CBD and South East Light Rail Project
State Significant Infrastructure Application

Supporting document

JUNE 2013

NSW GOVERNMENT | Transport for NSW

Document information

Client: Transport for NSW
Title: CBD and South East Light Rail
Subtitle: State Significant Infrastructure Application
Supporting Document
Document No: 2106549A-ENV-RPT-7217
Date: 21 June 2013

Rev	Date	Details
01	21/06/2013	Final

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Distribution

Transport for NSW, Parsons Brinckerhoff file

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Certified to ISO 9001, ISO 14001, AS/NZS 4801
A GRI Rating: Sustainability Report 2011

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Glossary and abbreviations

AAP	Area of archaeological potential
AHIMS	Aboriginal Heritage Information System
AZP	Archaeological Zoning Plan
BRT	Bus Rapid Transit
CBD	Central Business District
CCAS	City Centre Access Strategy
CCTV	Closed Circuit Television
CSELR	CBD and South East Light Rail (the proposal)
CSIRO	Commonwealth Scientific and Industrial Research Organisation
CoS	City of Sydney
DGRs	Director General's Requirements
DP&I	NSW Department of Planning & Infrastructure
DSEWPaC	Department of Sustainability, Environment, Water, Populations and Communities
EIS	Environmental Impact Statement
EP&A Act	NSW *Environmental Planning & Assessment Act 1979*
EPA	Environment Protection Authority
EPBC Act	Commonwealth *Environment Protection and Biodiversity Act 1999*
FM Act	*Fisheries Management Act 1994*
GPR	Ground Penetrating Radar
ISEPP	*State Environmental Planning Policy (Infrastructure) 2007*
LEP	*Local Environmental Plan*
LGA	Local Government Area
Master Plan	*The NSW Long Term Transport Master Plan* (December 2012)
MOU	Memorandum of understanding
MyZone	Sydney's integrated transport zoning system
NES	Matters of national environmental significance

OEH	NSW Office of Environment and Heritage
OHL	Overhead lines
Opal card	Sydney integrated electronic ticketing system, currently in trial
QVB	Queen Victoria Building
PCBs	polychlorinated biphenyls
PoEO	*Protection of the Environment Operations Act 1997*
PIDS	passenger information display systems
PPP	Private Public Partnership
RING	Rail Infrastructure Noise Guidelines 2013
RMS	NSW Roads and Maritime Services
Round Table	The Sydney Light Rail Round Table. A forum of executive representatives from key stakeholders.
SEPP	State environmental planning policy
SEPP 55	*State Environmental Planning Policy No. 55 – Remediation of Land*
SICEEP	Sydney International Convention, Exhibition and Entertainment Precinct
SRD SEPP	*State Environmental Planning Policy (State and Regional Development) 2011*
SREP SHC	*Sydney Regional Environmental Plan (Sydney Harbour Catchment) 2005*
SSI	State Significant Infrastructure
TSC Act	*Threatened Species Conservation Act 1995*

Executive summary

In December 2012, the NSW Government released two key strategic plans that set the framework for improving the central Sydney transport system – the *NSW Long Term Transport Master Plan* (2012a) and *Sydney's Light Rail Future* (2012b). These plans identify the need for, and a strategy to, ease transport congestion in the Sydney Central Business District (CBD) and improve public travel between key destinations in south-eastern Sydney and the CBD by:

- expanding the current light rail services in inner Sydney, from Circular Quay to Randwick and Kingsford (refer to Figure 1.1)
- creating a pedestrian zone along 40 per cent of George Street
- redesigning the Sydney CBD bus network to create an integrated public transport solution for the Sydney CBD through the coordination of light rail, heavy rail and bus services.

The CBD and South East Light Rail (CSELR) proposal addresses the first two of these strategies.

The proposal comprises construction and operation of a light rail service from Circular Quay to Kingsford and Randwick via Surry Hills, including approximately 20 light rail stops; major interchanges at ferry, rail and bus stations along the route; and pedestrianisation of approximately one kilometre of George Street from Bathurst Street to Hunter Street (refer to Figure 1.1 and an A3 version of the figure in Appendix A). The proposal is designed to:

- provide a transport system that is best able to satisfy long term customer demand
- improve travel times and reliability on public transport in the CBD
- improve public transport between key destinations in South East Sydney and the CBD, such as the University of NSW (UNSW), the Randwick hospital precinct, Royal Randwick Racecourse, NIDA, Centennial Park, Moore Park (including Sydney Cricket Ground, Sydney Football Stadium and the Entertainment Quarter), Central Station and the CBD
- reduce travel congestion in the CBD
- operate a high-capacity special event service between Moore Park and Central Station
- create opportunities to improve the amenity for workers, visitors and residents
- improve the efficiency and cost effectiveness of public transport
- provide urban renewal opportunities along the proposal route.

Transport for NSW, the proponent for the proposal, will deliver the planning and concept design phases of the proposal, and the early works. The detailed design, construction, maintenance and operation of the proposal will most likely be delivered through a Public Private Partnership (PPP).

A detailed strategy to ease CBD congestion is being developed as part of the NSW Government's City Centre Access Strategy (CCAS). The CSELR proposal is one component of the CCAS.

This report comprises a Supporting Document for Transport for NSW's State Significant Infrastructure Application for the proposal under Part 5.1 of the NSW *Environmental Planning & Assessment Act 1979* (EP&A Act). The report and the accompanying Application have been prepared to:

- provide relevant government agencies, other stakeholders and the community with an overview of the CSELR proposal, including a preliminary assessment of its likely impacts on the environment, and the proposed approach to the detailed environmental impact assessment required for the purposes of planning approval
- seek Director General's environmental assessment requirement's (DGRs) for the proposal under section 115Y of the EP&A Act.

Subsequent to release of this report, the DGRs will be prepared by the NSW Department of Planning and Infrastructure (DP&I) in consultation with other government agencies. These will confirm the required scope of the Environmental Impact Statement (EIS) for the proposal (refer to section 2 for further details of the planning approvals process for the proposal).

The report also provides a preliminary assessment of the potential environmental impacts of the proposal, including positive and negative impacts during construction and operation. This preliminary assessment has concluded that the CSELR proposal has the potential for significant impacts on the following key environmental issues:

- traffic, transport and access
- property and land use
- business and economic impacts
- social impacts
- noise and vibration
- built and non-Indigenous heritage
- urban design and visual impacts
- planted trees
- utilities and services
- cumulative impacts.

The report concludes that detailed environmental assessments are required for these issues as part of the EIS, including the development of management and mitigation strategies to minimise impacts. A number of other environmental impacts are also likely as a consequence of the proposal, and these will also require assessment as part of the EIS.

An indicative scope for the EIS has been outlined in section 6. It is expected that this Supporting Document will assist the Director-General of DP&I to formulate the environmental assessment requirements (DGRs) for the proposal.

1. Introduction

1.1 Background

In December 2012, the NSW Government released two key strategic plans that set the framework for improving the central Sydney transport system – the *NSW Long Term Transport Master Plan* (2012a) and *Sydney's Light Rail Future – Expanding public transport, revitalising our city* (2012b). The NSW Government (2013) also recently released the draft *Metropolitan Strategy for Sydney 2031* (the draft Strategy) that provides a comprehensive plan to manage the growth of Sydney up to 2031.

Together, these strategic planning documents identify a number of transport, economic and other challenges facing Sydney. These include catering for a growing city, the need to generate urban renewal and global competitiveness, and unlocking capacity on Sydney's transport network.

A key supporting document of the *NSW Long Term Transport Master Plan (2012a)* is the City Centre Access Strategy (CCAS). The CCAS will outline a suite of initiatives to improve the way the CBD transport system operates. The CCAS is further discussed in section 3.1.2. The proposal comprises two of these initiatives – expansion of light rail services (refer to section 3.1.2) and the pedestrianisation of George Street.

The *NSW Long Term Transport Master Plan* and *Sydney's Light Rail Future* documents also identify the need for, and a strategy to, ease transport congestion in the Sydney Central Business District (CBD) and improve public travel between key destinations in south-eastern Sydney and the CBD by:

- expanding the current light rail services in inner Sydney, from Circular Quay to Randwick and Kingsford (refer to Figure 1.1 and Appendix A)
- redesigning the Sydney CBD bus network to create an integrated public transport solution for the Sydney CBD through the coordination of light rail, rail and bus services
- creating a pedestrian zone along 40 per cent of George Street.

Sydney's Light Rail Future proposes the following four stages for development of an effective light rail system in Sydney:

1. *Service integration and improvements*: The first part of this stage has been completed through integration of Sydney's existing light rail system into the existing MyZone ticketing system. The second part is the introduction of the Opal electronic ticketing system.

2. *Modernise and extend the existing network:* This includes construction of the Inner West Light Rail Extension (under construction and due to be completed in 2014), introduction of a modern light rail fleet and real-time information and timetable updates.

3. *Deliver a new CBD and south east service:* This includes delivery of a new light rail service connecting Circular Quay, the CBD and Sydney's south-east, including Moore Park, the Randwick hospital precinct and the University of NSW; and pedestrianisation of approximately 40 per cent of George Street in the Sydney CBD.

4. *Longer-term investigations*: This includes feasibility investigations for light rail or other high capacity public transport along additional corridors, including Victoria Road, Parramatta Road, Anzac Parade to Maroubra and potentially Western Sydney. Future investigations are also proposed for potential extensions to locations such as Malabar, Walsh Bay and Barangaroo North.

The CBD and South East Light Rail project ('the CSELR proposal' or 'the proposal') that is the subject of this report comprises Stage 3 of the steps outlined above. The CSELR proposal is further described in sections 1.3 and 4.

Figure 1.1 identifies the existing light rail in Sydney, the Inner West Light Rail Extension (which is currently under construction), and the proposed route of the CSELR.

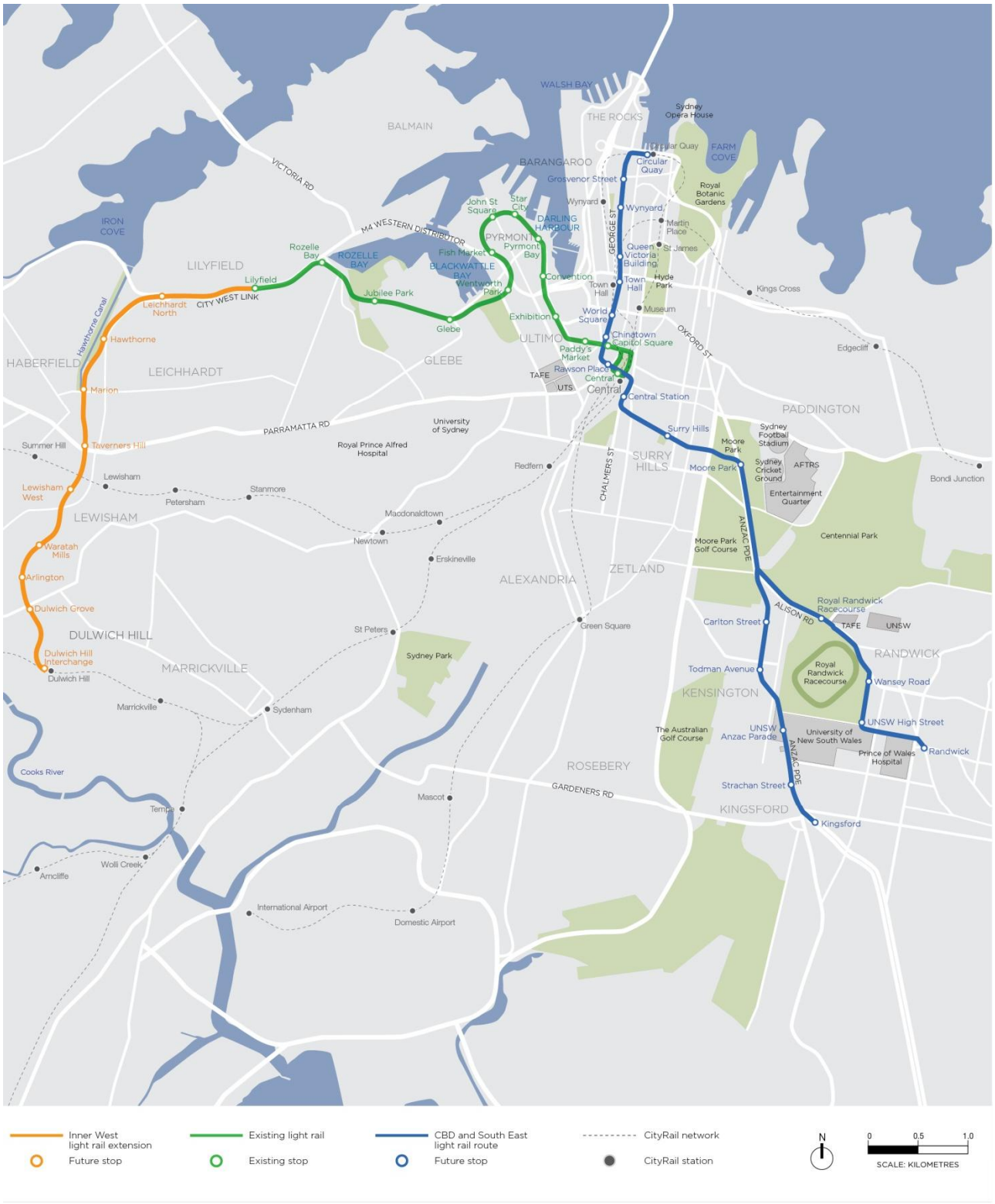

Figure 1.1 Existing and proposed light rail in Sydney (CSELR shown in blue)

1.2 Overview of the CSELR proposal

The CSELR proposal comprises construction and operation of a light rail service from Circular Quay to Kingsford and Randwick via Surry Hills (refer to Figure 1.1 and an A3 version of the figure in Appendix A). The proposal is designed to:

- provide a transport system that is best able to satisfy long term customer demand
- improve travel times and reliability on public transport in the CBD
- improve public transport between key destinations in South East Sydney and the CBD, such as the University of NSW (UNSW), the Randwick hospital precinct, Royal Randwick Racecourse, NIDA, Centennial Park, Sydney Boys and Girls High Schools, Moore Park (including Sydney Cricket Ground, Sydney Football Stadium and the Entertainment Quarter), Central Station and the CBD
- reduce congestion in the CBD
- operate a high capacity special event service between Moore Park and Central Station
- create opportunities to improve the amenity for workers, visitors and residents
- improve the efficiency and cost effectiveness of public transport
- provide urban renewal opportunities along the proposal route.

1.2.1 Key features

The route of the CSELR proposal is illustrated in Figure 1.1 and Appendix A. The key features of the proposal include:

- approximately 13 kilometres of new light rail track from Circular Quay to Central and Kingsford and Randwick via Surry Hills and Moore Park (including track at required depot and stabling facilities)
- 'Turn up and go' services every two to three minutes during peak periods within the CBD
- a pedestrianised zone on George Street between Hunter and Bathurst Streets
- approximately 20 light rail stops along the route
- facilities in Randwick and at Rozelle for light rail vehicle stabling and/or maintenance (including washdown)
- interchange with heavy rail, bus and ferry services at Circular Quay, Wynyard, Town Hall and Central stations
- integration with the existing light rail system
- bus interchanges at the Rawson Place, Central Station, Queen Victoria Building, Town Hall, Kingsford and Randwick stops
- special event services between Moore Park and Central Station
- a fleet of approximately 25 electric-powered light rail vehicles, approximately 45 metres long, featuring air conditioning and accessible low-floor design
- a highly reliable service with the capability to carry up to 9,000 passengers per hour in each direction
- capacity for approximately 100 seated and 200 standing passengers in each light rail vehicle
- public domain improvements including concepts for paving, street trees, lighting and furniture.

1.2.2 The proponent

As the proponent for the proposal, Transport for NSW will deliver the planning and concept design phases of the proposal, and the early works.

The detailed design, construction, maintenance and operation of the proposal will most likely be delivered through a Public Private Partnership (PPP).

1.2.3 CSELR partners and key stakeholders

Several key partners and stakeholders have been identified for this proposal. Consultation has already commenced with these CSELR partners and stakeholders, and Memoranda of Understanding (MoUs) are being developed to ensure all issues are considered throughout the planning approval, construction and operation phases of the proposal. The key CSELR partners and/or stakeholders are:

- Randwick City Council
- City of Sydney Council
- Australian Turf Club
- University of NSW
- Centennial Park and Moore Park Trust.

In addition, consultation has commenced with other key stakeholders along the route including up to 30 utility providers along the route. Further discussion on the consultation activities and key stakeholders is provided in section 7 of this report.

1.3 Purpose and structure of this report

This report comprises a Supporting Document for Transport for NSW's State Significant Infrastructure Application for the proposal under Part 5.1 of the NSW *Environmental Planning & Assessment Act 1979* (EP&A Act). The report and the accompanying Application have been prepared to:

- provide relevant government agencies, other stakeholders and the community with an overview of the CSELR proposal, including a preliminary high level assessment of its likely impacts on the environment, and the proposed approach to the detailed environmental impact assessment required for the purposes of planning approval
- seek Director General's environmental assessment requirement's (DGRs) for the proposal under section 115Y of the EP&A Act.

Subsequent to release of this report, the DGRs will be prepared by the NSW Department of Planning and Infrastructure (DP&I) in consultation with other government agencies. These will confirm the required scope of the Environmental Impact Statement (EIS) for the proposal (refer to section 2 for further details of the planning approvals process for the proposal).

The structure and content of this report is as follows:

- *Section 1 – Introduction*: Outlines the key elements of the proposal, and the purpose of this report.
- *Section 2 – Planning and assessment process*: Provides an outline of the statutory approvals framework for the proposal, including applicable legislation and planning policies.
- *Section 3 – Need and alternatives:* Provides an outline of why the proposal is required, and the alternatives considered.

- *Section 4 – Proposal description*: Provides an outline of the proposal.
- *Section 5 – Preliminary assessment of environmental impacts:* Provides a preliminary assessment of the potential impacts of the proposal on the environment.
- *Section 6 – Proposed scope of the EIS*: Outlines the proposed scope of the EIS for each of the identified key and other environmental issues.
- *Section 7 – Consultation:* Outlines the consultation which has been undertaken to date and what is proposed during the preparation of the EIS.
- *Section 8 – Conclusion:* Outlines the key conclusions of this report.

2. Planning and assessment process

2.1 Environmental Planning and Assessment Act 1979

2.1.1 Part 5.1

Part 5.1 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) establishes an assessment and approval regime for 'State Significant Infrastructure' (SSI). Part 5.1 applies to development that is declared to be SSI by a State environmental planning policy (SEPP).

