



## 6. Proposal construction

This chapter outlines the likely key activities that would occur during the construction of the Sydney CBD and South East Light Rail Project ('the CSELR' or 'the CSELR proposal'). The construction methodology described in the following sections is indicative only and may change as a result of design development. Detailed construction environmental management plans (CEMPs) would be prepared by the contractor(s) to cover the early works, main works and commissioning programs, prior to commencement of these works to manage potential adverse construction impacts (as discussed in Chapter 18).

### 6.1 Construction program and staging

#### 6.1.1 Construction program

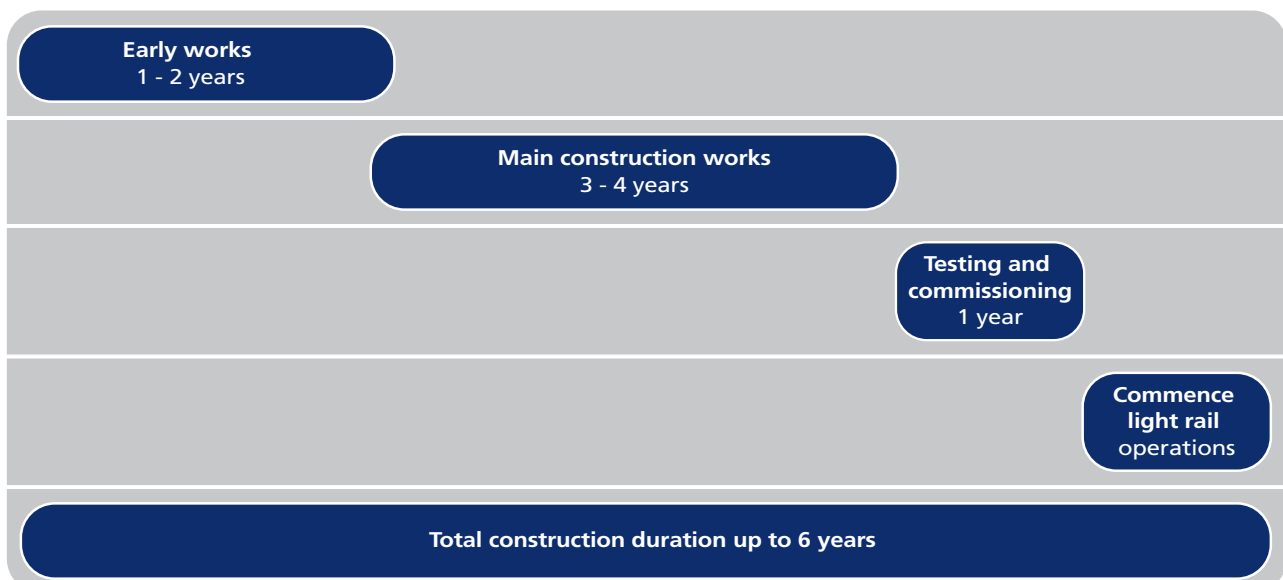
Construction of the CSELR proposal is expected to commence in mid-2014 (subject to planning approval) and is anticipated to take approximately five to six years. The proposal is expected to be commissioned and commence operations in 2019–2020. A construction program overview is provided in Figure 6.1. This program is based on the current design and construction staging. Therefore, the program is indicative only and may change once the construction contractor(s) is engaged.

The program comprises three main stages: early works, main construction works and commissioning. Each of these work stages comprise a number of discrete work packages which would be undertaken sequentially in order to construct the proposal. The precise sequencing and staging would be determined by the appointed contractor(s) in line with their preferred working method. The EIS presents an indicative representation of the likely works. In all cases the local community and other affected stakeholders would be consulted on and kept informed of the planned works and their progression through construction.

Leading up to and in parallel to the development of the early works program, certain tasks would be undertaken to facilitate the smooth progression of both the early works and main works programs. These are likely to include:

- communication and consultation with property owners and other affected stakeholders along the route
- planning of overall and localised traffic management plans in consultation with the local councils and roads authorities
- ordering of long lead items (e.g. construction plant and equipment that would take a long time to be delivered to the construction worksite).

Figure 6.1 Construction program overview



### 6.1.2 Construction staging and key activities

A summary of the indicative construction staging and key activities associated with the CSELR proposal is provided in Table 6.1. Construction methodologies for key activities listed in Table 6.1 are described in section 6.2.

Table 6.1 Indicative construction staging and key activities

| STAGE                   | KEY CONSTRUCTION ACTIVITIES                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|-------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Early works             | <ul style="list-style-type: none"> <li>Establishment of traffic management plans.</li> <li>Establishment of site for the Early Works Construction Contractor and installation of safety barriers around the worksites.</li> <li>Implementation of local bus diversions (outlined in Table 12.19) 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.</li> <li>Relocation or protection of major utilities identified in the early works package.</li> <li>Implementation of road configuration changes identified in the early works package.</li> <li>Potential remediation works (subject to the identification of contaminated materials, refer to section 10.3).</li> <li>Undertaking long lead time utility relocation and modification works.</li> <li>Demolition works (where required for the proposed early works).</li> <li>Early light rail works, such as preparation works for the track slab construction.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Main construction works | <ul style="list-style-type: none"> <li>Establishment of site compounds and installation of safety barriers around the worksites. In most cases the site compounds may need to be established at the start of the early works to support these works.</li> <li>Utility protection and relocations, where required, as part of the main works package.</li> <li>Demolition works.</li> <li>Commencement of rail installation once a clear corridor along a substantial part of the CSELR alignment has been established, with utility services diverted (where necessary) prior to the works beginning. Progress of rail installation would be linear within sections of the route between intersecting streets, with the intersections generally constructed behind or in advance of the adjacent sections.</li> <li>Progressive construction of light rail stops as the work front moves along as separate worksites so as to not interfere with the corridor works. These would need to be undertaken after the work front has progressed through or the work corridor would be restricted and productivities impacted.</li> <li>Restoration of the road for pedestrians and, where proposed as part of the operational phase for the CSELR, road traffic.</li> <li>Installation of overhead wiring. It is envisaged that installation of overhead wiring poles and fittings between intersections could occur in normal working hours within the construction corridor footprint; however, there may be some requirement for localised traffic diversions where the footprint is not sufficient to contain these activities.</li> <li>Construction of major structures, including the cut-and-cover tunnel across Moore Park, driven tunnel across Anzac Parade and the bridge over Eastern Distributor.</li> <li>Construction of the Rozelle maintenance depot and Randwick stabling facility.</li> <li>Substation construction.</li> <li>Landscaping and public domain works.</li> </ul> |
| Commissioning           | <ul style="list-style-type: none"> <li>Commissioning and trial running of the route.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |

## 6.2 Construction methodology

The construction methodology described in the following sections is indicative only, based on the current design and construction staging, and may change as a result of detailed design and/or the construction methodology proposed by the construction contractor(s).

### 6.2.1 Early works

Early works construction would be undertaken prior to the commencement of the main construction works. These works would be required to protect or relocate conflicting services and utilities to enable the main construction works to progress with less disruption and to allow for the



establishment of the worksites. These works would be critical as they would reduce the duration of the civil construction works (particularly within the City Centre Precinct) and associated disruptions to traffic and surrounding sensitive land uses.

The early works for the CSELR proposal would generally include the following:

- major works or service relocations/protection along the proposed CSELR alignment that may have a long lead item (i.e. potential critical path activities)
- major service relocations with a high risk cost profile to the main construction works contractor
- works with a dependency to facilitate bus and traffic re-routing and to minimise future traffic disruptions
- programmed and existing third party works (e.g. utility providers)
- works that have limited access dates (e.g. high voltage feeder works are typically limited to winter months)
- property access modifications along the proposed CSELR alignment, including the relocation of existing facilities
- critical pre-works outside the proposed CSELR corridor (e.g. street changes to accommodate the traffic management requirements during the main construction works)
- Roads and Maritime Services (RMS) traffic signal works.

Early works within the City Centre Precinct may include:

- relocation and modification of utilities pits and chambers, and pipes
- structural modification of miscellaneous below ground utilities and services, pits and tunnels that are required to be lowered
- structural survey and review of loading impacts to sewers
- partial construction of critical road intersections that are required to be completed prior to the relocation of the buses (these works would be separate to those road changes being undertaken as part of the redesign of the Sydney bus network)
- modification to services to cater for side access to pits and chambers.

Early works within the other four precincts would generally comprise underground and overhead utility relocations and/or protection.

Subject to landowner or asset owner agreement, property condition surveys would be completed for various infrastructure (including residences, roads, buildings, heritage items, etc.) prior to the commencement of vibration intensive construction works (e.g. proximate piling, excavation or bulk fill or any vibratory impact works including jack hammering and compaction) and post-construction (unless property/infrastructure is otherwise determined as being not adversely impacted by a qualified geotechnical engineer). These property surveys would be undertaken to determine the existing condition of property/assets and to ensure that any damage resulting from the works is able to be identified and rectified. Landowner/asset owner consent would be obtained to access private property to complete these property surveys.

Where required, vibration monitoring would be undertaken during vibration intensive works to confirm vibration predictions. Further discussion on potential vibration impacts and environmental management measures that Transport for NSW would implement to manage potential vibration impacts is provided in section 12.5.4.

The early works are anticipated to commence concurrently throughout the entire length of the proposed CSELR. The early works would be staged so as to minimise impacts to traffic flow. Early works at major intersections are anticipated to be constructed during weekends, night-time shifts or during holiday periods to minimise impacts to traffic cross-flows (as discussed in section 6.10). Early works that would cause major disruption to George Street would not commence until after 25 April 2015 to avoid impacting a number of major special events, including the Anzac Day centenary march along George Street. However, early works that would not cause major disruption to George Street may commence prior to this date. It is anticipated that the early works would take between three and four months (working weekends only) at any one location.

A description of the general construction methodology and staging that would be undertaken to manage potential traffic, transport and access impacts is provided in section 6.10.

## 6.2.2 Main construction works

Broadly the progression of the main works at all locations is expected to follow the sequence set out below. This would be adapted by the contractor(s) once appointed in discussion with Transport for NSW and other stakeholders as required to facilitate the effective construction of the works with minimal socio-economic and environmental impact.

Generally the main construction works are anticipated to following a sequence of:

- site establishment
- service diversions (where required for the main works)
- civil engineering works (comprising earthworks, construction of communications conduits, drainage and casting of rail base slabs)
- rail installation
- communications and electrical installations
- catenary power installation.

Discrete construction elements such as stop construction and substation construction would occur on a parallel and complementary construction program to minimise disruption to public space, residents and businesses.

### Site establishment

#### Demarcation of environmentally sensitive areas

Environmentally sensitive areas outside of the proposed construction footprint shown in Figures 6.2a to h (such as heritage items, trees to be retained and sensitive community land uses), as identified in Chapters 12 to 17 of this Environmental Impact Statement (EIS), would be demarcated and protected so that construction works do not adversely impact on them.

#### Installation of construction erosion and sediment control measures

Erosion and sediment control measures would be designed and installed in accordance with the 'Blue Book' *Managing Urban Stormwater: Soils and Construction* (Landcom 2004). Potential erosion and sedimentation impacts associated with the CSELR proposal are discussed in section 10.2.

#### Establishment of construction compounds and the worksite

Ground levelling works may be required to establish construction compounds and general worksite areas. The establishment of site offices and facilities would include deliveries of demountable office facilities, establishing utility connections to the compound sites (where required), erecting fencing and hoarding, signage and gates, establishing stockpiles and materials storage areas within the sites, and the delivery of construction plant and equipment. The possible locations of the construction compounds and the extent of the worksite are shown in Figure 6.2a to h. Before construction works begin, suitable barricades and traffic management measures would be implemented to protect the public and to prevent public access onto the worksite.

### Services and utilities protection and relocation

Where necessary, services and utilities would be protected, upgraded or relocated away from the construction worksite, in consultation with the relevant asset owners.

### Civil engineering works

The main civil engineering works would typically be undertaken in linear segments, with the exception of works at road intersections, which would be constructed separately to the mainline works due to traffic staging. Typically civil engineering works are anticipated to require up to four months for completion in any section. Indicative construction activities that would occur during track works would include the following:

- site clearance including removal or relocation of trees (where required), where tree roots would likely be traversed by the works zone or may impact on utility relocations
- undertake service/utility relocation and protection works



- earthworks
- sawcutting of existing road pavement and excavation for the light rail services; installation of light rail services conduits; backfilling of trenches; and construction of pits for the light rail services
- temporary reinstatement of affected areas, as required
- sawcutting and removal of existing road pavement and subgrade (where required) for the light rail tracks; preparation of track base and for binding layer; placement of reinforcement using bamtec or similar prefabricated cages (where required)
- excavation and compaction, where required
- concrete pumping and/or pouring.

An automated baseplate placing machine or slipform construction technique may be adopted in place of handwork to maximise productivity and minimise construction traffic disruptions. However, handwork would be adopted within public areas, wherever possible to minimise impacts on the community.

Subgrade works (e.g. excavation of existing material and backfilling with structural fill) would be required at a number of locations along the alignment where the proposed track is not underlain by an adequate subgrade. The subgrade works would be required to provide a suitable foundation for the track slab. Areas where subgrade works may be required (subject to detailed geotechnical investigation) are estimated to include:

- adjacent to the eastern side of Anzac Parade, between the proposed Moore Park tunnel portal and Lang Road
- adjacent to the southern side of Alison Road, between Doncaster Avenue and Darley Road
- adjacent to Alison Road, between Darley Road and Wansey Road
- adjacent to Wansey Road, between Alison Road and High Street
- south of the Nine Ways intersection (area between the northbound and southbound lanes of Anzac Parade).

A description of the general construction methodology and staging that would be undertaken to manage potential traffic, transport and access impacts is provided in section 6.10.

### Earthworks

A total of approximately 210,000 cubic metres of material would be excavated during construction works, as summarised in Table 6.2. Fill material would generally be required for backfilling excavations, subgrade works for sections of the alignment not underlain by existing road pavements and retaining wall construction. The estimated fill requirements for the proposal are also summarised in Table 6.2.

Table 6.2 Estimated volume of excavated material and fill required for the proposal

| PRECINCT                 | APPROXIMATE VOLUME OF MATERIAL TO BE EXCAVATED (CUBIC METRES) | APPROXIMATE VOLUME OF MATERIAL REQUIRED FOR FILL (CUBIC METRES) | EARTHWORK BALANCE (CUBIC METRES) |
|--------------------------|---------------------------------------------------------------|-----------------------------------------------------------------|----------------------------------|
| City Centre              | 44,000                                                        | 3,000                                                           | 41,000                           |
| Surry Hills              | 19,000                                                        | 14,000                                                          | 5,000                            |
| Moore Park               | 68,000                                                        | 32,000                                                          | 36,000                           |
| Randwick <sup>1</sup>    | 20,000                                                        | 7,000                                                           | 13,000                           |
| Kensington/<br>Kingsford | 59,000                                                        | 12,000                                                          | 47,000                           |
| <b>Total</b>             | <b>210,000</b>                                                | <b>68,000</b>                                                   | <b>142,000</b>                   |

Note 1: Includes the proposed Randwick stabling facility intersection; however, excludes the facility itself.

Where feasible, the excavated material would be used to meet the fill material needs for the proposal. However, this may be impractical if the excavated material is unsuitable for the purposes of structural fill. In this case, fill would need to be imported, and excavated material exported for re-use on other sites or for treatment or disposal.

It is estimated that, in the worst-case scenario, up to 210,000 cubic metres of excavated material would require disposal (i.e. off-site disposal of all excavated material). For the best-case scenario, all fill material would be sourced from on-site, and the remaining 142,000 cubic metres of material would require off-site re-use or disposal.

As outlined in section 7.2.2, a comprehensive list of sustainable initiatives was developed for the CSELR proposal (listed in Table 7.5) which would be used to guide the development of the proposal, with the aim of maximising the sustainability outcomes during the planning, construction and operational phases of the CSELR. One of these sustainability initiatives strives to divert 95 per cent of construction waste from landfill (measured by volume), with a minimum waste diversion target of 90 per cent. This sustainability initiative also strives to reuse 100 per cent of paving and other reusable materials or facilitate re-use of such materials.

### Rail installation works

Generally, rail installation will progress in linear sections over the course of up to six months within any one section, with disruption at any one point lasting less than a month. The nature of the proposal means that the rails may be either installed together or each line may be installed separately. Therefore, more than one pass of the installation works at any one location may be required depending on the requirements identified during the detailed design development. This would be determined by the contractor(s) once appointed. Typically the rail installation would entail the following activities:

- rail laying, welding and track finishing (installation of a topping slab, asphalt in-fill or paver in-fill)
- installation of rail boot in embedded track form (where applicable)
- installation of overhead wiring foundations and posts, where required
- rail systems installation
- permanent reinstatement of affected areas, including installation of road line markings
- systems integration, testing and commissioning.

One or more segments of track could be constructed simultaneously, depending on the construction methodology adopted; for example an automated baseplate placing machine or slipform machine (a machine used to form and pour concrete) may be used to lay the track slab and base plates, as opposed to handwork, pending applicable traffic restrictions and/or the accessibility of the worksites.

### Overhead wiring and posts, new smart poles and street lighting

Post foundations for new overhead wiring, smart poles and street lighting would be constructed during the main works (i.e. undertaken during the excavation of footpaths for utility relocations) or during track works.

Construction activities would vary from post to post; however, would typically involve:

- relocation/protection of utilities, where required
- sawcutting of existing pavement and excavation of footing
- placement of reinforcement cage, base plate and other reinforcement structures
- concrete pouring
- offsite fabrication of overhead wiring post and delivery to the worksite
- fit-out of overhead wiring post
- erection of posts
- stringing overhead wires, installation of droppers and wiring terminations.

Typically this would require localised road closures and disruption of up to a week at a time to enable the safe execution of the works.



### 6.2.3 Light rail stops

Light rail stops would be constructed separately to the main construction works, with works at each stop commencing progressively after the completion of the adjacent linear segment of track. Stop construction is likely to consist of prefabricated materials and on-site concrete pours. This work is anticipated to require up to three months to complete in each location, depending on the size and finish specified. Indicative construction activities during the establishment of light rail stops would vary between locations; however, would generally include the following:

- removal/relocation of significant trees (where required), where tree roots would likely be traversed by the works zone or may impact on utility relocations
- service/utility relocation and protection works
- installation of light rail services and conduits
- establishment of localised traffic controls
- sawcutting, scabbling and excavation of existing pavement
- formwork
- piling, as required
- construction of footings
- concrete pouring
- installation of services, including communications and electrical (including charging units for the wire free section of the track)
- installation of prefabricated stop canopy, signage, seating, tactile indicators and paving
- finishing works.

### 6.2.4 Demolition of Olivia Gardens apartment complex

The Olivia Gardens apartment complex is likely to be demolished using excavators with jaws/hammer attachments. Long reach excavators would likely be required to reach the upper levels of the building. Demolition rubble (brick and concrete) would be stockpiled and sorted within the proposed Wimbo Park construction compound, before being disposed of in accordance with a waste management plan that would be prepared as part of the CEMP. All waste requiring off-site disposal would be classified in accordance with the *Waste Classification Guidelines* (DECCW 2009b) prior to disposal (refer to section 7.4.3 for further discussion on waste management during the construction of the CSELR proposal). Demolition of the Olivia Gardens apartment complex is anticipated to take approximately 4 months to complete.

### 6.2.5 Moore Park tunnel

The Moore Park tunnel may generally be constructed using a bottom up construction sequence (cut-and-cover structure) where an open trough would be excavated prior to installing the tunnel roof. An alternative (mined) tunnelling technique would likely be adopted for the proposed crossing under Anzac Parade to avoid the need to divert traffic on Anzac Parade. Discussion on the potential construction methodology options for the proposed Moore Park tunnel is provided in the following sections.

The final tunnelling technique adopted for the proposed Anzac Parade crossing would be determined during detailed design, based on the results of geotechnical investigations and in consultation with RMS. The design and construction methodology adopted would aim to ensure that no adverse impact would occur to the Eastern Distributor, other surrounding structures or services/utilities.

#### Cut-and-cover tunnel

The proposed cut-and-cover tunnel through Moore Park may be a combination of a diaphragm wall structure through the park and an open box dive structure with a combination of diaphragm wall and piled walls (depending on structure depth).

Indicative construction activities associated with the diaphragm wall structures would generally include the following:

- clearing and grubbing operations to an on-site stockpile
- establishment of survey and monitoring locations
- potential relocation of trees (where required) impacted by the works
- installation of temporary dewatering and on-site groundwater treatment operations (This would include the establishment of a temporary groundwater treatment plant within Moore Park. The treatment plant would require either a mains power supply with a backup generator, or two generators to ensure adequate provisions to allow for any inadvertent power failure. The size and volume of these facilities would be determined based on groundwater flows.)
- installation of guide walls and diaphragm walls, with guide walls required to ensure the diaphragm wall operation is performed effectively and would be removed at the end of construction
- excavation works
- temporary propping works, which would be undertaken progressively as the excavation becomes deeper
- installation of the roof slab
- installation of tunnel mechanical and electrical services
- installation of waterproofing concrete base and track slab
- backfill tunnel and reinstatement of playing fields/landscaping
- installation of track and overhead wiring and rail systems.

### Tunnelling under Anzac Parade – driven tunnel options

Two driven tunnel options (a jack box and canopy tube driven tunnel) could be used to construct the tunnel crossing of Anzac Parade. These alternative options are described in the following sections.

#### Jack box option

This technique would involve the construction of a pit with diaphragm walls on the west side of Anzac Parade, which would later be incorporated into the permanent tunnel structure. A reinforced concrete box would be cast inside the jacking pit and fitted with a purpose-designed tunnel shield, before this is progressively jacked forward and lengthened. Both tracks would be contained within a single jacked box. The base and walls of the box would be cast in situ, whereas the roof of the box would be constructed with a precast members and a composite topping. During jacking, canopy tubes would be advanced ahead of the excavation.

#### Canopy tube driven tunnel

This option would involve the construction of the twin rail tracks in two separate tunnels with a cover of six metres (in order to limit settlement and ground support requirements). The approach and access to this tunnel section would require a deeper vertical alignment for the end of the cut-and-cover tunnel. In addition, the cut-and-cover tunnel would have to accommodate the widening in the overall width of the formation as it approaches the separate tunnel formation for each track in the driven tunnel section.

### Construction facilities required during construction of the Moore Park tunnel

The Moore Park tunnel would require the establishment of a worksite for a bentonite plant, wastewater treatment plant and laydown area at either end of the tunnel in a staged approach (i.e. establishment of these facilities on the western side of Anzac Parade, then relocating the facilities to the eastern side to complete the construction works). Bentonite is a clay slurry that would be used to support the excavated trench prior to the pouring of concrete to create the diaphragm tunnel wall. Each staged worksite would occupy approximately 5,600 square metres.



## Dewatering during construction

Groundwater is likely to be encountered during the construction of the Moore Park tunnel (refer to section 10.4); therefore, dewatering would be required. The level of dewatering required during the construction of the tunnel would be dependent on the depth of excavation, permeability of the aquifer and prevailing weather conditions during construction (i.e. the volume of rainfall recharging the aquifer). Drawdown of the groundwater table has the potential to lead to groundwater settlement. The design of the tunnel and construction method would consider the potential for settlement and incorporate measures to avoid or minimise settlement and potential damage to infrastructure. Dewatering could also adversely affect the Fig trees within the Moore Park playing fields and adjacent to Anzac Parade (without the implementation of adequate environmental management measures) due to the lowering of the water table below the depth of the tree roots. Further discussion on potential impacts to planted trees within the Moore Park Precinct is provided in section 14.6.

Groundwater encountered during the construction of the proposal would be managed in accordance with the requirements of the *Waste Classification Guidelines* (DECCW 2009b) and Transport for NSW's (2012a) *Water Discharge and Re-use Guideline*. Further discussion on potential groundwater impacts, and measures to manage such impacts, is provided in section 10.4.

## 6.2.6 Other structures

### New bridge crossing over the Eastern Distributor

The new bridge crossing over the Eastern Distributor may comprise a prefabricated steel arch bridge. The general construction approach would be to complete as much of the bridge works off-site to maximise efficiencies and minimise costs and disruptions to traffic (although there would still be a need for traffic closures of the Eastern Distributor and South Dowling Street).

