing Urban Stormwater: Soils and Construction* (DECC 2008).
Y.17	Stabilised surfaces would be reinstated as quickly as practicable after construction.
Y.18	All stockpiled materials would be stored in bunded areas and kept away from waterways to avoid sediment entering the waterways.
Y.19	Sediment would be prevented from moving off-site and sediment laden water prevented from entering any watercourse, drainage line or drainage inlet.
~~**Y.20**~~	~~Clean water would be diverted around the work site in accordance with Landcom's (2004) *The Blue Book – Managing Urban Stormwater: Soils and Construction*.~~ **Note: This mitigation measure has been consolidated with mitigation measure Y.16.**
Y.21	Erosion and sediment control measures would be regularly inspected (particularly following rainfall events) to ensure their ongoing functionality.
Y.22	Erosion and sediment control measures would be left in place until the works are complete and areas are stabilised.
~~**Y.23**~~	~~Works would be avoided during rainfall (or whilst the ground remains sodden) to minimise vehicle disturbance to the topsoil.~~
Groundwater	
Z.1	A construction groundwater management plan would be prepared prior to construction, and would detail the control measures that aim to minimise potential impacts to groundwater resources and receiving environments during construction. The purpose of the plan is to provide practical impact mitigation principles and measures for the design and construction of the proposal consistent with relevant legislation and standard guidelines.

ID No.	Environmental management measure – construction phase
Z.2	The construction groundwater management plan would include details of a groundwater monitoring program, which would be implemented prior to construction to identify changes in groundwater quality and levels during the construction. The monitoring program would be developed in consultation with the NSW Office of Water.
Z.3	Excavation techniques would be adopted to minimise impacts on aquifers.
Z.4	Groundwater encountered during the construction of the proposal would be tested, managed and disposed of in accordance with the *Waste Classification Guidelines* (DECC 2009) and Transport for NSW's (Transport for NSW 2012a) *Water Discharge and Re-use Guideline*. Groundwater would be disposed to ensure it does not cause the pollution of waters in accordance with Section 120 of the *Protection of the Environment Operations Act 1997*.
Z.5	Hazardous material procedures (including procedures for managing spills and refuelling and maintaining construction vehicles/equipment) would be developed and implemented as part of the CEMP to minimise potential for groundwater quality impacts due to chemical spills.
Z.6	~~The following construction~~ Construction techniques would aim ~~sequence may be used~~ to reduce the volume of dewatering required at the deeper sections of the tunnel. ▪ ~~Extend alternate diaphragm wall panels to form a groundwater cut-off in the swamp deposits underlying the Botany Sands. The other panels would be founded at a shallower depth to allow continued groundwater flow towards Botany Bay.~~ ▪ ~~Construct bentonite slurry cross walls at approximately 50 metre centres to confine the extent of drawdown.~~ ▪ ~~Excavate the entire tunnel to the underside of headstock level (excluding Anzac Parade), which is expected to be above groundwater level.~~ ▪ ~~Dewater one bay at a time with a line of wells at the centre of the excavation.~~ ▪ ~~Deep excavation of one bay at a time and construct the base slab.~~
Aboriginal heritage	
AA.1	All contractors would receive a Heritage induction advising and informing them of the archaeological potential and actions to be implemented in the event of any unexpected remains.
AA.2	A qualified archaeologist would be nominated and available to attend in the event that unidentified archaeological remains are discovered during construction.
~~**AA.3**~~	~~Where required, local Aboriginal stakeholders would be involved and consulted with during Aboriginal archaeological works.~~ **Note: This mitigation measure has been consolidated with mitigation measure I.4.**
AA.4	Should Aboriginal objects or other archaeological evidence be identified in these areas during works, works would cease in the immediate area and the archaeologist contacted to assess the evidence. Additional investigation, such as salvage excavation, may be required.
~~**AA.5**~~	~~If human remains were to be discovered during any phase of works associated with the CSELR proposal, works would cease immediately in the surrounding area. Any finding would need to be reported immediately to the NSW Coroner's Office and/or the NSW Police. If the remains are suspected to be Aboriginal, the Office of Environment and Heritage would also need to be contacted. A specialist would also be consulted to determine the nature of the remains.~~ **Note: This mitigation measure has been consolidated with mitigation measure V.11.**
Biodiversity	
AB.1	The location of the hollow-bearing trees identified in this EIS would be confirmed to inform and plan procedures for the removal of these habitat features.
AB.2	Nearby suitable habitat would be identified for the release of any fauna that may be encountered during the pre-clearing or habitat removal processes.