Under section 115U(3) of the EP&A Act, the following development that is declared SSI may be carried out without development consent under Part 4; however, the approval of the Minister for Planning and Infrastructure is required prior to proceeding to construction:

a) infrastructure

b) other development that (for this Part and within the meaning of Part 5) would be an activity for which the proponent is also the determining authority and would, in the opinion of the proponent require an environmental impact statement to be obtained under Part 5.

As explained further in section 2.1.3, the CSELR proposal is declared to be SSI, under *State Environmental Planning Policy (State and Regional Development) 2011* (the SRD SEPP).

2.1.2 Planning approvals process

Under Part 5.1 of the EP&A Act, the planning and approvals process includes the following key steps, as identified in Figure 2.1:

1. Submission of an SSI Application with the accompanying Supporting document (this document) to the Director General of DP&I under section 115X of the EP&A Act, to seek DGRs for the proposal (section 115Y).

2. Preparation and submission of an EIS under section 115Y(2), addressing the matters outlined in the DGRs.

3. Public exhibition of the EIS for a minimum of 30 days.

4. Assessment of the application by the DP&I and preparation of the Director-General's environmental assessment report (section 115ZA).

Figure 2.1 Approval process under Part 5.1 of the EP&A Act

2.1.3 State environmental planning instruments

State Environmental Planning Policy (State and Regional Development) 2011

State Environmental Planning Policy (State and Regional Development) 2011 (the SRD SEPP) identifies development that is SSI.

The CSELR proposal was declared by the Minister for Planning and Infrastructure as a critical SSI project on 20 May 2013, and is listed under Schedule 4 and 5 of the SRD SEPP.

State Environmental Planning Policy No. 55 – Remediation of Land

State Environmental Planning Policy No. 55 – Remediation of Land (SEPP 55) was enacted to provide a State-wide approach to the remediation of contaminated land for the purpose of minimising the risk of harm to the health of humans and the environment. In accordance with clause 7(1) of SEPP 55, a consent authority must not consent to the carrying out of any development on land unless:

a) 'It has considered whether the land is contaminated.'

b) 'If the land is contaminated, it is satisfied that the land is suitable in its contaminated state (or would be suitable, after remediation) for the purpose for which the development is proposed to be carried out.'

c) 'If the land requires remediation to be made suitable for the purpose for which the development is proposed to be carried out, it is satisfied that the land would be remediated before the land is used for that purpose.'

A Phase 1 contamination investigation is currently being undertaken for the CSELR to inform the design and EIS process. A Phase 2 investigation will also be undertaken as part of the EIS, to further assess the potential for contamination along the route.

Sydney Regional Environmental Plan (Sydney Harbour Catchment) 2005

The *Sydney Regional Environmental Plan (Sydney Harbour Catchment) 2005* (the SREP SHC, now referred to as a deemed SEPP) covers all the waterways of Sydney Harbour, the foreshores and its wider catchment. The plan aims to protect, enhance and maintain the catchment, foreshores, waterways and islands of Sydney Harbour. The plan also aims to establish a balance between promoting a prosperous working harbour, maintaining a healthy and sustainable waterway environment and promoting recreational access to the foreshore and waterways.

The Circular Quay section of the CSELR proposal may impact the boundary of the SREP SHC and the Sydney Opera House buffer zone, depending on the final design; however, it is unlikely to impact on any of the Strategic Foreshore Sites identified within the SREP SHC. The EIS for the CSELR proposal will consider the potential impacts of the proposal on the Sydney Harbour Catchment.

2.1.4 Local environmental planning instruments

The CSELR proposal is located on land which is subject to the *Sydney Local Environmental Plan 2012* and *Randwick Local Environmental Plan 2013.* Relevant provisions of both these planning instruments would be considered during the preparation of the EIS. However, as the CSELR proposal is to be assessed under Part 5.1 of the EP&A Act, the permissibility and consent provisions of these plans do not apply.

2.2 Other applicable legislation

2.2.1 Transport Administration Act 1998

Section 104N(2) of the *Transport Administration Act 1998* (TA Act) allows for the Minister for Transport to declare the route of a light rail system. Declaration of the CSELR as a light rail system would allow for various exemptions from various approvals, duties, rates and taxes, pursuant to Division 2A, part 9 of the TA Act.

The CSELR proposal is likely to be declared a light rail system pursuant to section 104N of the TA Act, following geotechnical investigations and prior to the commencement of construction.

2.2.2 Protection of the Environment Operations Act 1997

The *Protection of the Environment Operations Act 1997* (PoEO Act) establishes amongst other things, the procedures for issuing licences for environmental protection for specific activities relating to air, water and noise pollution, and waste management.

Under Schedule 1 of the PoEO Act, scheduled activities requiring a licence include railway system activities for a network of more than 30 kilometres of track. The CSELR includes the construction and operation of a 13-kilometre of light rail track within a future 27 kilometre light rail network and, therefore, would not require an Environmental Protection Licence under the PoEO Act.

2.2.3 City of Sydney Amendment (Central Sydney Traffic and Transport Committee) Act 2012

The *City of Sydney Act 1988* was amended in 2012 to establish the Central Sydney Traffic and Transport Committee (CSTTC) to provide effective coordination of transport and traffic management within Sydney's CBD. The CSTTC consists of seven representatives including the Director-General of the Department of Transport, three representatives from the City of Sydney Council and three representatives from the State Government.

The CSTTC is required to consider the potential impact of traffic and development of Sydney and the State and the efficient functioning of businesses, the maintenance of access for freight, the efficiency and traffic safety of the public transport network and the needs of commuters, residents, pedestrians and visitors to the CBD.

Details of the CSELR proposal will need to be forwarded to the CSTTC at least 28 days before commencement of any works within the CBD.

2.2.4 Roads Act 1993

Section 138 of the *Roads Act 1993* (the Roads Act) requires consent from the relevant roads authority for the erection of a structure, or the carrying out of work in, on or over a public road, or the digging up or disturbance of the surface of a road. The CSELR proposal would require work full and partial road closures, for the construction and operation of the proposal.

However, under clause 5(1) in Schedule 2 of the Roads Act, public authorities do not require consent for works on unclassified roads. Therefore, the proposal only requires consent from the relevant roads authority for works impacting classified roads such as Anzac Parade, Alison Road, South Dowling Street and the Eastern Distributor.

In addition to the above requirements, section 144C of the Roads Act also requires consent or approval from RMS for works relating to a light rail system prior to the undertaking of any works.

2.3 Commonwealth legislation

2.3.1 Environment Protection and Biodiversity Conservation Act 1999

Under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) a referral is required to the Commonwealth Minister for Sustainability, Environment, Water, Population and Communities for projects that have the potential to significantly impact on matters of national environmental significance or the environment of any Commonwealth land.

Environmental approvals under the EPBC Act may be required for an 'action' that has, will have or is likely to have a significant impact on:

- matters of national environmental significance (NES)
- the environment on Commonwealth land (whether or not the action is occurring on Commonwealth land).

Approval for such an action may be required from the Commonwealth Minister for Sustainability, Environment, Water, Population and Communities.

An 'action' is considered to include a project, development, undertaking, activity or series of activities. Matters of NES matters include:

- world heritage areas
- national heritage places
- Ramsar wetlands of international importance
- nationally listed threatened species and ecological communities
- listed migratory species
- Commonwealth marine areas
- the Great Barrier Reef Marine Park
- nuclear actions.

The Sydney Opera House is a declared World Heritage property. The CSELR route near Circular Quay at Alfred Street is located within the buffer zone of the Sydney Opera House; however, the proposal is not expected to impact on this buffer zone. It is anticipated that no referral to the Department of Sustainability, Environment, Water, Populations and Community (DSEWPaC) would be required. Any matter of NES, including construction on Commonwealth land will be further considered during the preparation of the EIS, to determine if an EPBC Act referral would be required.

2.3.2 Disability Discrimination Act 1992

The Commonwealth *Disability Discrimination Act 1992* (DDA) aims to eliminate as far as possible, discrimination against persons on the ground of disability in areas including access to premises and the provision of facilities, services and land. The CSELR proposal will be designed to be independently accessible and DDA compliant where topography permits.

2.4 Other legislation not applicable to SSI projects

Section 115ZG of the EP&A Act specifies that the following approvals are not required for projects to be considered under Part 5.1:

- concurrence under Part 3 of the *Coastal Protection Act 1979* of the Minister administering that Part of the Act
- a permit under section 201, 205 or 219 of the *Fisheries Management Act 1994*
- an approval under Park 4, or excavation permit under section 139, of the *Heritage Act 1977*
- an Aboriginal heritage impact permit under section 90 of the *National Parks and Wildlife Act 1974*
- an authorisation referred to in section 12 of the *Native Vegetation Act 2003* to clear native vegetation or State protected land
- a bushfire safety authority under section 100B of the *Rural Fires Act 1997*
- a water use approval under section 89, a water management work approval under section 90, or activity approval (other than an aquifer interference approval) under section 91 of the *Water Management Act 2000.*

While these approvals would not be required, consultation would be undertaken with the relevant agencies that administer these Acts.

3. Need and alternatives

3.1 Strategic context

3.1.1 NSW Long Term Transport Master Plan

In December 2012, the NSW Government released the *NSW Long Term Transport Master Plan* (the Master Plan), which is a 20 year plan to improve the NSW transport system (NSW Government 2012a). It provides the basis upon which further detailed transport planning, including the CSELR proposal, can be undertaken.

The Master Plan has considered the future population growth and employment precincts within the State, including Sydney.

The Master Plan outlines the capabilities and limitations of different transport modes, including bus, heavy rail, light rail and private vehicles to provide clear direction for future transport investigations.

In the current morning peak one hour, between 8.00 am and 9.00 am, buses bring 41,000 people into the city, while 19,500 other vehicles bring in a further 24,000 people. Over the next 20 years, trips into the Sydney CBD are set to grow by 31 per cent – an additional 56,500 trips, the equivalent of 942 standard buses. Putting more vehicles onto the roads to manage these trips will worsen congestion. An integrated public transport solution is needed to ease congestion in the CBD.

The Master Plan includes five steps to curtail CBD congestion, which in summary comprise:

1. Diverting 60 buses onto the Cahill Expressway.

2. Redesigning the bus network to be simpler, faster and better, removing 220 buses from the CBD in the peak hour.

3. Light rail in the CBD and South East to move up to 9,000 passengers per hour.

4. North West Rail Link to provide faster, single deck trains every five minutes and remove 160 buses from the CBD.

5. Second harbour rail crossing with capacity to carry up to 100,000 more people an hour.

The CSELR proposal will achieve the third step in this list.

The Master Plan includes 220 actions that focus on providing an integrated transport system in NSW over the next 20 years. Accompanying the Master Plan are seven modal delivery plans (refer Figure 3.1), which include light rail in the form of the *Sydney's Light Rail Future* document, which was discussed further in Section 1.1.

The CSELR proposal is a key action in the NSW Long Term Master Plan as it will introduce light rail into the high demand corridor from Circular Quay to Kingsford and Randwick and create a pedestrian zone along a section of George Street between Bathurst and Hunter streets.

3.1.2 City Centre Access Strategy

The City Centre Access Strategy (CCAS) is currently being developed in response to the NSW Long Term Transport Master Plan commitments that relate to improving access within and to Sydney's city centre (refer to Figure 3.1). This strategy will include a number of separate components across different modes (bus, heavy rail, light rail, ferry and cycling) that as a whole aim to unlock additional capacity within the Sydney CBD. The CSELR proposal represents two components of the CCAS – light rail and the pedestrianisation of a section of George Street. Other components of the CCAS are anticipated to be implemented over a number of years. One component of the CCAS of particular relevance to the CSELR is the city centre bus network redesign. These bus changes are being prepared in parallel with development of the CSELR proposal and will undergo a separate process of public consultation.

Figure 3.2 describes the scope of the bus changes (*Sydney's Bus Future*) and CSELR proposal. Any changes to bus services and infrastructure in the CBD and South East, as well as traffic management changes and other impacts associated with these changes, will be assessed as part of the CCAS. These will not, therefore, form part of the EIS for the CSELR proposal, with the exception of cumulative impact considerations.

These two initiatives are complementary and together comprise an integrated strategy to address the needs identified in Section 3.2.

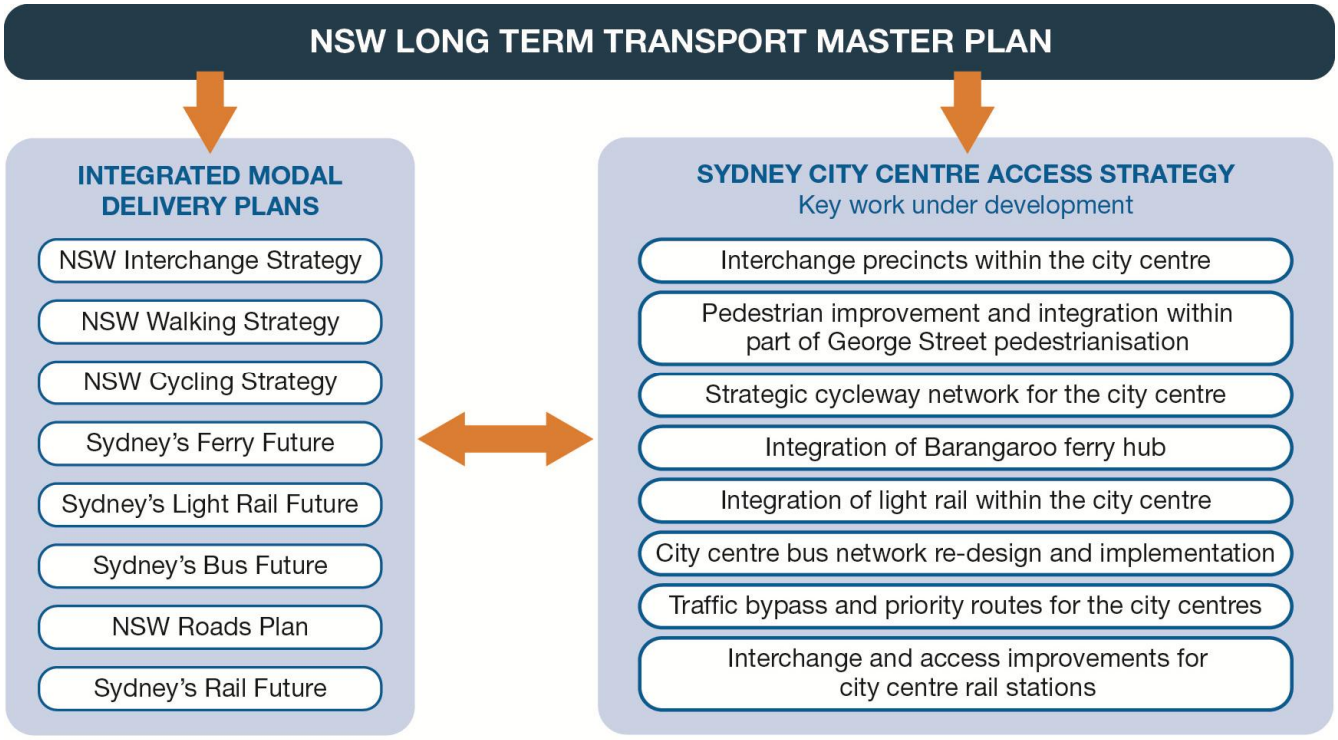

Figure 3.1 NSW Long Term Transport Master Plan and the City Centre Access Strategy

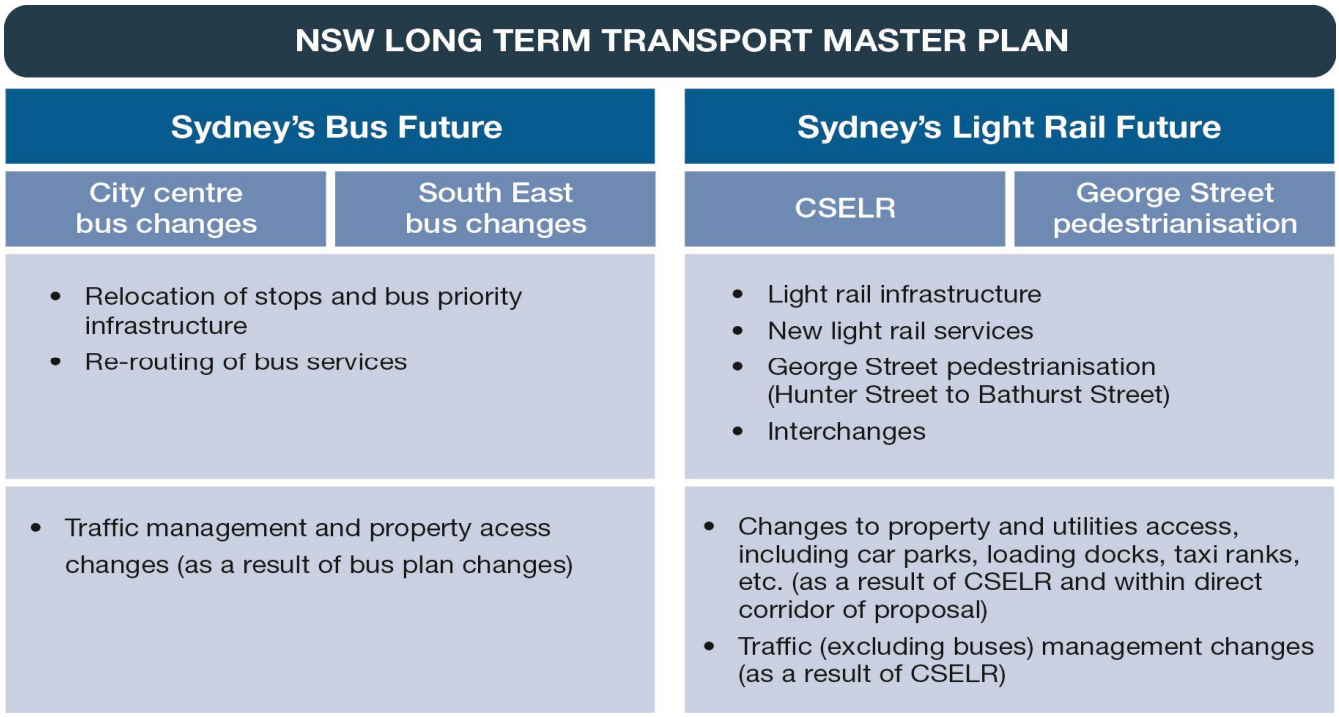

Figure 3.2 Proposed scope of CBD and South East traffic changes

3.1.3 Draft Metropolitan Strategy for Sydney to 2031

The draft *Metropolitan Strategy for Sydney 2031* (the draft Strategy) provides a comprehensive plan to manage the growth of Sydney. Sydney's population is expected to grow by 1.3 million by 2031 with an additional 625,000 jobs created. Within the draft Strategy, nine 'city shapers' will play an important role in shaping future growth across greater Sydney. Those which are relevant to the CSELR proposal include:

- *Global Sydney* – The area encompassed by Sydney's CBD and North Sydney is predicted to have an increase of more than 114,000 new jobs. Transport connections with other areas of Sydney will be improved.
- *Global Economic Corridor* – This extends from Port Botany and Sydney Airport through to the CBD, North Sydney, St Leonards, Chatswood and Macquarie Park. It is estimated that approximately 213,000 additional jobs will be provided in this area by 2031.
- *Anzac Parade Corridor* – This connects UNSW and the Randwick hospital precinct to Malabar and La Perouse. Additional houses and jobs will be focused around centres along Anzac Parade, including the Randwick Urban Activation precinct. Additional opportunities to improve transport in these areas, including extending the light rail corridor, will be considered.