Construction activities may typically include:

- establishment of work areas (laydown pad, temporary platforms and establishments) for the laydown of pre-cast structures and provision of level working platforms
- construction of bridge piles (This work would likely be undertaken during night time shutdowns of lanes on either South Dowling Street or the Eastern Distributor. Works would be undertaken sequentially so that either the Eastern Distributor or South Dowling Street would be available as an alternative access route.)
- erection of bridge deck steelwork during night road possessions of the Eastern Distributor and South Dowling Street (Temporary stability of the bridge arches would be required until all steelwork has been connected. The bridge would be lifted into place with permanent fences and screens in place (where possible) to enhance safety to the construction team and road users. Lifting of the bridge is likely to be undertaken using a large mobile crane, which would be established on the Moore Park side of the Eastern Distributor.)
- erection of permanent deck slab during night road possessions using detailed site specific traffic management plans and traffic control plans and in accordance with any conditions specified in the road occupancy licences for the works
- works to tie new bridge into the cut-and-cover tunnel
- installation of light rail track onto the new bridge spans
- regrading of South Dowling Street.

It is anticipated that construction of the new bridge crossing over the Eastern Distributor would take approximately seven months to complete. Construction works that would impact on the traffic operation of the Eastern Distributor would be scheduled to occur during off-peak closures (i.e. during night works) and, where possible, timed to coincide with the Eastern Distributor maintenance program. An indicative construction staging plan for the associated proposed South Dowling Street regrading works is provided in section 6.10.2.

## Retaining walls

Retaining walls along Alison Road/Wansey Road may be constructed through utilisation of gabions or crib walls or other alternatives where a more natural appearance of the retaining wall is required (as the retaining walls would front a tree lined section of Royal Randwick racecourse). Construction activities associated with these retaining walls would vary between locations; however, would typically involve:

- tree removal/relocation
- utility relocations
- excavation of construction footprint
- preparation of base and blinding slab
- construction of retaining wall structure, placement, and compaction with select surround fill
- progressively backfilling and compaction of free draining aggregate, geotextile and subsurface drainage system behind
- construction of a concrete dish drain on top of the wall to divert any surface stormwater flows.

Retaining walls along proposed light rail stops (where there is the need to raise or lower the alignment, such as at Rawson Place) would need to be aesthetically acceptable to the proposed streetscape and, therefore, would be more labour intensive to construct (as the retaining walls require some type of façade). Construction activities associated with these retaining walls would vary between locations; however, would typically involve:

- saw cutting and removal of existing pavement
- utility relocations
- tree removal/relocation
- excavation and removal of existing pavement
- preparation of base and binding
- construction of concrete footing
- formwork, if adopting in-situ concrete construction for the retaining wall
- reinforcement and concrete placement if adopting in-situ concrete construction for the retaining wall or placement of concrete pre-cast retaining wall panels
- progressively backfill and compaction of free draining aggregate, geotextile and subsurface drainage system behind
- placement of concrete dish drain on top of the wall to divert any surface stormwater flows
- placement of façade, subject to final design.

### 6.2.7 Maintenance depot and stabling yard

Construction of the maintenance depot at Rozelle and stabling yard at Randwick may be undertaken concurrently with the main construction works (e.g. track works) to enable train delivery and testing. Construction activities at each stabling/maintenance location would vary between locations; however, would typically comprise:

- demolition of existing buildings and structures
- utilities relocation, protection and modification
- establishment of alternative access arrangements for third parties (e.g. utility providers), as required
- remediation of the site (where required)
- clearing and grubbing of the construction footprint
- earthworks and installation of site drainage
- establishment of site roads and open spaces
- detailed excavation for buildings
- construction of foundations
- utilities supply to the site (where required)
- construction of retaining walls (where required)
- construction of buildings and water treatment facilities



- formation, track work and the construction of footpaths (for staff access) and foundations for railway systems (e.g. overhead wiring structures and signalling equipment)
- installation of rail systems (e.g. power distribution, overhead wiring and signalling) and flood lighting
- installation of maintenance equipment
- landscaping
- building fit-out, including installation and connection of electricity/communications, water and sewer systems.

The buildings could comprise a steel frame with a metal roof and either metal cladding or precast concrete panel walls.

Construction of each facility is anticipated to take approximately 18–24 months to complete. Further discussion of site specific constructability issues at the proposed Rozelle and Randwick sites is provided in the following sections.

### Rozelle maintenance depot

The existing maintenance workshops and facilities on the site would need to be demolished to accommodate the new depot. Major rock excavation would be required on the north-western side of this site where rock cliffs are exposed. As discussed in section 10.3, a Phase 1 Environmental Site Assessment was completed for the Rozelle Rail Yards site. Findings from two previous investigations (undertaken in 2003 and 2011) identified hydrocarbon and heavy metals levels exceeding site assessment criteria in soil at shallow depth (less than 1 metre below ground level). The hydrocarbon and metals contamination previously identified in the fill is associated with fuel and oil spills, maintenance of the trains and the yard. Dissolved phase hydrocarbon impact was also identified. Environmental management and remediation measures that would be implemented to minimise the risks associated with encountering contaminated land are provided in section 10.3.

### Randwick stabling facility

The Randwick site is relatively flat and does not appear to require major earthworks or retaining walls for the stabling yard. Demolition of existing buildings would be required, which may have asbestos issues. The risk of ground contamination in this area is not expected to be as high as at the Rozelle Rail Yards; however, the groundwater level in this area is high. Therefore, measures to manage potential risks associated with the contamination of the aquifer would need to be developed for the site (as discussed in section 10.4).

## 6.2.8 Substations and associated works

Substations would generally comprise prefabricated structures, with the manufacture and fit-out of each substation occurring off-site. On-site works would typically comprise excavation, foundation preparation and construction, and the installation of conduits and other in-situ works prior to the installation of the prefabricated substation building. There is the potential that existing Ausgrid chambers could be re-used for the establishment of underground substations (such as the proposed substation at Martin Place).

Construction activities would typically include:

- establishment of the worksite, temporary hoardings, construction pad and laydown area
- excavation for below-ground substations
- construction of foundations, footings, conduits and other in-situ works
- installation of earthing and lighting systems
- delivery and installation of prefabricated substations/transformers
- installation of high voltage cables between substations and the location cabinets situated at each light rail stop, as well as to existing Ausgrid substations within the network
- the supply, installation and termination of low voltage power and control cabling between equipment
- backfill around substation with concrete, pavers, or other materials depending on finished surface
- post construction testing and commissioning of substations.

### 6.2.9 Landscaping and public domain works

Landscaping and public domain works would generally commence as a final stage of work, which would be progressively undertaken as sections of construction work are completed. All landscaping and public domain works would comply with council urban design guidelines, where possible.

## 6.3 Plant and equipment

Table 6.3 provides an indicative list of construction plant and equipment that may be required during key construction scenarios.

Table 6.3 Indicative construction equipment required for key construction scenarios

| PLANT/EQUIPMENT                     | CONSTRUCTION SCENARIO |       |                 |                |                     |                     |                 |             |
|-------------------------------------|-----------------------|-------|-----------------|----------------|---------------------|---------------------|-----------------|-------------|
|                                     | TRACK WORK            | STOPS | OVERHEAD WIRING | SUBGRADE WORKS | TUNNEL CONSTRUCTION | BRIDGE CONSTRUCTION | RETAINING WALLS | SUBSTATIONS |
| Rigid tippers                       | ✓                     | ✓     |                 | ✓              | ✓                   | ✓                   | ✓               |             |
| Saw                                 | ✓                     | ✓     |                 |                |                     |                     | ✓               |             |
| Suction truck                       | ✓                     | ✓     |                 |                |                     |                     |                 |             |
| Truck and dog                       | ✓                     |       |                 | ✓              | ✓                   |                     |                 |             |
| Concrete agitator                   | ✓                     | ✓     | ✓               |                | ✓                   | ✓                   | ✓               | ✓           |
| Concrete pump                       | ✓                     | ✓     | ✓               |                | ✓                   | ✓                   | ✓               | ✓           |
| Bob cat                             | ✓                     | ✓     |                 |                | ✓                   |                     |                 | ✓           |
| Profiler                            | ✓                     | ✓     |                 |                | ✓                   |                     | ✓               |             |
| Roller                              | ✓                     | ✓     |                 | ✓              | ✓                   |                     |                 |             |
| Watercart                           | ✓                     | ✓     |                 | ✓              | ✓                   |                     |                 |             |
| Piling rig                          | ✓                     | ✓     | ✓               |                |                     | ✓                   |                 |             |
| Grader                              | ✓                     |       |                 | ✓              | ✓                   |                     |                 |             |
| Compactor                           | ✓                     |       |                 |                |                     |                     |                 |             |
| Dozer                               |                       |       |                 | ✓              | ✓                   |                     |                 |             |
| Excavator                           | ✓                     | ✓     |                 | ✓              | ✓                   | ✓                   | ✓               | ✓           |
| Hydraulic hammer                    | ✓                     | ✓     |                 |                | ✓                   |                     |                 |             |
| Crane                               | ✓                     | ✓     | ✓               |                | ✓                   | ✓                   | ✓               | ✓           |
| Backhoe                             |                       |       |                 |                | ✓                   |                     | ✓               | ✓           |
| Automated baseplate placing machine | ✓                     |       |                 |                |                     |                     |                 |             |
| Welder                              | ✓                     |       |                 |                |                     | ✓                   |                 |             |
| Paver                               | ✓                     | ✓     |                 |                | ✓                   |                     |                 |             |
| Bitumen sprayer                     | ✓                     | ✓     |                 |                | ✓                   |                     |                 |             |
| Suction sweeper                     |                       | ✓     |                 |                | ✓                   |                     |                 |             |



Table 6.3 cont.

| PLANT/EQUIPMENT            | CONSTRUCTION SCENARIO |       |                 |                |                     |                     |                 |             |
|----------------------------|-----------------------|-------|-----------------|----------------|---------------------|---------------------|-----------------|-------------|
|                            | TRACK WORK            | STOPS | OVERHEAD WIRING | SUBGRADE WORKS | TUNNEL CONSTRUCTION | BRIDGE CONSTRUCTION | RETAINING WALLS | SUBSTATIONS |
| Pneumatic jackhammer       |                       | ✓     |                 |                |                     |                     | ✓               |             |
| Kerbing machine            | ✓                     | ✓     |                 |                |                     |                     |                 |             |
| Elevated working platforms |                       |       | ✓               |                | ✓                   |                     |                 |             |
| Generator                  | ✓                     | ✓     |                 | ✓              | ✓                   |                     |                 |             |
| Bentonite plant            |                       |       |                 |                | ✓                   |                     |                 |             |

## 6.4 Resources and materials

Construction resources and materials required for the CSELR proposal would be determined during the detailed design and procurement phases of the proposal. These materials would likely include the following:

- steel rails, structural steel and steel reinforcement and prefabricated steel furniture and signage
- diesel
- petrol
- lubricating oil
- premix concrete
- road sub-base and road base
- timber/plywood
- rock gabions
- asphalt and bitumen
- bentonite
- water
- concrete, sand and cement
- precast concrete pipes and conduits
- paving stones
- structural fill (where existing subgrade material is not suitable).

## 6.5 Construction workforce

It is anticipated that the peak construction workforce across the whole CSELR proposal would be in the order of 700 full-time equivalent positions. These would be deployed across the whole proposal as required. For example, peak workforce for the George Street works, including subcontractors, is anticipated to be around 210 personnel.

## 6.6 Construction work hours

As the CSELR proposal would be constructed through busy urban areas, construction works have the potential to disrupt traffic at a number of intersections throughout the study area. To minimise disruption to traffic and for safety reasons, it is anticipated that construction works would be required outside of standard construction hours. Within the CBD, works may need to take place on a 24 hour basis. Outside of the CBD, works would be undertaken between 7 am and 11 pm; however, there would generally be more flexibility to restrict construction works outside of the CBD to the daytime, and occasionally evening periods.

Where reasonable and feasible, preference would be given to scheduling construction works within the standard construction hours of 7 am to 6 pm Monday–Friday and 8 am to 1 pm on Saturdays (particularly those activities generating high noise and/or vibration levels).

## 6.7 Construction sites and compounds

### 6.7.1 Construction zone

The construction site boundary for the CSELR proposal is shown in Figures 6.2a to h. Generally, construction works would take place within existing road reserves, with the exception of:

- works proposed at Circular Quay and Martin Place and the ends of streets to be closed or reconfigured as a result of the CSELR proposal
- components of work proposed within the Surry Hills and Moore Park precincts which would affect areas of public open space (Ward Park, Wimbo Park, Moore Park and Centennial Park), residential development (Olivia Gardens) and community facilities (the Langton Centre car park, Parkland Sports Complex)
- works proposed at the Randwick stop, which would affect an area of public open space (High Cross Park)
- works proposed at the Randwick stabling facility, which would affect private property
- works proposed on Anzac Parade in the vicinity of the Universities of NSW and on UNSW land
- works proposed at the Rozelle maintenance depot.

Some substations, utility, services and drainage works may also require construction access and work to be undertaken outside of existing road reserves, which could include public areas.