ID No.	Environmental management measure – construction phase
AB.3	The presence of flora and fauna species and habitat on-site would be checked before clearing begins such as the presence of bird nests or trees that contain hollows.
AB.4	An appropriate level of emergence survey would be undertaken to confirm absence of microbats in any buildings or structures likely to be directly impacted by the works.
AB.5	Prior to construction, site personnel would be adequately informed of environmental management procedures including, but not limited to, issues related to flora and fauna management, disease prevention, erosion and sediment control.
AB.6	Implementation of mitigation measures (refer measures T.1 to T.12) to ensure protection and management of all trees identified to be retained.
~~**AB.7**~~	~~Clearing of vegetation would be restricted to vegetation that is absolutely required to be removed in order to undertake work.~~ **Note: This mitigation measure has been consolidated with mitigation measure T.1.**
AB.8	Noxious weeds within the study area would be managed in accordance with the *Noxious Weeds Act 1993*.
AB.9	The potential for the introduction or spread of plant diseases would be managed. Management techniques may include ensuring that 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.
Air Quality	
AC.1	Dust minimisation measures would be developed and implemented prior to commencement of construction.
AC.2	Methods for management of emissions would be incorporated into project inductions, training and pre-start talks.
AC.3	Activities with the potential to cause significant dust emissions (such as bulk earthworks or demolition works) would be identified in the CEMP. Work practices which minimise emissions during these activities would be investigated and applied where reasonable and feasible.
AC.4	Vehicle movements would be limited to designated site entrances/exits, haulage routes and parking areas. Site exits would be fitted with hardstand material, rumble grids or other appropriate measures to limit the amount of material transported off-site (where required). Site speed limits of 20 kilometres per hour would be imposed on all construction vehicles at the site; although lower speeds may be required on unsealed roads.
AC.5	Work sites and exposed areas would be screened to assist in capturing airborne particles and reduce potential entrainment of particles from areas susceptible to wind erosion.
AC.6	Visually monitor dust and where necessary implement the following measures: ▪ Apply water (or alternative measures) to exposed surfaces that are causing dust emissions. Surfaces may include any stockpiles, hardstand areas and other exposed surfaces (for example recently graded areas and those areas recently scraped). ▪ Regular watering would ensure that the soil is moist to achieve 50 per cent control of dust emissions from scrapers, graders and dozers. ▪ Appropriately cover loads on trucks transporting material to and from the construction-site. Securely fix tailgates of road transport trucks prior to loading and immediately after unloading. ▪ Limit vehicle speeds along unsealed construction access routes. ▪ Apply water to internal unsealed access roadways and work areas. Application rates would be related to atmospheric conditions (e.g. prolonged dry periods) and the intensity of construction works. Paved roads would be regularly swept and watered when necessary. ▪ Promote and maintain awareness of weather forecasts to support anticipation of unfavourable conditions.

ID No.	Environmental management measure – construction phase
AC.7	Dust generating activities (particularly clearing and excavating) would be avoided or minimised during dry and windy conditions. Street sweeping of the CSELR alignment would be undertaken where an excessive build-up of material has occurred.
AC.8	Minimise drop heights during loading and unloading of bulk materials.
AC.9	Exposed areas and stockpiles would be limited in area and duration. For example, stage vegetation stripping or grading where possible, cover unconsolidated stockpiles, or apply hydro mulch or other revegetation applicant to stockpiles or surfaces left standing for extended periods.
AC.10	Revegetation or rehabilitation activities would proceed once construction activities are completed within a disturbed area.
~~**AC.11**~~	~~Onsite monthly dust deposition monitoring would be undertaken to measure dust fallout at selected sensitive receivers during construction.~~
~~**AC.12**~~	~~Real time dust monitoring would be undertaken during significant dust generating activities close to sensitive receivers.~~
AC.13	Construction plant and equipment would be well maintained and regularly serviced so that vehicular emissions remain within relevant air quality guidelines and standards. Where feasible, construction plant and equipment with lower emissions and higher energy/fuel efficiency would be selected.
AC.14	Emissions from trucks would be regulated in accordance with the requirements prescribed in National Environment Protection Council's (2001) *In Service Emission Testing – pilot study, fault identification and effect of maintenance* (diesel vehicle emissions).
AC.15	All construction vehicles would be tuned so as to not release excessive level of exhaust smoke, and would be compliant with the NSW Office of Environment and Heritage's Smokey Vehicles Program under the NSW *Protection of the Environment and Operations Act 1997* and associated regulations.
AC.16	All on-road trucks would comply with the latest emission standards.
AC.17	All new off-road construction equipment would meet, at a minimum, the United States Environmental Protection Agency's Tier 3 emission standards for non-road diesel engines.
AC.18	All chemicals and fuels would be stored in sealed containers as per appropriate regulations and guidelines.
AC.19	The onsite storage of fuel would be kept to a minimum.
AC.20	Unloading of fuels (diesel or liquefied nitrogen gas) would be vented via return hoses that recirculate vapours from delivery to receiver.
AC.21	Chemical/fuel storage tanks would be fitted with a conservation vent (to prevent air inflow and vapour escape until a pre-set vacuum or pressure develops).
AC.22	Strategies would be investigated to reduce the usage of chemical and fuels in addition to using alternative fuel technologies as recommended in the NSW Office of Environment and Heritage's *Action for Air – 2009 Update* (DECCW 2009a). Particular focus would be on those products with the potential to release high levels of air toxics.
Utilities	
AD.1	Services or utilities that may be impacted by the CSELR would be protected and/or relocated using the following hierarchy: ▪ Utilities within Zone 1 (as shown in Figure 10.8 of the EIS) are likely to require relocation due to the physical clash with the structural rail slab (including its construction). ▪ Utilities crossing Zone 2 (as shown in Figure 10.8 of the EIS) would be protected where feasible. ▪ Utilities crossing Zone 3 (as shown in Figure 10.8 of the EIS) may require protection but have the potential to remain undisturbed, subject to accurate identification and consultation with the relevant utility authorities.