The draft Strategy supports the delivery of key projects and actions identified in the NSW Long Term Transport Master Plan, including light rail and the CSELR proposal, through improving transport access to and within the Sydney CBD and along Anzac Parade.

3.1.4 NSW 2021

NSW 2021: A plan to make NSW number one, is a 10 year plan by the NSW Government to rebuild the economy, return quality services, renovate infrastructure, restore accountability to government, and strengthen the local environment and communities. It replaces the State Plan as the NSW Government's strategic business plan.

This plan sets immediate priorities for action and guides NSW Government resource allocation in conjunction with the NSW Budget.

Of relevance to the CSELR proposal, Goal 9 of the plan is to 'Improve customer experience with public transport services' and Goal 8 is to 'Grow patronage on public transport by making it a more attractive choice'.

The CSELR proposal would assist with achieving these goals by providing a high quality public transport service between Sydney's CBD and South East that will ensure a positive, whole of journey experience including real-time access to information, streamlined interchanges, comfortable and timely travel, well designed stops, comfortable vehicles and clear signage. This focus on customer experience should assist in making the CSELR proposal an attractive public transport choice.

3.2 Need for the CSELR

Growth in travel demand within the Sydney CBD and South East has led to increased transport congestion and a reduction in the quality of service to customers. The city has almost reached peak congestion – there is no room for additional buses. Due to this congestion, it can take up to 30 minutes for a bus to travel from Circular Quay to Central – a distance of 2.5 kilometres.

George Street in particular carries up to 290 buses during the AM peak (7am – 9am) and this is expected to increase to over 350 by 2015. The congested bus network combined with the demands of other road users impacts on customer service and delays essential business functions.

Congestion within Sydney's CBD is estimated to cost the city's economy approximately $5.1 billion per year which is higher than anywhere else in Australia (BTRE 2007). The cost of this is longer travel times, which make working days longer and means less time for family and recreational activities. Congestion also leads to higher transport costs, which can drive up the price of goods and services and affect the competitiveness of businesses. The existing transport network within the CBD has limited capacity to support the growth of employment, residential and other economic and cultural activities. Over the next 20 years, trips into the CBD are estimated to grow by 31 per cent. By 2020, the costs of congestion are expected to rise to $8.8 billion per year as Sydney's population grows and as travel increases (Transport for NSW 2012a).

Congestion on the road network also substantially affects the amenity of the CBD. This impact is especially evident along the George Street corridor due to noise, air quality and congestion impacts, which together result in a relatively poor travel experience for pedestrians and private/public transport users. Pedestrians are estimated to make approximately one million journeys in the CBD each day, with the result that pedestrian safety and travel congestion are significant issues in the CBD (NSW Government 2012b).

Outside the CBD, major travel generators in the south-east of the CBD such as the Moore Park sporting precinct, Royal Randwick Racecourse, UNSW and the medical precinct of Randwick are serviced by buses. These buses often operate at capacity and only 19–34 per cent of services arrive in the CBD within two minutes of the scheduled time (NSW Government 2012a).

The CSELR proposal will help to address these deficiencies in Sydney's transport network by:

- providing a high capacity transport system that will improve transport congestion by reducing the need for many bus services
- providing a frequent, reliable and comfortable travel option through the city and the south-eastern suburbs
- improving amenity, pedestrian safety and travel congestion within the CBD.

As described in section 3.1.2, the CSELR proposal is closely linked to the CCAS, which will assist with addressing the need to implement bus and other transport improvements in the Sydney CBD in tandem with the CSELR.

3.3 Key benefits

The introduction of light rail will fundamentally change the way transport services are delivered and used in Inner Sydney. Construction of a new high-capacity, frequent and reliable mode of transport presents a rare opportunity to reorganise the surrounding road and public transport system to unlock additional capacity and provide a better experience to customers who rely solely on the system every day. Historically, Sydney has relied on a radial public transport system where each 'spoke' entered the City Centre independently. With light rail as a 'trunk' line, the surrounding surface public transport system can be reorganised to provide significant customer benefits and improve the efficiency of the network as a whole.

The benefits of the CSELR are summarised in Figure 3.3.

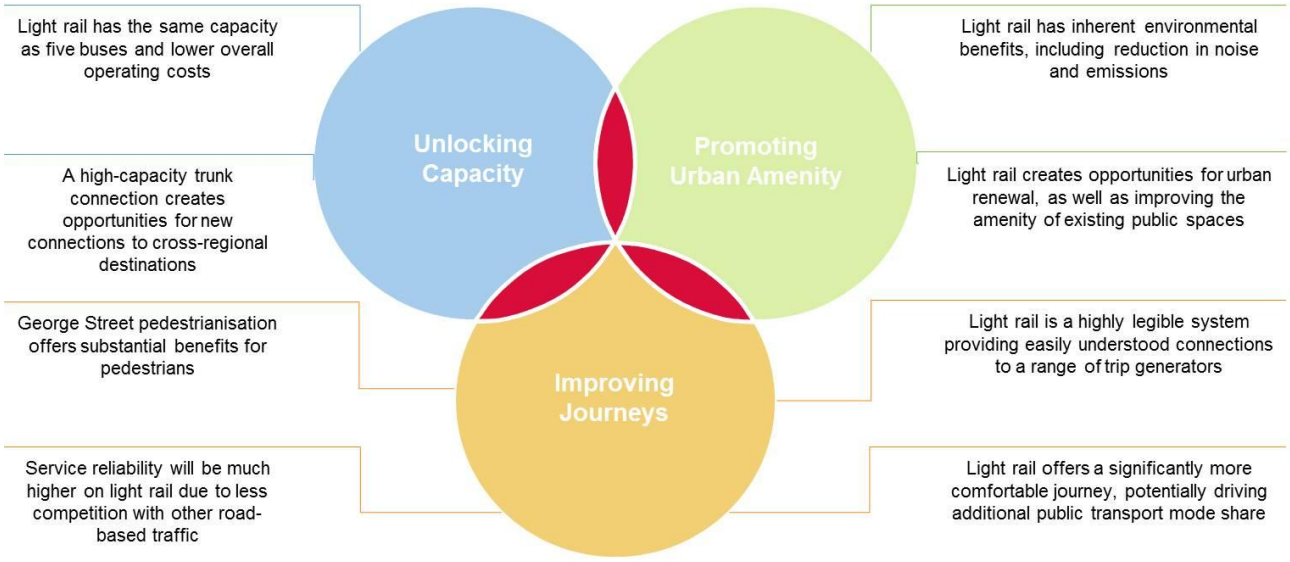

Figure 3.3 Potential benefits from introduction of the CSELR

The CSELR proposal would provide a simple, user-friendly mode of transport between, and to, key attractions in the city – from the Rocks and Circular Quay to the city's retail heart and on to Chinatown. New high-frequency light rail services would also benefit commuters travelling from the south-eastern suburbs of Sydney to the CBD for work, shopping and entertainment; students travelling to UNSW; and customers and staff, patients and visitors travelling to the Randwick hospital precinct.

The proposal would also make it more convenient for commuters to change between transport modes in the CBD, to take short trips within the city for business or recreation and to travel to major event precincts at Moore Park and Royal Randwick Racecourse.

The key benefits of the CSELR proposal are:

- *Unlock capacity in the CBD* – It is estimated that, combined with a redesign of the bus network as part of the CCAS, approximately 220 fewer buses per hour would be required in the CBD during the morning peak.
- *Faster, more reliable and more comfortable public transport* –
  - The proposed light rail vehicles could carry up to 9,000 people per hour in each direction and provide a comfortable experience for commuters, including quiet, air-conditioned vehicles.

- A 'turn up and go' reliable service would be provided every two to three minutes in peak times, with travel times comparable to current bus travel times, but with a much higher service reliability. An estimated 97 per cent of light rail services would arrive in the CBD within two minutes of their schedule, which compares to 19 to 34 per cent for buses.
- Integration with the Opal ticketing system and the existing light rail, along with modern, accessible stops with real-time service information.

- *Urban renewal and improved amenity* – The proposal includes a one kilometre pedestrian zone along George Street from Bathurst Street to Hunter Street and would provide various opportunities for servicing urban renewal along the route. The proposal would also be accompanied by public domain improvements, including revitalised public spaces.

3.4 Options considered

Full details of the options development and assessment process for the CSELR proposal will be included in the EIS. This section presents only a high level description of the options considered.

The CSELR proposal was developed following a detailed options evaluation process that commenced in December 2011, with identification of the strategic need for the proposal and its strategic objectives, which form the basis of the Sydney light rail program objectives defined in section 1.2.

A 'no build' option was also considered as part of this process. This no build option essentially comprises continued development of the existing bus system. This option was dismissed as not feasible, as there is insufficient capacity in the CBD for continued growth of the existing bus transport system. Furthermore, buses are a major cause of transport congestion in the CBD, so bus improvements on their own would not address the existing and projected significant transport congestion impacts within the Sydney CBD. Sydney's congestion is currently restraining economic development and causing significant amenity impacts (refer to section 3.2), which would continue if the no build option was selected.

3.4.1 Initial priority corridor options

As detailed in *Sydney's Light Rail Future* (NSW Government 2012b), three priority transport corridors were initially considered due to their identified significant patronage demand and trip generation potential:

- *The CBD corridor* – which experiences high transport demand and has limited capacity to accommodate additional buses to meet future growth.
- *The UNSW corridor* – which serves several major key activity hubs, including sporting precincts at Sydney Football Stadium, Sydney Cricket Ground, Royal Randwick Racecourse; recreation and entertainment facilities including Fox Studios and the Hordern Pavilion at Centennial Parklands; Randwick Education and Health Specialised Centre including the UNSW and Randwick Precinct Hospitals; high density centres in Surry Hills, Randwick and Kensington; as well as growing residential populations in Kingsford and Kensington. Major events at Moore Park and Royal Randwick Racecourse, together with the UNSW campus, generate significant travel demand in this corridor during peak and off-peak times. This corridor currently relies on buses for public transport.
- *The University of Sydney corridor* – which also includes several major destinations such as the University of Technology Sydney, the TAFE NSW Sydney Institute, the Central Park urban renewal site as well as the University of Sydney and Royal Prince Alfred Hospital. It serves high density residential and retail areas in Ultimo, Chippendale and Camperdown.

The feasibility of light rail within these priority corridors was investigated in detail, including consideration of a bus rapid transit option for the CBD to UNSW corridors. A shortlist of 11 initial route options was selected within these corridors and investigated in consultation with a Round Table of key stakeholders, including councils, universities, business groups, TAFE, hospitals, major sporting and entertainment precincts and other key groups. The 11 route options were developed and analysed taking into account substantial work previously carried out. For each option, the following factors were considered:

- ability to meet key project objectives
- costs and benefits
- anticipated demand.

Key findings of this initial options evaluation are summarised as follows.

CBD corridor light rail options

Investigations determined that alternative routes to George Street, such as Pitt Street, Castlereagh Street and Sussex Street, were not feasible to accommodate light rail as a result of their narrow widths and multiple vehicle access points. Other issues included steep grades at the northern end of Castlereagh Street and Sussex Street, the need to maintain access to the Western Distributor and high pedestrian numbers in Pitt Street Mall, which is narrower than George Street and therefore less able to accommodate both pedestrians and light rail.

A light rail link to Barangaroo via the Rocks and Walsh Bay was also considered. However, even with significant future development at Barangaroo, passenger numbers were forecast to be very low. This is because Wynyard Walk would provide a more direct link to other bus and rail services than any light rail service along this route. The area will also be serviced by a new ferry hub at Barangaroo.

UNSW corridor light rail options

The following alternative route options were considered in this corridor:

- *Via Green Square* – City of Sydney investigations indicated light rail could play a role in connecting Green Square with the Sydney CBD. Light rail options to serve Green Square via the UNSW were initially considered as part of the long list of route options. However, a light rail extension to Green Square could not efficiently service the UNSW, as travel time would be slower than taking an existing bus service. On this basis, a light rail link to Green Square was not further assessed. However, it has not been ruled out as a potential longer term option.
- *Via Darlinghurst* – A number of routes to Taylor Square were investigated via either Oxford Street or Campbell Street – connecting UNSW to Town Hall Station. Investigations showed a direct link from Central Station via Surry Hills was required to efficiently serve trips to UNSW and the Randwick hospital precinct. This meant, overall, commuter numbers on the Darlinghurst routes were 1/3 less patronage (per hour AM peak) of expected commuters on the Surry Hills routes. However, this does not prevent future long-term investigation of light rail or bus improvements along Oxford Street to Bondi Junction.
- *Via Randwick* – Four alternatives were investigated in the Randwick and UNSW area. A route via Alison Road and Belmore Road was discounted, as it did not serve the key student market at UNSW. Closer to the University, routes via Alison Road/Wansey Road, Anzac Parade and High Street were investigated. A route via High Street would require significant engineering works and road widening to enable light rail to operate on this steep street – significantly increasing the cost. The option selected was a combination of the Alison Road/Wansey Road and Anzac Parade routes – offering a light rail service to two catchments. This will service all key sites in the area, such as the Racecourse, University, the hospital precinct, Randwick town centre and Kingsford.

University of Sydney corridor light rail options

The following three route options within the University of Sydney corridor were assessed, all of which connected to the CBD via Railway Square:

- Parramatta Road and Missenden Road
- City Road and Carillon Avenue
- Regent Street, Cleveland Street and Carillion Avenue.

The Cleveland Street option was eliminated early in the investigation, as it is a key east-west traffic link. The Parramatta Road and City Road options performed similarly – each experiencing low demand and conflicting with heavy traffic flows. As the University of Sydney corridor extends only a short distance into the inner west there would be limited opportunities to terminate bus services at the University of Sydney campus. As a result, light rail services on this corridor would:

- directly compete with bus services between the University of Sydney and Central Station in both directions
- offer a similar travel time to buses
- attract low numbers of commuters, as demand would be shared between buses and light rail.

The University of Sydney corridor uses two of Sydney's busiest arterial roads: Parramatta Road and City Road (Princes Highway). In the short term, there would be limited opportunities to divert traffic to other routes. In the longer term, WestConnex may allow road space to be reallocated to public transport.

Considering the above and the anticipated significant patronage within the UNSW corridor, the University of Sydney corridor does not form part of the CSELR proposal.

Consideration of a bus rapid transit alternative

Bus rapid transit alternatives were considered for the following routes:

- at surface along the CBD and UNSW corridor (from Circular Quay)
- in tunnel between the Sydney Harbour Bridge and Town Hall

For the at surface bus rapid transit option, it was assumed the bus alternative would serve the same corridor and travel in dedicated lanes with high capacity 'bendy' buses. However, as one 'bendy' bus carries only one-third as many passengers as a light rail vehicle, more buses would need to run to meet the same demand. Investigations showed a bus alternative would not cater for the same level of demand as light rail – offering just two-thirds of the capacity in comparable traffic conditions. In addition, forecast commuter numbers were much lower – about half. Furthermore, the bus alternative would not reduce traffic congestion to the same extent as light rail and would not sufficiently overcome the key challenges facing the CBD to UNSW corridor, including the need to:

- remove buses from the CBD to improve amenity and reduce transport congestion
- provide sufficient network capacity to cater to future growth and network extensions
- improve commuter experience through restructuring the public transport network
- catalyse urban renewal.

Light rail was therefore recommended as the preferred solution for the CBD to UNSW corridor.

The underground bus tunnel option was considered in response to a recommendation by Infrastructure NSW. This option was eliminated in favour of light rail, as it would not comprise an effective transport solution for the CBD, considering the following:

- *Transport integration issues* – Investigations showed a bus tunnel would duplicate existing rail services, without integrating with other transport modes.
- *Pedestrianisation issues* – A bus tunnel would separate pedestrians and transport. This is contrary to good planning practice and international experience, which shows transport and pedestrians should be integrated to support thriving cities.
- *Urban renewal issues* – The bus tunnel does not provide opportunities to renew city spaces, and may lead to a decline in retail activity as pedestrians spend more time underground rather than at street level where retail operates.
- *Tunnel route issues* – There are a number of feasibility issues with the bus tunnel proposal, including new stations at Wynyard and Town Hall. It would not be feasible to build an underground tunnel between Wynyard and Town Hall due to existing building basements and tunnels. In addition, ventilation, access and safety are significant viability issues. To provide the necessary bus capacity, the bus tunnel would need to be four lanes wide and provide wide platforms. This is likely to be physically unfeasible and economically unviable.
- *Cost* – Infrastructure NSW has estimated it would cost $2 billion to build a tunnel in the CBD. The city component of the CSELR proposal is a quarter of the cost – about $500 million – and would deliver significantly greater benefits for Sydney.
- *Construction* – Building connections to the Cross City Tunnel and Sydney Harbour Bridge, redeveloping two major train stations and building a new bus tunnel will present a number of untested construction impacts on the CBD. Building new bus stations would have an impact on the operation of Town Hall and Wynyard Stations, affecting the journey of approximately 140,000 passengers every weekday.
- *CBD impacts* – Locating bus tunnels within the centre of the CBD would significantly affect traffic and the urban environment. Tunnel portals on the Harbour Bridge could create significant traffic impacts on vehicles coming across the bridge.

3.4.2 Subsequent options development and assessment

The design for the preferred route has been developing since December 2012. This development will continue to refine elements of the proposal, including constructability and design issues for oeprational components of the proposal. Further detail will be presented in the EIS.