Figure 6.2a Construction compounds and footprint for the CSELR proposal

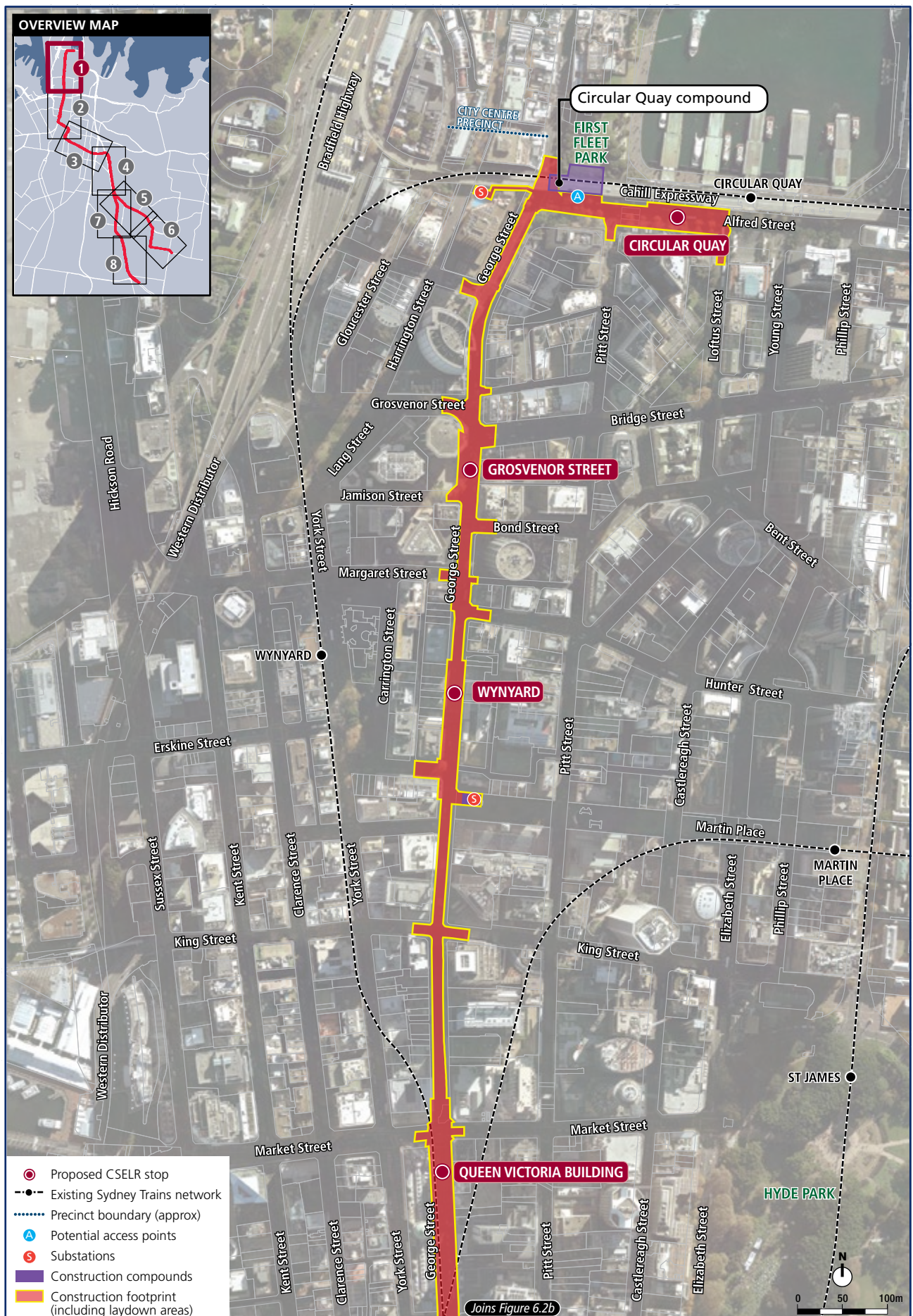


Figure 6.2b Construction compounds and footprint for the CSELR proposal

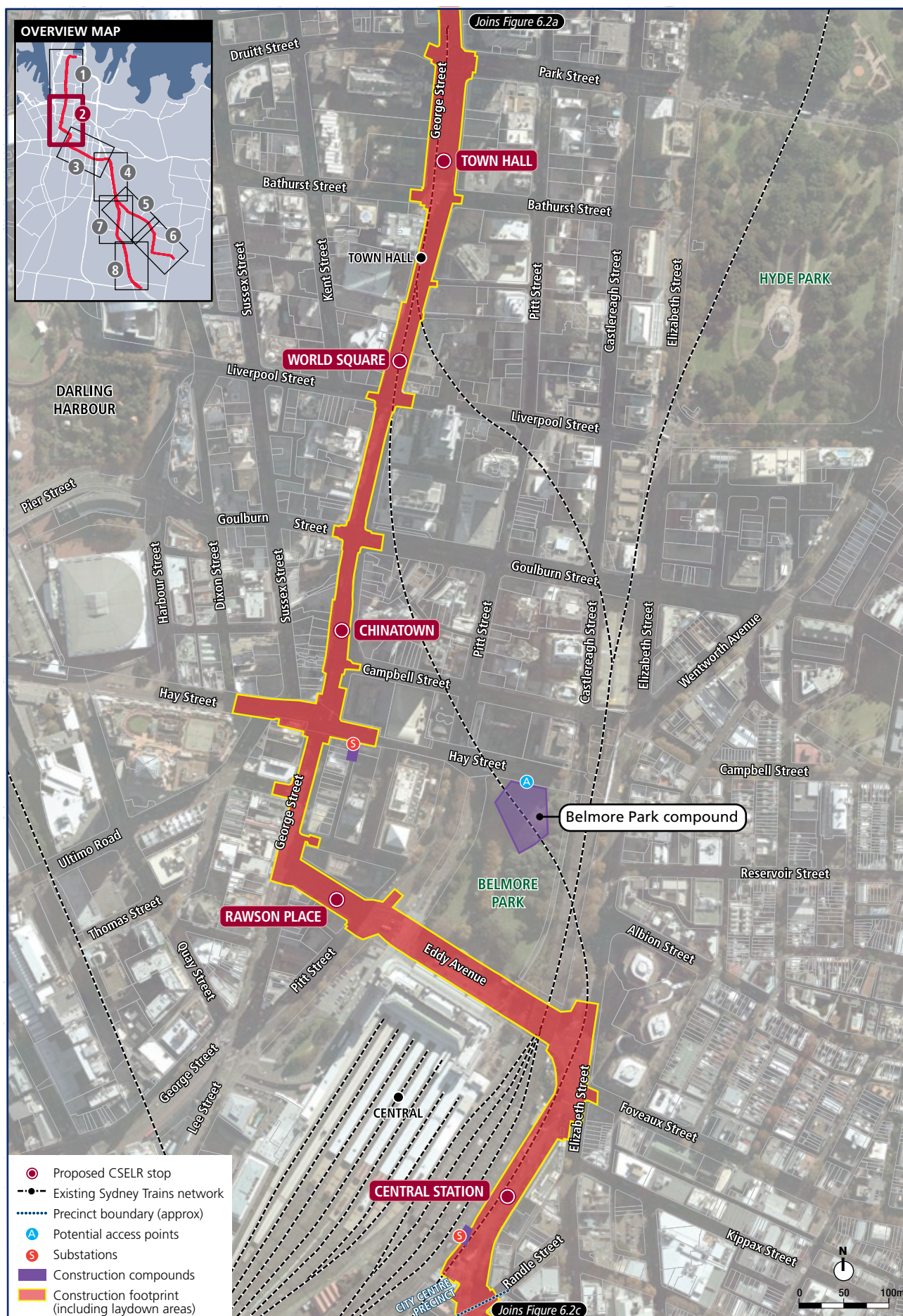




Figure 6.2c Construction compounds and footprint for the CSELR proposal

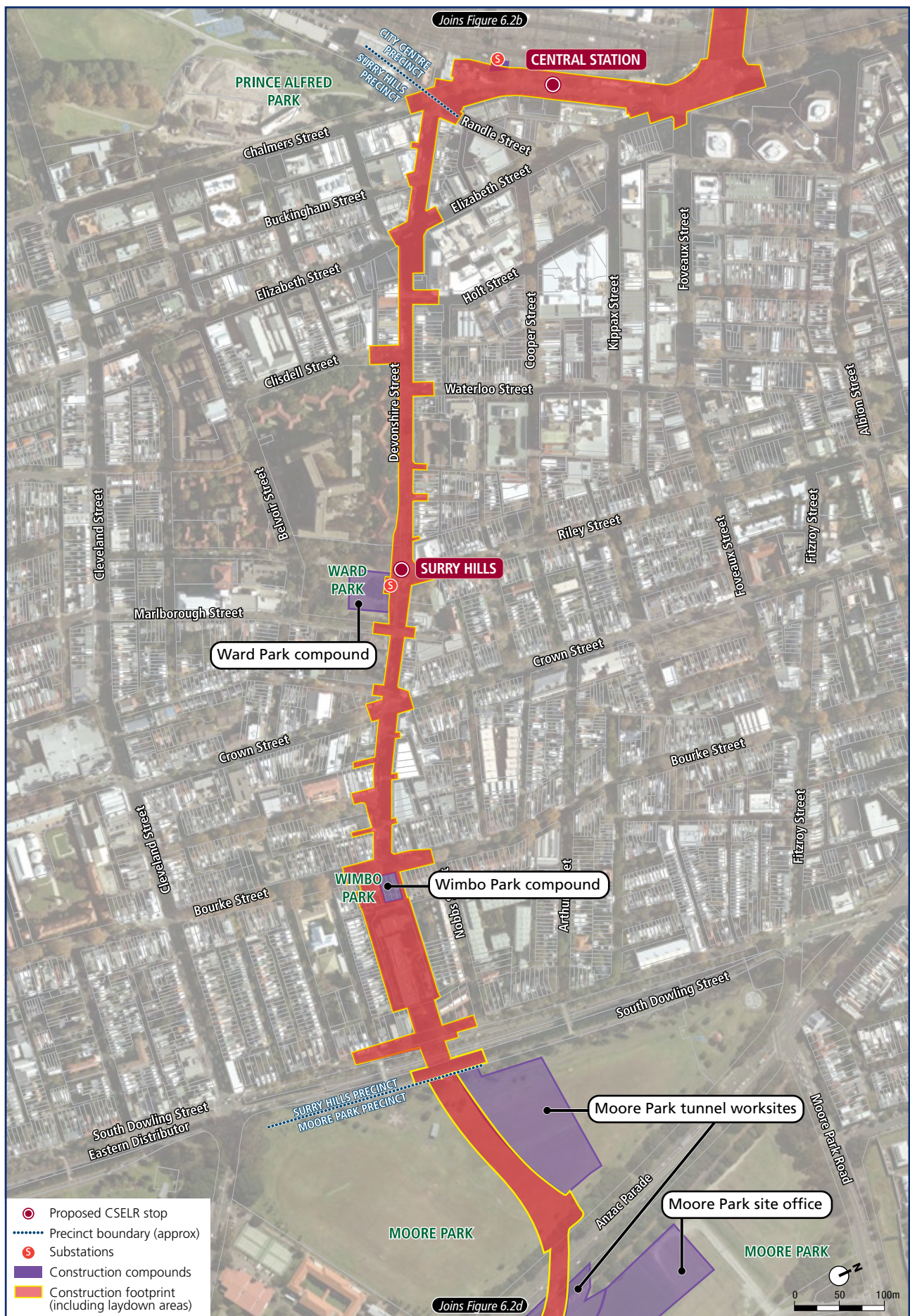


Figure 6.2d Construction compounds and footprint for the CSELR proposal

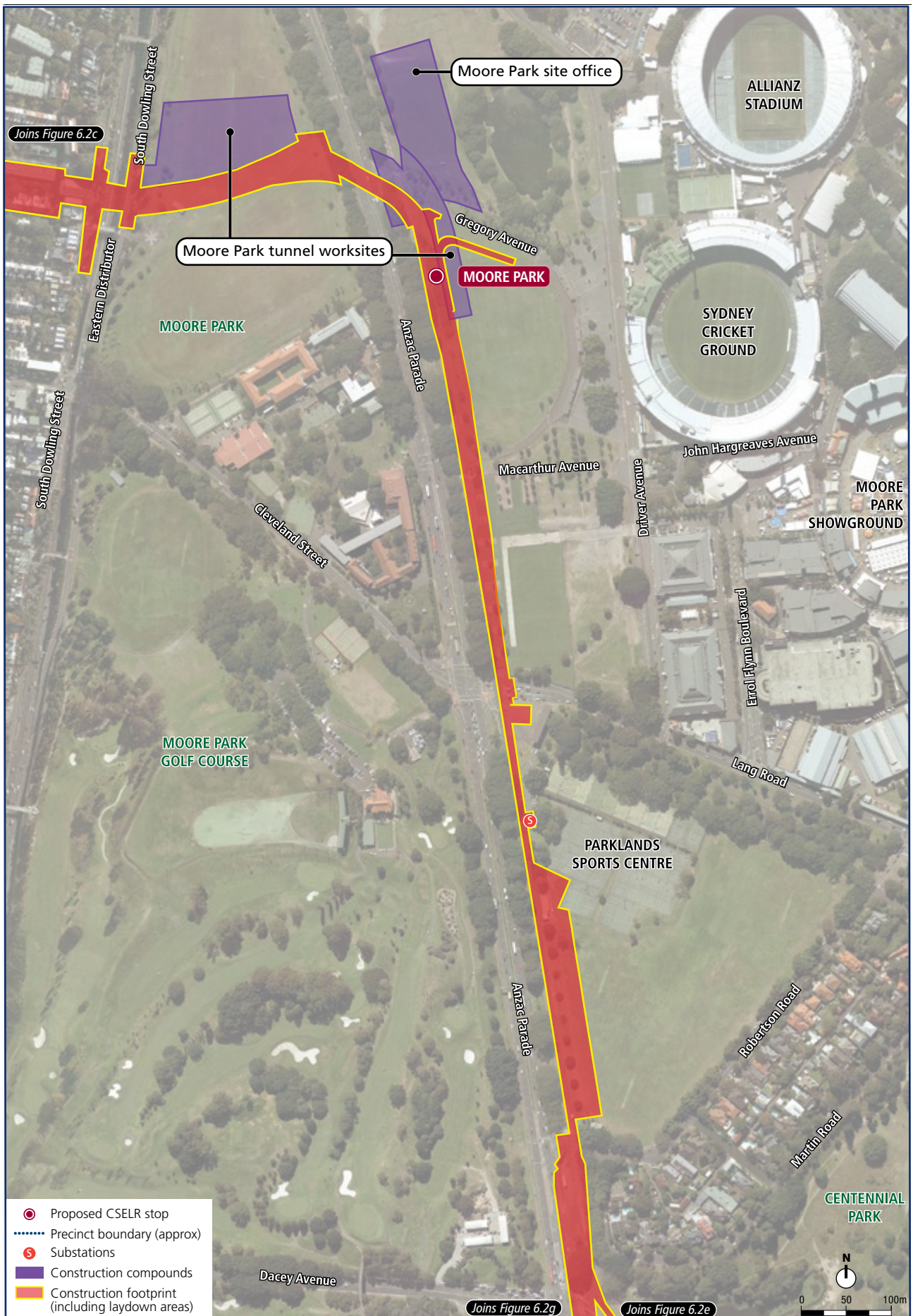




Figure 6.2e Construction compounds and footprint for the CSELR proposal



Figure 6.2f Construction compounds and footprint for the CSELR proposal

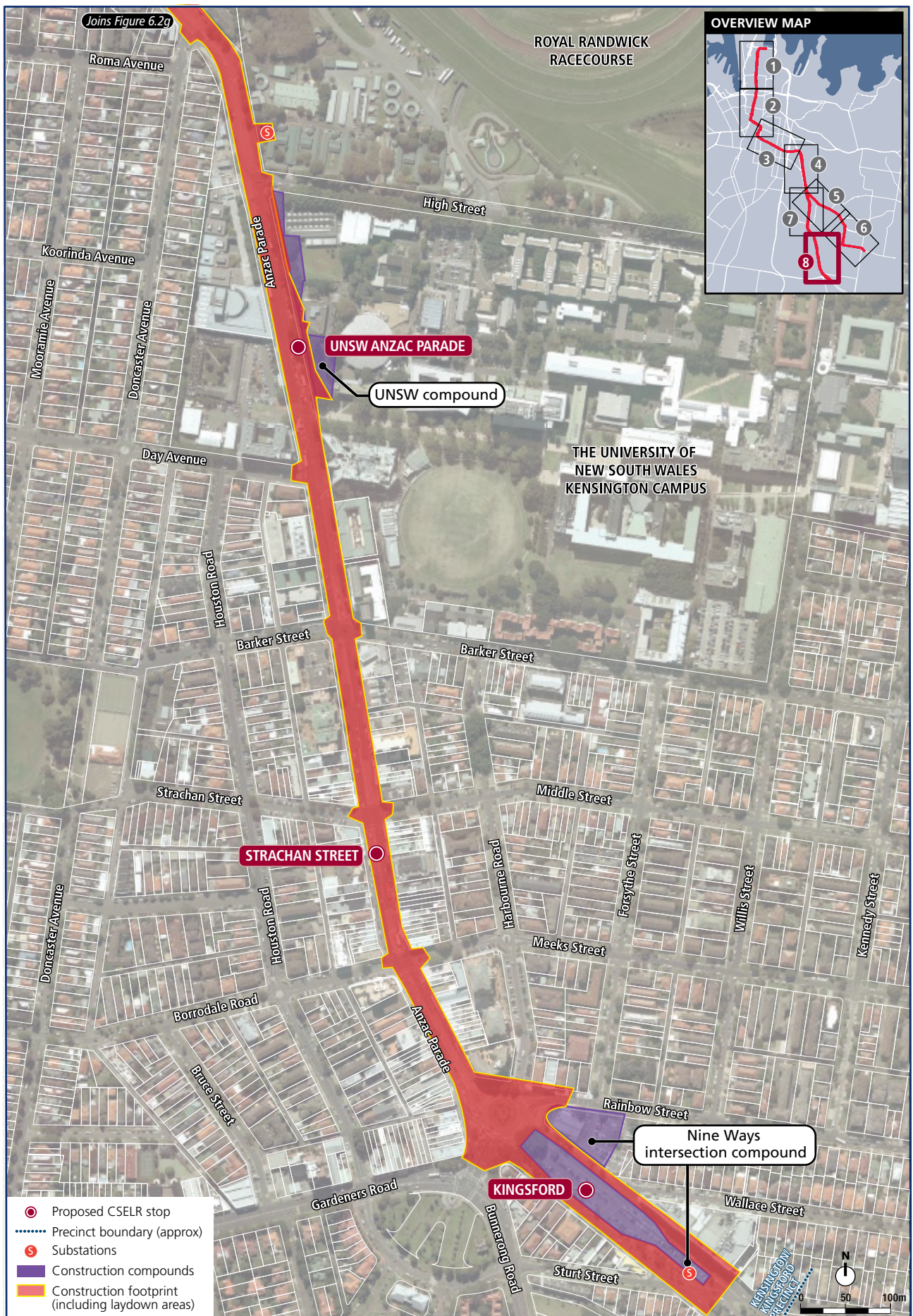




Figure 6.2g Construction compounds and footprint for the CSELR proposal



Figure 6.2h Construction compounds and footprint for the CSELR proposal





## 6.7.2 Primary construction compounds

### Location and key features

The proposed locations for the primary construction compounds are shown in Figure 6.2a to h and described in Table 6.4. These sites were selected as primary 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 approximately three years.

To minimise impacts from the construction compounds, the following site factors were considered during the selection of viable construction compound locations:

- location on relatively level ground of sufficient size to accommodate the required facilities
- accessible for construction traffic and deliveries
- close to key construction activities (such as stop locations and the Moore Park tunnel) to minimise transport of materials and equipment
- on public land to avoid impacts on private land uses/property
- located away from (or able to be managed in such a way so as to not significantly impact on) heritage items, significant trees (as listed under City of Sydney Council's (2013) *Register of Significant Trees* and Randwick City Council's (2007) *Significant Tree Register*), waterways, and areas prone to flooding
- ability to manage public safety and access around the construction compound
- undeveloped nature of the site (i.e. parks) to minimise impacts on existing structures, services and utilities.

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.

Table 6.4 Proposed primary construction compounds

| COMPOUND                    | GENERAL LOCATION AND DESCRIPTION <sup>1</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|-----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>City Centre Precinct</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Circular Quay               | <p>The construction compound would be located at the southern end of First Fleet Park (including the area beneath the Cahill Expressway) adjacent to Alfred Street (refer to Figure 6.2a) and would support construction activities proposed to be undertaken between Circular Quay and Central Station.</p> <p>The western side boundary would be established so as to avoid the need to clear existing street trees adjacent to George Street; while the eastern boundary would be located directly adjacent to the Quay West promenade.</p> <p>The northern footpath along Alfred Street would be closed to pedestrians between Pitt Street and George Street. The existing building located at the south-western corner of First Fleet Park would be fenced off to allow access from George Street during construction. Continuity of the promenade around Circular Quay would not be affected. Connectivity of the footpath between the Opera House, ferry terminal and the Quay West area would be maintained throughout construction.</p> <p>The site would generally accommodate an office, lunchroom, toilets, first aid room, security and laydown. It is anticipated that limited construction parking for this compound would be provided on Alfred Street and Loftus Street. Additional parking is likely to be provided through the establishment of long-term leases in existing off-street parking stations in George Street.</p> <p>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.</p> <p>Access/egress would be via Alfred Street to the construction corridor under the Cahill Expressway. Vehicle access to the compound would be via the following routes:</p> <ul style="list-style-type: none"> <li>• Harbour Bridge – via the Cahill Expressway, Bridge Street and Loftus/Pitt Streets</li> <li>• Anzac Bridge – The Rocks via Hickson Road.</li> </ul> |

Table 6.4 cont

| COMPOUND                                                                             | GENERAL LOCATION AND DESCRIPTION <sup>1</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|--------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Belmore Park                                                                         | <p>The construction compound would be located at the northern end of Belmore Park, adjacent to Hay Street (refer to Figure 6.2b). The site would support construction activities proposed to be undertaken within the City Centre and Surry Hills precincts.</p> <p>The site would generally accommodate offices, lunchrooms, toilets, first aid room, security, laydown, and security fencing and lighting.</p> <p>No on-site parking is proposed for the construction workforce, which would be expected to utilise existing public transport. An alternative arrangement would be to provide remote parking on the stabling yard and shuttle transfer workers to site, which would depend on demand for this facility and the shift hours.</p> <p>Where possible, the site layout would be configured so as to avoid the need to remove any of the trees within Belmore Park; however, there is the potential that some trees may require trimming to provide clearance for construction plant, equipment and laydown areas. Pedestrian access would be maintained along existing footpaths that traverse Belmore Park, which would be located outside of the construction compound.</p> <p>Modifications would be made at the intersection of Pitt Street and Hay Street (which may also include modifications to the Inner West Light Rail) to allow heavy vehicles to access the compound. Vehicle access to the compound would be via the following routes:</p> <ul style="list-style-type: none"> <li>• Anzac Bridge – via Pier and Harris Streets or Broadway and Wattle Streets</li> <li>• Parramatta Road – via Elizabeth Street and Cleveland Street or Pitt Street and Broadway.</li> </ul> <p>Access to/from the George Street construction worksite would be provided via the existing light rail corridor along Hay Street, which currently provides signalised access onto George Street.</p> |
| <b>Surry Hills Precinct</b>                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Ward Park                                                                            | <p>The construction compound would be located on the north-western side of Ward Park, adjacent to Devonshire Street (refer to Figure 6.2c). The site would be situated within an existing grassed area and would support construction activities proposed to be undertaken along Devonshire Street.</p> <p>The site would generally accommodate an office, toilets, first aid room, security and laydown area. No on-site parking is proposed for the construction workforce. Construction parking would likely be provided within the main construction compounds proposed at Moore Park and adjacent to Royal Randwick racecourse. Transport between worksites would be via the construction worksite, once established, or through bus shuttle runs until the construction corridor is fully established. Access to/from the compound would be provided from Devonshire Street.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Wimbo Park                                                                           | <p>The construction compound would be located on the former Olivia Gardens apartment complex site and on approximately 400 square metres of the adjacent Wimbo Park (comprising approximately half of the total Wimbo Park area; refer to Figure 6.2c). Affected areas of Wimbo Park would be used to provide construction vehicle access to the Olivia Gardens site as well as to sort construction waste generated from the demolition of the Olivia Gardens apartment buildings. There is the potential that Wimbo Park would also be used to accommodate traffic diversions during the construction of the Bourke Street/Devonshire Street intersection.</p> <p>Access to/from the Wimbo Park compound would be provided from Bourke Street.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Moore Park Precinct</b>                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Moore Park tunnel – associated construction facilities east and west of Anzac Parade | <p>A corridor of approximately 25 metres is required behind the outside edges of the diaphragm wall for the proposed Moore Park cut-and-cover tunnel (as shown in Figure 6.2d). This worksite would be required to support the cut-and-cover construction works and would accommodate space for a bentonite plant, wastewater treatment plant and laydown area at either ends of the tunnel in a staged approach (i.e. establishment of these facilities on the western side of Anzac Parade, then relocating the facilities to the eastern side to complete the construction works). Each staged worksite would occupy approximately 5,600 square metres.</p> <p>The worksite on the western side of Anzac Parade would be accessed via the southbound lane of South Dowling Street, the northbound lane of Anzac Parade and Cleveland Street, with access points likely to be established at the locations shown in Figure 6.2d. Access to/from the worksite on the eastern side of Anzac Parade would be via an existing gravel driveway, which connects to the road network via Moore Park Road and Driver Avenue.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Moore Park – site office compound                                                    | <p>A site office compound would be required to service the proposed construction works within the eastern suburbs. It is anticipated that this compound would be located in either Moore Park (on the eastern side of Anzac Parade – refer Figure 6.2d), or at the proposed Randwick stabling facility site. The site would generally accommodate offices, staff car parking area, toilets, first aid room, security and laydown area. Access to/from the worksite on the eastern side of Anzac Parade would be via an existing gravel driveway, which connects to the road network via Moore Park Road and Driver Avenue.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |



Table 6.4 cont

| COMPOUND                             | GENERAL LOCATION AND DESCRIPTION <sup>1</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|--------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Randwick Precinct</b>             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Royal Randwick racecourse            | <p>The Randwick stabling facility site would be used as a temporary construction compound, until such time as stabling facility construction needs to commence (refer Figure 6.2e). The construction compound would be used to service works along Alison Road between Anzac Parade and Wansey Road.</p> <p>The Royal Randwick racecourse compound site may also be used as an alternative location for the proposed site office compound at Moore Park in order to facilitate parking for the south-eastern construction works. Construction requirements for this site compound would be similar to those previously described for the Moore Park site office compound.</p> <p>Access to the construction compound would be provided from Doncaster Avenue, via a number of existing access points.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| High Cross Park                      | <p>The construction compound would be located within High Cross Park (refer to Figure 6.2f). The compound would occupy approximately half of the park. The construction compound would be required to service construction works proposed on High Street and Wansey Road. The site would be a satellite compound to the main compounds located at Moore Park and the Nine Ways intersection.</p> <p>The compound would generally accommodate a site office, toilets, first aid room, security and laydown area. Limited construction parking could be provided at the Randwick Shopping Centre, subject to landowner consent; however, the major parking area for this compound would be located at the main construction compounds at Moore Park and/or Royal Randwick racecourse.</p> <p>As outlined in section 15.8, High Cross Park contains a war memorial at the centre of the park. The proposed construction compound at High Cross Park would be configured so as to not impact on this war memorial (either directly or indirectly). Opportunities to retain public access to the war memorial, from the Avoca Street side of the park, would be further investigated during detailed design. It is noted, however, that access to the war memorial would be very limited for Anzac Day functions during construction.</p> <p>The High Cross Park worksite would be accessed mainly via High Street and Belmore Road with potential access points available from all three road frontages.</p> |
| <b>Kensington/Kingsford Precinct</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| UNSW                                 | <p>The construction compound would be located within the UNSW grounds, adjacent to Anzac Parade and the proposed UNSW Anzac Parade stop (refer to Figure 6.2h). The compound would be required to facilitate the construction of the proposed light rail stop and to service construction works proposed on Anzac Parade. The compound would function as a satellite compound to the main compounds located at Moore Park and the Nine Ways intersection.</p> <p>The compound would generally accommodate a site office and security. Limited construction parking could be provided through consultation with UNSW; however, the major parking area for this compound would be located at the main construction compound at either Moore Park or Royal Randwick racecourse.</p> <p>Access to the construction compound would be provided via Anzac Parade and Alison Road with secure entry and exit points established to ensure the worksites are clearly defined to motorists.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Nine Ways intersection               | <p>The construction compound would be located between the northbound and southbound lanes of Anzac Parade (south of the Nine Ways intersection), as well as on a parcel of land currently owned by Transport for NSW located at the corner of Rainbow Street and Anzac Parade (refer to Figure 6.2h). The majority of the site would be situated within the construction footprint for the proposed Kingsford stop with the exception of the area located to the east of Anzac Parade (comprising an existing building and surrounding car park), which would be used for the site compound and laydown areas.</p> <p>The site would be the primary worksite for the Kensington/Kingsford Precinct works and would generally accommodate an office, lunchroom, toilets, first aid room, security, laydown, construction parking and security fencing and lighting. Access to/from the site would be provided from Anzac Parade.</p> <p>Access to the construction compound would be provided via Anzac Parade and Alison Road with secure entry and exit points established to ensure the worksites are clearly defined to motorists.</p>                                                                                                                                                                                                                                                                                                                                                                |
| <b>Rozelle locality</b>              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Rozelle maintenance depot            | <p>The construction worksite associated with the Rozelle maintenance depot would be limited to internal activities within the former goods yard at Rozelle. Construction activities that would be accommodated within the site would include a vehicle crossing between the site and Lilyfield Road; demolition of existing buildings; paving and track work; equipment installation; and fit outs.</p> <p>Site access is proposed on the southern side of Lilyfield Road, to the east of Catherine Street. Access to the Rozelle maintenance depot would be via the existing vehicle access point on Lilyfield Road, which is designed to accommodate heavy vehicles turning to and from Lilyfield Road.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |

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

### Management of known environmental constraints

Environmental management measures that would be implemented to manage site specific environmental constraints at each of the proposed primary construction compounds are described in Table 6.5.



Table 6.5 Proposed environmental management measures for primary construction compounds

| COMPOUND                    | ENVIRONMENTAL CONSTRAINTS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | PROPOSED ENVIRONMENTAL MANAGEMENT MEASURES                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|-----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>City Centre Precinct</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Circular Quay</b>        | <ul style="list-style-type: none"> <li>First Fleet Park is of State heritage significance. Therefore, impacts to trees within the park need to be avoided.</li> <li>First Fleet Park is likely to contain subsurface archaeology of State significance which could be impacted through excavation of the site.</li> <li>Construction access to the site from George Street is restricted by ground level differences. Access from Alfred Street (under the Cahill Expressway) is currently available. This access point could be improved by temporarily removing the plantings under the Cahill Expressway (subject to agreement with City of Sydney). These plantings would need to be reinstated at the completion of construction.</li> <li>Sydney Harbour is located in close proximity to the construction compound boundary.</li> <li>First Fleet Park is heavily used by the community and forms a significant contribution to the visual environment and amenity of the Circular Quay area (a landmark tourist destination).</li> </ul> | <ul style="list-style-type: none"> <li>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.</li> <li>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.</li> <li>No excavation would be undertaken within First Fleet Park to minimise the risk of impacting on potential subsurface archaeology.</li> <li>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 City of Sydney. Any removed plantings would be reinstated at the completion of construction.</li> <li>Adequate measures would be implemented to minimise the visual amenity impact of the construction compound on the surrounding area.</li> <li>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).</li> </ul> |
| <b>Belmore Park</b>         | <ul style="list-style-type: none"> <li>Very limited usable space, due to the need to avoid impacts to the drip lines of trees.</li> <li>Park contains a footpath that is heavily utilised by pedestrians due to its proximity to Central Railway Station and the strong desire line to destinations north of Central Railway Station.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | <ul style="list-style-type: none"> <li>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 the underlying tree roots, in accordance with Australian Standard AS 4970.</li> <li>Pedestrian access through Belmore Park would be maintained for the duration of construction.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Surry Hills Precinct</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Ward Park</b>            | <ul style="list-style-type: none"> <li>There are a number of significant trees located within Ward Park, particularly towards the back of the park.</li> <li>Vehicle access to the construction compound from Marlborough Street would not be possible due to ground level differences.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | <ul style="list-style-type: none"> <li>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 the underlying tree roots, in accordance with Australian Standard AS 4970.</li> <li>Vehicle access to the construction compound would be provided from Devonshire Street via the southern side of Ward Park. This 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).</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |

Table 6.5 cont

| COMPOUND                                                                             | ENVIRONMENTAL CONSTRAINTS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | PROPOSED ENVIRONMENTAL MANAGEMENT MEASURES                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|--------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Wimbo Park                                                                           | <ul style="list-style-type: none"> <li>There are a large number of trees located within Wimbo Park, all of which would generally be removed to accommodate the proposed CSELR alignment.</li> <li>An existing community mural depicts the history of the site as a former stonemason's yard.</li> <li>There are a number of businesses and residential properties located near the Devonshire Street/Bourke Street intersection that would be adversely affected by the construction compound, particularly if construction vehicle access to the site is provided via an extension of Devonshire Street.</li> </ul>                                                                                                                                                                                                             | <ul style="list-style-type: none"> <li>The proposed construction vehicle access to Wimbo Park would be designed so as 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).</li> <li>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 RMS.</li> <li>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).</li> <li>The community mural would be preserved and relocated within the redesigned Wimbo Park.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Moore Park Precinct</b>                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Moore Park tunnel – associated construction facilities east and west of Anzac Parade | <ul style="list-style-type: none"> <li>Moore Park contains a number of sporting fields that are heavily utilised by the community and local schools. The bottom grounds of Moore Park are also currently being used by the adjacent schools.</li> <li>There is a war memorial (commemorating the Korean War) and children's play area located towards the north-western corner of Moore Park.</li> <li>There are significant trees scattered throughout Moore Park.</li> <li>There is a pedestrian footpath located within Moore Park (which provides east-west access between Surry Hills and Moore Park) that would be impacted by the proposed construction works.</li> <li>The site is fringed by a number of significant trees.</li> <li>The site is utilised as a car park during special events at Moore Park.</li> </ul> | <ul style="list-style-type: none"> <li>The final layout of the construction compound would be configured so as to retain as many of the sporting fields as possible.</li> <li>The construction compound boundary would be rationalised 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 the underlying tree roots, in accordance with Australian Standard AS 4970.</li> <li>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).</li> <li>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.</li> <li>A temporary footpath would be provided through Moore Park, to maintain current pedestrian access during the construction of the Moore Park tunnel.</li> <li>Exclusion fencing would be installed around the drip lines of all trees fringing the proposed staff car park to avoid impacts to the viability of these trees.</li> <li>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.</li> </ul> |



Table 6.5 cont

| COMPOUND                             | ENVIRONMENTAL CONSTRAINTS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | PROPOSED ENVIRONMENTAL MANAGEMENT MEASURES                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|--------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Randwick Precinct</b>             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| High Cross Park                      | <ul style="list-style-type: none"> <li>High Cross Park is heritage listed under the <i>Randwick Local Environment Plan 2012</i> (local significance).</li> <li>There are a number of trees within High Cross Park, including large Cook Island and Norfolk Island Pines. Some of these trees may contribute to the heritage significance of High Cross Park. Generally, significant trees are located towards the northern side of the park.</li> <li>High Cross Park contains a war memorial, which is used during Anzac Day ceremonies.</li> <li>High Cross Park is heavily utilised by the community for passive recreation (e.g. eating lunch), particularly during lunchtime.</li> <li>There is a lack of alternative public open space/parkland within the immediate area that the community could use while High Cross Park is being used as a construction compound.</li> </ul> | <ul style="list-style-type: none"> <li>The construction compound boundary would minimise impacts to 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 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.</li> <li>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 (albeit reduced in size) and the war memorial.</li> <li>The High Cross Park construction compound would not impact on the war memorial.</li> <li>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.</li> <li>Opportunities to increase the size of the construction footprint in the vicinity of the Wansey Road light rail stop would be investigated during detailed design to accommodate a smaller satellite construction compound, thereby reducing the size of the construction compound required at High Cross Park.</li> </ul> |
| Royal Randwick racecourse            | <ul style="list-style-type: none"> <li>There are a number of trees within the proposed Randwick stabling facility temporary construction compound, including a large Moreton Bay Fig at the western end of the site.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | <ul style="list-style-type: none"> <li>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.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Kensington/Kingsford Precinct</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| UNSW                                 | <ul style="list-style-type: none"> <li>The site contains a large number of significant trees, some of which could predate the UNSW development (1949).</li> <li>There is limited available space to accommodate a redesigned/relocated construction compound.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | <ul style="list-style-type: none"> <li>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).</li> <li>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 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 AS 4970.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Nine Ways intersection               | <ul style="list-style-type: none"> <li>There are no significant constraints for this construction compound.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | <ul style="list-style-type: none"> <li>No specific mitigation measures would be required for this construction compound.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |

### 6.7.3 Ancillary construction worksites

#### Laydown areas

It is anticipated that additional laydown areas would be required at various locations within the proposed CSELR construction footprint (in addition to the construction compounds described in section 6.7.2) to store track, small tools, equipment, conduits, barriers/traffic management gear, and cables etc. These additional laydown areas would be situated in the following locations:

- along Wansey Road (in the parking lane) or Alison Park (at the Alison Road/Belmore Road intersection)
- Tay Reserve (at the Alison Road/Anzac Parade intersection)
- along Devonshire Street
- along George Street and Alfred Street within the Sydney CBD.