ID No.	Environmental management measure – construction phase
AD.2	All appropriate service utility providers (e.g. electricity, communication, water and other utility services) would continue to be consulted throughout construction.
Greenhouse gas	
AE.1	Methods for management of greenhouse gas emissions would be incorporated into site inductions, training and pre-start talks.
AE.2	Activities with the potential to cause substantial greenhouse gas emissions (such as material delivery and loading and bulk earthworks) would be identified. Work practices which minimise greenhouse gas emissions during these activities would be investigated and applied where reasonable and feasible. These would potentially include: ▪ the use of biodiesel and other low carbon fuels in vehicles and equipment ▪ the use of fuel-efficient construction equipment with the latest technology.
AE.3	Construction services and materials would be procured locally, where practicable, to minimise the distance travelled and therefore greenhouse emissions from vehicles accessing the site.
AE.4	During construction planning, deliveries would be managed in an efficient manner to minimise the number of trips required and therefore reduce the amount of greenhouse gas emissions.
AE.5	Energy-efficient work practices would be implemented, such as switching off construction plant, vehicles and equipment when not in use to minimise idling.
AE.6	Regularly monitoring, auditing and reporting on energy, resource use and associated greenhouse gas emissions would be undertaken as part of the environmental reporting requirements specified within the CEMP.
AE.7	Selection of materials during construction planning to ensure products that reduce embodied carbon are considered and used.
Hazards and risks	
AF.1	Hazards and risks associated with construction activities would be identified prior to construction. Management measures for each identified hazard/risk would be developed. A process for regularly reviewing work practices/procedures would be implemented throughout construction to identify, report and respond to any new environmental hazards/risks.
AF.2	Construction worksites located adjacent to public areas would be screened (where required) to minimise risks of injury as a result of unsecured debris, tools and other objects.
Regional cumulative impacts	
AG.1	The following construction management plans would incorporate measures, where required, to manage cumulative construction impacts: ▪ construction traffic management plan ▪ construction noise and vibration management plan ▪ air quality and dust management plan ▪ construction compounds and ancillary facilities management plan ▪ earthworks management plan – which would include measures to manage water quality.

8.4 Operation

The revised environmental management measures to be implemented during the operation of the CSELR proposal are listed in Table 8.3.

Table 8.3 Revised environmental management measures for the CSELR proposal – operation