3.4.3 The preferred option

The preferred route and stop locations (as at May 2013) are identified in Appendix A and described in section 4. The route was chosen because it presented the best solution to fulfil the strategic need and Sydney light rail objectives. The preferred route would deliver good levels of patronage, good travel times, and a vital link to many of Sydney's business, sporting, entertainment, education and health precincts.

Full details of the option development and assessment process will be included in the EIS.

4. Proposal description

The proposal scope outlined in this section is indicative and based on the current construction planning and level of design available at May 2013. This design is continuing to develop as more engineering and assessment work is completed and will benefit from input from stakeholders and the community. Some scope may change as the design progresses and more detail becomes available. These changes will be considered as the environmental impact assessment process continues – and will be documented in the EIS.

4.1 Overview

The CSELR proposal comprises the construction and operation of a light rail service from Circular Quay to Kingsford and Randwick via Surry Hills and would include:

- approximately 13 kilometres of track (including stabling and depots) and approximately 20 stops
- transport interchanges at major rail stations (Central, Town Hall, Wynyard and Circular Quay), ferry interchange at Circular Quay and bus interchanges at Central Station, Rawson Place, Queen Victoria Building, Town Hall, Randwick and Kingsford stops
- a pedestrianised zone in George Street from Bathurst Street to Hunter Street, with light rail vehicles (LRVs) operating wire-free in this zone
- a new bridge structure spanning the Eastern Distributor
- an underground route in the form of a cut-and-cover tunnel across Moore Park (this is the base case)
- special events sidings at the Circular Quay, Rawson Place, Central Station, Moore Park and Royal Randwick Racecourse stops
- turnback facilities at Circular Quay, Wynyard, Kingsford and Randwick
- platforms at all stops to accommodate 45-metre long light rail vehicles, except at the Central Station and Moore Park stops, where platforms will be provided to accommodate both 45 metre and 90 metre long light rail vehicles (double-length vehicles) running during special event services between Central Station and Moore Park
- facilities at Randwick and Rozelle for light rail vehicle stabling and/or maintenance (including washdown).

The works required to deliver the CSELR proposal include early works, main works and the George Street public domain works which are described in further detail below.

4.2 Scope of CSELR works

Main works are activities to be undertaken within the corridor or in close proximity to the corridor and associated with the physical construction of the light rail infrastructure. Main works for the CSELR proposal would include the following:

- early works (critical upfront activities with long lead times), which may include (but not be limited to) property acquisition; establishment and use of construction sites; service relocations; temporary drainage and water management; building demolition of existing buildings and infrastructure; vegetation clearance, including the removal of street trees where necessary
- earthworks
- track route and track slabs
- civil works
- road, footpath and kerb realignment and intersection works to accommodate light rail and other access provisions, both temporary and permanent
- works to buildings and other built structures such as fences and street furniture located within or immediately adjacent to the proposed corridor
- light rail stops including access to these locations, facilities, security, safety (CCTV), lighting and furniture, and other customer facilities and wayfinding information, including passenger information display systems (PIDS) to alert customers of the next service
- surfaces and paving in the proposed light rail corridor
- power including supply, substations and overhead lines
- rail systems and signalling, as required
- provision of light rail vehicles
- depot facilities at Randwick and Rozelle for light rail vehicle stabling and/or general maintenance (including washdown)
- light rail vehicle driver and passenger facilities at light rail termini and other locations within or in close proximity to the proposed corridor
- integration with the existing light rail network, including the Inner West Light Rail Extension
- temporary and permanent changes to property access and local traffic circulation, car parking and loading docks
- temporary and permanent road, traffic and intersection modifications
- public domain modifications along the route, including strategies for access, streetscapes (paving, trees and furniture) and lighting
- rail/road interaction including traffic signal prioritisation and road sharing
- temporary and permanent removal and/or relocation of on-street parking, loading zones, cycling infrastructure, taxi ranks, bus stops and other public transport facilities
- worksite compounds, workforce access, facilities, activities, plant and equipment.

4.3 George Street pedestrianised zone

The establishment of a pedestrianised zone on George Street between Hunter Street and Bathurst Street forms part of the CSELR proposal. An assessment of the changes to the public domain of George Street from Alfred Street (Circular Quay) to Rawson Place (Central) (including Alfred Street treatment) will be undertaken as part of the EIS and a proposal developed which includes:

- concepts for the following public domain components:
  - paving strategy (typical design for block without stop, typical design for block with stop, typical design for Rawson Place, typical design for Alfred Street)
  - street tree concept including indicative locations and density for each block
  - lighting concept (typical design and features assumed derived from lighting master plan)
- public domain furniture stop design and concept design recommendations for canopies, separation devices, way-finding devices
- access strategy including:
  - property access
  - timed restrictions
  - commercial vehicles
  - disabled access
  - construction traffic access (coordination with private development)
  - night-time access (e.g. event and hire cars and taxis).

4.4 Proposal timeframe

The timeframe for the CSELR proposal is still in development; however, Table 4.1 identifies key dates for the EIS, and the proposal's construction and operation.

Table 4.1 Estimated timeframe for the CSELR

Activity	Anticipated date
SSI Application to be lodged with DP&I (including this supporting document)	June 2013
Initial community engagement	Ongoing from April 2013
Director General Requirements	July 2013
Prepare EIS	June – October 2013
EIS on exhibition	End 2013
Early works *	Mid 2014 - 2016
Main works *	2015 – 2019/2020

* Subject to approval from the Minister for Planning and Infrastructure and resolving delivery strategy.

4.5 Construction of the proposal

It is anticipated that it will take approximately five to six years to build the CSELR, with work beginning at multiple sites. Construction would be staged to minimise disruption to residents, businesses and transport customers where possible. It is anticipated that various components of work may be required to be undertaken out-of-hours (i.e. during the evening and night time periods). The construction program and methodology is still under development and will be detailed in the EIS, which is due to go on public exhibition later this year.

4.6 Operation of CSELR

The CSELR will have the capacity to move up to 9,000 people per hour in each direction, with up to 300 people per vehicle. For special events at Moore Park, two light rail vehicles may be joined together to move higher volumes of people. Special event services may also be implemented for Randwick Racecourse events.

By 2021, users of the CSELR proposal are expected to make approximately 14,000 trips in the morning peak hour (shortly after opening). Of these:

- 20 per cent are expected to interchange from rail
- 51 per cent are expected to interchange from bus and ferry
- 29 per cent are expected to walk up from the surrounding area.

It is currently proposed to operate the light rail under a public-private partnership structure.

Other key features of the CSELR's proposed operations are summarised in Table 4.2. These details are indicative only and subject to change as the design progresses.

Table 4.2 Key operational features (indicative only)

Feature	Description
Services	■ Two routes are currently proposed: ▸ Circular Quay to Randwick ▸ Circular Quay to Kingsford ■ Special event services will also be provided as required. ■ Normal hours of operation from 5am to 1am, 365 days per year (with amendments as required for special events and/or to integrate with other public transport operations) ■ 'Turn up and go' services ■ Special event timetables to meet demand of events at Royal Randwick Racecourse, Moore Park, the city centre, and other events as required ■ Light rail vehicles may have priority at some intersections along the corridor
Light rail vehicles (LRVs)	■ Distinctive, electric-powered, low floor, air conditioned vehicles ■ approximately 45 m long vehicles, with capacity for 100 seated and 200 standing customers ■ Real-time information on services via audio and visual displays
Light rail stops	■ Legible and highly visible with step-free access to LRVs, shelter and seating ■ Passenger Information Displays (PID), audio announcements and signage ■ Enhanced facilities at CSELR termini and interchange stops

Feature	Description
Stabling/maintenance facilities	▪ At Randwick and Rozelle, for LRV stabling and general maintenance (including washdown)
Ticketing	▪ Fully integrated with Opal ticketing system
Accessibility	▪ Fully accessible in accordance with DDA requirements, designed for people with a disability, the elderly and those travelling with prams
Operational power supply	▪ An overhead wire free system within parts of the CBD and potentially other parts of the wider light rail network ▪ Conventional overhead line electrification for other sections

4.7 Associated projects (excluded from the CSELR)

4.7.1 City Centre Access Strategy

A number of additional initiatives and projects are planned to be implemented under the *NSW Long Term Transport Master Plan*. These initiatives and projects are aimed at improving public transport and traffic management in the city. As Transport for NSW is committed to an integrated transport system, they are related to the CSELR proposal but do not form part of it. The initiatives are captured within the CCAS.

Transport network modifications proposed outside the CSELR corridor would be assessed and implemented as part of the City Centre Access Strategy and not included within the CSELR EIS. These include:

- bus network modifications – including re-routing and stop relocations
- traffic network and intersection modifications including altered turning movements and lane configurations
- transport operations and monitoring (such as a control centre) – ongoing plan for monitoring and control
- signage modifications
- network performance measures – bus/customer travel times, selected intersection performance, traffic diversion
- improvement to CBD stations
- improvements to wharves
- cycleways.

4.8 Sustainability

Sustainability is a key priority for the CSELR. In partnership with City of Sydney Council and Randwick City Council, Transport for NSW has been working towards high level sustainability objectives for the CSELR proposal. These objectives aim to promote sustainability by:

- achieving best practice when measured against both government agency and Australia-wide sustainability rating systems
- complying with the applicable Transport for NSW sustainability targets for transport projects
- reinforcing the inherent benefits to be realised with the introduction of light rail (e.g. changing travel behaviour to more sustainable transport modes)
- collaborating with other government agencies and utility providers to achieve efficiencies in infrastructure provision and upgrade works and through green infrastructure provision where feasible
- exploring opportunities for offsetting operational energy usage
- using more carbon and energy efficient power sources for the light rail vehicle fleet.

Key measures to achieve and implement sustainability for the proposal will include:

- preparing a detailed sustainability framework for the proposal, which will assess the feasibility of the agreed objectives
- collaborating with key stakeholders, including City of Sydney Council and Randwick City Council, and capitalising on existing sustainability initiatives, knowledge and systems within these agencies
- embedding the sustainability framework requirements across all relevant project disciplines including but not limited to assessment, procurement, construction and operations.

5. Preliminary assessment of environmental impacts

This section provides a preliminary assessment of the potential environmental impacts that are likely to be associated with the construction and operation of the CSELR proposal. This assessment has been based on the current design for the proposal (at May 2013). The impacts described are considered preliminary and may change throughout the design and environmental impact assessment process, as more information becomes available. Any changes to environmental impacts would be adequately assessed as part of the EIS and associated technical studies. An outline of the proposed EIS scope is provided in section 6.

The environmental impacts identified in this section have been classified as either 'key' or 'other' environmental issues. This classification was based on the likely significance of the identified environmental impacts, based on the findings of the preliminary environmental assessment and previous experience with similar infrastructure projects.

'Key' environmental issues were defined as those impacts that are considered likely to be significant (without the adoption of adequate environmental management measures) and would require further detailed investigation during the preparation of the EIS. 'Other' environmental issues were defined as those impacts that are not expected to be significant and would be manageable through the application of best practice environmental management measures.

5.1 Key environmental issues

5.1.1 Traffic, transport and access

Existing environment

The CSELR proposal would operate through areas with varying traffic and transport characteristics, constraints and opportunities. The existing traffic and transport environment has been categorised into four precincts, which are described below.

Sydney CBD and Circular Quay

Sydney's CBD is the commercial heart of the city with substantial office-based weekday employment. It is the primary retail and entertainment core of the city and has a growing residential population, including high rise apartment complexes throughout the commercial core and other residential precincts such as Pyrmont and the Rocks. The CBD generates a substantial peak travel demand, as well as a broader range of travel markets. The CBD is located in the centre of Sydney's predominantly radial public transport system.

The Sydney CBD is a highly constrained urban environment with substantial levels of congestion on most road corridors. Over 1,500 buses enter the Sydney CBD during the 2-hour morning peak period, each weekday. Footpaths are also at capacity at many intersections during the peak periods.

Circular Quay currently forms a major interchange for ferry, bus and rail services to and from the CBD. George Street, as the primary north-south corridor through the CBD, has a highly congested road and footpath environment. It supports 290 buses in the peak direction during the morning peak hour, which is anticipated to grow further to over 310 buses per hour by 2015. George Street forms the central spine through the CBD, linking key locations such as Circular Quay, Town Hall and Railway Square.

Central Station to Surry Hills

The Central Station to Surry Hills precinct is a complex, mixed use area which contains the major NSW rail network terminus of Central Station, a major bus interchange at Railway Square, a significant leisure and entertainment precinct in Surry Hills, as well as high and medium-density residential land uses.

Traffic and transport operations in this area are characterised by the interaction of public and private transport through key links entering and bypassing the CBD such as Cleveland Street, Eddy Avenue, Elizabeth Street and Chalmers Street. Devonshire Street is one of a number of east-west connections through Surry Hills. It traverses a relatively steep gradient of a maximum 6.5 per cent, which rises to the east towards Moore Park.

Moore Park, Anzac Parade and Alison Road

The Moore Park sports and entertainment venues are a significant trip generator within this precinct, generating large volumes of traffic, public transport and pedestrian trips during special events.

Both Anzac Parade and Alison Road are strategic links within the eastern suburbs road network and operate at degraded levels of performance for private vehicle traffic during weekday peak travel periods. Recent data shows average vehicular travel speeds of 21 and 28 kilometres per hour for Alison Road and Anzac Parade respectively during the AM peak period (RMS 2012).

Anzac Parade provides significant levels of bus priority with bus lanes along its entire length. By contrast, Alison Road offers only localised bus priority, with buses operating in general traffic lanes for the bulk of the corridor. There is, however, a dedicated segregated bus corridor between Doncaster Avenue (on Alison Road) and Anzac Parade (at Moore Park Road).

Randwick and Kingsford

Currently, these precincts support a variety of land uses including inner suburban residential development (low, medium and high density), commercial, retail, leisure, health and education uses. The traffic and transport environment is generally characterised by wide strategic road corridors (two to three lanes in each direction of travel) with a degree of bus priority. Good localised parking is offered in this area, particularly for local residential uses as well as for access to retail, education and health precincts.

Traffic, transport and access impacts

The CSELR proposal will impact on traffic, transport and access along the route. These impacts have been categorised into four categories, as discussed in the following sections.

Traffic network operations

The CSELR proposal will impact the traffic network operations along the route, especially within the CBD and Surry Hills area.

The CSELR would generate traffic during the construction period which may impact the stakeholders along the route. Construction is likely to be staged to reduce the impact along the route; however, construction will result in increased competition between private vehicles, construction traffic and public transport during this period.

The pedestrianisation of George Street between Bathurst and Hunter Street requires the road hierarchy within the CBD to change significantly. This is likely to have an impact on the general traffic flow within the CBD.

The pedestrianisation of the one kilometre strip of George Street is likely to have a positive impact on the pedestrian traffic along George Street which is already at capacity during peak periods.

Due to the changes to the road hierarchy and occupation of general traffic lanes by light rail tracks, there is likely to be an increase in competition for road space in the CBD. There may be a reduction in the level of service experienced on some roads by some commuters who continue to travel to the CBD by private vehicle in peak hours arising from traffic management measures such as one-way systems, restricted turns, clearways and changes to phasing at some signalised intersections to allow for light rail vehicles to cross safely. Some areas, however, would improve due to the reduction in buses. Existing east-west traffic flows within the CBD and along Anzac Parade and Alison Road are to be retained as part of the proposal.

Modelling of traffic network impacts will be undertaken, with solutions developed in consultation with relevant stakeholders to mitigate these impacts.

Access

During operation, the CSELR proposal would provide improved access for walk-up and bus transfer passengers at major interchanges along the route. New high-frequency light rail services would benefit those travelling within the CBD for business or leisure and commuters from the south-eastern suburbs of Sydney to the CBD for work, shopping and entertainment; students travelling to UNSW and Sydney Boys and Sydney Girls high schools at Moore Park; and customers and staff, patients and visitors travelling to the Randwick hospital precinct. Pedestrian access along George Street is also likely to improve as a result of the CSELR proposal.

The CSELR proposal is likely to impact access to some key destinations, during construction and operation. Existing private vehicle access within the Surry Hills area may be restricted during operation especially on some laneways intersecting with Devonshire Street. However the CSELR would provide improved public transport access to the centre of Surry Hills.

Access arrangements within the pedestrianised section of George Street would also be considered. Service vehicle access would be retained to existing businesses along George Street such as the Hilton Hotel, Myer and Dymocks buildings.

User experience

During operation the user experience along the CSELR corridor is predicted to be a substantial improvement from existing public transport options, especially those passengers travelling to Randwick and Kingsford. The CSELR proposal would provide a simple, user-friendly mode of transport between key attractions – from the Rocks and Circular Quay to the city's retail heart and on to Chinatown. The proposal would also make it more convenient for commuters to change between transport 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. A more reliable, efficient and comfortable passenger experience is likely on the light rail vehicles.

During operation, some commuters from the south east suburbs beyond Randwick and Kingsford would need to transfer from bus to light rail at these interchanges.

During the construction of the CSELR proposal slower journey times and a reduction in the reliability of services are likely to be experienced by some commuters on buses. Commuters in private vehicles are also likely to experience some delays.

Kerbside uses

Kerbside uses along the CSELR proposal would be modified from existing conditions during both construction and operation. Both temporary and permanent changes to parking availability and type are likely along the route, especially within areas such as Devonshire Street, Surry Hills, Wansey Road, and Anzac Parade and High Street in Randwick. There would be some limited opportunity to offset the loss of these parking spaces within the surrounding area. However, this loss of parking would be offset by improved access to public transport via the light rail. Temporary kerbside uses such as servicing/loading and taxi stands may also be impacted by the CSELR proposal.

5.1.2 Property and land use

Existing environment

Land uses along the CSELR corridor generally range from high density commercial development within the CBD to medium to high residential development within the surrounding inner south-eastern Sydney suburbs. Recreation, education and health related land uses are located towards the southern end of the route near Moore Park, Randwick and Kensington. The route also traverses a number of major arterial and sub-arterial roads.

Sensitive land uses located along the route include residential dwellings, commercial premises (e.g. cafes, restaurants and commercial buildings within the CBD), schools and educational facilities, places of worship, hospitals, child care facilities and recreational facilities (e.g. parks, sporting fields and Royal Randwick Racecourse).

A more detailed analysis of the land use characteristics and potential impacts to property along the CSELR proposal would be undertaken during the preparation of the EIS.