The location of the above laydown areas is shown in Figures 6.2a to h.

#### Substation worksites

Smaller site compounds would be required for each of the proposed substations (refer to Figures 6.2a to h). The size of these compounds would be considerably smaller than the main worksites described in section 6.7.2. Worksites for proposed above ground substations would generally be approximately 250 square metres in size (assuming a one metre offset to the site boundary) and would accommodate laydown for the prefabricated substation and a large mobile crane. Worksites for proposed belowground substations would generally be approximately 500 square metres in size (assuming a one metre offset to the site boundary) and would accommodate a lunchroom, toilet block, laydown for the substation (including an area for benching), excavated material and a 250 tonne crane.

### 6.7.4 Stockpiling

Stockpiling of construction materials and spoil would generally occur within proposed construction compounds as well as throughout the construction worksite (as shown in Figures 6.2a to h). All stockpiled materials would be stored in bunded areas and kept away from waterways and stormwater drainage structures to avoid sediment entering surrounding waterways. All fuels, chemicals and hazardous liquids would be stored within an impervious bunded area in accordance with Australian Standards and NSW Environment Protection Authority guidelines.

## 6.8 Construction parking and access

### 6.8.1 Construction parking

Parking for the construction workforce would not generally be provided at construction worksites. To minimise parking impacts on the surrounding road network, parking for the construction workforce may be provided through the following:

- early utilisation of the proposed Randwick stabling facility site as a staff parking area, with transfers between the stabling facility and the worksite
- long-term lease of adjacent commercial parking stations within the CBD
- parking within Moore Park and Royal Randwick racecourse worksites, with transfers to adjacent worksites.

Employees would also be encouraged to use public transport (where feasible) to further reduce the impact of staff parking on surrounding areas, particularly for employees working within the Sydney CBD. It is intended that workers could be transported from the above sites to their worksites using minibuses so as to minimise parking requirements for the proposal, as well as to reduce impacts on the local traffic conditions. A traffic management plan would be prepared to provide further details on car parking arrangements and minimise impacts on the surrounding network during construction of the proposal.



## 6.8.2 Construction haulage routes

The proposed construction haulage routes are shown in Figures 6.3 to 6.8. Further details of the proposed haulage routes are provided in Technical Paper 2 (*Construction Traffic and Transport Management Plan* in Volume 2).

Designated access routes for construction and spoil vehicles would be via the shortest viable route to the arterial road network. Where possible, the construction corridor would be used as much as possible for haulage to minimise negative impacts to other road users.

Details of all routes used for access and haulage during construction would be refined in consultation with relevant stakeholders and detailed in the appropriate section of the site specific traffic management plans.

## 6.8.3 Construction material deliveries

While the likely volume of delivery materials and spoil removal are not high, a holding area would permit consolidated delivery and removal, potentially by larger trucks. It would be the responsibility of the contractor(s) to determine the requirements of truck storage and dispatching. However, no heavy vehicle storage would be provided in the CBD and would operate as a 'call in' process. The contractor(s) would determine any options in detailed worksite planning and traffic management plans.

## 6.8.4 Spoil removal

Spoil haulage routes would be developed in a format such that a suite of individual instructions and maps are provided to contract operators for all points of origin to respective destinations and return. In addition, layover areas would be nominated for vehicles to 'store' prior to arriving at the spoil removal sites, if required. Approximate travel times during various periods of the day would be developed for each route as a guide to operators and also to assist in more consistent and uniform arrival rates at each site.

Figure 6.3 Proposed construction haulage routes for the City Centre Precinct





Figure 6.4 Proposed construction haulage routes for the Surry Hills Precinct

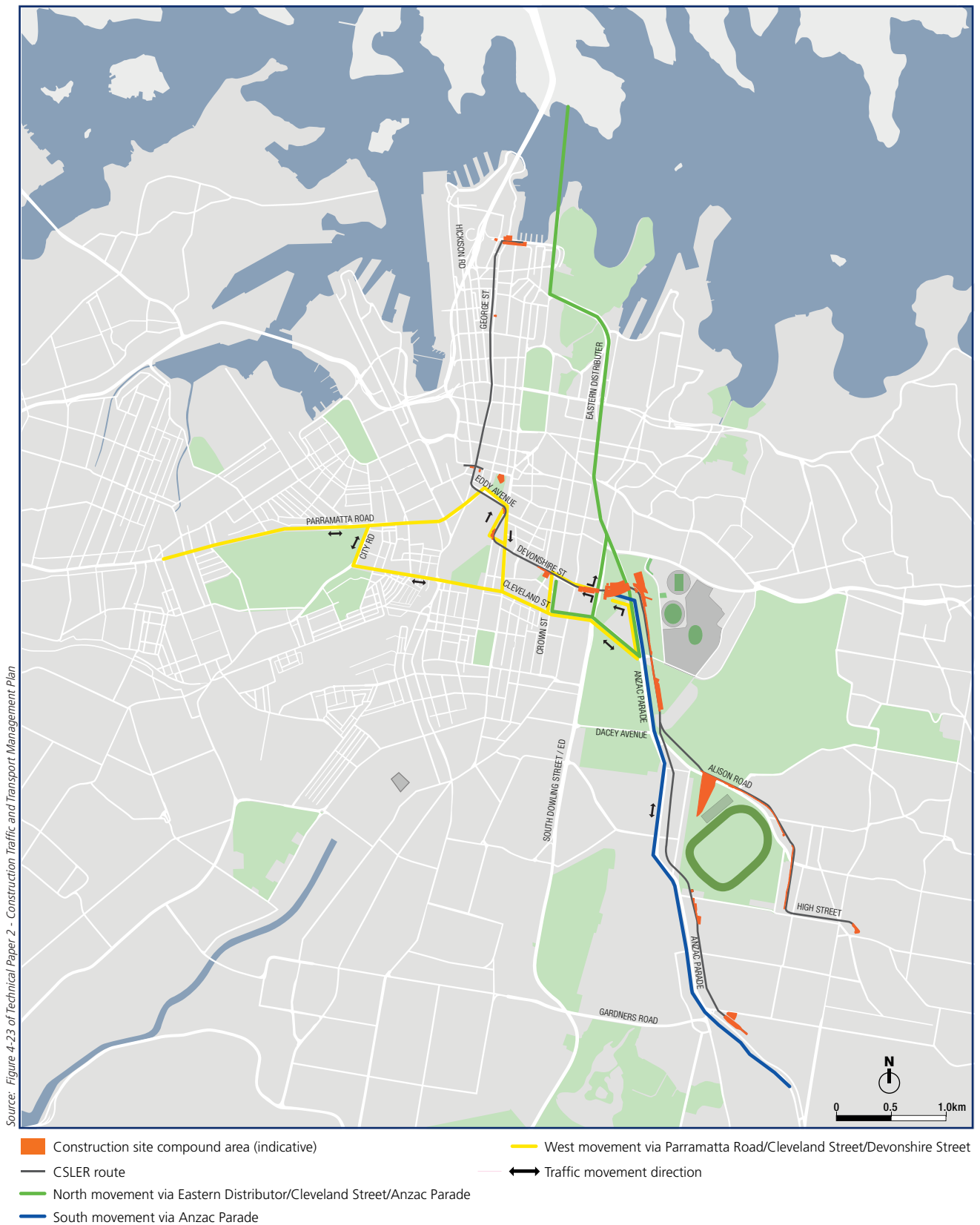


Figure 6.5 Proposed construction haulage routes for the Moore Park Precinct





Figure 6.6 Proposed construction haulage routes for the Randwick Precinct

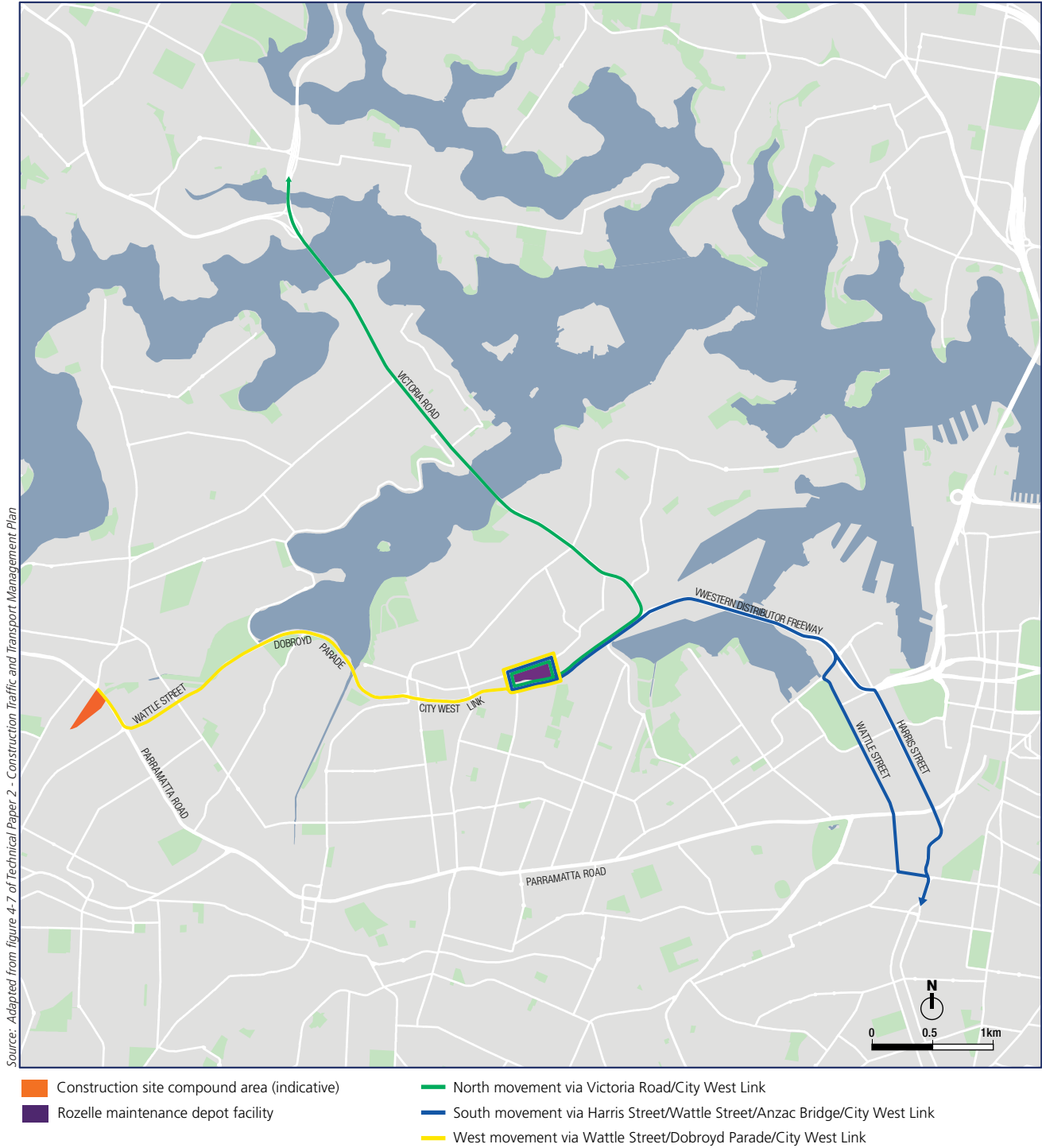


Figure 6.7 Proposed construction haulage routes for the Kensington/Kingsford Precinct





Figure 6.8 Proposed construction haulage routes for the Rozelle maintenance depot



## 6.9 Construction traffic

Construction traffic would comprise vehicles transporting equipment, materials and spoil, as well as worker's vehicles. Minor volumes of materials are expected to be excavated for utility relocations/protection works, or for the track slab. Larger volumes of heavy vehicles would likely occur during the main civil construction works when heavy vehicles are required to transport spoil, concrete, equipment, tracks, overhead wiring etc.

Average and peak daily heavy vehicle movements anticipated to occur within each precinct during the construction of the proposal are outlined in Table 6.6. These truck movements have been estimated based on the average number of truck movements per day and the individual peak number of heavy vehicle movements for any activity throughout the works. The truck movements stated in Table 6.6 are indicative only and may change as a result of detailed construction planning.

Generally, the peak level of truck movements in the CBD is anticipated to be associated with concrete pours, which would typically be of short duration (extending over one to four shifts, nominally over one to four days, depending on whether day or night work is proposed). For the south-east section, the peak number of truck movements is anticipated to be associated with concrete pours, excavation of diaphragm wall, excavation and pavement construction. The major construction works in this section of the CSELR alignment (such as the Moore Park tunnel) would require the peak number of truck movements to extend over a longer timeframe (e.g. the excavation for the diaphragm wall would extend over approximately eight shifts).

Heavy vehicle movements would comply with the *NSW Road Rules 2008, Regulation 300-3 – Driving lengthy vehicles in the Sydney CBD*.

Most of the light vehicle movements associated with the construction works would generally be limited to construction staff travelling to and from site for work. For construction activities within the CBD, no allowance for staff parking has been assumed; although, limited parking could be provided at existing commercial car parks.

For construction works within the south-eastern sector, potential limited parking has been identified within either of the Royal Randwick racecourse or Moore Park site compounds for staff associated at adjacent worksites. Although nominal areas are identified for the staff parking, the number of private vehicle parking spaces that would be provided is currently undetermined since the staffing levels are yet to be established.

Table 6.6 Indicative average and peak daily heavy vehicle movements estimated during the construction of the proposal

| ROUTE                | ROAD SEGMENT                   | INDICATIVE DURATION OF WORKS <sup>1</sup> | AVERAGE DAILY HEAVY VEHICLE MOVEMENTS <sup>2</sup> | PEAK DAILY HEAVY VEHICLE TRIPS <sup>3</sup> | TOTAL NUMBER OF PEAK ACTIVITY SHIFTS |
|----------------------|--------------------------------|-------------------------------------------|----------------------------------------------------|---------------------------------------------|--------------------------------------|
| City Centre Precinct |                                |                                           |                                                    |                                             |                                      |
| Chalmers Street      | Eddy Avenue                    | 8 months                                  | 3                                                  | 87                                          | 3                                    |
| Eddy Avenue          | Chalmers Street to Pitt Street | 9 months                                  | 3                                                  | 84                                          | 4                                    |
| Rawson Place         | Pitt Street to George Street   | 11 months                                 | 1                                                  | 87                                          | 1                                    |
| George Street        | Rawson Place to Hay Street     | 7 months                                  | 2                                                  | 86                                          | 1                                    |
| George Street        | Hay Street to Goulburn Street  | 7 months                                  | 3                                                  | 87                                          | 2                                    |



Table 6.6 cont.

| ROUTE                           | ROAD SEGMENT                                | INDICATIVE DURATION OF WORKS <sup>1</sup> | AVERAGE DAILY HEAVY VEHICLE MOVEMENTS <sup>2</sup> | PEAK DAILY HEAVY VEHICLE TRIPS <sup>3</sup> | TOTAL NUMBER OF PEAK ACTIVITY SHIFTS |
|---------------------------------|---------------------------------------------|-------------------------------------------|----------------------------------------------------|---------------------------------------------|--------------------------------------|
| George Street                   | Goulburn Street to Liverpool Street         | 4 months                                  | 4                                                  | 87                                          | 2                                    |
| George Street                   | Liverpool Street to Bathurst Street         | 8 months                                  | 3                                                  | 93                                          | 2                                    |
| George Street                   | Bathurst Street to Druitt Street            | 4 months                                  | 4                                                  | 87                                          | 2                                    |
| George Street                   | Druitt Street to Market Street              | 8 months                                  | 3                                                  | 88                                          | 3                                    |
| George Street                   | Market Street to King Street                | 5 months                                  | 4                                                  | 87                                          | 3                                    |
| George Street                   | King Street to Margaret Street              | 9 months                                  | 4                                                  | 95                                          | 1                                    |
| George Street                   | Margaret Street to Grosvenor Street         | 9 months                                  | 2                                                  | 96                                          | 1                                    |
| George Street/<br>Alfred Street | Grosvenor Street to Circular Quay           | 9 months                                  | 6                                                  | 86                                          | 4                                    |
| <b>Surry Hills Precinct</b>     |                                             |                                           |                                                    |                                             |                                      |
| Devonshire Street               | Chalmers Street to Elizabeth Street         | 8 months                                  | 3                                                  | 89                                          | 3                                    |
| Devonshire Street               | Elizabeth Street to Crown Street            | 10 months                                 | 5                                                  | 87                                          | 5                                    |
| Devonshire Street               | Crown Street to Bourke Street               | 5 months                                  | 4                                                  | 88                                          | 3                                    |
| Devonshire Street               | Bourke Street to South Dowling Street       | 5 months                                  | 3                                                  | 84                                          | 2                                    |
| <b>Moore Park Precinct</b>      |                                             |                                           |                                                    |                                             |                                      |
| South Dowling Street            | South Dowling Street to Anzac Parade        | 15 months                                 | 18                                                 | 80                                          | 8                                    |
| Anzac Parade                    | Anzac Parade to Lang Road                   | 11 months                                 | 7                                                  | 113                                         | n/a                                  |
| Anzac Parade                    | Lang Road to Alison Road                    | 8 months                                  | 13                                                 | 118                                         | n/a                                  |
| <b>Randwick Precinct</b>        |                                             |                                           |                                                    |                                             |                                      |
| Alison Road                     | Anzac Parade to Darley Road                 | 11 months                                 | 16                                                 | 126                                         | n/a                                  |
| Alison Road                     | Darley Road to Wansey Road                  | 10 months                                 | 13                                                 | 126                                         | n/a                                  |
| Wansey Road                     | Alison Road to High Street                  | 10 months                                 | 10                                                 | 118                                         | n/a                                  |
| High Street                     | Wansey Road to Avoca Street / Belmore Road  | 19 months                                 | 5                                                  | 112                                         | 8                                    |
| Belmore Road                    | Avoca Street/Belmore Road to Cuthill Street | 3 months                                  | 22                                                 | 105                                         | n/a                                  |

Table 6.6 cont.

| ROUTE                                | ROAD SEGMENT                          | INDICATIVE DURATION OF WORKS <sup>1</sup> | AVERAGE DAILY HEAVY VEHICLE MOVEMENTS <sup>2</sup> | PEAK DAILY HEAVY VEHICLE TRIPS <sup>3</sup> | TOTAL NUMBER OF PEAK ACTIVITY SHIFTS |
|--------------------------------------|---------------------------------------|-------------------------------------------|----------------------------------------------------|---------------------------------------------|--------------------------------------|
| Randwick Stabling – Alison Road      | Doncaster Avenue to stabling facility | 9 months                                  | 2                                                  | 116                                         | n/a                                  |
| <b>Kensington/Kingsford Precinct</b> |                                       |                                           |                                                    |                                             |                                      |
| Anzac Parade                         | Alison Road to Todman Avenue          | 9 months                                  | 11                                                 | 103                                         | 14                                   |
| Anzac Parade                         | Todman Avenue to Doncaster Avenue     | 4 months                                  | 10                                                 | 104                                         | 5                                    |
| Anzac Parade                         | Doncaster Avenue to High Street       | 3 months                                  | 13                                                 | 119                                         | n/a                                  |
| Anzac Parade                         | High Street to Barker Street          | 5 months                                  | 9                                                  | 104                                         | 6                                    |
| Anzac Parade                         | Barker Street to Nine Ways            | 5 months                                  | 11                                                 | 103                                         | 7                                    |
| Anzac Parade                         | Nine Ways to terminus of track        | 8 months                                  | 14                                                 | 111                                         | n/a                                  |

Source: Adapted from Tables 2-1 and 2-2 of Technical Paper 2 – Construction Traffic and Transport Management Plan.

Note 1: The number of months or overlapping sections of work would not be added separately, only the first and last date of that whole section of overlapping works is allowed when calculating average truck movements.

Note 2: Average/peak daily heavy vehicle trips represent the total inbound and outbound truck movements associated with the worksite (construction works only).

Note 3: The average/peak daily heavy vehicle trips do not include the cumulative truck movements (i.e. the numbers stated represent vehicle movements associated with a single construction site).

## 6.10 Key construction traffic, transport and access management strategies

The CSELR proposal would require construction works to be undertaken on George Street in the CBD and within or adjacent to major arterial/sub-arterial and local roads between the CBD, Kingsford and Randwick. The following sections provide an outline of the key traffic, transport and access management strategies that would be adopted during the construction of the CSELR proposal. Details of specific construction traffic, transport and access management measures are discussed on a precinct by precinct basis in sections 12.3.3 (City Centre Precinct), 13.3.3 (Surry Hills Precinct), 14.3.3 (Moore Park Precinct), 15.3.3 (Randwick Precinct) and 16.3.3 (Kensington/Kingsford Precinct).

### 6.10.1 Intersection works

Disruption to current intersection movements would generally be kept to a minimum (to maintain network operations) through the adoption of the following principles:

- Partial or full closures of major intersections would not be undertaken during peak traffic periods (works would be generally scheduled on weekends or nights).
- Intersection closures would be staged in consultation with RMS and the Traffic Management Centre (TMC) to minimise network impacts.
- Major closures of intersections could be scheduled to occur at times of the year with reduced traffic demand (e.g. school holidays).
- The days and times for proposed intersection works would be qualified and assessed/approved by the TMC.



- Advanced public notification of upcoming road closures would be provided, with alternative routes advertised.