ID No.	Environmental management measure – operational phase
Traffic, transport and access	
AH.1	A network management plan would be developed for the CSELR proposal during detailed design to identify key management measures that would be implemented to minimise impacts to journey times and congestion levels. Transport for NSW would be responsible for developing and maintaining the network management plan in consultation with stakeholders.
AH.2	Transport for NSW would work alongside the relevant road authorities to develop appropriate demand management strategies for the construction and operational phases of the CSELR proposal. These demand management strategies would be integrated with network optimisation measures being developed as part of the Sydney City Centre Access Strategy, to ensure their maximum effectiveness.
AH.3	In conjunction with the demand management measures, targeted traffic management upgrades would be undertaken to improve general traffic circulation in the vicinity of the CSELR proposal. Within the CBD, these measures would also form part of the Sydney City Centre Access Strategy which identifies the priority traffic routes shown in Figure 9.12 of the EIS and the redesign of the city centre bus network. Outside of the CBD, Transport for NSW would continue to work with local councils and the Roads and Maritime Services to mitigate the local traffic impacts and potential increased traffic flows that may occur on local roads as a result of the CSELR proposal.
AH.4	Key road network changes to accommodate the introduction of light rail within the CBD and South East, as described in section 5.2.7 of the EIS, section 9.2 of the EIS and the relevant sections of the precinct chapters of the EIS (sections 12.3.2, 13.3.2, 14.3.2, 15.3.2, 16.3.2) would be implemented as part of the CSELR.
AH.5	Transport for NSW would continue to work with City of Sydney, Randwick City Council and Roads and Maritime Services to mitigate the local traffic impacts and potential increased traffic flows that may occur on the road network as a result of the CSELR proposal.
AH.6	The following intersections would be signalised as part of the CSELR to manage light rail conflicts with pedestrian and traffic movements: ▪ Devonshire Street/Marlborough Street intersection. ▪ Devonshire Street/Bourke Street intersection. ▪ South Dowling Street southbound and northbound traffic lanes at the CSELR crossing point. ▪ Wansey Road/Alison Road intersection would be signalised (on all arms) to provide pedestrian access from the residential catchments in the north and east to the Wansey Road stop. ▪ High Street/Wansey Road intersection would be signalised to accommodate pedestrians and the light rail turning movements between Wansey Road and High Street. Pedestrian crossings would be provided across Wansey Road and the eastern arm of High Street as a minimum, which would replace the existing zebra crossing on High Street. ▪ High Street/Hospital Road intersection. ▪ High Street/Clara Street intersection. ▪ The existing Nine Ways roundabout would be reconstructed and upgraded to incorporate traffic signals.

ID No.	Environmental management measure – operational phase
AH.7	All existing property accesses along the CSELR would be maintained during the operational phase of the CSELR proposal; however, certain restrictions are likely to apply which would be implemented by the relevant road authority and could include: ▪ Access restrictions on George Street implemented by the City of Sydney to provide for appropriate safety and amenity for pedestrians. These measures would be determined by City of Sydney, in consultation with Transport for NSW. ▪ Left-in, left out-out limitations on driveway access along the proposed CSELR corridor, where feasible. ▪ Property accesses along Devonshire Street would be maintained; however, access arrangements to some properties may change. Ongoing consultation would be undertaken with owners of properties with direct access onto the CSELR corridor to determine specific access arrangements.
AH.8	General traffic access to the pedestrianised section of George Street (between Bathurst Street and Hunter Street) would be restricted through the introduction of appropriate vehicle restrictions. However, exceptions to this control would be provided for local access, service delivery and emergency vehicles to access driveways and loading zones (at a maximum speed of 10 kilometres per hour).
AH.9	Within the George Street pedestrian zone, signalised pedestrian crossing facilities would be provided on all arms of existing signalised intersections to provide controlled crossing points of the light rail alignment.
~~**AH.10**~~	~~Pedestrian access to the proposed Eddy Avenue coach station island platform would be provided via the existing Eddy Square pedestrian crossing at the eastern end. A new crossing at the western end would be provided to allow pedestrian movement between the existing coach booking office and the coach platform.~~ **Note: This mitigation measure has been consolidated with mitigation measure E.3.**
AH.11	The existing access to the Sydney Trains car park located opposite Devonshire Street would be integrated with the new traffic signals proposed at this location.
AH.12	Loading dock access on the southern side of Eddy Avenue would require management across the light rail alignment through time restricted access and/or audio visual warnings. Suitable treatment measures to address this issue would be identified during detailed design.
AH.13	Access for emergency vehicles would be maintained at all times along the length of the CSELR.
AH.14	Existing City of Sydney bicycle routes crossing George Street would be maintained, however George Street would no longer be promoted as a bicycle route, with cyclists being directed to alternate existing north-south corridors such as Pitt, Castlereagh and York Streets.
AH.15	The existing provision of short and long stay parking available along Chalmers Street south of Devonshire Street would be retained.
AH.16	Replacement parking to offset parking spaces removed at the Langton Centre as a result of the CSELR would be provided nearby, most likely along the northern side of the new Wimbo Park open space on the site of the Olivia Gardens apartment complex, as shown in Figure 6.5 of the Submissions Report. The final location and number of replacement parking spaces would be determined in consultation with the Langton Centre and City of Sydney. Access to this facility would be maintained at all times.
AH.17	The existing pedestrian/cyclist bridge and associated crossings located adjacent to Parkham Street would be relocated to the proposed light rail bridge structure.
AH.18	The existing pedestrian and cycle crossing linking Arthur Street to Moore Park would be retained to provide a continuous cycle link between Moore Park and Central Railway Station through Surry Hills. Appropriate signposting would be provided to direct cyclists from the crossing location at Devonshire Street and Bourke Street.
AH.19	Light rail vehicles would be given priority over other traffic along Devonshire Street to ensure traffic and pedestrians are not adversely affected by the queuing of longer light rail vehicles at traffic signals during special events (which could block adjacent intersections).