Property and land use impacts and integration

Property and land use impacts associated with the CSELR proposal would generally comprise:

- direct positive impacts on local amenity due to the reduction of traffic within pedestrianised section of George Street, and urban design improvements elsewhere along the route
- direct adverse impacts due to the use or acquisition of privately and publically owned land for the establishment of light rail infrastructure, stops, construction compounds and ancillary facilities (construction and operational phases)
- possible direct and indirect impacts (positive and/or negative) on the future development potential of some sites where land may be acquired
- impacts associated with the loss and/or modifications to existing public open space, including the potential acquisition of some areas of public open space (e.g. parts of Ward Park, Wimbo Park, Moore Park and High Cross Park) and/or the revitalisation of existing public spaces and the public domain (operational phase)
- indirect positive impacts associated with the creation of opportunities for urban renewal along the light rail route (particularly in relation to proposed light rail stops) (operational phase)
- impacts on land use amenity during construction (e.g. noise, construction traffic and air quality) and possible land use amenity impacts in some areas during operation (e.g. where street trees removed).

Management strategies would be developed to address the land use impacts associated with the CSELR proposal including further consideration during detailed design and ongoing consultation with the community. Impacts associated with the acquisition of property would be managed through a defined process and communicated with affected parties as soon as possible.

5.1.3 Business and economic impacts

Existing environment

The CSELR proposal would operate through areas with varying economic characteristics and activities. Key areas of economic activity along the route include:

- Sydney CBD – the commercial heart of the city with substantial office-based daytime employment and some retail/entertainment focused night-time employment. This is the primary retail and entertainment core and accounts for approximately a quarter of Australia's gross domestic product (NSW Trade and Investment 2012).
- Surry Hills – a significant leisure and entertainment precinct (particularly for restaurants, bars, cafes, etc.) which also supports medium to high density residential development.
- The Moore Park sports and entertainment precinct – a significant leisure and entertainment precinct which generates considerable levels of economic activity during special events.
- Randwick and Kingsford/Kensington – supports a variety of small business including restaurants and retail business along Anzac Parade, two major hospitals and a medical precinct, entertainment venues including the National Institute of Dramatic Arts (NIDA) and educational facilities including the University of NSW.

Congestion within Sydney is estimated to cost the city's economy approximately $5.6 billion in 2013 which is higher than anywhere else in Australia (BTRE 2007).

Construction impacts

Economic impacts during construction can range from local to regional and national impacts. On a regional or national scale, this is specifically evident where construction may impact on the operation of a global city such as Sydney. Whilst the impacts generated during construction may be short term they may have long term positive economic impacts (refer to operational impacts section below).

The construction of the proposal may temporarily affect the day-to-day operation of businesses where access has changed including changed parking and kerbside uses in addition to those businesses located near construction work sites. Economic impacts associated with the construction of the proposal could include loss of trade/patronage at existing businesses due to reductions in local amenity (e.g. increased noise and vibration, air quality impacts and traffic, as well as a reduction in visual amenity) or disruption/loss of accessibility (e.g. reduction in the availability of car parking for customers and/or loading zones).

Notwithstanding the above possible adverse impacts, some businesses may experience a positive benefit from additional customers and passing trade. The presence of a large number of construction workers may have the potential to generate positive economic impacts on local and regional businesses (particularly eateries and take-away food stores). For a project of this size, there is also likely to be measurable benefits to the construction industry through increased employment.

The significance and scale of the potential economic impacts and benefits arising during the construction of the proposal would be assessed during the preparation of the EIS. Measures to address these impacts may include minimising construction impacts during special events at Royal Randwick Racecourse and Moore Park sports and entertainment precinct, engaging with affected stakeholders so they are aware of the impacts and assisting to manage these impacts.

Operational impacts

The operational phase of the proposal would result in a range of economic impacts which would vary in magnitude and extent along the route. Impacts can be considered at a local, regional and national level. Generally, businesses located in the vicinity of the CSELR proposal could experience increased trade/patronage due to improved accessibility and amenity. This may increase the viability of some businesses in the longer term and may stimulate additional business development around light rail stops. Wider economic impacts would also be expected due to economic multipliers associated with the investment in a major new form of public infrastructure, as well as the direct and indirect generation of employment.

The CSELR proposal has the opportunity to benefit the regional and national economy through increased access to tourist precincts within the CBD and entertainment and sporting precincts of Moore Park and Randwick. The CSELR proposal also has the opportunity to increase trade and business within the CBD through improving travel capacity (i.e. the number of people able to travel past a certain point), travel time reliability, pedestrian access to retail businesses.

Notwithstanding the above benefits, some businesses may experience impacts on trade/patronage due to local amenity impacts. Some local businesses may also experience a reduction in accessibility due to the loss of available parking spaces along the route. However, these impacts are likely to be offset by customers utilising the new light rail service to reduce overall demand for parking. During operation, there may also be changes to existing vehicle loading and access conditions along George Street. Businesses particularly sensitive to such impacts (such as those only requiring short stays) could experience a loss of trade/patronage if not adequately managed.

Economic benefits and impacts would be communicated with affected business during the EIS phase and management strategies developed to minimise any negative impacts considering the timing and magnitude of the impacts.

5.1.4 Social impacts

Existing environment

The CSELR proposal is located within the City of Sydney and Randwick local government areas (LGAs). The key demographic and employment characteristics of these LGAs are outlined in Table 5.1. The social characteristics of the resident population and workforce are likely to vary considerably along the CSELR corridor, based on the range of land uses and community facilities located throughout the area.

Table 5.1 Demographic and employment characteristics of the study area

Demographic	LGA	
	City of Sydney	Randwick
Estimated resident population (2011 data)	183,494 people[1]	137,757 people[2]
Population density	68.66 persons per hectare[1]	37.91 persons per hectare[2]
Change in estimated resident population between 2001 and 2011	+ 53,798 people[1]	+ 12,534 people[2]
Median age of persons (2011 data)	32[3]	35[3]

Demographic	LGA	
	City of Sydney	Randwick
Top three non-English languages spoken at home (based on 2011 data)	▪ Chinese languages (Cantonese, Mandarin, other)[3] ▪ Korean[3] ▪ Indo-Aryan languages[3]	▪ Chinese languages (Cantonese, Mandarin, other)[3] ▪ Greek[3] ▪ Italian[3]
Resident population for which English is a second language	24%[3]	24%[3]
Median total household income ($/weekly)	$1,639[3]	$1,577[3]
Per cent unemployment (2011)	5.8[1]	5.5[2]
Top three industry sectors of employment for resident population	▪ Professional, scientific and technical services (16.8 per cent)[1] ▪ Financial and insurance services (10.1 per cent)[1] ▪ Accommodation and food services (10.0 per cent)[1]	▪ Healthcare and social assistance (12.3 per cent)[2] ▪ Professional, scientific and technical services (11.9 per cent)[2] ▪ Education and training (10.2 per cent)[2]

Notes: 1: Source: City of Sydney Council (2013a) and the Australian Bureau of Statistics (2013).
2: Source: Randwick City Council (2013) and the Australian Bureau of Statistics (2013).
3: Data sourced from the Australian Bureau of Statistics website.

Along the route, the demographics also change. Surry Hills, for example, has a high percentage (71.3 per cent) of couples without children compared to Kingsford (35.6 per cent) which is similar to the state average of 36.6 per cent (ABS 2011). Surry Hills also has a higher percentage of fulltime workers (72.3 per cent) compared to Kingsford (56.2 per cent) which may be due to Kingsford's proximity to the UNSW and the number of students likely to live in that area. Due to the location of hospitals on the CSELR route, health services are the largest workforce within Randwick at 6.3 per cent, which is almost twice the State average.

The CSELR corridor traverses several areas used by the local community, commuters and tourists. Key features of the social environment along the route include:

- major transport interchanges
- shopping precinct along George Street, including the Queen Victoria Building, Strand Arcade, Mid City
- office spaces within the CBD
- commercial spaces and small businesses along the route
- existing residential communities along the route
- future residential growth area of the Randwick Urban Activation precinct and the Green Square development area
- the leisure and entertainment precinct of Surry Hills which also supports medium to high density residential development
- recreational areas of Moore Park, Centennial Park and Royal Randwick Racecourse
- UNSW which has an enrolment of approximately 50,000 students at the Randwick campus
- the Randwick hospital precinct including Prince of Wales and Randwick Women's and Children's Hospitals and several specialist clinics servicing the greater Sydney area.

Social impacts

The CSELR proposal would result in a range of positive and negative social impacts, which would vary in magnitude and extent along the route. Social impacts and benefits would be expected for those community members who work, reside, or access businesses/community infrastructure or services within the vicinity of the proposal.

The area of influence of the CSELR proposal is likely to be considerably large, due to:

- the length of the CSELR corridor
- the diversity of land uses and community facilities located along the route (some of which generate significant levels of community activity, such as the Moore Park sports and entertainment precinct)
- the number and diversity of stakeholders and the large origin-destination catchment area of people that regularly travel to and from the CBD, Randwick and Kingsford for employment, education, retail/shopping, access to health services and leisure purposes
- the necessary traffic management changes that will accompany the proposal, which could affect stakeholders travelling through the CBD, Randwick and Kingsford to reach other destinations.

Generally, most of the social impacts arising during the construction phase are likely to be adverse. However, a number of social benefits would be expected during the operational phase, as summarised below.

Construction impacts

Social impacts associated with the construction phase of the proposal may include:

- reduction in local amenity due to increased noise and vibration, air quality impacts, traffic, and reduced visual amenity
- temporary loss of, or disruption to, access to private property, community facilities, employment/businesses, education, open space and recreational areas
- acquisition of privately owned land
- impacts to social cohesion, relating to perceived connectivity
- community concern and anxiety over the real and/or perceived impacts during construction of the proposal (with sensitive receivers located within close proximity to the proposal likely to have the greatest level of concern).

Management strategies would be developed to address the social impacts associated with the proposal as part of the Construction Environmental Management Plan. This would include the preparation and implementation of a Community and Stakeholder Liaison Plan for the construction phase to actively communicate impacts/disruptions with stakeholders.

Operational impacts

Social impacts associated with the operational phase of the proposal may include:

- reductions in local amenity at some locations due to increased noise and traffic (due to the redistribution of traffic from traffic management changes), as well as reduced visual amenity
- changes to the accessibility of private property, community and education facilities, employment/businesses, open space and other recreational areas
- impacts to social cohesion, relating to connectivity
- community concern and anxiety associated with real and/or perceived impacts during the operation of the proposal.

The operation of the CSELR proposal would also be expected to result in a number of social benefits, which may include:

- improved accessibility to key community facilities (e.g. educational and health related land uses located within Randwick and Kingsford), leisure/entertainment land uses and special events (e.g. Surry Hills and the Moore Park sports and entertainment precinct) and key tourist locations such as Circular Quay, the Opera House and The Rocks
- improved amenity in some areas, including along the pedestrianised section of George Street, due to the removal of traffic from the road corridor and other public domain improvements
- increased connectivity and social cohesion through improving linkages between communities such as the Rocks, Surry Hills, Randwick and Kingsford
- potential opportunities to create new public open spaces and revitalisation of existing public spaces and the public domain
- potential to stimulate urban renewal along sections of the corridor.

The social impacts of the CSELR proposal would be managed through consultation with the local community and key stakeholders and further development of the design to incorporate mitigation measures.

5.1.5 Noise and vibration

Existing environment

The existing noise environment varies considerably along the CSELR proposal corridor. Road and aircraft noise and special events held at nearby sporting facilities (e.g. Sydney Football Stadium, Sydney Cricket Ground and Royal Randwick Racecourse) are likely to be key factors influencing background noise levels.

Noise sensitive land uses along the route include medium to high-density residential dwellings, commercial premises (e.g. cafes, restaurants and commercial buildings), schools and educational facilities, performance venues/theatres, places of worship, hospitals, child care facilities and recreational facilities (e.g. parks, sporting fields and Royal Randwick Racecourse). There may be several vibration sensitive buildings along the route, including performance venues, places of worship, listed heritage buildings and those buildings containing sensitive medical equipment.

Construction noise and vibration impacts

The construction of the proposal would result in noise and vibration impacts to surrounding land uses and sensitive receivers. Activities with the potential to result in significant noise and vibration impacts include the construction of light rail stops, the demolition of existing structures and road pavement, relocation of services and utilities, bridge construction works over the Eastern Distributor, the cut-and-cover tunnel across Moore Park (this is the base case), and the installation of light rail tracks and associated ancillary infrastructure (e.g. overhead wires). Noise from construction traffic could also impact on sensitive receivers.

The extent of construction noise and vibration impacts would be dependent on the construction sequencing adopted, plant and equipment used, working hours (e.g. standard working hours or out-of-hours works) and the distance to surrounding receivers.

Construction of the proposal may take approximately five to six years to complete; however, given the transient nature of the proposed works, the potential impacts to any individual receiver would be considerably less than this period. It is anticipated that various components of work may be required to be undertaken out-of-hours (i.e. during the evening and night time periods), which would increase the potential for adverse noise impacts on surrounding sensitive receivers. However, this approach could also result in an overall reduction in the total duration of construction for some receivers.

Given the nature of the proposed works, construction noise and vibration impacts may exceed the noise management levels documented in the *Interim Construction Noise Guideline* (DECC 2009) at some locations, due to the proximity to residential dwellings and other sensitive receivers. There is also the potential for vibration impacts to several vibration sensitive buildings along the route (including listed heritage buildings, performance venues and those buildings containing sensitive medical equipment). Reasonable and feasible construction noise and vibration mitigation measures would be developed for the CSELR proposal as part of the construction noise and vibration management plan that would be prepared prior to construction. These measures would be consistent with the principles and practices detailed in the Transport for NSW (Transport Projects Division) (2012) *Construction Noise Strategy*.

Operational noise and vibration impacts

Light rail vehicles, light rail stops and interchanges, stabling/maintenance areas and traffic management changes along the CSELR corridor would generate airborne noise and vibration impacts. The key parameters that would influence the level of airborne noise would include light rail vehicle speeds, wheel condition, rail condition, track features, rolling stock design and receiver distance.

Where vehicle traffic is to be reduced, the CSELR proposal is likely to lower the existing background noise; this will be especially evident around the pedestrianised section of George Street. The reduction of existing background noise may have a positive impact in some areas; however, in others the introduced noise sources as a result of the CSELR proposal may be more noticeable.

Operational vibration impacts would primarily be associated with the movement of light rail vehicles. People are able to perceive vibration at very low levels, well below the levels that would cause damage to building contents or structures. Parameters that would influence the vibration levels at surrounding land uses would include the speed of light rail vehicles, wheel condition, rail condition, track features and receiver distance.

In addition to the noise and vibration sources themselves, the extent of noise and vibration impacts on any individual receiver would depend on the transmission paths from the source to the receiver. Factors affecting noise and vibration transmission include:

- acoustic shielding provided by buildings or other features
- distance to receiver buildings
- varying ground conditions along the route including open space around Moore Park and the urban environments of the CBD, Randwick and Kingsford (for vibration transmission).

The proposal is likely to result in 'perceptible' to 'clearly noticeable' increases in noise levels at some locations during both the daytime and night-time periods. Operational noise will be assessed in accordance with the *Rail Infrastructure Noise Guideline* (RING) (OEH 2013). Noise is likely to be managed through detailed an operational management plan, targeting directly affected receivers.

5.1.6 Built and non-Indigenous heritage

Existing environment

A review of the following statutory heritage lists was undertaken to determine the presence of historic heritage items, conservation areas and archaeological sites within the study area:

- State Heritage Register
- NSW State Heritage Inventory database
- *Sydney Local Environmental Plan 2012* (Sydney LEP 2012)
- *Randwick Local Environmental Plan 2012* (Randwick LEP 2012)
- Sydney Water S170 Heritage and Conservation Register
- RMS s170 Heritage and Conservation Register
- Draft City of Sydney (CoS) Register of Significant Trees 2013.

For the purposes of this preliminary assessment, the study area comprised areas within and immediately adjacent to the proposed CSELR corridor (i.e. sites that would either be traversed, or would face onto, the proposed light rail corridor).

The Sydney Opera House is a listed on the World Heritage list. The CSELR proposal would not directly affect this heritage item. The route near Circular Quay at Alfred Street is located within the buffer zone for the Sydney Opera House, as identified in the SREP SHC and World Heritage listing; however, the proposal is not expected to impact on this buffer zone.

Heritage listed items

A total of 178 heritage listed items were identified within the study area, of which 8 have the potential to be directly affected by the proposal. Historic heritage items with the potential to be directly affected by the proposal are outlined in Table 5.2.

Table 5.2 Historic heritage listed items with the potential to be directly affected by the proposal

Suburb	Item	Address	Listing
Sydney	Sydney Terminal and Central Railway Stations Group	Great Southern and Western Railway, Illawarra Railway, NSW	State Heritage Register (listing no. 01255)
Sydney	Sydney Cove West Archaeological Precinct	112-156 George Street, The Rocks, NSW 2000	State Heritage Register (listing no. 01860)
Haymarket	Belmore Park	Belmore Park, Haymarket	CoS LEP 2012 (Item no. I825)
Haymarket	Belmore Park Significant Trees	Belmore Park, Haymarket	Draft CoS Register of Significant Trees 2013 (Item no. 8.01)
Moore Park	Anzac Parade Obelisk	Anzac Parade	RTA s170 Heritage and Conservation Register
Surry Hills	Devonshire Street Significant Trees	Devonshire Street, Chalmers Street to Riley Street	Draft CoS Register of Significant Trees 2013 (Item no. 10.02)
Moore Park	Martin Road Significant Trees	Martin Road (corner Reserve with Anzac Parade)	Draft CoS Register of Significant Trees 2013 (item no. 24.03)
Centennial Park	Centennial Park–Moore Park/Anzac Parade Significant Trees	Anzac Parade	Draft CoS Register of Significant Trees 2013 (item no. 24.12)
Randwick	Centennial Park, Moore Park, Queens Park	n/a	State Heritage Register (listing no. 01384)
Randwick	High Cross Park (includes Anzac memorial in centre of park)	217-219R Avoca Street	Randwick LEP 2012 (item no. I288)

In addition to the items identified in Table 5.2, there are several state heritage listed properties included within the identified 178 items, including the Queen Victoria Building, Sydney Town Hall, General Post Office and the Strand Arcade. At this stage it is unlikely that these items will be directly impacted by the CSELR proposal; however, they will be fully considered in the EIS.

Heritage conservation areas

The CSELR corridor would either traverse, or be located in close proximity to, 12 heritage conservation areas, of which nine have the potential to be directly affected by the proposal. Heritage conservation areas with the potential to be directly affected by the proposal are outlined in Table 5.3.