A hierarchy of major and minor intersections has been established for the proposal (in consultation relevant stakeholders, as discussed in section 2.5 of Technical Paper 2 – *Construction Traffic and Transport Management Plan*) for the purposes of determining appropriate closure treatments and interdependencies. Intersection works were grouped in two categories which define when works can be undertaken:

- night works (10 pm to 5 am) – staged and full intersection closures
- weekend works (10 pm Friday to 5 am Monday) – staged and full intersection closures.

During these closures, pedestrian crossing movements would be managed by directing pedestrians around the intersection, to alternate footpaths or where permitted by the work, providing a path through the worksite.

A description of construction works proposed at key road intersections is provided in sections 12.3.3 (City Centre Precinct), 13.3.3 (Surry Hills Precinct), 14.3.3 (Moore Park Precinct), 15.3.3 (Randwick Precinct) and 16.3.3 (Kensington/Kingsford Precinct).

### 6.10.2 South Dowling Street regrading works

An indicative construction staging plan for the proposed South Dowling Street regrading works is provided in Table 6.7. As indicated in Table 6.7, a large component of the proposed regrading works would be required to be undertaken out-of-hours (i.e. during the night-time period) to reduce impacts to traffic on South Dowling Street and the Eastern Distributor. The final construction staging for the proposed South Dowling Street regrading works would be determined during detailed design in consultation with RMS. Any property adjustments required to accommodate the proposed South Dowling Street regrading works would be undertaken prior to the commencement of these works.

Table 6.7 Indicative construction staging plan for the proposed South Dowling Street regrading works

| STAGE | CONSTRUCTION HOURS     | KEY INDICATIVE CONSTRUCTION ACTIVITIES                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|-------|------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|       |                        | NORTHBOUND LANES                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | SOUTHBOUND LANES                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| 1     | Standard daytime works | <ul style="list-style-type: none"> <li>• Remove the parking lane on the western kerb of South Dowling Street for the establishment of a temporary pedestrian footpath.</li> <li>• Remove street furniture and light poles; relocate other affected services and utilities.</li> <li>• Demolish existing kerbs, pedestrian footpath (with access maintained via the temporary footpath established on the closed parking lane on the western kerb of South Dowling Street).</li> <li>• Modify existing retaining wall generally adjacent to the Langton Centre to accommodate the raised road surface level.</li> <li>• Construct a small retaining structure on the existing western kerblines of South Dowling Street.</li> <li>• Earthworks to raise road surface level.</li> <li>• Rebuild footpath and kerblines.</li> </ul> | <ul style="list-style-type: none"> <li>• Install traffic barriers (jersey kerbs) along lane line (may require reduction in lane widths to provide sufficient space for construction).</li> <li>• Demolish kerb, remove landscaping and vegetation within the construction footprint.</li> <li>• Construct a small retaining structure along the kerblines of South Dowling Street to accommodate the raised road surface level.</li> <li>• Install new kerbs and construct earthworks to final road surface level.</li> </ul> |

Table 6.7 cont.

| STAGE          | CONSTRUCTION HOURS | KEY INDICATIVE CONSTRUCTION ACTIVITIES                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|----------------|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                |                    | NORTHBOUND LANES                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | SOUTHBOUND LANES                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| 2 <sup>1</sup> | Night works        | <ul style="list-style-type: none"> <li>Clear the median between the Eastern Distributor parapet wall and the Eastern Distributor northbound on-ramp lane.</li> <li>Modify the parapet wall structure to accommodate the raised road surface level.</li> <li>Demolish existing kerb and construct a small retaining structure along the kerblane to accommodate the raised road surface level.</li> <li>Works may require closure of the Eastern Distributor on-ramp due to the narrow width median providing minimal space for construction plant and equipment.</li> </ul> | <ul style="list-style-type: none"> <li>Clear the median between the Eastern Distributor parapet wall and the Eastern Distributor northbound on-ramp lane.</li> <li>Modify the parapet wall structure to accommodate the raised road surface level.</li> <li>Demolish existing kerb and construct a small retaining structure along the kerblane to accommodate the raised road surface level.</li> <li>Construct earthworks to final road surface level.</li> </ul> |
| 3 <sup>2</sup> | Night works        | <ul style="list-style-type: none"> <li>Regrade South Dowling Street and the northbound Eastern Distributor on-ramp using deep lift asphalt.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                      | <ul style="list-style-type: none"> <li>Regrade South Dowling Street using deep lift asphalt.</li> </ul>                                                                                                                                                                                                                                                                                                                                                             |

Note 1: Stage 2 of the South Dowling Street regrading works could be incorporated into the new bridge abutment works.

Note 2: Regrading works would likely be undertaken one lane at a time (with traffic diverted around the works in the adjacent lanes), with 100 millimetres lifts to minimise level differences between lanes (i.e. traffic diverted into lane 2 while working within lane 1, etc.).

### 6.10.3 Traffic signal modifications

Traffic signal modifications are likely to be required to the facilitate network management measures described in Chapter 3 of Technical Paper 2 (*Construction Traffic and Transport Management Plan*). These modifications are likely to include:

- phase adjustments
- temporary vehicle detection
- removal of kerb buildouts
- geometry upgrades.

Any temporary or permanent works requiring reconstruction or adjustment to traffic signals would require prior RMS approval of traffic signal design plans. Prior approval of the timing of intersection works may also be required from the TMC. The construction contractor(s) would be responsible for the preparation of traffic signal designs and obtaining prior approvals. Designs would comply with the RMS manual, *Traffic Signal Design* and Specification SI/TCS/8 *Installation and Reconstruction of Traffic Light Signals*. Any works would be undertaken by an RMS accredited traffic signal contractor.

### 6.10.4 Midblock works

Midblock cross-sections along the construction corridor dictate the number of traffic lanes that could be kept open to traffic during the construction program. Access would be maintained to local land uses, including residential, employment and retail. Traffic lanes provided adjacent to construction worksites would be in accordance with RMS's *Traffic Control at Worksite Manual Version 4.0* and RMS's *D&C G10 Traffic Management*. All safety barriers adjacent to traffic lanes would be in accordance with Australian Standard 1742 *Manual of Uniform Traffic Control Devices*, the *RMS Supplements to Australian Standards* and other RMS complementary materials.



### 6.10.5 Road changes

Key road changes that would occur during the construction of the proposal would include the following:

- Alfred Street would be closed to general traffic between George Street and Loftus Street, with only local and emergency access permitted into this zone (refer to section 12.3).
- The George Street entrance to Jamison Street would be closed during construction and access and egress would be provided via York Street. A turn-around facility would be provided for vehicles on Jamison Street (refer to section 12.3).
- Bond Street would be closed at George Street, with a 'no stopping restriction' proposed on approach to George Street to permit cars and vans to turn around for entry/exit to Pitt Street (refer to section 12.3).
- North of Liverpool Street, George Street would be closed to general traffic with only local and emergency access permitted. South of Liverpool Street, a general traffic lane would be maintained in each direction (refer to section 12.3). The major intersections along George Street would remain open; however, full intersection closures would occur on weekends (although would be in accordance with TMC approvals) (refer to section 12.3).
- Part of Chalmers Street, and all of Devonshire Streets would be closed to general traffic with only local and emergency access permitted (refer to sections 12.3 and 13.3).
- The coach station and bus lane along Eddy Avenue would be relocated (refer to section 12.3).
- Anzac Parade would be unaffected north of Dacey Street; however, would operate with two of the six lanes closed south of Dacey Street. There would be a change in operating arrangements and weekend closures of some intersections (refer to sections 15.3 and 16.3).
- Alison Road would remain open; however, would operate with two of the six lanes closed and weekend closures of some intersections. This would reduce the number of right-turn lanes on Darley Road and the intersection with Alison Road (refer to section 15.3).
- Wansey Road and High Street would be closed to general traffic with only local and emergency access permitted (refer to section 15.3).
- High Street would remain open, with weekend closures of some intersections (refer to section 15.3).

All intersection closures would be undertaken in accordance with TMC approvals.

### 6.10.6 Bus operations

#### Sydney CBD bus services

As discussed in section 9.2.1, the NSW Government proposes to make a number of changes to existing bus routes within the Sydney CBD as part of the redesign of the city centre bus network. An overview of the proposed future bus network redesigns is provided in section 9.2.1. Bus changes interfacing with the construction of the CSELR proposal would occur prior to the commencement of construction (for example, the removal of buses off George Street). However, the proposed future bus network redesigns would interface with the construction of proposal at the following four key locations:

- Chalmers Street
- Eddy Avenue
- Rawson Place
- Park Street/Druitt Street/George Street intersection.

Local bus arrangements that would be implemented to manage the impact on bus operations at the above four locations are described in Table 12.19 (refer to the City Centre Precinct assessment provided in section 12.3.3).

It should be noted that changes to bus services and infrastructure in the CBD as a result of the redesign of the Sydney bus network, as well as traffic management changes and other impacts associated with these changes, would be addressed as part of the *Sydney City Centre Access Strategy* (as discussed in section 3.2.3). Therefore, these changes do not form part of this EIS, with the exception of cumulative impact considerations (refer to chapter 11).

### South East bus services

Impacts to the operation of the South East bus network during construction would be managed through a mixture of local route diversions and construction staging to ensure continuity of access. Key areas where this approach would be adopted to manage construction impacts include:

- Anzac Parade, particularly at Kingsford and Kensington
- High Street
- Alison Road
- the Anzac Parade/Alison Road intersection
- the Moore Park Busway.

### 6.10.7 Interaction with the Inner West Light Rail

The existing Inner West Light Rail intersects the CSELR at the Hay Street intersection; two turnouts would be constructed to facilitate future interoperability. The operation of the Inner West Light Rail would be maintained during weekday hours, with the intersection constructed over five weekends, when there would be disruptions to services. During such disruptions, signage, traffic controllers and shuttle bus transfers for Inner West Light Rail passengers would be provided where the installation of turnouts and commissioning of signalling at the junction requires weekend closure of the existing light rail service and access to Central Railway Station. Short running of the Inner West Light Rail tracks during weekend closures would require shuttle bus transfers to connect to Central Railway Station. Buses may be permitted to use Hay Street between Pitt Street and George Street and turn left onto George Street during this time, to permit light rail passenger transfers.

### 6.10.8 Pedestrian traffic management

For the majority of the main construction works, existing longitudinal pedestrian movements (i.e. pedestrian movements running parallel to the CSELR alignment) would be maintained along the footpaths. Transverse pedestrian movements (i.e. pedestrian movements crossing the CSELR alignment) would generally be maintained at existing pedestrian crossing facilities either at signals or controlled by traffic controllers. While the mid-block transverse pedestrian crossing at Martin Place would be maintained during construction, the mid-block crossings at the Strand Arcade, Queen Victoria Building and Event Cinemas (on George Street) would be closed during construction.

Where the installation of overhead wiring foundations and service relocations encroach on footpaths, the footpaths would be temporarily narrowed past the worksite or pedestrians would be diverted to adjacent footpaths via safe crossing facilities with appropriate barriers and signs. Alternatively, temporary structures would need to be installed to facilitate the pedestrians over the worksites. Footpaths adjacent to worksites with high volumes of construction vehicle movements would require traffic controllers to manage the conflict between construction vehicles and pedestrians.

Where worksites have an impact on footpaths, consideration would be given to the requirements of all pedestrians and especially vulnerable users (e.g. those with mobility limitations). *Disability Discrimination Act 1992* (DDA) 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.

Further discussion on pedestrian traffic management measures that would be implemented during construction of the CSELR proposal is provided in section 9.2.3.



### 6.10.9 Cycle routes

Where existing cycle routes or facilities are occupied by the construction worksites, alternate routes would be identified. Alternative cycle route changes that are currently anticipated to be required during the construction of the CSELR proposal include the following:

- To avoid Devonshire Street, an alternative route along Cooper Street/Author Street is proposed.
- To avoid Wansey Road and Alison Road, an alternative route along Botany Street, Church Street and Kings Street is proposed.

Any proposed alternate cycle route would be reviewed by the relevant roads authority with input from local bicycle user groups and local communities, prior to their establishment. Existing cycle paths located within the construction corridor, but not occupied by the required worksite, would be maintained during construction.

Further discussion on measures that would be implemented to minimise construction impacts to cycle routes is provided in section 9.2.3.

### 6.10.10 On-street parking

As discussed in sections 12.3, 13.3, 14.4, 15.3 and 16.3, on-street parking and loading along the proposed CSELR corridor would be affected during construction in order to provide sufficient worksite width and to maximise the number of traffic lanes available. These changes would apply from the commencement of construction in any area. Parking capacity would be managed through:

- extension of parking permit schemes, particularly in predominately residential precincts surrounding the project 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.)
- providing priority on streets immediately adjacent to the CSELR corridor where commercial land uses are present for loading and short-term parking
- adjusting parking configuration to increase capacity, where possible.

Transport for NSW would continue to work with the key stakeholders involved in the management and operation of the road network and management of kerbside activity to implement the mitigation measures outlined in sections 12.3, 13.3, 14.4, 15.3 and 16.3 of the EIS. The City of Sydney and Randwick City Council will be key stakeholders in the implementation of any changes to the function and management of on-street kerbside activity within the area of influence of the CSELR proposal.

The purpose of further consultation and design would be to ensure appropriate and satisfactory measures are implemented which promote better utilisation and efficiency of use for kerbside space, while considering the access requirements of local residents, businesses, sporting, health and education use and all other land uses along and in the vicinity of the corridors.

The project approvals process for the CSELR proposal sits alongside a suite of strategies and plans which together shape the future direction of access into and around the Sydney CBD and broader metropolitan area. These documents include the NSW Government geographical and modal strategies: the *Sydney City Centre Access Strategy* and *Sydney's Bus Future* (under development) which sit under the *NSW Transport Master Plan*. The changes proposed through these strategies, as well as the changes to the broader South East bus network, would need to be considered alongside the CSELR proposal for the implementation of on-street changes to kerbside activity in specific locations. The implementation would be undertaken by the two relevant councils; therefore any on-street changes to kerbside activity would also need to be made in accordance with local government planning policies of the two councils and through their normal approvals processes for such changes.

### 6.10.11 Emergency access

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. Advice would include information about upcoming traffic switches, anticipated delays to traffic, extended times of work, locations of road possession or any likely major disruptions.

Measures to facilitate the movement of emergency vehicles through worksites would be made available at all worksites and would be defined in the worksite specific traffic management plans. These measures may include the establishment of clearways adjacent to worksites and/or the installation of road plates.

During short periods when major construction and loading/unloading activities are underway, it may not be possible to allow emergency vehicles to traverse the full block length. Access to an emergency within the block would be maintained at an identified access point and diversion routes would be agreed with the emergency services prior to the commencing the major construction and loading/unloading activities. The construction contractor(s) would consult with NSW Fire and Rescue during the preparation of the site specific traffic management plans, to obtain any specific requirements for any of the buildings adjacent to the CSELR alignment in preparing the site specific traffic management plans. An Emergency Management Plan would coordinate these measures and provide a framework for input to the individual worksite traffic management plans.

### 6.10.12 Emergency evacuation procedures for buildings

It is anticipated that emergency evacuation procedures for buildings located along the proposed CSELR alignment may need to be amended to account for the CSELR construction worksite and compounds. This would particularly be the case for buildings which utilise public open spaces affected by the CSELR proposal (such as Belmore Park) as emergency evacuation marshalling areas. Transport for NSW would consult with building owners/managers along the proposed CSELR alignment to assist with the redesign of emergency evacuation procedures for affected buildings.

Emergency evacuation requirements would need to 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.

### 6.10.13 Property and utility access

Access would be maintained along the proposed CSELR corridor to minimise the impact to local residents and businesses and for maintenance of utilities. However, due to the closure of some approach routes, diversions to properties on or adjacent to the CSELR corridor would result in some increased travel distances. The areas most affected due to the closure of key corridors would comprise The Rocks (due to closures of George and Alfred Streets) and Surry Hills (due to the proposed Devonshire Street closure). For these precincts, access maps have been produced to detail the effect of these alternate routes. These precinct maps are provided in Appendix A of Technical Paper 2 (*Construction Traffic and Transport Management Plan*).

Further discussion on measures that would be adopted to maintain access to local businesses and residences along the CSELR corridor are described on a precinct by precinct basis in sections 12.3.3 (City Centre Precinct), 13.3.3 (Surry Hills Precinct), 14.3.3 (Moore Park Precinct), 15.3.3 (Randwick Precinct) and 16.3.3 (Kensington/Kingsford Precinct).



#### 6.10.14 Special event management

The RMS special event management guidelines process identifies four classes of special events:

- Class 1: is an event that impacts major traffic and transport systems and there is significant disruption to the non-event community. (For example, an event that affects a principal transport route in Sydney, or one that reduces the capacity of the main highway through a country town.)
- Class 2: is an event that impacts local traffic and transport systems and there is low scale disruption to the non-event community. (For example, an event that blocks off a main street town or shopping centre but does not impact a principal transport route or a highway.)
- Class 3: is an event with minimal impact on local roads and negligible impact on the non-event community. (For example, an on-street neighbourhood Christmas party.)
- Class 4: is an event that is conducted entirely under Police control (but is not a protest or demonstration). (For example, a small march conducted with a Police escort vehicle.)

Wherever possible, agreement would be sought with event organisers to avoid Class 1 and 2 events occurring concurrently, where such events are identified to have a cumulative impact on travel demand around the CSELR construction corridors.

The traffic management requirements of special events may require adjustment to times of operation and routes used by haulage or delivery operations as well as varying approved road occupancy licence (ROL) conditions for the construction. The ROL approval would identify time and day restrictions, where potential conflicts are known at the time of submission.

The construction contractor(s) would be responsible for incorporating known special events into the construction program and detailed responses and contingencies in the construction traffic management plan, subject to further inputs from other stakeholders (such as City of Sydney, Randwick City Council, State Emergency Services and RMS). The construction contractor(s) would work with event organisers to identify the possibility of relocating planned events, if possible.





## 7. Proposal sustainability

Chapter 7 provides an outline of how the principles of ecologically sustainable development have been, and would continue to be, considered and integrated into the Sydney CBD and South East Light Rail Project ('the CSELR proposal' or 'the CSELR'). This includes:

- an outline of the four principles of ecologically sustainable development (ESD) and how Transport for NSW has addressed these principles through the CSELR proposal design and assessment processes
- discussion of a project-specific sustainability strategy that has been developed for the CSELR proposal, which includes a comprehensive list of sustainable initiatives that form the sustainability management strategy for the proposal.

Chapter 7 also provides a summary of a climate change risk assessment for the CSELR proposal (and recommended mitigation measures and/or potential design responses to address such risks), as well as an outline of waste, energy and resource issues anticipated to occur during construction and operation of the CSELR proposal. Measures that Transport for NSW proposes to manage these waste, energy and resource issues are also outlined.

### 7.1 Sustainability principles and approach

#### 7.1.1 Ecologically sustainable development

The *National Strategy for Ecologically Sustainable Development* (Department of Environment and Heritage 1992) defines ESD as 'using, conserving and enhancing the community's resources so that the ecological processes, on which life depends, are maintained and the total quality of life, now and in the future, can be increased'. The concept of ESD gives formal recognition to environmental and social considerations in decision-making to ensure that current and future generations enjoy an environment that functions as well as, or better than, the environment they inherit.

Schedule 2 of the *Environmental Planning and Assessment Regulation 2000* and Section 6(2) of the *Protection of the Environment Administration Act 1991* outline the four principles of ESD, which are:

- *Precautionary principle* — Where there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for not implementing mitigation measures or strategies to avoid potential impacts.
- *Inter-generational equity* — The present generation should ensure that the health, diversity and productivity of the environment are equal to or better for the future generations.
- *Conservation of biological diversity and ecological integrity* — Preserving biological diversity and ecological integrity requires that ecosystems, species and genetic diversity within species are maintained.
- *Improved valuation and pricing of environmental resources* — This principle establishes the need to determine economic values for services provided by the natural environment, such as the atmosphere's ability to receive gaseous emissions, cultural values and visual amenity.

The CSELR proposal — more specifically the establishment of light rail as a key mode of transport within Sydney's CBD and South East, and the associated revitalisation of an existing transport corridor — would present opportunities for inherent sustainability benefits to be realised. The inherent sustainability benefits expected to be associated with the delivery of the CSELR proposal are summarised in Table 7.1.

Table 7.1 Inherent sustainability benefits associated with the CSELR proposal

| KEY SUSTAINABILITY BENEFITS | DISCUSSION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|-----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Improved connectivity       | <p>The CSELR proposal would increase public transport network capacity and connectivity between the Sydney CBD and South East suburbs of Surry Hills, Randwick, Kensington and Kingsford, resulting in improvements to frequency and reliability of services.</p> <p>The CSELR proposal aims to move up to 9,000 people every hour in each direction to achieve 97 per cent travel time reliability; and, as a highly legible system, the light rail would provide easily understood connections to a range of trip generators.</p> <p>These improvements would provide significant benefits for commuters travelling from the South East suburbs to the CBD for work, shopping and entertainment; students travelling to the University of NSW (UNSW) and Sydney Boys and Sydney Girls High Schools at Moore Park; and customers and staff, patients and visitors travelling to the Randwick health precinct.</p> <p>Furthermore, the proposal would make it more convenient for commuters to change between modes in the CBD, take short trips within the city for business or recreation and travel to major event precincts at Moore Park and Royal Randwick racecourse.</p> <p>The proposal would also offer a simple, user-friendly way to travel between key attractions – from the Rocks and Circular Quay to the city’s retail heart and on to Chinatown, linking visitors staying in our world-class hotels to the in-progress Sydney International Convention and Exhibition Centre.</p> |
| Urban renewal               | <p>The CSELR proposal would enhance opportunities for urban renewal in the Urban Activation Precincts at Randwick (as discussed in section 9.3 and 15.4) and more generally along the alignment by improving accessibility and activating streets, public spaces, restaurants and shopping areas.</p> <p>Public transport enhancements, like the CSELR proposal, would contribute to city-building. In Sydney’s CBD, the proposal would support the revitalisation of the city, contributing to the urban renewal already underway at Barangaroo, Ultimo and Darling Harbour.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Economic growth             | <p>For Sydney’s CBD, the amenity and access benefits provided by the CSELR proposal would enable the city centre to strengthen its position at the peak of Sydney’s retail (Price Waterhouse Cooper, AECOM and Booz &amp; Co 2013). The increase in retail share combined with an expected increase in tourist and other spend could result in a 4–5 per cent improvement in sales across the whole of the city centre (Macro Plan Dimasi 2013).</p> <p>Increased transport capacity and more reliable travel times may be expected to help reduce transport costs as well as unlocking potential for further employment growth in the CBD, leading to enhanced productivity and economic growth.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Social well-being           | <p>Increased connectivity, improved travel time reliability, ‘turn-up-and-go’ services, and more comfortable, quiet, air-conditioned vehicles would enhance the customer travel experience.</p> <p>Supporting urban renewal would also enable homes to be built in areas with good access to jobs as well as services and facilities. It would also contribute to revitalisation of streets and the public domain creating a more attractive, accessible environment for visitors, residents and workers.</p> <p>The CSELR proposal would deliver public domain improvements, particularly along George Street (i.e. improved ease of access and movement for pedestrians; 25,000 square metres of road space would be reclaimed for pedestrians). These improvements would provide pedestrians with travel time savings. Creation of an urban environment which is more supportive of physical activity would also enhance health outcomes.</p> <p>Overall, improvements in connectivity are expected to increase the ability of individuals to engage in community activities and access family and friends, thereby promoting social inclusion.</p>                                                                                                                                                                                                                                                                                                                                              |
| Environment                 | <p>Urban renewal supported by the CSELR proposal has the potential to result in more energy efficient and water efficient housing stock, contributing to reductions in household greenhouse gas emissions as well as reduced household expenditure on energy and water.</p> <p>By unlocking transport capacity, establishing a pedestrianised zone along George Street and switching to electrified light rail vehicles, the CSELR proposal would:</p> <ul style="list-style-type: none"> <li>• alter noise levels within the corridor, especially along George Street where buses and other vehicles would be removed</li> <li>• improve local air quality within the corridor due to the removal of buses and other vehicles, particularly along George Street</li> <li>• encourage a modal shift to less greenhouse gas intensive forms of transport (such as light rail and walking) which would contribute to reduced greenhouse gas emissions (subject to how electricity for the proposal is generated).</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |

Transport for NSW is committed to ensuring that its activities are undertaken in a manner that is consistent with the four principles of ESD. These principles would be incorporated into Transport for NSW’s management systems for the CSELR proposal (discussed further in Chapter 18).