ID No.	Environmental management measure – operational phase
AH.20	Adoption of appropriate parking management measures (parking controls) to balance supply and demand would be considered. ~~Transport for New South Wales would work through implementation of these measures to manage kerbside activity with the City of Sydney in the City Centre and Surry Hills precincts.~~ Local area parking management in the precincts surrounding the CSELR should primarily provide: ▪ For residents — local area residential parking schemes. To provide for residential parking, particularly during the pre-morning and post-afternoon peaks. ▪ For businesses — short-term timed parking to encourage turnover, trade and increase capacity for customers. Transport for NSW would work with City of Sydney and Randwick City Council to refine these measures. These councils would lead the development and implementation and management of general parking displaced by the CSELR and the relocated special uses. Council would be responsible for the implementation of any changes to the function and management of on-street kerbside activity within the area of influence of the CSELR proposal.
~~**AH.21**~~	~~Transport for NSW would work with Randwick City Council to identify any parking management measures that would be required to manage kerbside activity within the Randwick and Kensington/Kingsford precincts.~~ **Note: This mitigation measure has been consolidated with mitigation measure AH.20.**
AH.22	The following changes to bus stops would be implemented as part of the CSELR to allow for bus services to service the Prince of Wales Hospital, Children's Hospital and University of NSW: ▪ An indented bus bay for westbound buses on High Street would be introduced adjacent to the adult wing of the Prince of Wales Hospital. ▪ The westbound bus stop on High Street adjacent to the Children's Hospital emergency entrance would be relocated to Clara Street, with access to the hospital via a signalised intersection. ▪ An indented bus bay for westbound buses would be provided on High Street between Botany Street and Wansey Road (within the UNSW site).
AH.23	The off-road shared pedestrian and cyclist path between Darley Road and Wansey Road would be reinstated between the proposed CSELR route and Royal Randwick racecourse.
AH.24	Sufficient car parking provisions would be provided at the proposed Randwick stabling facility, so that there would be no requirement for CSELR employees to use existing on-street parking when accessing this facility.
AH.25	A 3.5 metre wide shared bus and light rail running lane~~s~~ would be provided on Anzac Parade between the Kingsford interchange and ~~High Street for normal bus services in the Kensington/Kingsford precinct~~ a location to the north of UNSW (the location where the express buses would re-join the general traffic lanes along Anzac Parade would be determined during detailed design). ~~This would include an additional short bus only lane adjacent to the proposed light rail track on approach to Meeks Street (southbound).~~
AH.26	One existing signalised pedestrian crossing of Anzac Parade south of Goodwood Street would be relocated to be adjacent to the Carlton Street stop.
AH.27	Within the Kensington/Kingsford Precinct, physical separation would be provided between light rail and general traffic, particularly at locations where right turns off Anzac Parade were previously permitted but would be prohibited in the future.
AH.28	The existing on-road shared path along the eastern kerb of Anzac Parade between Moore Park Road and Alison Road in the Kensington/Kingsford Precinct would be retained.
AH.29	Cycle storage facilities would be provided at key bus interchanges such as Rawson Place, Randwick and the Kingsford stop, providing opportunities for cyclists to change mode onto the light rail.
AH.30	Pedestrian crossing facilities across Anzac Parade would be provided to permit safe access to the proposed light rail stops situated within the central median of Anzac Parade.
AH.31	Pedestrian access to the Kingsford stop would be provided via signalised crossings on all approaches to the Nine Ways intersection.