Table 5.3 Heritage conservation areas with the potential to be directly affected by the proposal

Suburb	Item	Listing
Surry Hills	Brumby Street	Sydney LEP 2012 (area no. C61)
Surry Hills	Cleveland Gardens	Sydney LEP 2012 (area no. C62)
Surry Hills	High Holborn Street	Sydney LEP 2012 (area no. C64)
Surry Hills	Bourke Street South	Sydney LEP 2012 (area no. C60)
Surry Hills	Little Riley Street	Sydney LEP 2012 (area no. C65)
Moore Park	Moore Park	Sydney LEP 2012 (area no. C36)
Centennial Park	North Randwick	Randwick LEP 2012 (area no. C1)
Randwick	Racecourse Heritage Conservation Area, Alison Road	Randwick LEP 2012 (area no. C13)
Randwick	High Cross	Randwick LEP 2012 (area no. C12)

Historical archaeological sites

A total of six historical archaeological sites were identified within the study area, of which two have the potential to be directly affected by the proposal. Historical archaeological sites with the potential to be directly affected by the proposal are outlined in Table 5.4.

Table 5.4 Historical archaeological sites with the potential to be directly affected by the proposal

Suburb	Item	Address	Listing
Circular Quay	Tank Stream	Alfred Street, between George and Pitt Streets	State Heritage Register (listing no. 00636)
Sydney	Bennelong Stormwater Channel No. 29	Various–intersections of George St and Bridge Street, Hunter Street, King Street, Market Street, Park Street	Sydney Water S170 Register (item no. 005146)

A number of potential archaeological sites listed on the City of Sydney's *Central Sydney Archaeological Zoning Plan* (AZP) (prepared in 1992) are located in the vicinity of the CSELR corridor. The majority of these sites correspond to the footprint of buildings that front George Street or Devonshire Street. An item listed as having archaeological potential on the AZP may or may not also be listed as a heritage item on the Sydney LEP 2012, and may have already been subject to destruction as a result of redevelopments that have occurred since the AZP was prepared.

The primary areas where archaeology may be an issue include (but are not limited to):

- the Tank Stream, close to Circular Quay
- parts of the Old Sydney Burial Ground (near Town Hall) which may be present in areas not impacted during the construction of Town Hall Station
- the area in Moore Park currently proposed for a cut-and-cover tunnel (this is the base case)
- other potentially significant historic infrastructure.

Built and non-Indigenous heritage impacts

Potential built and non-Indigenous heritage impacts associated with the CSELR proposal would primarily occur during the construction phase, but may continue into the operation phase (e.g. for curtilage and visual impacts). The key historic heritage impacts likely to be associated with the proposal would comprise:

- impacts to heritage building facades/visual outlook due to overhead wiring or insensitive design, or siting of stops or street furniture
- potential impacts on the curtilage of listed heritage items (listed in Table 5.2)
- potential indirect impacts to several items listed on the State Heritage Register such as the Queen Victoria Building, Town Hall, General Post Office and the Strand Arcade
- potential vibration impacts on heritage listed items, which may result in damage to the structural integrity and/or fabric of such items
- potential impacts to the significance of heritage conservation areas (listed in Table 5.3)
- potential impacts to previously unrecorded archaeological remains.

A detailed study would be required to determine the potential for unlisted in situ archaeological remains to be present on-site, as well as provide details on possible archaeological impacts to such remains. For example, few previous studies have comprehensively focused on the archaeological potential of Sydney's roadways. However, experience in central Sydney indicates that some sections of the roadway along which the CSELR is proposed to run may have potential for archaeological evidence of former significant road surfaces or routes. If historical road routes have changed significantly and current roadways pass over the locations of former buildings it is likely that archaeological remains associated with these structures, such as basements or footings, may survive in the roadways. Historical research would be required to allow the areas of archaeological potential within roadways to be better determined.

5.1.7 Urban design and visual impact

Existing environment

The sensitivity of the existing visual environment varies considerably along the CSELR corridor with areas such as Circular Quay (with views to Sydney Harbour, the Sydney Opera House and the Sydney Harbour Bridge), Moore Park (significant area of public open space) and some heritage buildings (Town Hall, Queen Victoria Building) more sensitive to change than urban areas such as Kingsford and Randwick. The existing visual environment of the CSELR proposal is generally characterised by:

- high density commercial development (e.g. high rise buildings) within the CBD
- medium to high residential and commercial developments within the surrounding inner Sydney suburbs
- pockets of recreational, education and health related land uses throughout the CBD and inner Sydney suburbs, as well as towards the southern end of the route
- public open space including that associated with Ward Park, Moore Park, Centennial Park, Royal Randwick Racecourse and High Cross Park
- the existing road network (including major arterial and sub-arterial roads).

Visual catchments along the CBD and Surry Hills sections of the route are generally likely to be small due to the presence of intervening structures (e.g. commercial and residential buildings) which would restrict views of the CSELR corridor from land uses and receivers situated away from directly affected areas. Larger visual catchments are likely to occur within the vicinity of Moore Park and Centennial Park, along the long road corridors of Anzac Parade and Alison Road and surrounding the Royal Randwick Racecourse. This is due to the existing road network and undeveloped open space and recreational nature of these areas which would offer increased opportunities for views of the CSELR corridor from surrounding land uses.

Visually sensitive receivers located along the route include residential dwellings, commercial premises (e.g. cafes, restaurants and commercial buildings within the CBD), schools (Sydney Boys and Girls High, Bourke Street Primary School) and educational facilities (University of NSW), places of worship, hospitals (Prince of Wales and Royal Randwick Women's and Children's Hospitals), child care facilities and recreational facilities (e.g. Moore Park, Centennial Park, local parks (Wimbo and Ward Parks in Surry Hills), sporting fields and Royal Randwick Racecourse). In addition to the residents which live along the route, there is a high volume of receivers including commuters, CBD workers, students, retail shoppers and tourists which will need to be considered in the EIS.

A number of trees along the route are listed on either the City of Sydney or Randwick Council Significant Tree Registers and have substantial visual value to the streetscape (see also section 5.1.8).

Construction impacts

The construction of the proposal may cause temporary adverse visual amenity impacts for those who work, study, reside, visit, or access businesses/community services within the vicinity of the proposal due to:

- the establishment of construction compounds, worksites and stockpiles
- erection of fencing, barricades, gates and security lighting for the provision of safe and secure worksites
- construction vehicle movements both within construction worksites and along haulage routes
- traffic disruptions associated with traffic management measures (road diversions/closures) and/or construction traffic
- the removal of some existing street trees (including within Surry Hills, Moore Park and Randwick – refer to section 5.1.8)
- earthworks
- the parking and use of construction plant and equipment.

The impact of the proposal on individual sensitive receivers would be dependent on the stage of construction, their location and severity of the impact. Visual amenity impacts during construction would be greatest where residential/sensitive receivers have unscreened views of the construction worksite.

It should be noted, however, that the visual amenity impacts associated with the construction of the proposal would be temporary in nature and would be reduced in the medium to long term through the revitalisation of existing public spaces and the public domain.

Any visual amenity impacts likely to occur during the proposal will be communicated with the community and stakeholders, specifically on the timing and duration of the impacts.

Operational impacts

Visual amenity impacts associated with the operational phase of the proposal would primarily be associated with:

- the establishment of new light rail stops and associated infrastructure (e.g. lighting, shelters, signage, seating, etc.)
- the establishment of the light rail tracks, overhead wires, lighting and associated support structures
- the establishment of new electrical substations for the operational power supply
- the movement of light rail vehicles
- the establishment of a new bridge crossing over the Eastern Distributor
- establishment of a pedestrian zone on George Street
- the establishment of the light rail depots at Randwick and Rozelle
- loss of street trees in some areas (refer to section 5.1.8).

Indicative artist impressions of the CSELR proposal at Martin Place, Chalmers Street (Central Station stop) and Kingsford are shown in Figures 5.1 to 5.3, respectively. Project features shown in Figures 5.1 to 5.3 are indicative only, subject to detailed design.

Overall, the proposal has the potential to enhance the existing visual character of some areas due to the removal of traffic from the corridor, and the creation of opportunities to revitalise existing public spaces and the public domain, particularly within the George Street pedestrianised zone.

However, in some areas, the proposal is likely to have a noticeable adverse impact on the visual character of the receiving environment, due to the introduction of a new form of transport infrastructure into areas with strong existing visual identities. The significance of this impact on surrounding sensitive land uses and receivers would vary along the route, based on the visual sensitivity of the receiving environment and the magnitude of the change. Generally, visual impacts would be greatest where a public view is lost or changed such as Ward Park (Surry Hills), Royal Randwick Racecourse and High Cross Park.

It is generally expected that adverse visual amenity impacts would rapidly decrease with distance away from the CSELR corridor as opportunities for views of the proposal from surrounding receivers and land uses would be obscured by existing development (e.g. residential and commercial buildings).

A set of urban design and landscaping principles would be investigated during the development of the EIS. These principles would aim to guide the development of major design elements of the proposal, with the aim of reducing visual amenity impacts on surrounding sensitive receivers and land uses. Generally, light rail infrastructure (e.g. stops, depots, electrical substations, overhead wires and associated support structures) would be located and designed so as to minimise intrusive visual impacts to surrounding sensitive receivers, where possible.

Any potentially significant visual impacts would be adequately assessed in the EIS, and measures would be adopted to minimise any adverse effects.

Note: Indicative only, subject to detailed design.

Figure 5.1 Indicative artist impression of the CSELR proposal – Martin Place

Note: Indicative only, subject to detailed design.

Figure 5.2 Indicative artist impression of the CSELR proposal – Central Station stop (Chalmers Street)

Note: Indicative only, subject to detailed design.

Figure 5.3 Indicative artist impression of the CSELR proposal – Kingsford

5.1.8 Planted trees

The proposal is likely to directly affect a number of planted trees, some of which are likely to be listed under and City of Sydney Council's (2013b) *Draft Register of Significant Trees* and Randwick City Council's (2007) *Significant Tree Register*. Impacts on significant planted trees (both direct and indirect) will be confirmed in the EIS as the design develops, but are likely to include some immature and/or mature figs on Anzac Parade, and a number of other significant street trees along the route. Trees that may be affected include Moreton Bay Figs, Port Jackson Figs, Hills Weeping Figs, Canary Island Date Palms, Washington Palms, Cook Pines, Pepperberry and Wood Pears. Ecology impacts associated with the tree removal are discussed in section 5.2.2.

5.1.9 Utilities and services

A large number of utilities are located along the CSELR route. The types of utilities with the potential to be affected include power; telecommunications; water; sewer; stormwater; secondary gas mains; City of Sydney street lighting; RMS traffic lights; and RailCorp power and communications.

Field investigations are continuing to be undertaken to verify and map the specific location of underground utilities in a 3D model utilising methods such as: conventional survey, ground penetrating radar (GPR), push-rodding of conduits and laser scanning. Potholing and road trenching works to visually verify utilities and confirm exact depths of utilities as the design progresses.

Detailed consultation would be undertaken with the relevant asset owners prior to the commencement of any external works. Potential environmental impacts associated with the relocation and protection of services and utilities would be considered in the EIS.

5.1.10 Cumulative impacts

A number of other major developments are proposed or have already commenced in the vicinity of the CSELR proposal. There is potential for cumulative impacts of these projects with the CSELR proposal, particularly if the construction programs for the projects overlap. Operational cumulative impacts should largely be avoided through effective consultation and consideration of project interactions during the planning and design phase.

Current or planned major projects that could interact with the CSELR proposal (during the construction and/or operational phases) include:

- the CCAS and associated changes to buses and other transport modes in the CBD (refer to section 4.7)
- Wynyard Walk
- pedestrian improvement works at Wynyard
- Wynyard Masterplan
- Wynyard City One development
- Monorail Removal Project
- Barangaroo redevelopment
- Town Hall Station Upgrade
- Sydney International Conventions, Exhibition and Entertainment Precinct (SICEEP), Darling Harbour
- developments proposed by the Moore Park Trust (ES Marks Athletics Field Track Upgrade, Moore Park West, Golf Course)
- Sydney Cricket Ground upgrade (due for completion January 2014)
- the Green Square development area
- UNSW Kensington Campus Materials Science and Engineering Building
- development of a Comprehensive Cancer Care and Blood Disorder Centre at Prince of Wales Hospital
- Australian Turf Club Masterplan and redevelopment of Royal Randwick Racecourse (including the Royal Randwick Hotel Development) development within the Randwick Urban Activation Precinct.

Cumulative impacts during construction could include increased traffic and transport disruption, socio-economic, noise and vibration, air quality, heritage impacts and changes in visual amenity. Operational cumulative impacts could include traffic and transport disruption, socio-economic, visual/urban design and heritage impacts.

Transport for NSW has commenced preliminary consultation with the proponents of the above projects to determine their likely timing and potential interactions with the CSELR proposal. Consultation with these stakeholders would continue throughout the design development and EIS process to determine the likely magnitude and extent of potential cumulative impacts and to identify suitable design and/or mitigation measures to reduce such impacts.

5.2 Other environmental issues

5.2.1 Aboriginal heritage

The CSELR proposal would be constructed and operated within a highly disturbed environment that is not expected to contain any significant Aboriginal heritage constraints. Most of the CSELR corridor has been subjected to previous ground disturbances as a result of the establishment of roads, services and utilities, and commercial/residential developments. A search of the NSW Atlas of Aboriginal Places (administered by the Office of Environment and Heritage; OEH) indicated that no registered Aboriginal Places are currently located along the CSELR corridor.

There is the potential for registered Aboriginal sites or areas of Aboriginal archaeological potential to be located along or in the vicinity of the CSELR corridor.

Adequate environmental management measures would be developed and implemented during the construction of the proposal. These measures would include appropriate 'stop work' provisions to manage potential impacts to any unexpected Aboriginal heritage item uncovered during construction. Consultation with Aboriginal Stakeholders would be undertaken as part of the EIS consultation process.

Given the highly disturbed nature of the CSELR corridor, Aboriginal heritage is not considered to be a key environmental issue for the proposal.

5.2.2 Ecology

The construction footprint is generally situated within and adjacent to existing road pavements and previously developed areas within the CBD and Inner Sydney suburbs. The wider area has been subject to ecological pressures associated with clearing and urbanisation over an extended period. This has resulted in a reduction in the abundance and species diversity within native flora and fauna populations and the consequent fragmentation of the remaining vegetation and habitat.

A preliminary desktop assessment has been undertaken for the CSELR corridor, which included a review of the following:

- aerial photography
- NSW OEH's *Atlas of NSW Wildlife* database records for threatened species and endangered ecological communities listed under the *Threatened Species Conservation Act 1995* (TSC Act) and the *Fisheries Management Act 1994* (FM Act)
- DSEWPaC's *Protected Matters Search Tool* for matters of NES listed under the EPBC Act.

The species identified during the desktop assessment are considered to be either highly mobile or have limited appropriate habitat along the CSELR route.

The 10 kilometre radius search of matters of NES recorded one wetland of international importance (Botany Wetlands), three listed threatened ecological communities, 78 listed threatened species and 71 listed migratory species.

The search of the *Atlas of NSW Wildlife* database recorded the following listed (vulnerable or endangered) species: two amphibians, one reptile, 22 birds, 10 mammals (including marine mammals) and 16 flora.

Many of the listed threatened species and migratory birds identified during the searches require aquatic or marine environments, which are limited along the route. Pockets of Eastern Suburbs Banksia Scrub of the Sydney Region (a State and Commonwealth listed community) are known to occur within Centennial Park, but would not be directly affected by the CSELR proposal.

While the CSELR corridor runs through a highly urbanised environment, the corridor and surrounding areas provide a variety of habitats of potential value to locally occurring threatened species (e.g. Grey-headed Flying-fox, Southern Myotis and Powerful Owl).

Key ecological issues for the proposal would include:

- the potential presence of threatened plant species listed under the TSC Act and/or the EPBC Act
- the presence of foraging habitat for the Grey-headed Flying-fox (listed as vulnerable under both the TSC Act and EPBC Act)
- the potential presence of roosting habitat (culverts, trees etc.) and foraging habitat for threatened or vulnerable microbat species such as the Southern Myotis
- the presence of a wetland of national importance (Botany Wetlands) approximately 1 kilometre to the south-west of the Kingsford Stop.

Given the highly modified nature of the CSELR corridor, it is considered unlikely that the proposal would have a significant impact on a threatened species or endangered ecological community listed under either the TSC Act or the EPBC Act. Similarly, the proposal is considered unlikely to have a significant impact on a migratory species listed under the EPBC Act. Overall, ecology is not considered to be a key environmental issue for the proposal.

5.2.3 Hydrology and groundwater

Existing environment

The CSELR corridor would not cross any major surface waterways; however, a number of stormwater drainage structures (drains, gutters and culverts etc.) are located within the corridor, which are likely to drain into the surrounding waterways.

Surface waterways located within the broader study area include:

- Sydney Harbour
- Kippax Lake (located within Moore Park)
- Kensington Ponds (located adjacent to Alison Road, between Dacey Avenue and Darley Road)
- a pond system located within Centennial Park (including Busbys Pond and Randwick Pond)
- Botany Wetlands (located approximately 1 kilometre to the south-west of the Kingsford Stop)
- Mill Pond (located approximately 3 kilometres to the south-west of the Kingsford Stop)
- Botany Bay.

Surface water quality within the above waterways is likely to be heavily influenced by stormwater runoff from surrounding residential, commercial and other urban land uses.

A number of existing information on flooding is available for the CSELR route, including:

- *Green Square and West Kensington (Sheas Creek – Victoria Branch) Flood Study* (Webb, McKeown and Associates Pty Ltd 2008)
- *Alexandria Canal Catchment Flood Study Report – Exhibition Draft* (Cardno 2011)
- *Kensington – Centennial Park Flood Study – Final Draft Report* (WMA Water 2011)
- *Newmarket, Randwick Flood Assessment* (Cardno 2011).

These existing studies have identified relatively widespread, deep and frequently occurring flooding along the proposed UNSW corridor of the CSELR. There is a greater quantity of existing flood risk information available for the UNSW corridor than for the CBD corridor. This most likely reflects a lack of quantitative studies having been undertaken for the CBD, rather than an absence of flood risk issues. It is likely that there would be a number of flooding issues associated with stormwater network capacity issues within the CBD.

Information on registered groundwater bores was obtained from the NSW Water Information Groundwater Works reports (accessed online at http://waterinfo.nsw.gov.au/gw/). The review of the database identified approximately 88 groundwater bores located in close proximity to the proposed CSELR route. The beneficial uses of the bores and the anticipated groundwater levels are summarised in Table 5.5.