Table 7.2 summarises how the four principles of ESD have been addressed through the CSELR proposal design and assessment processes. Further discussion on sustainability initiatives that have been considered during the development of the CSELR proposal is provided in section 7.2.

Table 7.2 Adherence with the principles of ESD

| ESD PRINCIPLE                                                 | ADHERENCE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|---------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Precautionary principle                                       | <p>A precautionary approach has been applied throughout the proposal's development.</p> <p>A staged environmental risk analysis has been completed, with initial analysis during the proposal's development and review of risks as part of this environmental impact statement (EIS), including assessment of key issues by technical specialists in these areas.</p> <p>The options development and assessment, the design development and the EIS process have reduced the environmental impact of the proposal. Although some residual environmental risks were identified as High (refer to Table 18.4 in section 18.2.2), these are not anticipated to result in any threats of serious or irreversible environmental damage. In areas where there is some uncertainty in relation to potential impacts (such as flooding, refer to section 10.2), detailed mitigation measures and strategies have been proposed, as outlined in section 10.2.4 and Appendix I.</p>                                                                                                                                                                                                                                                                                                                   |
| Intergenerational equity                                      | <p>Issues that have potential long-term implications, such as consumption of non-renewable resources, waste disposal, greenhouse gas emissions, removal of vegetation, land use changes and impacts on visual amenity, have been considered in this EIS and the impacts reduced through design considerations and identification of various mitigation and management measures.</p> <p>When the proposal begins operation, it would deliver inter-generational equity by:</p> <ul style="list-style-type: none"> <li>• addressing CBD congestion through transfer from existing buses and private vehicles, improving access for the inner South East suburbs to the CBD and supporting continued population and employment growth in the region</li> <li>• delivering improved and more reliability journeys for public transport users, a net reduction in congestion and accident costs for private vehicle users, and improved travel times and amenity for pedestrians</li> <li>• delivering broader community benefits through a reduction in environmental and health externalities such as air pollution and noise in some areas (including the George Street pedestrian zone); and wider economic benefits – through opportunities for urban renewal and agglomeration.</li> </ul> |
| Conservation of biological diversity and ecological integrity | <p>A specialist biodiversity assessment was completed as part of this EIS, as described in section 10.6. Vegetation in the study area of the CSELR proposal currently exists as highly fragmented and isolated individual street trees that have been planted. Some of these trees do comprise habitat for potential foraging and roosting birds (Powerful Owl only) and threatened biodiversity such as the Grey-headed Flying-fox, Eastern Bent-wing Bat and Powerful Owl. Where possible, the CSELR proposal has avoided impacts on these trees, as described in sections 12.6, 13.6, 14.6, 15.6, 16.6 and 17.6.</p> <p>A range of other mitigation measures are proposed to minimise impacts on biological diversity and ecological integrity and ensure ecosystems, species and genetic diversity are maintained with development of the proposal.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Improved valuation and pricing of environmental resources     | <p>An economic appraisal for the CSELR proposal indicates that the project economic benefits significantly outweigh the project costs with a benefit cost ratio of 2.5 (Price Waterhouse Coopers, AECOM, Booz 2013). The economic appraisal considered a range of potential benefits including environmental externalities such as reduced air and noise emissions, reduced greenhouse gas emissions, health benefits and pedestrian amenity benefits (refer Chapter 3).</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |

## 7.2 Sustainability in design

### 7.2.1 CSELR sustainability strategy

The NSW Government, the City of Sydney and Randwick City Council have collaborated to develop a project-specific sustainability strategy for the CSELR proposal. The purpose of the *CSELR Project Sustainability Strategy* is to provide information and formally document how sustainability considerations have been, and would continue to be, integrated into the CSELR proposal. Overall, the strategy:

- outlines the sustainability case for the CSELR proposal, including the benefits of light rail as a sustainable transport mode (a summary of the sustainability case for the proposal is provided in Table 7.1)
- confirms the NSW Government's commitment to achieving the highest standards of sustainable design and delivery for new transport infrastructure for Sydney
- provides insight into the commitment for joint working across all levels of government to deliver the CSELR proposal sustainably and with as little disruption to Sydney as possible.

The *CSELR Project Sustainability Strategy* contains six project-specific sustainability objectives and 15 key sustainability themes, which are listed in Table 7.3. The six sustainability objectives were developed in conjunction with the City of Sydney and Randwick City Council, while the sustainability themes were derived from the following sources:

- Transport for NSW and Transport Projects Division Sustainability Targets
- Transport for NSW's *Sustainable Design Guidelines for Rail (Version 3.0)*
- Infrastructure Sustainability Council of Australia's *Infrastructure Sustainability Rating Scheme*.

The sustainability themes were selected with the objective of embedding sustainability across key areas of the CSELR proposal.

Table 7.3 Sustainability objectives and themes included in the CSELR Project Sustainability Strategy

| SUSTAINABILITY THEMES                                                                                                                                                                                                                                                                                                                                                                                                              | LINKED SUSTAINABILITY OBJECTIVES                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>• Management systems</li> </ul>                                                                                                                                                                                                                                                                                                                                                             | <ul style="list-style-type: none"> <li>• <i>Objective 1: Reinforcing inherent sustainability benefits</i> — Reinforcing the inherent sustainability benefits to be realised through diversion of trips to light rail from less sustainable or efficient modes (including buses and cars), and facilitating increased cycling, walking, and other public transport use within the CSELR corridor, along with environmental improvements.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <ul style="list-style-type: none"> <li>• Procurement and purchasing</li> <li>• Climate change adaptation</li> <li>• Energy and greenhouse gases</li> <li>• Water</li> <li>• Waste</li> <li>• Materials</li> <li>• Discharge to air, land and water</li> <li>• Land</li> <li>• Ecology</li> <li>• Community health, wellbeing and safety</li> <li>• Heritage</li> <li>• Urban and landscape design</li> <li>• Innovation</li> </ul> | <ul style="list-style-type: none"> <li>• <i>Objective 2: Transport for NSW Sustainability Targets</i> — Striving to comply with all applicable sustainability stretch targets (including Transport Projects Division sustainability stretch targets), with a minimum of achieving baseline targets proposed by Transport for NSW, the Transport Projects Division, and City of Sydney's <i>Sustainable Sydney 2030</i> targets and Randwick City Council's 20 year City Plan where feasible.</li> <li>• <i>Objective 3: Transport for NSW Sustainable Design Guidelines for Rail</i> — Striving for a 'Platinum' rating, with a minimum of 'Gold' rating, under Transport for NSW's <i>Sustainable Design Guidelines for Rail (Version 3.0)</i> (Transport for NSW 2013c).</li> <li>• <i>Objective 4: Infrastructure Sustainability Council of Australia's Infrastructure Rating Tool</i> — Striving for a 'Leading' (greater than 75 points) rating, with minimum of 'Excellent' (50 to 75 points) rating, under the Infrastructure Sustainability Council of Australia's <i>Infrastructure Sustainability Rating Scheme</i>.</li> <li>• <i>Objective 5: Renewable energy offsetting</i> — Striving to offset 100 per cent of the operational electricity requirements for the CSELR proposal through both integration of renewable energy generation within the proposal and purchase of renewable energy offsets (such as Green Power).</li> </ul> |
| <ul style="list-style-type: none"> <li>• Stakeholder participation</li> </ul>                                                                                                                                                                                                                                                                                                                                                      | <ul style="list-style-type: none"> <li>• <i>Objective 6: Collaboration with governments and stakeholders to account for existing and future buried services and infrastructure</i> — Collaborating with City of Sydney and the Federal Government to align the project works program with <i>Sustainable Sydney 2030</i> related works and National Broadband Network (NBN) infrastructure related requirements (utilities generally), and making appropriate provisions to facilitate City of Sydney's Green Infrastructure requirements, and Randwick City Council's requirements.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |



Discussion on activities that Transport for NSW has undertaken to date to work towards achieving the six sustainability objectives listed in Table 7.3 is provided in Table 7.4.

Table 7.4 Activities that Transport for NSW has taken to work towards achieving the CSELR sustainability objectives

| SUSTAINABILITY OBJECTIVE <sup>1</sup> | SUSTAINABILITY THEMES                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|---------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Objective 1                           | Key to meeting Objective 1 is using project management systems to support the inherent sustainability benefits of the CSELR proposal, as outlined in Table 7.1. This includes, for example, ensuring that design of light rail interchanges optimises modal interchange to facilitate the shift from cars and buses to light rail (for example, through stop design and location). Facilities for bikes would also be provided at key locations to promote walking and cycling to access the light rail services.                                                                                                                                                                                               |
| Objective 2                           | The Transport for NSW corporate sustainability targets and the Transport Projects Division sustainability targets have been developed based on reviews of global best practice in infrastructure development. The targets cover a comprehensive range of sustainability themes including: energy, pollution control, climate change resilience, resource management, biodiversity, heritage, liveable communities and corporate sustainability.<br><br>The CSELR proposal would meet the base line sustainability targets established by Transport for NSW and the Transport Projects Division, while seeking to deliver on the stretch targets defined by the Transport Projects Division of the organisation. |
| Objective 3                           | The CSELR proposal is striving to achieve a 'Platinum' rating, with a minimum of 'Gold' rating under Transport for NSW's <i>Sustainable Design Guidelines (Version 3.0)</i> . The Sustainability in Delivery Plan (refer section 7.2.3) provides an outline of some of the relevant initiatives that would be incorporated on the proposal to meet this aspiration.                                                                                                                                                                                                                                                                                                                                             |
| Objective 4                           | The CSELR proposal is striving for a 'Leading' rating, with a minimum 'Excellent' rating, under the <i>Infrastructure Sustainability Rating Tool</i> . The Infrastructure Sustainability Council of Australia (ISCA) rating scheme is an independently verified rating scheme which aims to create a nationally consistent approach to project sustainability across the asset lifecycle.<br><br>The Sustainability in Delivery Plan (refer section 7.2.3) provides an outline of some of the relevant credits that would be applied for to meet this aspiration for the proposal.                                                                                                                              |
| Objective 5                           | Transport for NSW has committed to offsetting 20 per cent of construction energy requirements and would strive to offset 100 per cent of operational energy requirements for the CSELR proposal through the purchase of renewable energy offsets. This would enable the proposal to reduce Sydney's contribution to global climate change. It would also help support the development of additional renewable energy projects in Australia.                                                                                                                                                                                                                                                                     |
| Objective 6                           | Transport for NSW is working closely with the City of Sydney and Randwick City Council as well as the Federal Government and other utility service providers to minimise disruption and provide cost effective solutions for the supply of services utilities along the proposal corridor. This includes discussions with NBN Co. regarding rollout of the National Broadband Network and coordination with City of Sydney to facilitate its Green Infrastructure facilities. It also involves discussions with a wide range of other utilities related organisations including Sydney Water and energy and telecommunications companies.                                                                       |

Note 1: Objective 1 – Reinforcing inherent sustainability benefits; Objective 2 – Transport for NSW sustainability targets; Objective 3 – Transport for NSW Sustainability Guidelines for Rail (Version 3.0); Objective 4 – Infrastructure Sustainability Council of Australia's Infrastructure Rating Tool; Objective 5 – Renewable energy offsetting; Objective 6 – Collaboration with governments and stakeholders.

The project-specific sustainability objectives and themes listed in Table 7.3 were used to develop a comprehensive list of sustainable initiatives, which form the sustainable management strategy for the CSELR proposal. These initiatives are discussed further in section 7.2.2. An outline of how the sustainability initiatives documented in the *CSELR Project Sustainability Strategy* would be implemented during the detailed design, construction and operational phases of the CSELR proposal is provided in section 7.2.3.

## 7.2.2 Sustainability initiatives considered for the CSELR proposal

A comprehensive list of sustainable initiatives was developed for the CSELR proposal based on the six project-specific sustainability objectives and 15 key sustainability themes outlined in Table 7.3. These initiatives are documented in Table 7.5 and form the sustainability management strategy for the proposal. The sustainability initiatives listed in Table 7.5 would be used to guide the development of the proposal, with the aim of maximising the sustainability outcomes during the planning, construction and operational phases of the CSELR.

The party responsible for driving the achievement of each initiative was also identified (e.g. Transport for NSW, Design Contractor, Construction Contractor, the Operator), as well as the stage in the CSELR proposal that the achievement of each initiative would be sought. Actions to further address each initiative were also identified.

The sustainability management strategy documented in Table 7.5 would be regularly reviewed and updated throughout the design development, construction and operation of the CSELR proposal.

## 7.2.3 Implementation of the CSELR project sustainability strategy

The sustainability initiatives documented in the *CSELR Project Sustainability Strategy* would be implemented through a Sustainability Delivery Plan, using ISCA's *Infrastructure Sustainability Rating Scheme* and Transport for NSW's *Sustainable Design Guidelines for Rail (Version 3.0)*.

The proposal Sustainability Manager would undertake review and consultation with each discipline design team throughout each stage of the proposal. This process would evaluate where initiatives are being implemented in project design in addition to promoting continuous improvement and innovation. This process would feed into the sustainability initiatives register which would be regularly updated as the CSELR proposal progresses.



Table 7.5 Sustainability initiatives considered as part of CSELR proposal

| SUSTAINABILITY MEASURE                                                  | DETAILS                                                                                                                                                                                                                                                                                 | PROJECT PHASE TO BE IMPLEMENTED <sup>1</sup> |      |      |     | RESPONSIBILITY                                        | STATUS                                                                                                                                              |
|-------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|------|------|-----|-------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                         |                                                                                                                                                                                                                                                                                         | DEF.                                         | DET. | CON. | OP. |                                                       |                                                                                                                                                     |
| Management systems                                                      |                                                                                                                                                                                                                                                                                         |                                              |      |      |     |                                                       |                                                                                                                                                     |
| Sustainability leadership and commitment                                | Sustainability leadership on the proposal through the development and endorsement of a sustainability strategy, and public statement of the sustainability strategy and commitments.                                                                                                    | ✓                                            | ✓    | ✓    | ✓   | Transport for NSW, Designers, Construction contractor | A sustainability strategy has been prepared for the CSELR proposal ( <i>CSELR Project Sustainability Strategy</i> ), as discussed in section 7.2.1. |
|                                                                         | Sustainability implementation plans will be developed for individual work packages and operations.                                                                                                                                                                                      |                                              |      | ✓    | ✓   | Transport for NSW, Construction contractor, Operator  | Sustainability implementation plans would be developed prior to construction and operation of the proposal.                                         |
|                                                                         | Decision making will consider environmental, social and economic aspects of the proposal. Options will be evaluated considering the life of the proposal and using multi-criteria analysis or other tools.                                                                              | ✓                                            | ✓    | ✓    | ✓   | Transport for NSW, Designers, Construction contractor | Environmental, social and economic aspects of the CSELR proposal are described in Chapters 9 to 17 of this EIS.                                     |
|                                                                         | Project Management Systems will be developed and will be accredited to internationally recognised best practice management systems for environmental management, quality and operational health and safety: ISO14001 (Environment), ISO9001 (Quality), and AS4804 (OH&S) or equivalent. |                                              |      | ✓    | ✓   | Transport for NSW, Construction contractor, Operator  | Project Management Systems would be developed prior to construction and operation of the proposal.                                                  |
| Sustainability risks and opportunities assessment                       | Environmental, social and economic risks and opportunities will be assessed for the proposal.                                                                                                                                                                                           | ✓                                            | ✓    | ✓    | ✓   | Transport for NSW, Construction contractor, Operator  | Assessment of environmental, social and economic impacts of the CSELR proposal is provided in Chapters 9 to 17 of this EIS.                         |
| Appropriate allocation of roles and responsibilities for sustainability | Senior management responsibility for managing sustainability and an accredited Infrastructure Sustainability Professional will be a part of the project team to provide ongoing sustainability advice.                                                                                  | ✓                                            | ✓    | ✓    | ✓   | Transport for NSW, Construction contractor            | To be actioned post project approval.                                                                                                               |

Table 7.5 cont.

| SUSTAINABILITY MEASURE                                                  | DETAILS                                                                                                                                                                                                                           | PROJECT PHASE TO BE IMPLEMENTED <sup>1</sup> |      |      |     | RESPONSIBILITY                                                 | STATUS                                                                                                                                           |
|-------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|------|------|-----|----------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                         |                                                                                                                                                                                                                                   | DEF.                                         | DET. | CON. | OP. |                                                                |                                                                                                                                                  |
| Regular sustainability performance evaluations, reviews and reporting   | Audits of the project management systems, internally every quarter and externally at least annually.                                                                                                                              |                                              |      | ✓    | ✓   | Transport for NSW, Construction contractor                     | To be actioned post project approval.                                                                                                            |
|                                                                         | Weekly site inspections during construction and monthly during operations.                                                                                                                                                        |                                              |      | ✓    | ✓   | Transport for NSW, Construction contractor                     | To be actioned post project approval.                                                                                                            |
|                                                                         | Annual sustainability performance reporting and reviews by senior management. Changes and improvements to be made to management systems following management reviews.                                                             |                                              |      | ✓    | ✓   | Transport for NSW, Construction contractor                     | To be actioned post project approval.                                                                                                            |
|                                                                         | Processes will be in place to facilitate knowledge sharing both within and beyond the proposal to the wider industry, including sharing of 'mistakes', 'lessons learnt' and 'good industry practices'.                            |                                              |      | ✓    | ✓   | Transport for NSW, Construction contractor                     | To be actioned post project approval.                                                                                                            |
| Provide services corridor                                               | Provide services corridor for current or planned energy, water, telecommunications and other buried infrastructure.                                                                                                               |                                              | ✓    | ✓    | ✓   | Transport for NSW, Designer, Construction contractor, Operator | Opportunities to provide service corridors would be investigated during detailed design, where required and feasibly and reasonably practicable. |
| Procurement and purchasing                                              |                                                                                                                                                                                                                                   |                                              |      |      |     |                                                                |                                                                                                                                                  |
| Sustainability consideration in procurement – maximising local benefits | Social, economic and environmental aspects will be considered in the procurement process. For example, procurement of labour and materials from local suppliers, and exploring opportunities to reuse materials where applicable. |                                              | ✓    | ✓    | ✓   | Transport for NSW, Construction contractor, Operator           | The procurement of appropriate quantities of construction materials would be managed during the procurement phase of the proposal.               |



Table 7.5 cont.

| SUSTAINABILITY MEASURE                                                     | DETAILS                                                                                                                                                                                                                                                                                                                                                                                                                                                          | PROJECT PHASE TO BE IMPLEMENTED <sup>1</sup> |      |      |     | RESPONSIBILITY                                        | STATUS                                                                                                                                           |
|----------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|------|------|-----|-------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | DEF.                                         | DET. | CON. | OP. |                                                       |                                                                                                                                                  |
| Incorporate sustainability into supplier selection processes and contracts | Prequalification requirement for suppliers to have a sustainability policy and implementation plan, a forward commitment to stimulate innovation and engaging with potential suppliers to explain sustainability requirements and expectations. Where opportunity exists, there will be selective procurement of only local and Australian suppliers of materials where possible and suitable, in addition to sustainable materials with preference over others. |                                              | ✓    | ✓    | ✓   | Transport for NSW, Construction contractor            | Opportunities to source construction materials from local and Australian suppliers would be investigated during detailed design and procurement. |
|                                                                            | Supplier selection will include sustainability criteria in procurement specifications and evaluation. Contracts will outline supplier objectives and targets, and a supplier performance management and rewards program will be in place.                                                                                                                                                                                                                        |                                              |      | ✓    | ✓   | Transport for NSW, Construction contractor            | Sustainability requirements will be built into project procurement processes.                                                                    |
| Climate change adaptation                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                              |      |      |     |                                                       |                                                                                                                                                  |
| Climate change adaptation measures                                         | Incorporation of climate change adaptation measures into the delivery of the proposal, including both design and operational responses such as passenger shelters, protection of sensitive assets, equipment resilience to temperature, drainage system designs and emergency management plans.                                                                                                                                                                  | ✓                                            | ✓    | ✓    | ✓   | Transport for NSW, Designers, Construction contractor | To be further investigated during detailed design.                                                                                               |
| Climate change risk assessments                                            | Risk and opportunity assessments would be undertaken on an on-going basis and would include identification and mitigation of the key climate change risks for the proposal.                                                                                                                                                                                                                                                                                      | ✓                                            | ✓    | ✓    | ✓   | Transport for NSW, Designers, Construction contractor | Risk assessments workshops with multi-disciplinary team was undertaken as part of the definition design stage.                                   |
| Energy and greenhouse gases                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                              |      |      |     |                                                       |                                                                                                                                                  |
| Sub-metering of substantive energy uses                                    | Sub-metering to be considered for all individual energy uses greater than 100 kVa (e.g. depot or stabling facilities).                                                                                                                                                                                                                                                                                                                                           |                                              | ✓    |      | ✓   | Transport for NSW, Operator                           | Opportunities to use of sub-metering would be further investigated during detailed design.                                                       |
| Energy efficient signals                                                   | With new signal requirements, opportunity identified to use energy efficient signals, such as light emitting diode (LED) technology to reduce energy consumption.                                                                                                                                                                                                                                                                                                |                                              | ✓    | ✓    |     | Transport for NSW, Construction contractor            | Opportunities for the use of energy efficient signals would be investigated during detailed design.                                              |

Table 7.5 cont.

| SUSTAINABILITY MEASURE                                   | DETAILS                                                                                                                                                                                                | PROJECT PHASE TO BE IMPLEMENTED <sup>1</sup> |      |      |     | RESPONSIBILITY                                                          | STATUS                                                                                                                                   |
|----------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|------|------|-----|-------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|
|                                                          |                                                                                                                                                                                                        | DEF.                                         | DET. | CON. | OP. |                                                                         |                                                                                                                                          |
| Power factor correction equipment                        | Power factor correction equipment, such as switched 'capacitor banks' to regulate the output of power supplies, and minimise wasted energy.                                                            |                                              | ✓    | ✓    |     | Transport for NSW, Construction contractor                              | Opportunities for the use of power factor correction equipment would be investigated during detailed design.                             |
| Alternate fuels in construction and maintenance vehicles | Alternate fuels (e.g. biodiesel) may be considered for construction and maintenance vehicles, during construction and operation.                                                                       |                                              | ✓    | ✓    | ✓   | Construction contractor, Operator                                       | Opportunities to use alternative fuels will be considered during the project procurement and operational phases of the proposal.         |
| Transport construction materials via shortest route      | Consideration will be given to the transportation of construction materials via the shortest route, in order to minimise fuel and energy requirements and therefore minimise greenhouse gas emissions. |                                              | ✓    | ✓    |     | Transport for NSW, Construction contractor                              | Measures to manage the transport of construction materials to site have been included in section 6.8.3.                                  |
| Photovoltaic system                                      | Consideration may be given to the incorporation of a photovoltaic system to provide electricity for any new requirements (such as lighting).                                                           |                                              | ✓    | ✓    |     | Transport for NSW, Design contractor, Construction contractor           | Opportunities to incorporate a photovoltaic system into any new requirements would be further investigated during detailed design.       |
| Timer units                                              | Timer units can be incorporated into boiler hot water units and A/C to minimise power use after hours.                                                                                                 | ✓                                            | ✓    | ✓    |     | Transport for NSW, Design contractor, Construction contractor           | Opportunities to use timer units would be investigated during detailed design.                                                           |
| Energy efficient equipment/systems                       | Any equipment or systems installed should be selected based on high energy efficiency (such as air conditioning systems, transformers, maintenance equipment, light rail vehicles).                    | ✓                                            | ✓    | ✓    |     | Transport for NSW, Design contractor, Construction contractor           | Energy efficiency of equipment and systems would be considered during detailed design.                                                   |
| Energy efficient light fittings                          | Consideration of T5 linear fluorescent, compact fluorescent, LED and metal halide lamps for efficiency where new or old light fittings are being replaced.                                             | ✓                                            | ✓    | ✓    |     | Transport for NSW, Design contractor, Construction contractor           | Opportunities to use T5 linear fluorescent, compact fluorescent, LED and metal halide lamp would be investigated during detailed design. |
| Maximise use of natural ventilation                      | Depot design to consider prevailing winds and maximise use of natural ventilation where feasible.                                                                                                      | ✓                                            | ✓    | ✓    | ✓   | Transport for NSW, Design contractor, Construction contractor, Operator | Opportunity to maximise the use of natural ventilation would be investigated during detailed design.                                     |