ID No.	Environmental management measure – operational phase
~~**AH.32**~~	~~To mitigate the impacts that the introduction of the CSELR proposal would have to existing bus priority along Anzac Parade (due to a reduced cross section available for general traffic and bus priority lanes) the following measures are proposed:~~ ▪ ~~A dedicated city-bound bus only lane would be provided in locations where the cross-section permitted five traffic lanes.~~ ▪ ~~The Kingsford stop would provide direct platform interchange for bus and light rail passengers.~~ ▪ ~~Shared running of bus and light rail movement through the proposed signalised Nine Ways intersection.~~ **Note: This mitigation measure has been superseded by the proposed design change to the UNSW Anzac Parade stop arrangement, as described in section 6.13 of the Submissions Report.**
AH.33	The Operator would develop detailed contingency measures to address issues such as flooding, fallen trees/branches and LRV breakdowns which could impact on the operation of CSELR services, LRVs, customers, infrastructure and/or other modes of transport. These contingency measures would be developed prior to the commencement of CSELR operations. An outline of the preliminary operational contingency measures that would be implemented in the event of such incidents occurring on the CSELR network have been outlined in Appendix J of the EIS.
AH.34	At the Rozelle maintenance depot site, vehicle access to the facility and adjacent commercial properties within the rail corridor would be maintained via the existing driveway located on Lilyfield Road, east of Catherine Street, and the existing internal site access road.
AH.35	Parking for staff vehicles at the Rozelle maintenance depot would be accommodated internally, with approximately 50 parking spaces provided for both staff and visitors. Parking provisions at the depot would be sufficient to accommodate all traffic generated by the maintenance depot to minimise impact on adjacent on-street parking provisions.
~~**AH.36**~~	~~The existing Langton Centre off-street and on-street parking affected by the CSELR proposal would be replaced with a similar number of spaces within the vicinity of the Langton Centre. The final location and number of replacement parking spaces would be determined in consultation with the Langton Centre and City of Sydney. Access to this facility would be maintained at all times.~~ **Note: This mitigation measure has been consolidated with mitigation measure AH.16.**
AH.37	All impacted special kerbside uses (e.g. disabled parking and loading zones) along the CSELR corridor would be replaced on a 'like for like' basis within the local vicinity of existing provision. The detailed implementation of this replacement is being worked through with the two local councils, City of Sydney and Randwick City Council.
AH.38	The CSELR alignment would be designed so as to not preclude the opportunity for on-street parking to be provided (during periods of low traffic demands) within the kerbside lane of the road, where sufficient road space is present, in consultation with RMS, City of Sydney and Randwick City Council.
Noise and vibration	
AI.1	For the Surry Hills Precinct, at locations where the *Rail Infrastructure Noise Guideline* (RING) (EPA 2013) operational noise trigger levels are predicted to be exceeded by more than 2 dB, a detailed investigation of feasible and reasonable noise mitigation measures would be undertaken to minimise the worst-case predicted noise levels. As detailed further in Chapter 13 of the EIS and Technical Paper 11 (*Noise and Vibration*) of the EIS, potential measures to be considered include: ▪ more stringent specification of LRV noise emissions in the procurement process, which would only be recommended following consultation with rolling stock providers to establish whether more stringent noise specifications could feasibly be achieved ▪ higher absorption track forms, including those described in the EIS ▪ speed restrictions to 30 kilometres per hour during the night-time between the Central Railway Station and the Surry Hills stops (with the exception of during special events) ▪ minimising wheel and rail roughness through specifications for CSELR operations, such as maintaining the rail surface (via rail grinding) and train wheel conditions (via a wheel lathe) in accordance with defined acceptance standards ▪ individual property treatments, in the event that the above alternatives are determined as not feasible or reasonable.

ID No.	Environmental management measure – operational phase
	The final form of the proposed mitigation measures would be ~~determined during detailed design~~ documented in the Operational Noise and Vibration Review, as required as part of mitigation measure B.1.
AI.2	Warning bells on LRVs would only be used in the event of emergencies or where the driver considers there is a danger to public safety. Warning bells would not form part of normal rail operations (i.e. they would not be used on approach or departure from stations, or at level crossings).
AI.3	Noise from PA systems at the light rail stops would be controlled to minimise potential impacts at the nearest receptors to the stops. The need for announcements at stops in residential areas would also be reviewed, particularly during the more sensitive night-time period.
AI.4	For the Randwick stabling facility, operational noise mitigation measures would be implemented to meet the NSW *Industrial Noise Policy* criteria. The range of alternative measures to be considered would include: ▪ an acoustic shed across the site, including a six metre noise barrier at the site boundary – which would only be implemented if considered feasible considering potential cost, visual and overshadowing implications ▪ operational measures, such as changes to pre-start practices ▪ changes to times of use of areas/noise sources, for example the wash plant ▪ increased noise attenuation targeting particular sources, for example the wash plant ▪ use of barriers within the site (not just at the site boundary), for example between stabling roads or nearer to other noise sources, such as the site access roads, wash plant and sand plant ▪ use of a partial roof enclosure, potentially in conjunction with a combination of other options.
AI.5	At the Rozelle maintenance depot, the LRV entry doors would be closed at night-time to mitigate operational noise during the night-time period.
Visual and landscape	
~~**AJ.1**~~	~~Consider the opportunity to combine several above-ground street elements (lighting, traffic signals, overhead wiring etc.) on common use poles to reduce visual clutter and to reduce potential impacts on existing awnings and footpaths, in consultation with the City of Sydney or Randwick City Council as appropriate.~~ **Note: This mitigation measure has been consolidated with mitigation measure C.2.**
AJ.2	Where possible, catenary should be located with consistent pole types and even spacing.
AJ.3	Use semi-mature to mature tree specimens, in accordance with the Transport for NSW '*Vegetation Offset Guide*' (2013d) and the Landscape Strategy (Appendix F of the EIS) to replace the character of those lost on a 'like for like' basis, in consultation with the City of Sydney and Randwick City Council.
AJ.4	Where necessary, reconstruct the Ibero-American Statue Plaza to incorporate all statues and restore its setting in consultation with the City of Sydney.
AJ.5	Incorporate tree planting within the Northcott Estate's northern boundary to reinforce the green edge and filtering effect of trees lost in consultation with Housing NSW.
AJ.6	Redefine the northern edge of Ward Park through a new plaza and tree planting in consultation with the City of Sydney and in accordance with the Transport for NSW '*Vegetation Offset Guide*' (Transport for NSW 2013a) and the Landscape Strategy (Appendix F of the EIS).
AJ.7	Enhance the northern edge of Devonshire Street with tree planting (to mitigate the character of those lost within the Devonshire Street road corridor) in consultation with the City of Sydney and in accordance with the Transport for NSW '*Vegetation Offset Guide*' (Transport for NSW 2013a).
AJ.8	Recreate Wimbo Park, together with the new Olivia Gardens, as a high quality open space. Enhance these areas with mature tree specimens to mitigate the character of those trees proposed to be removed, in consultation with the City of Sydney.
AJ.9	Provide appropriate landscape treatment to the surroundings of the Moore Park tunnel portal in consultation with the Centennial and Moore Parks Trust and City of Sydney.