Table 5.5 Summary of registered groundwater bores

Sections along CSELR	Beneficial use	Standing water level (mBGL[1])
Circular Quay to Haymarket	Monitoring	2.5
Haymarket to Moore Park via Surry Hills	Domestic, irrigation	6.0 to 7.0
Moore Park to Randwick	Irrigation, Monitoring	3.0 – 5.0
Moore Park to Kingsford	Domestic, Monitoring and irrigation	2.0 – 5.0
Rozelle Stabling Yard	Monitoring	0.5 – 6.0
Racecourse Stabling Yard	Irrigation, monitoring	3.0 – 5.0
Randwick tram shed Stabling Yard	Domestic and irrigation	2.0 – 4.5

Notes: 1: mBGL = metres below ground level.

Potential impacts – surface water

Potential impacts to water quality would primarily relate to the pollution of stormwater runoff with sediments, fuel and other hazardous materials from construction worksites. These impacts are anticipated to be manageable through the application of standard environmental management measures. Soil and water management measures would be developed for the proposal as part of the Construction Environmental Management Plan. These measures would be consistent with the principles and practices detailed in Landcom's (2004) *Managing Urban Stormwater: Soils and Construction*.

The proposal would alter existing stormwater catchment flows and the operation of the existing piped and overland drainage networks. Although only minor increases in impervious areas are expected along the light rail route, some catchments would require significant redirection of stormwater flows. Where the proposed light rail track intersects existing overland flows or drainage networks, rerouting of drainage will be required to prevent flooding of adjacent areas. Best practice stormwater management measures would be incorporated into the proposal design to minimise the proposal's impact on downstream receiving environments.

Sections of the CSELR route are anticipated to be at risk of flooding. As the proposal would be integrated into an existing environment, there is likely to be limited opportunity to adopt rail levels significantly higher than the existing ground level, particularly where the route follows existing road. As a result, the achievable level of flood immunity for the proposal would be influenced by the existing flood immunity of the CSELR corridor. The introduction of the proposal may alter local catchment boundaries and, therefore, change the distribution of stormwater between existing drainage networks. This may have flood risk implications and may necessitate adjustments to the local network. Largely, flooding risk and impacts should be manageable through design and operational measures.

Potential impacts – groundwater

Groundwater levels across the CSELR route are likely to be variable (as indicated in Table 5.5). In areas where the water table is high, groundwater may be encountered during excavation. The current preferred route includes a cut-and-cover tunnel section through Moore Park from South Dowling Street to Anzac Parade (this is the base case). Given groundwater levels in this area, dewatering during construction would be required. Groundwater encountered during the construction of the proposal would be managed in accordance with the requirements of the *Waste Classification Guidelines* (DECCW 2009) and Transport for NSW's (2012) *Water Discharge and Re-use Guideline*. The tunnel section would be tanked, which would minimise potential groundwater impacts during operation.

Construction and operational hydrology and groundwater impacts associated with the CSELR are anticipated to be manageable through design measures and the application of standard environmental management measures. Overall, hydrology and groundwater are not considered to be a key issue for the proposal.

5.2.4 Soils, geology and contamination

Existing environment

The general topography, geology and soil landscape units likely to be present along the CSELR corridor are outlined in Table 5.6. In summary, the proposed CSELR route is underlain by unconsolidated quaternary sediments and Middle Triassic age sedimentary rocks (comprising Middle Triassic Ashfield Shale (part of the Wianamatta Group) and Hawkesbury sandstone). Soil landscape units (and associated hazards) likely to be encountered along the route are outlined in Table 5.7.

Based on the Commonwealth Scientific and Industrial Research Organisation's (CSIRO's) *Acid Sulfate Soil Risk Map*, the overall risk of disturbing acid sulfate soils is considered to be low, as no known occurrences of acid sulfate soils have previously been identified along the CSELR route.

Table 5.6 Topography, geology and soil landscape units along the CSELR route

Section of CSELR	Approximate elevation	Anticipated geological units	Anticipated soil landscape units	Potential occurrence of ASS[1]
Circular Quay to Haymarket	10 – 20 mAHD	Man-made fill Quaternary alluvium Hawkesbury sandstone Ashfield shale	Disturbed terrain Gymea Lucas Height Deep Creek Blacktown	No known occurrence to low probability
Haymarket to Moore Park via Surry Hills	20 – 40 mAHD	Quaternary alluvium Hawkesbury sandstone	Blacktown Tuggerah	No known occurrence
Moore Park to Randwick	30 – 60 mAHD	Quaternary alluvium	Tuggerah	No known occurrence
Moore Park to Kingsford	20 – 30 mAHD	Quaternary alluvium	Tuggerah	Low probability

Notes: 1: Acid sulfate soils.

Table 5.7 Potential hazards/limitations for soil landscape units

Soil landscape unit	Potential hazards/limitations
Disturbed terrain	Dependant on nature of fill. Mass movement hazard, unconsolidated low wet-strength materials, impermeable soil, poor drainage, localised very low fertility and toxic materials.
Gymea	Localised steep slopes, high soil erosion hazard, rock outcrop, shallow highly permeable soil.
Lucas Height	Stony soil, low soil fertility, low available water capacity.
Deep Creek	Flooding, extreme soil erosion hazard, sedimentation hazard, localised very low fertility and permanently high water tables.
Blacktown	Moderately reactive highly plastic subsoil, low soil fertility, poor soil drainage.
Tuggerah	Extreme wind erosion hazard, non-cohesive, highly permeable soil, very low soil fertility, localised flooding and permanently high water tables.
Newport	Very high soil erosion hazard, localised steep slopes, very low soil fertility, non-cohesive topsoils.

A search of the NSW OEH's 'Contaminated Land – Record of Notices' and the 'List of NSW Contaminated Sites Notified to EPA' identified three parcels of land along the CSELR route that have the potential to be contaminated. A summary of these properties is provided in Table 5.8.

Table 5.8 Potential contaminated sites within 100 metres of the CSELR route

Section of the CSELR	Source of contamination	Address
Circular Quay to Haymarket	No known potential contaminated sites notified to Environmental Protection Authority (EPA)	n/a
Haymarket to Moore Park via Surry Hills	No known potential contaminated sites notified to EPA	n/a
Moore Park to Randwick	Service station	▪ 2 Alison Road
Moore Park to Kingsford	Service station	▪ 76-82 Anzac Parade ▪ Footpath adjacent to 10-20 Anzac Parade ▪ 135 Anzac Parade ▪ 219a Anzac Parade
Potential Rozelle Stabling Yard	No known potential contaminated sites notified to EPA	n/a

A number of contaminating activities located along the CSELR route are likely to have impacted the soil and/or groundwater underlying the proposal corridor through surface water run-off or migration along groundwater flow. A summary of the potential contaminating activities and sources of contaminants that are likely to be located in the vicinity of the CSELR route is provided in Table 5.9. Contaminants that may be encountered include polychlorinated biphenyls (PCBs), organochlorine and organophosphorous pesticides, total petroleum hydrocarbons and heavy metals.

Table 5.9 Potential contaminating activities or contamination sources within the vicinity of the CSELR route

Potential contaminating activities	Source of contaminants
Fill; road and road reserve; park and open space	▪ Imported fill, and reworked local soils, ash ▪ Application of pesticides, fertilisers
Old building/structures	▪ Paint containing lead ▪ Asbestos containing material
Rail corridor including embankments Light rail and monorail	▪ Fuel and oil spills, engine emissions, rail corridor maintenance, brake lining, historical cable and/or pipework ▪ Ash from historical use of rail corridor ▪ Asbestos cable trays
Bus depot	▪ Re-fuelling areas and storage of fuels, vehicle maintenance depot
Racecourse; horse stables	▪ Applications of pesticides and or herbicides, fertilisers and imported fill ▪ Use of solvents for polishing metals and/or leather goods
Service station	▪ Spills and leaks from service station bowsers and storage tanks
Mechanics and auto workshop	▪ Run-off from storage and hydraulic oils
Dry cleaning establishment	▪ Spills or inappropriate handling of dry cleaning chemicals
Electrical substation	▪ Leak of transformer oil
Car wash bay or facility	▪ Run-off of oil and grease and detergent from car wash
Cemetery	▪ Weeds and pest control, pathogens

Impacts

Construction of the proposal would expose the natural ground surface and subsurface through the removal of existing overlying surfaces (e.g. road pavements) and the excavation/grading of construction footprints for structures and foundations, particularly during the relocation of services and utilities. The exposure of soil to water runoff and wind could increase soil erosion potential. There is the potential for exposed soils to be transported into surrounding waterways via stormwater runoff from construction worksites.

Soil and water management measures would be developed for the proposal as part of the Construction Environmental Management Plan. These measures would be consistent with the principles and practices detailed in Landcom's (2004) *Managing Urban Stormwater: Soils and Construction*.

No significant issues are anticipated to be associated with the nature of the substrate of the study area. Targeted geotechnical investigations would be undertaken as part of the design development process to confirm this conclusion. Where required, engineering controls (such as retaining walls and foundation treatments) would be incorporated into the CSELR proposal design to address any identified geotechnical constraints.

There is a low to medium level potential for contamination to be encountered during the construction of the proposal between Circular Quay and Moore Park, and medium to high risks of contamination between Moore Park to Kingsford and Randwick. Areas where potentially contaminating activities are occurring require further assessment to ascertain the extent of potential contamination. This may include an intrusive soil and groundwater investigation program. Where areas of contamination are identified along the CSELR proposal route, adequate environmental management measures would be developed.

During construction, any material or soil suspected or showing evidence of contamination would be tested and managed in accordance with the *Waste Classification Guidelines* (DECCW 2009) and the *Contaminated Land Management Act 1997*.

Overall, soils, geology and contamination impacts are not considered to be a key issue for the proposal as such impacts could be effectively managed through the application of standard environmental management measures.

5.2.5 Air quality

Ambient air quality within the study area is affected by a number of factors including topography, prevailing meteorological conditions and local and regional air pollution sources.

A search of the national pollution inventory database (www.npi.gov.au) on 15 April 2013 indicated that 15 facilities reported air emissions from within the City of Sydney and Randwick LGAs during the 2011-2012 reporting period. An additional 22 facilities reported air emissions from within the adjacent LGAs (Botany Bay, Leichardt, Marrickville, Waverley and Woollahra) during the same reporting period. Local air quality within the vicinity of the CSELR proposal is likely to be heavily influenced by vehicle exhaust emissions from the existing road network, as well as regional pollution within the Sydney basin including industrial areas at Botany located to the south.

During construction, local air quality within the study area may be temporarily affected by particulate (dust) and exhaust emissions. The main potential impacts would be associated with the generation of dust, particularly during earthworks and the hammering of concrete during demolition works. Dust generated during construction could result in reduced local air quality and dust deposition at the nearest potential affected receivers (without the implementation of adequate management measures), due to the small offset distance between these receivers and the worksites. Gaseous emissions associated with the combustion of fuel in construction plant and machinery are expected to be manageable through the effective implementation of appropriate environmental management measures.

During operation, the proposal would use electric-powered light rail vehicles. Considering this, it is anticipated to benefit local air quality through the removal of approximately 220 buses per hour in the CBD during the morning peak in tandem with the CCAS. The proposal is also anticipated to generate a mode shift from private vehicles to public transport due to the creation of fast and reliable transport links to/between the Randwick hospital precinct, UNSW, Sydney Cricket Ground, Sydney Football Stadium, Moore Park, Central and Circular Quay.

The CSELR proposal is not likely to have a significant impact on local air quality. Construction and operational air quality impacts associated with the CSELR proposal are anticipated to be manageable through the application of standard environmental management measures. Overall, air quality is not considered to be a key issue for the proposal.

5.2.6 Greenhouse gas and energy

Greenhouse gas emissions would be generated during the construction and operational phases of the CSELR proposal, with substantial energy-consuming activities anticipated to occur throughout the construction period.

During construction, greenhouse gas emissions would predominantly be generated by the following activities:

- combustion of fuel in construction plant, equipment and vehicles (direct emissions)
- electricity use at construction compounds and during general construction works (indirect emissions)
- disposal of waste from construction staff and compounds (indirect emissions from the decomposition of waste material)
- indirect emissions embodied in construction materials, including cement and steel (i.e. the energy and resources that were consumed to produce a particular construction material).

Operational greenhouse gas emissions would primarily be associated with the operation of light rail infrastructure, particularly electricity used to power light rail vehicles, signalling and other infrastructure (e.g. lighting, CCTV, PA systems at light rail stops and depots). However, the use of electric-powered light rail vehicles and the reduction in the number of buses in the CBD, in tandem with the CCAS, is likely to result in an overall reduction in greenhouse gas emissions from current levels.

Opportunities to reduce construction-related greenhouse gas emissions would be investigated during the detailed design and construction procurement phases. These opportunities could include the use of construction materials with lower embodied emissions (where a suitable substitute is available for construction materials with high embodied emissions) and the adoption of energy efficient work practices.

Opportunities to further minimise operational greenhouse gas emissions would be investigated during detailed design. These opportunities could include purchasing electricity derived from a renewable energy source (where available), the use of regenerative braking on rolling stock, promoting the selection of energy efficient rolling stock, the use of photovoltaic lighting at stops and undertaking a traction power assessment during detailed design.

A comprehensive list of sustainability initiatives will be developed for the proposal based on a review of Transport for NSW's (2012c) *NSW Sustainable Design Guidelines for Rail (Version 2.0)*. These initiatives will be documented in the EIS and would form a sustainable management strategy for the CSELR proposal. The sustainability management strategy would be regularly reviewed and updated throughout the design development, construction and operational phases.

Greenhouse gas emissions and energy usage are considered to be manageable through design and the application of standard mitigation measures. Therefore, these impacts are not considered to be key environmental issues for the proposal.

5.2.7 Climate change adaptation

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.

A number of climatic variables have the potential to impact on the proposal, including:

- sea level rise (at Circular Quay)
- more frequent and severe wind and rainstorms
- increased rainfall intensities
- more frequent and extreme heat waves.

Possible treatment measures would be considered during the detailed design phase to manage climate change risks to the CSELR proposal (e.g. resilience of proposed infrastructure to predicted extreme weather events).

Climate change risks during the construction phase of the proposal are not anticipated to be significant, given the anticipated timing of construction (2015 to 2020).

5.2.8 Hazard and risks

Hazards and risks associated with the construction of the proposal would generally be associated with:

- works close to sensitive receivers such as schools, childcare centres and hospitals
- undertaking works within or adjacent to major arterial and regional roads (including George Street, Devonshire Street, Anzac Parade and the Eastern Distributor)
- works which may impact or restrict emergency access from existing building and/or emergency vehicles
- undertaking works within highly pedestrianised areas in the CBD and areas like the Moore Park entertainment precinct
- undertaking works within close proximity to existing buildings and vibration sensitive structures
- undertaking works within the vicinity of existing services and utilities (e.g. high voltage power lines, gas mains, etc.)
- the use and storage of hazardous materials
- the use of heavy machinery.

Hazards and risks associated with the operation of the proposal would primarily be associated with:

- the movement of light rail vehicles through highly pedestrianised areas – this has the potential for collisions/accidents. This has been managed in many major European cities such as Strasbourg, France and Linz, Austria and also in Melbourne, through widespread and targeted educational programs and detailed design considerations of the vehicles and stops
- collisions between road and light rail vehicles – which can be managed through driver education programs
- disruption to emergency access
- natural events (including flooding and extreme weather events)
- utility failure (power or communication system failure)
- accidental interactions with the overhead wiring

- external events (events occurring at adjacent facilities)
- impacts of climate change (changed frequency of natural events).

Construction hazards and risks are considered to be manageable through the application of standard mitigation measures, which would be developed by the construction contractor prior to construction. Operational hazards and risks are considered to be manageable through design and the application of education programs, and standard mitigation measures and plans (such as emergency response plans). Overall, hazards and risks are not considered to be key issues for the proposal.

5.2.9 Waste and resource use

Waste produced during the construction and operation of the proposal would include:

- spoil from excavation and trenching works (construction phase)
- spoil and groundwater that is potentially contaminated (construction phase)
- demolition waste from directly impacted buildings, structures, road pavement, and services and utilities (construction phase)
- surplus construction materials (construction phase)
- general domestic waste from construction and maintenance personnel (construction and operational phases)
- waste from portable on-site toilets at construction compounds (construction phase)
- wastewater from dewatering activities, such as groundwater (if groundwater is encountered during cut-and-cover tunnel works at Moore Park, this is the base case), maintenance of the light rail vehicle fleet, and stormwater runoff from the construction site and permanent works (construction and operational phases)
- general domestic waste generated by commuters (operational phase).

The disposal of waste generated during the construction and operation of the proposal is not anticipated to result in significant adverse environmental impacts. All waste generated by the proposal would be assessed, classified, managed and disposed of in accordance with the *Waste Classification Guidelines* (DECCW 2009). Standard environmental management measures would be prepared (based on the *Waste Classification Guidelines*) by the construction contractor prior to construction.

Resources used during the construction and operation of the proposal would include:

- electricity (construction and operational phases)
- fuel (construction phase)
- concrete (primarily construction phase)
- steel (primarily construction phase)
- water (construction and operational phase)
- paving materials (such as asphalt) (primarily construction phase).

Whilst the proposal would increase demand on local and regional resources, it is unlikely that the CSELR proposal alone would result in any resource becoming scarce or in short supply. Environmental management measures would be developed to reduce the proposal's demand on resources. The production of waste and the consumption of resources are, therefore, not considered to be key issues for the proposal.

6. Proposed scope of the EIS

Section 5 of this report provided an overview of the potential environmental impacts that are likely to be associated with the construction and operation of the CSELR proposal. After consideration of these impacts, it is concluded that the proposal has the potential to have a significant impact on the environment. Therefore, the CSELR proposal is classified as 'SSI' (as discussed in section 2.1) and Transport for NSW is required to prepare an EIS for the proposal, pursuant to seeking an approval from the Minister for Planning under Part 5.1 of the EP&A Act.

Table 6.1 outlines the proposed scope of the EIS. The proposed scope focuses on undertaking further detailed specialist investigations for the 'key' environmental issues described in section 5.1, based on the likely significance of the resulting impacts. This scope would be refined (if necessary) following receipt of the DGRs.

Some further investigation of the 'other' environmental issues will also be undertaken, as outlined in Table 6.1. These investigations will be used to help confirm the current assumption that these 'other' environmental issues would not result in a significant impact on the environment and could be appropriately managed through the application of design and/or best practice environmental management measures. Should any 'other' environmental issue be identified as being significant during the environmental assessment process, the likely impacts would be adequately assessed and documented in the EIS.