Table 7.5 cont.

| SUSTAINABILITY MEASURE                                                                                  | DETAILS                                                                                                                                                                                                                    | PROJECT PHASE TO BE IMPLEMENTED <sup>1</sup> |      |      |     | RESPONSIBILITY                                                          | STATUS                                                                                                                                          |
|---------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|------|------|-----|-------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                         |                                                                                                                                                                                                                            | DEF.                                         | DET. | CON. | OP. |                                                                         |                                                                                                                                                 |
| High efficiency fans and pumps                                                                          | Use of high-efficiency fans, pumps, heating and cooling systems will be maximised where feasible.                                                                                                                          | ✓                                            | ✓    | ✓    | ✓   | Transport for NSW, Design contractor, Construction contractor, Operator | Opportunities to use high-efficiency fans, pumps, heating and cooling systems would be investigated during detailed design.                     |
| Maximise use of solar panels or other renewable energy opportunities                                    | Maximise on-site renewable energy generation through use and integration of solar panels into structures or use of other renewable energy generation technologies at depot, stabilising facility and light rail alignment. | ✓                                            | ✓    | ✓    | ✓   | Transport for NSW, Design contractor, Construction contractor, Operator | Opportunities to incorporate on-site renewable energy generation would be investigated during detailed design.                                  |
| Offset carbon emissions from 100% of operational energy use and 20% of construction energy requirements | Offset carbon emissions from 100% of net operational energy needs and 20% of construction energy needs using renewable energy offsets.                                                                                     |                                              |      | ✓    |     | Transport for NSW, Operator                                             | To be investigated by the Operator.                                                                                                             |
| Low-light CCTV monitoring                                                                               | Low-light CCTV monitoring will be promoted where feasible.                                                                                                                                                                 | ✓                                            | ✓    | ✓    | ✓   | Transport for NSW, Design contractor, Construction contractor, Operator | Opportunities to use low-light CCTV monitoring would be investigated during detailed design.                                                    |
| Water                                                                                                   |                                                                                                                                                                                                                            |                                              |      |      |     |                                                                         |                                                                                                                                                 |
| Water sensitive urban design                                                                            | Water sensitive urban design approaches would be incorporated as part of urban design and landscaping. Design responses may include bioswales, slotted kerbs, and permeable paving around tree plantings.                  | ✓                                            | ✓    | ✓    |     | Transport for NSW, Design contractor, Construction contractor           | Opportunities to incorporate water sensitive urban design approaches into the proposal would be investigated during detailed design.            |
| Landscaping – endemic and water tolerant species                                                        | With the required urban design and landscape requirements as part of the proposal, the planting of endemic species that do not require watering or extensive maintenance after establishment would be considered.          | ✓                                            | ✓    | ✓    |     | Transport for NSW, Design contractor, Construction contractor           | The urban and landscape design for the proposal would be further progressed during detailed design.                                             |
| Water efficient fittings                                                                                | Water efficient fittings will be utilised for any new fixtures or taps required as part of the works.                                                                                                                      |                                              | ✓    | ✓    |     | Transport for NSW, Design contractor, Construction contractor           | The incorporation of water efficient fittings would be further investigated during the detailed design and construction stages of the proposal. |

Table 7.5 cont.

| SUSTAINABILITY MEASURE                                                           | DETAILS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | PROJECT PHASE TO BE IMPLEMENTED <sup>1</sup> |      |      |     | RESPONSIBILITY                                                          | STATUS                                                                                                               |
|----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|------|------|-----|-------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------|
|                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | DEF.                                         | DET. | CON. | OP. |                                                                         |                                                                                                                      |
| Integrated water management and reuse                                            | Integrated water management solutions for the stabling and train wash facility will include rainwater storage and aquifer recharge and storage. Non potable uses would include water used for wash downs or irrigation requirements, where landscaping is provided.                                                                                                                                                                                                                                                                                                                                                                                       | ✓                                            | ✓    | ✓    |     | Transport for NSW, Design contractor, Construction contractor           | Opportunities to implement these integrated water management solutions would be investigated during detailed design. |
| Water submeters and real time meters                                             | Metering and monitoring of water use during construction may be considered. Where appropriate, water meters would be fitted to the proposed maintenance and stabling facilities to track and record usage during the operation of the proposal.                                                                                                                                                                                                                                                                                                                                                                                                           | ✓                                            | ✓    | ✓    |     | Transport for NSW, Design contractor, Construction contractor           | To be undertaken during the construction phase of the proposal.                                                      |
| Maximise use of non-potable water uses                                           | Explore replacing 100% of non-potable water uses using non-potable water sources, including bore water.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | ✓                                            | ✓    | ✓    | ✓   | Transport for NSW, Design contractor, Construction contractor, Operator | Opportunities to use non-potable water sources would be investigated during detailed design and project procurement. |
| Waste                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                              |      |      |     |                                                                         |                                                                                                                      |
| Construction waste management plan including on-site reuse of construction waste | A waste management plan would be developed for the construction phase of the proposal. The waste management plan would include segregation of waste into stockpiles of spoil, concrete, steel, timber, paper and cardboard and vegetation to make it easier to recycle components. Setting recycling targets would also provide structure and guidance for recycling where appropriate, with monthly monitoring recommended to track waste.<br>Any impacts to topsoil during civil and construction works would consider reusing, in particular for landscaping.<br>Mulching of vegetative waste material would be considered to be used for landscaping. | ✓                                            | ✓    | ✓    |     | Transport for NSW, Construction contractor                              | Waste management measures would be included in, and implemented through, the CEMP, as outlined in section 18.1.6.    |
| Maximise recycling during construction and operation                             | Waste and recycling systems would be in place to maximise recycling and prevent/minimise waste generation.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | ✓                                            | ✓    | ✓    | ✓   | Transport for NSW, Design contractor, Construction contractor, Operator | Waste management measures would be included in, and implemented through, the CEMP, as outlined in section 18.1.6.    |



Table 7.5 cont.

| SUSTAINABILITY MEASURE                                               | DETAILS                                                                                                                                                                                                                                                                                                                                            | PROJECT PHASE TO BE IMPLEMENTED <sup>1</sup> |      |      |     | RESPONSIBILITY                                       | STATUS                                                                                                                                    |
|----------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|------|------|-----|------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                      |                                                                                                                                                                                                                                                                                                                                                    | DEF.                                         | DET. | CON. | OP. |                                                      |                                                                                                                                           |
| Sustainability consideration in procurement – reducing waste         | Social, economic and environmental aspects will be considered in the procurement process. For example, procurement of materials on and 'as needed' basis to reduce over-ordering and wastage, and exploring opportunities to reuse materials where applicable.                                                                                     |                                              | ✓    | ✓    | ✓   | Transport for NSW, Construction contractor, Operator | The procurement of appropriate quantities of construction materials would be managed during the procurement phase of the proposal.        |
| Establishment of waste targets                                       | The CSELR proposal would strive 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 project will also strive to reuse 100 per cent of paving and other reusable materials or facilitate reuse of such materials.                      | ✓                                            | ✓    |      |     | Transport for NSW, Construction contractor           | Waste management measures would be included in, and implemented through, the CEMP, as outlined in section 18.1.6.                         |
| <b>Materials</b>                                                     |                                                                                                                                                                                                                                                                                                                                                    |                                              |      |      |     |                                                      |                                                                                                                                           |
| Material Life Cycle Analysis consideration in design and procurement | A Life Cycle Analysis could be undertaken for construction materials selected during the detailed design and procurement stages of the proposal to ensure such materials meet proposal standards and requirements. By specifying and procuring best option materials the environmental impact of the proposal can be minimised.                    |                                              | ✓    | ✓    |     | Transport for NSW, Construction contractor           | Opportunity to undertake a Life Cycle Analysis for construction materials would be considered (where appropriate) during detailed design. |
| Maximise use of sustainable supply chains                            | Use guidance from BS8903:2010 – principles and framework for procuring sustainably.<br>Target a minimum 25 per cent use of materials/products by value with environmental labels, e.g. ecospecifier green tag labelling or GBCEA BEP labelling or ISEAL Alliance compliant, ECO-Buy, WELS, FSC, Low Carbon Australia Carbon Neutral certified etc. |                                              | ✓    | ✓    | ✓   | Transport for NSW, Construction contractor, Operator | To be investigated during detailed design and project procurement.                                                                        |
| Low smoke zero halogen cabling                                       | For low voltage distribution, low smoke zero halogen cabling may be considered as an alternative to polyvinyl chloride (PVC). This initiative supports the Transport for NSW <i>Sustainable Design Guidelines</i> material procurement suggestions to minimise the use of PVC.                                                                     |                                              | ✓    | ✓    | ✓   | Transport for NSW, Construction contractor           | Opportunities to use low smoke zero halogen cabling would be investigated during detailed design and procurement.                         |

Table 7.5 cont.

| SUSTAINABILITY MEASURE                                    | DETAILS                                                                                                                                                                                                                                                                                                                                                                                                                                                        | PROJECT PHASE TO BE IMPLEMENTED <sup>1</sup> |      |      |     | RESPONSIBILITY                                                | STATUS                                                                                                                                                                  |
|-----------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|------|------|-----|---------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                | DEF.                                         | DET. | CON. | OP. |                                                               |                                                                                                                                                                         |
| Recycled concrete                                         | There is the opportunity to use concrete that has a recycled content, including fly ash or blast furnace slag as a substitute for general Portland Cement.<br>The amount of recycled content would be subject to structural requirements and suitability, however, inclusion of this recycled content would reduce the carbon footprint of the proposal.                                                                                                       | ✓                                            | ✓    | ✓    |     | Transport for NSW, Construction contractor                    | Opportunities to use concrete that has a recycled content would be investigated during detailed design and procurement.                                                 |
| Recycled steel                                            | There may be the opportunity to use steel with a recycled content. Both structural and reinforced steel which complies with the relevant Australian Standards may be considered where steel is required.                                                                                                                                                                                                                                                       | ✓                                            | ✓    | ✓    |     | Transport for NSW, Construction contractor                    | Opportunities to use steel that has a recycled content would be investigated during detailed design and procurement.                                                    |
| Recycled road base                                        | Construction works would result in the generation of road base. Due to the amount likely required, consideration may be given to the reuse or recycling of this material.                                                                                                                                                                                                                                                                                      | ✓                                            | ✓    | ✓    |     | Transport for NSW, Construction contractor                    | Opportunities to reuse or recycle road bases would be investigated during detailed design and procurement.                                                              |
| Structural fill reuse<br>Cut-fill balance and Spoil reuse | Earthworks would result in generation of material. Where possible material would be re-used on-site as structural fill to avoid off-site disposal.<br>In general a balanced between the cut and fill of material will be sought to minimise excess or import of material.<br>Material generated during bulk earthworks and excavations that is suitable for reuse in accordance with relevant legislation and guidelines, may be considered for reuse in fill. | ✓                                            | ✓    | ✓    |     | Transport for NSW, Design contractor, Construction contractor | Detailed earthworks balance design will be undertaken during detailed design.<br>Opportunities to reuse materials on-site would be investigated during detailed design. |
| Vegetative reuse                                          | Where existing vegetation is disturbed, reuse on-site may be considered through mulching for landscaping (excluding weeds).                                                                                                                                                                                                                                                                                                                                    | ✓                                            | ✓    | ✓    |     | Transport for NSW, Design contractor, Construction contractor | Opportunities to reuse disturbed vegetation on-site (e.g. mulching) would be investigated during detailed design and procurement.                                       |
| Precast materials                                         | Precast concrete helps reduce construction phase waste generation and emissions associated with embodied energy and greenhouse gas generation as the materials are delivered to the proposal site erected.<br>Consideration may be given to the use of precast concrete where feasible and appropriate to reduce construction waste.                                                                                                                           | ✓                                            | ✓    | ✓    |     | Transport for NSW, Design contractor, Construction contractor | Opportunities to use precast concrete would be investigated during detailed design and procurement.                                                                     |



Table 7.5 cont.

| SUSTAINABILITY MEASURE                                         | DETAILS                                                                                                                                                                                                                                       | PROJECT PHASE TO BE IMPLEMENTED <sup>1</sup> |      |      |     | RESPONSIBILITY                                                          | STATUS                                                                                                                                                         |
|----------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|------|------|-----|-------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                |                                                                                                                                                                                                                                               | DEF.                                         | DET. | CON. | OP. |                                                                         |                                                                                                                                                                |
| Timber certified by Forest Stewardship of Australia            | Where timber is required, this would be sourced from sustainable sources rather than native vegetation where possible. This would form part of the procurement procedures in order to communicate this initiative.                            |                                              | ✓    | ✓    |     | Transport for NSW, Design contractor, Construction contractor           | Opportunities to use timber certified by Forest Stewardship of Australia would be investigated during detailed design and procurement.                         |
| Low formaldehyde composite wood products                       | Where wood products are used, where reasonable and feasible products which are sustainable low formaldehyde composite wood products would be procured.                                                                                        |                                              | ✓    | ✓    |     | Transport for NSW, Design contractor, Construction contractor           | Opportunities to procure products which are sustainable low formaldehyde composite wood products would be investigated during detailed design and procurement. |
| Appropriate durability                                         | Appropriate durability would be specified by incorporating adequate materials to meet requirements together with recycled and reused materials, where possible.                                                                               | ✓                                            | ✓    | ✓    |     | Transport for NSW, Design contractor, Construction contractor           | Opportunities to utilise recycled and reused materials (where possible) would be investigated during detailed design and procurement.                          |
| Discharge to air, land and water                               |                                                                                                                                                                                                                                               |                                              |      |      |     |                                                                         |                                                                                                                                                                |
| Dust, erosion, sediment and contaminated stormwater management | During construction, there is opportunity to incorporate mitigation measures into an overarching erosion and sediment control plan, whilst also favouring a design which minimises land disturbance.                                          |                                              | ✓    | ✓    |     | Transport for NSW, Construction contractor                              | Measures to manage dust, erosion, sediment and contaminated stormwater have been included in Chapter 18. Commitments are to be implemented through the CEMP.   |
| Manage impacts on local receiving water quality                | Measures are in place to minimise any adverse impacts to local receiving water quality during construction and operation, and water quality of discharges are monitored during construction and operation (e.g. depot and stabling facility). |                                              | ✓    | ✓    | ✓   | Transport for NSW, Design contractor, Construction contractor, Operator | Commitments are to be implemented through the CEMP and OEMP.                                                                                                   |
| Water pollution                                                | Water sensitive urban design measures would be employed in suitable locations to reduce water pollutant loads.                                                                                                                                | ✓                                            | ✓    | ✓    | ✓   | Transport for NSW, Design contractor, Construction contractor, Operator | Opportunities to incorporate water sensitive urban design measures into the CSELR design would be investigated during detailed design.                         |

Table 7.5 cont.

| SUSTAINABILITY MEASURE                      | DETAILS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | PROJECT PHASE TO BE IMPLEMENTED <sup>1</sup> |      |      |     | RESPONSIBILITY                                                                   | STATUS                                                                                                                                                                                                                                   |
|---------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|------|------|-----|----------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | DEF.                                         | DET. | CON. | OP. |                                                                                  |                                                                                                                                                                                                                                          |
| Hazardous materials                         | Use of dangerous goods and hazardous materials would be avoided where possible. Consideration would be given to lower hazard alternatives where reasonable and feasible.                                                                                                                                                                                                                                                                                                                                                                                      |                                              | ✓    | ✓    | ✓   | Transport for NSW,<br>Design contractor,<br>Construction contractor,<br>Operator | Consideration of lower hazard alternatives in design and procurement.<br>Measures to minimise risks associated with the transport, handling, storage and use of hazardous materials would be developed and implemented through the CEMP. |
| Monitoring                                  | Monitoring programs would be implemented (where appropriate) to confirm pollution control requirements are being met. Target for no demonstrated exceedences of environmental quality goals.                                                                                                                                                                                                                                                                                                                                                                  | ✓                                            | ✓    | ✓    | ✓   | Transport for NSW,<br>Design contractor,<br>Construction contractor,<br>Operator | Opportunities to implement pollution control monitoring would be considered during detailed design and implemented during construction and operation.                                                                                    |
| Construction noise and vibration management | Prepare and adhere to a noise and vibration strategy for the construction phase and operational phase of the proposal. Target for no demonstrated exceedences of noise and vibration goals.                                                                                                                                                                                                                                                                                                                                                                   |                                              | ✓    | ✓    | ✓   | Transport for NSW,<br>Design contractor,<br>Construction contractor,<br>Operator | Construction noise management commitments have been included in sections 12.5, 13.5, 14.5, 15.5, 16.5 and 17.5. Commitments would be implemented through the CEMP.                                                                       |
| Land                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                              |      |      |     |                                                                                  |                                                                                                                                                                                                                                          |
| Maximise conservation of soil resources     | Ensure all subsoil and topsoil impacted is separated and protected. Aim for 95% of all topsoil impacted by volume retains its productivity and is beneficially reused.                                                                                                                                                                                                                                                                                                                                                                                        |                                              | ✓    | ✓    |     | Transport for NSW,<br>Construction contractor                                    | To be further investigated during the detailed design and construction stages of the proposal.                                                                                                                                           |
| Contaminated land management                | As discussed in section 10.3, a number of potential sources of contamination have been identified along the proposed CSELR route. Measures to minimise risks associated with encountering contaminated land during construction are described in section 10.3.5.<br>As part of the detailed design, a Phase 2 ESA would be undertaken to further characterise the nature of potential contamination along the proposed CSELR alignment. From the Phase 2 work, it will be possible to detail specific remediation requirements to be applied to the proposal. |                                              | ✓    | ✓    |     | Transport for NSW,<br>Construction contractor                                    | Measures to minimise risks associated with encountering contaminated land during construction are described in section 10.3.5. These commitments would be implemented through the CEMP.                                                  |



Table 7.5 cont.

| SUSTAINABILITY MEASURE                                                       | DETAILS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | PROJECT PHASE TO BE IMPLEMENTED <sup>1</sup> |      |      |     | RESPONSIBILITY                                                          | STATUS                                                                                                                                                                                                                                   |
|------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|------|------|-----|-------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | DEF.                                         | DET. | CON. | OP. |                                                                         |                                                                                                                                                                                                                                          |
| Minimise impacts to existing green spaces                                    | Investigate opportunities to reduce construction footprint and retain trees wherever possible. Reinstate all impacted vegetated areas and offset removed trees in accordance with in accordance with the Transport for NSW 'Vegetation Offset Guide' (Transport for NSW 2013).                                                                                                                                                                                                                                | ✓                                            | ✓    | ✓    |     | Transport for NSW, Design contractor, Construction contractor           | Opportunities to reduce impacts to existing vegetation would be investigated during detailed design. Councils and other stakeholders would be consulted with regard to replacement of removed trees.                                     |
| Support urban renewal                                                        | The CSELR proposal would be designed to support urban renewal, particularly for the Randwick Urban Activation Precinct, in South Randwick and along the Anzac Parade Corridor which would enable more efficient use of valuable inner city land.                                                                                                                                                                                                                                                              | ✓                                            | ✓    | ✓    | ✓   | Transport for NSW, Design contractor, Construction contractor, Operator | The CSELR has been, and would continue to be, designed to support urban renewal.                                                                                                                                                         |
| Undertake best-practice flooding design                                      | Aim for flooding risks to be assessed and managed in accordance with the requirements of 'Flood plain management in Australia: best practice principles and guidelines'.                                                                                                                                                                                                                                                                                                                                      | ✓                                            | ✓    | ✓    | ✓   | Transport for NSW, Design contractor, Construction contractor, Operator | To be further investigated during detailed design.                                                                                                                                                                                       |
| <b>Ecology</b>                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                              |      |      |     |                                                                         |                                                                                                                                                                                                                                          |
| Avoid impact to significant street trees wherever possible                   | The CSELR design has sought to avoid impact to significant street trees wherever possible.<br>Where impact to a significant tree cannot be reasonably avoided, an arborist would be consulted to determine whether opportunity exists to trim branches from the tree (i.e. where sufficient clearances to overhead wires could be achieved via such a method) rather than completely removing the tree.<br>Consideration would be given to relocation of trees where size and condition do not preclude this. | ✓                                            | ✓    | ✓    | ✓   | Transport for NSW, Design contractor, Construction contractor           | The CSELR design has sought to avoid impact to significant street trees wherever possible.<br>Measures to reduce the CSELR proposal's impact on significant street trees are outlined in sections 12.6, 13.6, 14.6, 15.6, 16.6 and 17.6. |
| Maintain and enhance ecological value, habitat connectivity and biodiversity | Opportunities for enhancing ecological value, biodiversity improvements and habitat connectivity would be considered during detailed design, as part of the Urban Design and Landscaping Plan. Opportunities could include offsetting cleared street trees and increasing vegetation in revitalised areas to provide shade, improve micro-climate and air quality and enhance the overall urban aesthetic.                                                                                                    | ✓                                            | ✓    | ✓    | ✓   | Transport for NSW, Design contractor, Construction contractor           | Opportunities for biodiversity improvements would be considered during detailed design, as part of the Urban Design and Landscaping Plan.                                                                                                |

Table 7.5 cont.

| SUSTAINABILITY MEASURE                                                                                                    | DETAILS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | PROJECT PHASE TO BE IMPLEMENTED <sup>1</sup> |      |      |     | RESPONSIBILITY                                                          | STATUS                                                                                                                                                         |
|---------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|------|------|-----|-------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | DEF.                                         | DET. | CON. | OP. |                                                                         |                                                                                                                                                                |
| Community health, wellbeing and safety                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                              |      |      |     |                                                                         |                                                                                                                                                                |
| Delivering community health, wellbeing and safety benefits                                                                | <p>The CSELR would provide a range of community health, wellbeing and safety benefits through:</p> <ul style="list-style-type: none"><li>improving travel time reliability</li><li>encouraging physical activity in the form of walking and cycling, particularly through enhancements along George Street</li><li>fully complying with the <i>Disability Discrimination Act 1992</i> to provide equal access to the entire CSELR network</li><li>delivering modern accessible stops with real-time service information.</li></ul>                                                                                                                                                                                                                    | ✓                                            | ✓    | ✓    | ✓   | Transport for NSW, Design contractor, Construction contractor, Operator | Design features have been included into the CSELR proposal.                                                                                                    |
| Maximise the community health, wellbeing and safety benefits of the CSELR proposal                                        | <p>Opportunities to maximise the community health, wellbeing and safety benefits of the CSELR proposal would be considered during detailed design. These opportunities could include:</p> <ul style="list-style-type: none"><li>incorporating Crime Prevention Through Environmental Design (CPTED) into the design of the light rail</li><li>facilitating state of the art way-finding</li><li>integration with pedestrian and cycling infrastructure (including provision of bicycle storage facilities)</li><li>public art projects</li><li>comprehensive program of community and user safety audits through all phases of the project, including facilitating stakeholder involvement and improving stakeholder perceptions of safety.</li></ul> | ✓                                            | ✓    | ✓    | ✓   | Transport for NSW, Design contractor, Construction contractor, Operator | Opportunities to maximise the community health, wellbeing and safety benefits of the CSELR proposal would be considered during detailed design.                |
| Low volatile organic compounds (VOC) paints, finishes, adhesives and sealants minimise effects to workforce and community | <p>Where required, the specification of low volatile organic compounds paints, finishes, adhesives and sealants would minimise adverse effects to members of the workforce applying the product as well as those members of the community who come in to contact with the products.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                              | ✓    |      |     | Transport for NSW, Construction contractor                              | Opportunities to use low volatile organic compounds paints, finishes, adhesives and sealants would be investigated during the detailed design and procurement. |



Table 7.5 cont.