ID No.	Environmental management measure – operational phase
AJ.10	Provide a boulevard of street trees along Anzac Parade to improve the streetscape and extend the ceremonial avenue of street trees.
AJ.11	~~At night the strategy for lighting is to~~ Ensure lighting ~~the project~~ contributes to a safe and legible streetscape. In particular, the lighting required for the proposal would be mitigated as follows: ▪ all lights would be located at a similar level to the overhead catenary system so to minimise the light spill onto adjacent areas ▪ all lights would be directed downwards, with the exception of feature lighting that would always be capped by a surface material ▪ light colour would be designed in response to the surrounding context and be selected to complement the surrounding lighting colour ▪ Australian Standard levels for public safety and CCTV would be used, so no unnecessary lighting would be required to be provided.
AJ.12	Where possible any areas of direct light intrusion (glare and spill) from LRV headlights should be identified and managed.
AJ.13	At stops and stabling areas, cut off and directed light fittings (or similar techniques) should be used to minimise glare and light spill onto private property. The design of street lighting along the route would also consider the sensitive placement and specification of lighting to minimise any potential light spill into residential properties.
Air Quality	
AK.1	Ancillary maintenance service vehicles and equipment would be maintained and operated in accordance with the manufacturers requirements.
AK.2	~~Unnecessary release of air pollutants from~~ Operational practices at the Rozelle maintenance depot and Randwick stabling facility would seek to minimise emissions of air pollutants ~~be avoided~~.
Hazards and risks	
AL.1	Targeted road safety campaigns would be used in the lead up to the opening of the CSELR and during operation to raise awareness around the operation of LRVs and to promote the safe operation of the proposal. This would focus on raising awareness and promoting safe behaviours in shared zones and at key CSELR crossings.
AL.2	All cables would be buried within ducts and would adhere to all International and Australian electrical standards in terms of distances from surrounding cables (i.e. adjacent high voltage cables require minimum separation in accordance with industry standards).
AL.3	Hazardous material procedures (including procedures for managing spills, and the refuelling and maintenance of vehicles/equipment) would be developed and implemented during the operation of the CSELR proposal to minimise potential for impacts associated with chemical spills and leaks. These procedures would adequately address activities at the proposed Rozelle maintenance depot and Randwick stabling facility, as well as other general maintenance facilities that would occur along the CSELR alignment (such as storage of chemicals for operation and maintenance of LRVs in line with EPA guidelines and legislative requirements).
Socio-economic	
AM.1	Light rail stops would incorporate a high quality urban design that would reflect the precinct in which they would be located to assist in minimising impacts to visual amenity resulting from the provision of the CSELR proposal.
AM.2	Transport for NSW would continue to work with stakeholders to identify potential opportunities to integrate CSELR public domain improvements with other city planning strategies (such as the City of Sydney's other public square projects) to improve access to local community services and further enhance the public domain along the route.