| SUSTAINABILITY MEASURE                                                                                                  | DETAILS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | PROJECT PHASE TO BE IMPLEMENTED <sup>1</sup> |      |      |     | RESPONSIBILITY                                                          | STATUS                                                                                                                                                                                                                                       |
|-------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|------|------|-----|-------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | DEF.                                         | DET. | CON. | OP. |                                                                         |                                                                                                                                                                                                                                              |
| Bicycle racks and lockers                                                                                               | Bicycle u-rails are proposed at Circular Quay and at all non-CBD light rail stops, located on the street adjacent to, or at, the stop. Secure lockers would also be provided at the Randwick and Kingsford stops, supplemented by u-rails. The provision of these bicycle facilities would promote more efficient and sustainable intermodal transport.                                                                                                                                                         | ✓                                            | ✓    | ✓    |     | Transport for NSW, Design contractor, Construction contractor           | As discussed in section 9.2.2, bicycle u-rails are proposed at Circular Quay and at all non-CBD light rail stops, while secure lockers would be provided at the Randwick and Kingsford stops, supplemented by u-rails.                       |
| Heritage                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                              |      |      |     |                                                                         |                                                                                                                                                                                                                                              |
| Avoid impacts to heritage items wherever possible<br>Minimise impacts on heritage items where impacts cannot be avoided | Opportunities to monitor and retain heritage features, enhance heritage values and avoid impacts on items of heritage significance are being investigated in planning for construction and operation of the project. This includes completion of heritage and archaeological studies, impact assessments and identification of impact mitigation as part of this EIS, identification of enhancement measures, development of educational and community resources around heritage values etc. where appropriate. | ✓                                            | ✓    | ✓    |     | Transport for NSW, Design contractor, Construction contractor           | Comprehensive heritage assessments have been completed as part of this EIS (refer to Technical Papers 5 and 6). Mitigation measures to manage the potential heritage impacts are outlined in sections 12.8, 13.8, 14.8, 15.8, 16.8 and 17.8. |
| Stakeholder participation                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                              |      |      |     |                                                                         |                                                                                                                                                                                                                                              |
| Community liaison                                                                                                       | Due to the nature of works, development and implementation of an appropriate community and stakeholder liaison strategy would provide proactive communication management with the community.                                                                                                                                                                                                                                                                                                                    |                                              | ✓    | ✓    |     | Transport for NSW, Construction contractor                              | A management commitment has been included Chapter 18 for the preparation and implementation of a Communication and Stakeholder Management Plan.                                                                                              |
| Urban and landscape design                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                              |      |      |     |                                                                         |                                                                                                                                                                                                                                              |
| Contribution to good quality urban design                                                                               | The CSELR proposal would contribute to good quality urban design through providing for: disability access; safe pedestrian movement; separate cycle ways and footpaths; modern, accessible light rail stops; high quality finishes and state of the art way finding.                                                                                                                                                                                                                                            | ✓                                            | ✓    | ✓    | ✓   | Transport for NSW, Design contractor, Construction contractor, Operator | Opportunities to maximise the CSELR proposal's contribution to good quality urban design would be further investigated through an Urban Design and Landscaping Plan that would be prepared during detailed design.                           |

Table 7.6 cont.

| SUSTAINABILITY MEASURE              | DETAILS                                                                                                                                                                                                                                                                                                             | PROJECT PHASE TO BE IMPLEMENTED <sup>1</sup> |      |      |     | RESPONSIBILITY                                                          | STATUS                                                                                                                              |
|-------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|------|------|-----|-------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|
|                                     |                                                                                                                                                                                                                                                                                                                     | DEF.                                         | DET. | CON. | OP. |                                                                         |                                                                                                                                     |
| Innovation                          |                                                                                                                                                                                                                                                                                                                     |                                              |      |      |     |                                                                         |                                                                                                                                     |
| Wire-free traction power technology | Wire-free traction power technology would be adopted for a section of the CSELR proposal between Circular Quay and Bathurst Street. This technology would involve on-board energy storage systems on the light rail vehicles. As a result, no overhead wires would be required for this section of the CSELR route. | ✓                                            | ✓    | ✓    | ✓   | Transport for NSW, Design contractor, Construction contractor, Operator | Wire-free traction power technology has been adopted for a section of the CSELR proposal between Circular Quay and Bathurst Street. |

Note 1: Def. = Definition Design; Det. = Detailed Design; Con. = Construction; Op. = Operation



## 7.3 Climate change adaptation

The following sections provide a summary of a climate change risk assessment that was undertaken for the CSELR proposal as part of this EIS. A full copy of the climate change risk assessment is provided in Appendix G.

### 7.3.1 Existing climate

Sydney's temperate subtropical climate is generally characterised by very warm summers and mild, warm winters. Average daily temperatures generally range between 18°C and 26°C during summer and between 9°C and 18°C in winter. Uniform rainfall is experienced throughout the year with an average of 1,287 millimetres received per annum at Observatory Hill. Autumn is typically the wettest period, while spring is generally the driest. More detailed information on the existing climate of Sydney is provided in Appendix G and section 6 of Technical Paper 9 (Air Quality Assessment).

### 7.3.2 Climate change projections

According to Commonwealth Scientific and Industrial Research Organisation (CSIRO 2007) and Office of Environment and Heritage (OEH 2010) research, the Sydney area is likely to become warmer, with more hot days and fewer cold nights. Detailed climate change projections for the Sydney region are presented in Appendix G. In summary, these climate change projections include the following:

- *By 2030* — Approximately 0.9°C increase in temperature (0.6°C — 1.3°C range), with increasing frequency of hot days and warm nights. Average rainfall may range from a 9 per cent decrease to a 3 per cent increase, with increased likelihood and intensity of extreme rainfall.
- *By 2050* — Further increase in temperature, with increase in frequency of hot days and warm nights, a likely increase in summer rainfall and a decrease in winter rainfall.
- *By 2070* — Approximately 3.0°C increase in temperature (2.1°C — 4.3°C range), with increasing frequency of hot days and warm nights. Winter and spring rainfall patterns may range from a 25 per cent decrease to a 10 per cent increase with increased likelihood and intensity of extreme rainfall.
- *By 2100* — Up to 6.4°C increase in temperature, with increasing frequency of hot days and warm nights. Winter and spring rainfall patterns to vary widely with increased likelihood and intensity of extreme rainfall.
- *Up to 2100* — Sea level rise estimates of 18–59 centimetres, with a possible additional contribution from ice sheets of 10 to 20 centimetres (relative to 1990). Sea level rise, coupled with increased flooding would pose an increased risk to property and infrastructure. Developments near estuary entrances and beaches and on coastal floodplains are most vulnerable.

### 7.3.3 Climate change risk assessment

A number of climatic variables may have a potential impact on the CSELR proposal (for example, increased frequency and severity of extreme rainfall events resulting in increased flooding of CSELR infrastructure). The vulnerability of the CSELR proposal to climate change would be dependent on its exposure to a particular climate change variable (e.g. increased frequency, severity and duration of extreme temperatures); its sensitivity to the change; the adaptive capacity of the Operator to respond to such a change; and/or the extent to which the change is able to be managed through design (i.e. infrastructure designed to be resilient to projected extreme weather events).

Key components of the CSELR proposal would have a design life of up to 100 years. Therefore, there is the potential for long-term climate changes to impact on the operational phase of the proposal.

Conversely, climate change is not anticipated to present a significant risk to the construction phase of the proposal, given the anticipated timing of construction (2015 to 2020). Construction-related climate change risks (e.g. increased frequency and severity of extreme rainfall events placing increased pressure on construction water quality control measures) would generally be considered during the development of environmental management measures as part of the CEMP.

A climate change risk assessment was undertaken for the CSELR proposal to identify the potential risks and associated consequences that the projected climate change projections, listed in section 7.3.2, would have on CSELR infrastructure and operations. Mitigation measures and/or potential design responses to address such risks were also identified as part of the climate change risk assessment.

Table 7.6 provides a summary of the 'medium' and 'high' climate change risks to the CSELR proposal that were identified during the risk assessment, as well as recommended mitigation measures and/or potential design responses to be further investigated during detailed design. The full climate change risk assessment for the CSELR proposal is provided in Appendix G.

### 7.3.4 Management and mitigation measures

#### Detailed design

Possible design responses to address potential climate change risks to the CSELR proposal, as documented in Appendix G, would be considered during detailed design. The adequacy and comprehensiveness of the design responses documented in Appendix G would also be reviewed during detailed design, with additional mitigation measures and/or design responses developed, as appropriate.

#### Operation

The environmental management measures documented in Table 7.5 would be implemented (where appropriate) to reduce climate change risks to the CSELR proposal.

#### Construction

Construction-related climate change risks (e.g. increased frequency and severity of extreme rainfall events placing increased pressure on construction water quality control measures) would be considered during the development of environmental management measures as part of the construction environmental management plan (CEMP).



Table 7.6 Medium and high climate change risks identified for the operational phase of the CSELR proposal

| RISK (RISK RATING)                                                 | IMPACT                                                                                                                                                                                                                       | RECOMMENDED MANAGEMENT MEASURES TO REDUCE RISK                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | OPPORTUNITIES TO BE CONSIDERED DURING DETAILED DESIGN TO MINIMISE RISK                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|--------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Increased frequency and severity of extreme rainfall events</b> |                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Flooding of CSELR infrastructure (high risk)                       | Flooding of light rail tracks, the proposed Moore Park tunnel, drainage and culverts, maintenance and stabling facilities and light rail stops; loss of access due to disruptions to CSELR services; foundation instability. | <p>The environmental management measures documented in section 10.2 would be implemented. All drainage systems would be designed according to specific design lives and predicted flood levels, which correlate with the manageable level of acceptable risk. Track drainage to be designed to limit water depth to 15 millimetres or less where at or adjacent to the track surface during whichever event is larger of a 10 year average recurrence interval (ARI) or the design ARI of the adjacent road.</p> <p>Similar light rail systems are designed with a maximum water level of 50 millimetres above track level, after which it is recommended that operations should cease.</p> | <p>Drainage design to provide sufficient capacity to account for increased stormwater volumes under projected climate change scenarios. The Sydney Metropolitan Catchment Authority commissioned a study in 2011 to review the impact of climate change on urban stormwater infrastructure in Sydney. This study recommended that an additional 15 per cent is added to peak rainfall intensities design to take account of increasing rainfall intensities due to climate change. It is recommended that the CSELR drainage network design includes this 15 per cent increase to reduce the potential impacts of climate change.</p> <p>Design responses that could be incorporated into the CSELR proposal to address drainage risks include:</p> <ul style="list-style-type: none"> <li>• upsizing the trunk drainage network downstream of the CSELR corridor until a network of sufficient capacity is reached, or through to the outfalls into receiving waterways (e.g. Sydney Harbour) if necessary</li> <li>• adopting a 'surcharge pit' approach</li> <li>• accepting reduced design criteria for the CSELR in areas where existing flooding issues occur (as discussed in section 10.2).</li> </ul> <p>Water sensitive urban design to be integrated into the CSELR proposal, wherever possible to reduce flows.</p> <p>Develop flood evacuation plans for high risk areas (e.g. closing areas that are subject to flooding during predicted flood events).</p> |
| Water damage to electrical circuitry (medium risk)                 | Malfunctioning power supplies, signalling, communications, track sensors and associated circuitry; traction problems; disruption to services and maintenance issues.                                                         | <p>Electrical cables would be protected, insulated and have fail-safe mechanisms to manage safety risks associated with electrical discharges.</p> <p>Electrical circuitry would operate autonomously, such that one failure would not result in the failure of entire system.</p> <p>Location of electrical equipment (with the exception of cables) above the 1 in 100 year ARI flood level (where feasible) to minimise damage and to allow prompt resumption of services when water recedes.</p> <p>Stringent maintenance, inspection and safety protocols would be developed and implemented during the operational phase of the proposal.</p>                                         | <p>Drainage design to provide sufficient capacity to account for increased stormwater volumes under projected climate change scenarios. The Sydney Metropolitan Catchment Authority commissioned a study in 2011 to review the impact of climate change on urban stormwater infrastructure in Sydney. This study recommended that an additional 15 per cent is added to peak rainfall intensities design to take account of increasing rainfall intensities due to climate change. It is recommended that the CSELR drainage network design includes this 15 per cent increase to reduce the potential impacts of climate change.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |

Table 7.6 cont

| RISK (RISK RATING)                                                                                                   | IMPACT                                                                                                                                                                                                                                                                             | RECOMMENDED MANAGEMENT MEASURES TO REDUCE RISK                                                                                                                                                                                                                                                                                                                                                                                           | OPPORTUNITIES TO BE CONSIDERED DURING DETAILED DESIGN TO MINIMISE RISK                                                                                                                                                                          |
|----------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Increased frequency, severity and duration of extreme temperature (days exceeding 35°C)                              |                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                 |
| Track movement/cracking (medium risk)                                                                                | Derailment; increased maintenance costs; increased CSELR travel times due to speed restrictions.                                                                                                                                                                                   | Regular inspection and maintenance of light rail track would be undertaken during operation of the CSELR proposal.                                                                                                                                                                                                                                                                                                                       | Heat-emitting infrastructure to be located away from the CSELR tracks to reduce contribution to ambient temperature.                                                                                                                            |
| Increased difficulty/cost (including maintenance) to adequately ventilate and cool light rail vehicles (medium risk) | Warmer tunnel or ambient temperature environment resulting in ill passengers; reduced patronage; failure of light rail vehicle (LRV) air conditioning units.                                                                                                                       | The design of the Moore Park tunnel would be developed to ensure provision is made for adequate ventilation for fire and life safety purposes. Light rail vehicles would be adequately air conditioned/ventilated. Vegetation could be used (where practicable) to provide passive cooling in surround areas.                                                                                                                            | Ventilation design of the proposed Moore Park tunnel to account for increased frequency, severity and duration of extreme temperature (days exceeding 35°C). Interlock LRV air conditioning with windows so both cannot be used simultaneously. |
| More frequent interruptions to mains power supply and reduced transformer efficiency (medium risk)                   | More frequent and prolonged brownouts/blackouts caused by increased air conditioning demands, reduced generation, conductor and transformer efficiency.                                                                                                                            | Stringent maintenance, inspection and safety protocols would be developed to enable rail systems to be managed efficiently and effectively during extreme hot weather events.                                                                                                                                                                                                                                                            | n/a                                                                                                                                                                                                                                             |
| Failure of signalling and communication equipment and reduced functionality of electrical systems (medium risk)      | Increased electrical resistance in conductors and transformers. Reduced lifespan and efficiency of electrical equipment. Heat-related sag in overhead powerlines. Reduced functionality of computing systems, signalling and communication equipment. Increased maintenance costs. | Regulated tension wiring and safety screens would take account of temperature-related sag (no overhead wiring along parts of George Street). All systems (including track circuits) would have fail-safe mechanisms. Overhead wiring would be designed for ambient temperatures of up to 60–65°C. The overhead wiring system would be double insulated. Substation equipment would be designed for ambient temperatures of up to 50–60°C | n/a                                                                                                                                                                                                                                             |



Table 7.6 cont

| RISK (RISK RATING)                                                                     | IMPACT                                                                                                                                                                                                                                                                                                                                   | RECOMMENDED MANAGEMENT MEASURES TO REDUCE RISK                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | OPPORTUNITIES TO BE CONSIDERED DURING DETAILED DESIGN TO MINIMISE RISK                                                                                                                                                            |
|----------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Increased frequency and severity of extreme wind events</b>                         |                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                   |
| Debris, fallen trees and branches; damage to wind-exposed infrastructure (medium risk) | Dewirement; phase conductors swinging together; snagging of overhead lines; damage to communications, structures and signs; reduced service life of wind exposed infrastructure; traction and braking problems for light rail vehicles; debris landing on trains, and any area where passengers or general public may be on the network. | Electrical design to incorporate adequate safety measures to manage risks associated with damage to overhead wires (e.g. circuit breakers).<br><br>Adequate clearances between vegetation and structures would be adopted to reduce the risk of debris, fallen trees and branches damaging overhead wiring.<br><br>Stringent maintenance, inspection and safety protocols would be developed and implemented during the operational phase of the proposal. This would include pruning and landscaping regimes.                                                                                                                                 | Wind loading of structural elements (e.g. station canopies) to be evaluated. Design of structures to provide sufficient capacity to account for increased frequency and severity of extreme wind events.                          |
| Rolling stock blowing over (medium risk)                                               | Derailment; delays; operational and safety risks.                                                                                                                                                                                                                                                                                        | Risk would be manageable through the application of standard mitigation measures (e.g. design standards for light rail vehicles).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | n/a                                                                                                                                                                                                                               |
| <b>Sea level rise and increased frequency and severity of storm surge events</b>       |                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                   |
| Flooding of CSELR infrastructure (medium risk)                                         | Flooding of light rail tracks (generally restricted to Circular Quay), drainage and culverts, maintenance and stabling facilities and light rail stops; loss of access due to disruptions to CSELR services; foundation instability.                                                                                                     | n/a                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Drainage design to provide sufficient capacity to account for rising sea levels under projected climate change scenarios. This could include the consideration of increasing pump and well sizes and/or providing backup pump(s). |
| Water damage to electrical circuitry (medium risk)                                     | Malfunctioning power supplies, signalling, communications, track sensors and associated circuitry; traction problems; disruption to services and maintenance issues.                                                                                                                                                                     | Electrical cables would be protected, insulated and have fail-safe mechanisms to manage safety risks associated with electrical discharges.<br><br>Electrical circuitry would operate autonomously, such that one failure would not result in the failure of entire system.<br><br>Location of electrical equipment (with the exception of cables) above the 1 in 100 year storm surge level (where feasible) to minimise damage and to allow prompt resumption of services when water recedes.<br><br>Stringent maintenance, inspection and safety protocols would be developed and implemented during the operational phase of the proposal. | n/a                                                                                                                                                                                                                               |

## 7.4 Waste, energy and resources

### 7.4.1 Operation

#### Waste

Waste generating activities during the operation of the proposal would include maintenance of light rail vehicles, stops, track and associated infrastructure, use of the light rail stops by commuters (e.g. domestic waste in stop bins), and office/administration operations at the proposed stabling and maintenance facilities.

Maintenance waste streams would include:

- oils, grease and other chemicals from the servicing of light rail vehicles at the Rozelle maintenance depot
- oils and greases from maintenance vehicles along the proposed alignment
- sand from LRVs along the alignment (used for traction control and to improve emergency braking performance)
- scrap materials
- LRV brake pads.

Waste streams from the office/administration operations at the proposed stabling and maintenance facilities would include sewage, wastewater and general office waste from staff. Waste streams from light rail stops would include rubbish from commuters.

Wastewater generated from the washing of light rail vehicles and staff amenities at the proposed stabling and maintenance facilities would be treated and recycled for use at these facilities (where possible) or disposed of via the sewer under a trade waste licence (where required).

The management of wastes during the operation of the proposal is not considered to be a key issue provided that standard mitigating measures are implemented. These standard mitigation measures would be developed by the Operator as part of the operational environmental management plan (OEMP) for the proposed Randwick stabling facility and Rozelle maintenance depot. The OEMP would include a waste management plan, which would contain a sustainability target of diverting 85 per cent of waste from landfill.

#### Energy

The operation of the proposal would require electricity for LRVs, stops, stabling and maintenance facilities, lighting and the operation of signalling equipment. Sustainability initiatives that could be adopted to reduce the amount of energy that the CSELR proposal would consume during operations are documented in Table 7.6.

An Energy and Greenhouse Gas Strategy would be developed for the CSELR proposal. Underpinning this strategy would be the application of an energy hierarchy as follows:

- *avoid or reduce energy use* — for example, minimising the weight of rolling stock to reduce the energy required to operate vehicles
- *improve energy efficiency* — for example, using energy efficient lighting
- *source low carbon energy (on-site)* — for example, incorporating solar voltaic cells on large buildings at the, maintenance and stabling facilities
- *source low carbon energy (offsite)* — for example, purchasing renewable energy to offset construction and operational energy consumption.

Additionally, it is a sustainability objective of the CSELR proposal to seek to maximise opportunities for renewable energy production within the proposal footprint, and to offset 100 per cent of operational energy with renewable energy offsets.



## Resources

The operation of the proposal would require the use of resources such as electricity, water and fuel at the proposed Rozelle maintenance depot, Randwick stabling facility, light rail stops and at various locations along the CSELR during routine maintenance activities. Other resources required for maintenance and stabling activities (e.g. cleaning chemicals, oils, sand for traction sanding devices in LRVs and asphalt and concrete for track maintenance) would be determined during detailed design.

As outlined by the sustainability initiatives listed in Table 7.5, an integrated approach to water management for maintenance and stabling facilities would be undertaken to minimise the use of potable water for maintenance and train wash activities.

While the operation of the proposal would increase demand on local and regional resources, it is unlikely that the proposal alone would result in any resource becoming scarce or in short supply.

### 7.4.2 Construction

#### Waste

Waste generating activities during the construction of the proposal would include earthworks, tunnelling, demolition of existing structures and road pavements, vegetation clearing, wash-down and maintenance of equipment, and on-site office activities. The key waste streams generated during these activities would include:

- green waste from vegetation clearing (e.g. removal of street trees and stripping of grassed areas at Moore Park)
- concrete, asphalt, bricks, steel and other general construction waste from the demolition of existing buildings and structures (e.g. the Olivia Gardens apartment complex and road pavements)
- potential asbestos containing materials from the demolition of existing buildings at the proposed Randwick stabling facility site
- excess spoil from excavations where cut/fill balance may not be achieved
- rock fragments from excavation and tunnelling activities
- contaminated/unsuitable spoil material
- excess concrete and asphalt
- domestic waste from construction material packaging and site personnel including food scraps, glass and plastic bottles, paper and plastic containers
- site sewage and other wastewater run-off including water utilised for dust suppression
- liquid wastes such as oils and used chemicals from equipment maintenance.

Overall, the quantities of construction wastes generated by the CSELR proposal are expected to be typical of similar sized infrastructure projects and are therefore considered to be manageable. Measures are discussed below in section 7.4.3. Additionally, there are a number of practical options for reusing/recycling surplus materials, which would be implemented for the proposal.

It is a sustainability objective of the CSELR proposal to strive 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 strive to reuse 100 per cent of paving and other reusable materials or facilitate reuse of such materials.

#### Energy

The construction of the proposal would require the use of energy for a number of construction activities. Fuel would be used for machinery (such as cranes and excavators), vehicles (such as trucks and staff vehicles), equipment and generators (particularly for power supply for groundwater treatment plants at Moore Park and during any night works). Electricity would be required at the construction compounds and worksites. The potential impacts of energy use and greenhouse gas emissions during construction are discussed in section 10.9.

## Resources

The construction of the proposal would require the use of resources such as water, steel, concrete and paving materials (such as asphalt). Other resources required for tracks, signals and for the construction of the new light rail stops and stabling and maintenance facilities would be determined during detailed design.

While the construction of the proposal would increase demand on local and regional resources, it is unlikely that the proposal alone would result in any resource becoming scarce or in short supply.

### 7.4.3 Management and mitigation measures

#### Operation

Waste, energy and demand on resources during the operation of the proposal would be managed in accordance with CSELR Operator's environmental management system.

#### Construction

##### Waste

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

1. *Avoidance of waste:* Minimising the amount of waste generated during construction by avoiding unnecessary resource consumption (e.g. avoiding the use of inefficient plant and construction equipment and avoiding materials with excess embodied energy, waste and excessive packaging).
2. *Resource recovery:* Reusing, reprocessing and recycling waste products generated during construction to minimise the amount of waste requiring disposal.
3. *Disposal:* Where resources cannot be recovered, disposing of them appropriately to minimise the potential adverse environmental impacts.

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

Procurement of materials would be undertaken on an 'as needed' basis to reduce over-ordering and wastage, and exploring opportunities to reuse materials, where applicable.

The CSELR proposal would strive 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 strive to reuse 100 per cent of paving and other reusable materials or facilitate reuse of such materials.

##### Energy

Environmental management measures to reduce energy usage (and any associated greenhouse gas emissions) are discussed in section 10.9.4.

##### Resources

Environmental management measures to reduce usage (and any associated greenhouse gas emissions) are discussed in section 10.9.4.