ID No.	Environmental management measure – operational phase
AM.3	Where feasible, the CSELR would incorporate features to maintain the safety of passengers, CSELR employees and the general public. Stops would be designed to be safe and attractive places to wait for CSELR services and would (where feasible and appropriate) incorporate light emitting diode (LED) lighting technology, emergency calling capabilities and CCTV.
AM.4	Within the George Street pedestrian zone, the light rail tracks would be highlighted by either a different material colour, finish, texture or size of paving, so that pedestrians can visually and texturally distinguish between the pedestrian zone and the light rail track zone.
AM.5	Special event organisers would be consulted to determine the nature and extent of existing and planned future events that would require the use of George Street and, thus, would be affected by CSELR operations.
AM.6	Access to local community services and open spaces would be maintained during operation of the CSELR proposal. Consultation with the operators of community services (including local childcare centres and places of worship) would be undertaken to minimise impacts to the access of these facilities.
AM.7	Public open spaces directly affected by the CSELR proposal would be reinstated as soon as possible after construction.
AM.8	Revegetation of the CSELR corridor through the Moore Park Precinct would be undertaken (where required) to assist with integrating the light rail into the parkland vista. Visual connectivity would be maintained across the Anzac Road corridor and the existing AFL training field.
AM.9	Pedestrian movements, signage for passengers, and changes to intersection signalisation associated with accessing the Moore Park stop would be considered during detailed design. This would be undertaken in consultation with relevant property owners and stakeholders.
AM.10	Parks and playing fields within Moore Park would be reinstated to their former condition as soon as possible after construction to minimise disruptions to community activities.
AM.11	CCTV would be used to monitor the Moore Park tunnel.
AM.12	Where possible, urban design measures, such as revegetation along the corridor, would be adopted to neutralise or enhance any impacts to the existing median strips and reinstate the visual amenity characteristic of Anzac Parade.
AM.13	A targeted communication strategy would be developed for University of NSW staff and students to allow for a smooth transition to light rail operations.
AM.14	A targeted communication strategy would be developed to maintain access for businesses in the Kensington and Kingsford town centres.
AM.15	The light rail and stops would be designed to promote interaction with, and facilitate access to/from, neighbouring areas.
AM.16	Informational material advertising the commencement of CSELR operations would be prepared in multiple languages widely spoken by the affected community.

9. Conclusion

The CSELR Environmental Impact Statement (EIS) included a comprehensive assessment of the likely environmental impacts of the proposal and, where appropriate, proposed environmental management measures to address these potential impacts. This included an assessment of issues raised by the community during consultations held during the development of the EIS.

The EIS was placed on public exhibition between 14 November and 16 December 2013. A comprehensive community engagement program was undertaken to encourage community feedback on the proposal during this period.

A total of 487 submissions were received, comprising 13 submissions from government agencies and 474 community submissions, including two submissions received directly by Transport for NSW. These numbers include submissions received from the five project partners, these being City of Sydney, Randwick City Council, the Centennial Park and Moore Park Trust (CPMPT), Australian Turf Club and University of New South Wales (UNSW). This Submissions Report has documented submissions received and outlined Transport for NSW's responses to the issues raised.

Most community submissions were concerned about the CSELR proposal design and operations, proposal alternatives and traffic, transport and access issues within the Surry Hills and Randwick precincts. Socio-economic considerations, impacts to planted trees and noise and vibration impacts were also raised as important issues. Key issues of most concern to the community included:

- impacts to on-street parking (particularly along Devonshire Street and Anzac Parade) and the ability to replace this parking in the surrounding area
- changes to existing bus routes (particularly in the south eastern suburbs) and potential impacts to commuters
- the removal of a number of significant and mature trees along the proposed CSELR alignment
- the location of the proposed CSELR alignment, particularly the alignment along Devonshire Street, Surry Hills
- the location and layout of the proposed CSELR stops, particularly the Randwick stop at High Cross Park
- operational noise and vibration impacts, particularly within the Surry Hills and Randwick precincts
- socio-economic issues arising from impacts from the CSELR proposal on amenity, character and local businesses, particularly within the Surry Hills, Randwick and Kensington/Kingsford precincts

A number of design changes are proposed in response to the submissions received, ongoing consultations with key stakeholders and further design development. The impacts associated with the proposed design changes would be manageable through the application of the environmental management measures documented in Chapter 8 of this Submissions Report, which includes some new and revised measures. Overall, the benefits of the changes to the community and the environment, and the benefits for operation of the CSELR, are expected to outweigh the potential impacts of these changes.

It is proposed that the CSELR proposal, as described in Chapters 5 and 6 of the EIS, and as amended by this Submissions Report, should be submitted for determination by the Minister for Planning and Infrastructure.

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