Table 6.1 Proposed scope of the EIS

Issue	Proposed scope
General	■ Expand on the planning and statutory requirements for the CSELR proposal (as outlined in section 2 of this report). ■ Provide information on the strategic context, need, justification and options considered for the CSELR proposal. ■ Update and expand the proposal description based on the ongoing design development. ■ Provide indicative and preliminary details of construction planning, including identifying potential work sites, outlining the preliminary construction program and staging, identifying haulage routes, describing temporary traffic arrangements and stating construction work hours. ■ Provide an overview on the operation of the CSELR proposal including details on the vehicle fleet, operating times including special event services and integration within the broader transport network.
Consultation	■ Provide information on the consultation activities that have been undertaken prior to, and during, the preparation of the EIS, as well as details on the key issues raised during this consultation, and how these issues have been addressed through the EIS and design development.
Key issues	
Traffic, transport and access	■ The traffic and transport assessment will consider both the permanent (operational) and temporary (construction) changes associated with the proposal. The assessment will include traffic management changes as a direct consequence of the CSELR and their impacts, but will exclude impacts of any bus and wider road network changes, which are to be assessed as part of the CCAS. The assessment will focus on the CSELR corridor but will also consider (and take into account) any potential impacts to surrounding precincts (excluding buses). ■ The traffic and transport assessment for both the construction and operational phases of CSELR will cover: ▸ the management and operation of: – traffic and transport integration – access to key light rail stops and interchanges (considering customer access by bus, private vehicle, foot, bicycle, heavy rail, and ferry) – traffic once the CSELR proposal is in operation – pedestrian, cyclist and traffic and transport safety ▸ the integration of traffic and light rail within the corridor's road environment, including pedestrian crossing and cycle network revisions, road linemarking and signposting and wayfinding ▸ intersection analysis to validate proposed traffic management changes for intersections directly along the corridor as required using RMS approved traffic modelling software ▸ the development of a parking and access strategy which will include, but would not be limited to, an assessment of the impact of light rail on: – vehicular access to properties located along the proposal corridor – kerbside access including parking, loading zones, bus zones etc. – the provision for emergency vehicle access, refuse collection vehicles and other service vehicles ▸ special events analysis, to assess the compatibility of light rail with special events (such as street parades, major sporting and cultural events) along the proposal corridor ▸ road safety audits in accordance with RMS standards. ■ The traffic and transport implications during the construction phase of CSELR proposal will also be assessed, considering the following areas: ▸ construction timeframe, phases and staging ▸ construction site access and routes ▸ property and kerbside access and routes ▸ intersection and road network impacts ▸ pedestrian, cyclist and traffic and transport safety

Issue	Proposed scope
	▸ measures to mitigate potential impacts to all users of the transport network (i.e. bus, private vehicle, and cyclists).
Noise and vibration	■ A noise and vibration assessment will be undertaken in accordance with the following documents: ▸ *Rail Infrastructure Noise Guideline* (Office of Environment and Heritage 2013) ▸ *Interim Construction Noise Guidelines* (Department of Environment and Climate Change 2009) ▸ *NSW Industrial Noise Policy* (EPA 2000) ▸ *Construction Noise Strategy* (Transport for NSW 2012b) ▸ *Road Noise Policy* (Department of Environment, Climate Change and Water 2011). ■ The noise and vibration assessment will: ▸ identify the existing acoustic environment, including existing surrounding land uses and noise levels ▸ assess the predicted noise and vibration levels as a result of the construction and operation of the proposal ▸ identify likely options for reasonable and feasible mitigation measures to minimise impacts during construction and operation.
Property and land use	■ Potential impacts on land use (including recreation) will be identified with consideration of the following issues: ▸ existing land use and property ownership along the proposed route and likely future land use based on zoning, consultation with major landholders and DP&I, and a search of DP&I's major project's database ▸ direct impacts on property and land use within the proposal boundary and other areas proposed to be acquired ▸ indirect positive and negative impacts on property and land use, including potential land use integration issues, impacts on land use amenity, potential opportunities and/or benefits for urban renewal/development.
Business and economic impacts	■ The economic assessment will include: ▸ a corridor analysis to document and gain a better appreciation of the range of businesses, entertainment facilities and tourism uses likely to be influenced by the proposal ▸ a review of socio-economic and employment factors (e.g. forecast job growth, resident growth and key industries) for the study area and their relevance/role for Sydney's (and NSW's) economy ▸ assessment of the proposal's likely economic impacts, including: – business operation impacts during construction and operational phases – tourism impacts – lifestyle and business attractors – investment stimulus – development opportunities created – the economic benefits of time travel savings – changes to traffic congestion – loss of car parking – job generation impacts – direct and indirect economic multipliers – potential cumulative impacts of the proposal – any other likely economic issues. ▸ Business surveys and interviews (10-20 undertaken within 10 different locations along the route) directed to local retailers, commercial operators and other businesses to gain a better understanding of key issues, perceptions and concerns regarding the economic impacts of the proposal.

Issue	Proposed scope
Social impacts	■ A social impact assessment (SIA) will be undertaken to identify and evaluate key social issues that could potentially arise during the construction and operation of the proposal. The SIA will draw upon various specialist studies including the economic impact, property and land use, traffic, noise, air quality, visual and other assessments to provide an integrated approach. ■ The assessment will include: ▸ a review of background documents, including recent relevant SIAs, key strategic planning documents and any local government economic development plans ▸ development of a community profile ▸ identification of key socio-economic and health benefits and impacts ▸ identification of impacts on existing community services and facilities ▸ identification of mitigation measures.
Built and non-Indigenous heritage	■ A built and non-Indigenous heritage assessment will be undertaken to assess the proposal's impact on listed heritage items and conservation areas, as well as areas of historical archaeological potential. The assessment will be prepared in accordance with the guideline documents *Statement of Heritage Impact and Archaeological Assessments*, contained in the NSW Heritage Office's (now the Heritage Branch) *NSW Heritage Manual*. The assessment will include: ▸ a review of existing heritage listings on statutory and non-statutory registers ▸ an inventory of heritage items, including a description and statement of significance based on existing information ▸ a review of relevant LEPs, the State Heritage Register, State Agency S170 Heritage and Conservation Registers and the National Trust register for known or potential historical archaeological sites ▸ a site inspection of the proposed route to view existing heritage items, inform the impact assessments and identify any potential visual impacts with heritage implications. (Areas of known archaeological potential will also be inspected and areas of historical archaeological potential that may require assessment will be identified.) ▸ an assessment of the historical archaeological potential of each works zone along the CSELR proposal route ▸ an assessment of the significance of areas of historical archaeological potential against the NSW heritage criteria, including the preparation of a statement of heritage significance ▸ an assessment of the heritage impacts of the CSELR proposal on heritage listed items, heritage conservation areas and areas of historical archaeological potential ▸ recommendations to mitigate any impacts.
Urban design and visual impact	■ A visual impact assessment (the impact on views) and a landscape character assessment (the impact of an area's built, natural and cultural character or sense of place) will be undertaken. The visual impact assessment will define the day to day visual effects of the CSELR proposal on people's views whilst the landscape character assessment will determine the overall impact of the proposal on an area's character or sense of place. ■ The assessment will consider the visual impact of all proposed infrastructure, including approximately 20 stops which include a mix of street-based stops and interchanges along the route. A broad landscape character assessment will also be undertaken for key areas along the route which could include George Street, Devonshire Street, Moore Park and Anzac Parade. ■ The assessment will use the Roads and Maritime Services (RMS) Visual Assessment Methodology, 'Environmental Impact Assessment Guidance Note (EIA-N04)' as a basis for the work as part of EIS. ■ The urban design and visual impact assessment will also: ▸ consider the impact on views for sensitive visual receivers and sensitive/important view corridors, including residential properties overlooking the proposal ▸ identify urban design and landscape initiatives (including a Landscape Concept Plan) to minimise the visual impacts of the proposal ▸ consider the visual impacts and mitigation associated with the establishment of electricity substations, stabling facilities and other light rail infrastructure such as overhead wiring.

Issue	Proposed scope
Planted trees	■ An arborist assessment of direct and indirect impacts on significant planted trees will be undertaken, including identification of mitigation measures.
Utilities and services	■ Preliminary information on the location of existing services and utilities will be reviewed through consultation with key utility and service providers. Works likely to be required to protect or relocate affected services will be identified and adequately assessed. Where required, appropriate environmental management measures for these works would be developed to minimise impacts on the receiving environment.
Cumulative impacts	■ Details of known surrounding developments with the potential to interact with the CSELR proposal will be identified through consultation with stakeholders and review of relevant LEPs and DP&I's major projects database. Potential cumulative impacts arising due to the interaction of these projects will be identified and assessed in a qualitative manner. Management and mitigation measures will be proposed, where appropriate.
Other environmental issues	
Aboriginal heritage	■ No detailed investigation required. ■ A Due Diligence Aboriginal archaeological assessment will be undertaken, in accordance with the Office of Environment and Heritage's *Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales*. The assessment will include: ▸ a review of relevant Aboriginal heritage reports and database searches (the NSW OEH's Aboriginal Heritage Information System and the NSW Atlas of Aboriginal Places) to determine the presence of known Aboriginal sites and places within, or in the vicinity of, the site ▸ a site inspection of the proposed CSELR route to inspect registered Aboriginal sites and/or any Aboriginal places, as well as identify areas of Aboriginal archaeological potential that may require assessment ▸ an assessment of the Aboriginal archaeological potential of each works zone along the CSELR route ▸ an assessment of the potential impacts of the CSELR proposal on known or potential Aboriginal archaeological sites ▸ recommendations to mitigate any impacts on Aboriginal sites and areas of Aboriginal archaeological potential.
Ecology	■ No detailed investigation required. ■ An ecology impact assessment will be prepared to address impacts during construction and operation, in accordance with: ▸ Part 3A EP&A Act guidelines for species, populations and communities listed under the TSC Act ▸ assessments for species listed under the EPBC Act, following the *EPBC Act Policy Statement 1.1 Significant Impact Guidelines* (Department of Environment, Water, Heritage and the Arts 2009). ■ The assessment will include: ▸ a review of relevant documents and database searches to determine likely vegetation and habitats on-site and to prepare a list of threatened species, populations and communities which may have the potential to occur on the site ▸ a single site inspection to determine the nature, location and condition of vegetation and fauna habitats, with particular attention to species of conservation concern, such as threatened and migratory species or locally significant species ▸ determination of the potential presence of threatened species based on a habitat assessment, rather than targeted survey (as this is a more conservative approach which is likely to include species that are difficult to detect) ▸ recommendations for measures to avoid, minimise, mitigate or offset impacts on biodiversity values.
Hydrology and groundwater	■ No detailed investigation required. ■ A desktop groundwater assessment will be undertaken to identify groundwater constraints that may impact on the proposal development and to provide mitigation measures to address these groundwater constraints. The proposed approach is to undertake a high level desktop study

Issue	Proposed scope
	summarising the current hydrogeological conditions in the study area to determine the potential construction and operational risks to groundwater. The summary will include an assessment of groundwater levels, groundwater quality, aquifers present, groundwater recharge and discharge conditions and potential groundwater contamination issues. Recognising that the cut-and-cover tunnel through Moore Park would be tanked, no detailed groundwater modelling is proposed. ■ A high level stormwater assessment of the likely impacts of the proposal will be undertaken, which will include: ▸ a brief assessment of existing flood and potential flood impacts of the light rail corridor, based on a review of published flood study information ▸ assessment of the likely stormwater quality impacts ▸ recommended general construction stage erosion and sediment management controls.
Soils, geology and contamination	■ Further targeted geotechnical investigations will be undertaken to confirm the findings of the preliminary environmental assessment. ■ A desktop soils and geology assessment will be undertaken and management and mitigation measures will be proposed, where appropriate. ■ A Phase 2 contamination assessment will be undertaken to confirm the likelihood of the presence of contaminated material and potential contamination impacts. Management and mitigation measures will be proposed, where appropriate.
Air quality	■ No detailed investigation required. ■ A qualitative air quality assessment will be undertaken focusing on the construction impacts and the development of management and mitigation measures, where appropriate. The assessment will include: ▸ a description of the existing air quality environment and meteorology using existing background data ▸ identification of sensitive receptors and neighbouring land uses ▸ key pollutant criteria for the proposal, referenced from relevant NSW guidelines and legislation ▸ identification of on-site key emission sources during the construction and operational phases ▸ a qualitative assessment of construction air quality impacts ▸ a qualitative assessment of potential air quality impacts and/or improvements associated with the operational phase of the proposal ▸ where relevant, appropriate mitigation/management measures for the construction and operational phases to minimise impacts on the receiving environment.
Greenhouse gas and energy	■ A quantitative greenhouse gas emissions assessment will be undertaken for the proposal. This assessment will comprise: ▸ an inventory of likely greenhouse gas emissions for the proposal including construction phase emissions and annual operational emissions for major greenhouse gases attributable to specific components of the proposal, with total emissions expressed in tonnes of carbon dioxide equivalent (t $CO_{2\text{-}e}$) ▸ an outline of the proposal's annual and overall contribution to the NSW and national greenhouse gas emissions profile ▸ an outline of the upstream greenhouse gas generating activities associated with the proposal, including fossil fuel generated electricity ▸ a high-level commentary on the significance of predicted greenhouse gas emissions on the environment and legislative implications of these emissions to the proposal (e.g. carbon tax) ▸ a high-level investigation of greenhouse gas abatement opportunities, including a description of the intended measures to avoid and/or minimise greenhouse gas emissions ▸ basic qualitative assessment of the potential benefits of using electric-powered light rail vehicles in terms of greenhouse gas emissions and energy intensity.
Climate change adaptation	■ A climate change risk and adaptation assessment will be undertaken for the proposal using publically available scenarios of projected climate change for the Sydney region. The assessment will be undertaken in accordance with the following documents and guidelines: ▸ NSW Office of Environment and Heritage's *Guide to Climate Change Risk Assessment for*

Issue	Proposed scope
	NSW Local Government ▸ *Climate Change Impacts and Risk Management: A Guide for Business and Government* (AGO 2006) ▸ AS/NZS ISO 31000:2009 *Risk Management – Principles and Guidelines* ▸ ISO/IEC 31010 *Risk Management – Risk Assessment Techniques* ▸ The risk management framework in AS/NZ 4360:2004 *Risk Management 1* and its supporting Handbook HB4360 ▸ Draft Australian Standard (DR AS 5334) *Climate change adaption for settlements and infrastructure*. ■ The assessment will include: ▸ a targeted literature review, focusing on NSW and rail-specific policy and up-to-date climate change information ▸ an outline of key climate change risks to the proposal and their relative risk ratings ▸ a qualitative description of the likely impacts of climate change on the proposal ▸ mitigation or adaption measures that may be required during the life of the proposal.
Hazard and risks	■ No detailed investigation required. ■ A high level, desktop hazard and risks assessment will be undertaken and management and mitigation measures will be proposed, where appropriate. This will incorporate findings from other studies such as safety aspects of the traffic and transport assessment.
Waste and resources	■ No detailed investigation required. ■ A desktop waste and resources assessment will be undertaken and management and mitigation measures will be proposed, where appropriate. This assessment will include: ▸ likely waste streams and volumes from construction and operation of the proposal, including spoil, wastewater and demolition materials ▸ likely resources required for construction and operation of the proposal, including energy, fuel, steel etc.

7. Consultation

7.1 Consultation strategy

A consultation strategy has been prepared to provide a framework for the proactive management of communications with the community and key stakeholders along the route of the CSELR proposal. Engagement with the community, stakeholders and key partners has already begun and will continue throughout the EIS phase.

Key partners and stakeholders for the CSELR proposal include City of Sydney Council, Randwick City Council, Australian Turf Club, University of NSW, Centennial and Moore Park Trust, and NSW Roads and Maritime Services.

The sections below provide a description of the consultation activities already undertaken and proposed during the EIS.

7.2 Consultation activities undertaken to date

7.2.1 Sydney Light Rail Round Table

In September 2011 the Sydney Light Rail Round Table (Round Table) was formed. The Round Table comprises executive representatives from key stakeholders to develop an understanding of the benefits, challenges and opportunities of Sydney's transport needs. Seven Round Table meetings have been held to June 2013.

From the Round Table meetings, several technical working groups have been formed for technical experts represented by stakeholders at the Round Table to provide more detail on specific issues related to the CSELR proposal.

7.2.2 Utility providers

The CSELR proposal would require significant interface with utilities along the length of the corridor. Of importance to the successful delivery of the proposal is securing active cooperation from all affected utility providers, thereby ensuring relocation and/or protection of utilities can be designed, agreed, and constructed without delay. The project team's strategy with this interface would include:

- letters from the Minister for Transport to heads of utility providers requesting support and cooperation (these were sent in early May 2013)
- high level briefing of senior utility representatives (undertaken on 16 May 2013)
- project level interaction with utility providers to determine interface requirements (scheduled to occur during mid 2013)
- development of Interface Agreements with utility providers, documenting specific project requirements (scheduled to occur during mid 2013)
- incorporating Interface Agreement requirements into project design and delivery (to occur between 2014 and 2018).

7.2.3 Proposal contact

The proposal team has encouraged feedback on the proposal since 2012 via the following methods:

- phone: 1800 684 490
- email: projects@transport.nsw.gov.au
- website: http://www.transport.nsw.gov.au/lightrail-program/cbd-and-south-east-light-rail.

7.2.4 Letterbox drop

A letterbox drop of a brochure for the CSELR proposal was undertaken in April 2013 to all residents within 500 metres of the proposed route, with the exception of the CBD section, within which brochures were sent to all building managers potentially affected by the proposal. In total, 50,000 brochures were delivered. The purpose of the letterbox drop was to create awareness of the proposal, outline the next steps and give the community an opportunity to contact the proposal team through the mechanisms discussed in section 7.2.3.

7.2.5 Industry briefing session

An industry briefing session was held on 9 April 2013, including a presentation by the Minister for Transport and the Deputy Director General Transport Projects. The session attracted 224 attendees from a wide audience including industry groups, government agencies and private businesses.

A general overview of the proposal was given including discussions on the existing challenges associated with reducing CBD congestion, and the potential benefits associated with improved connectivity, service quality and urban renewal opportunities.

7.2.6 Stakeholder briefings

Over 35 stakeholder briefings have been held since January to provide stakeholders along the route with information and the opportunity to provide feedback.

7.2.7 Place Managers

Designated Place Managers commenced work on the project in May. Place managers act as the direct point of contact for the community, businesses and other stakeholder on behalf of the project.

Place Managers are conducting on the ground assessments, building relationships and providing consistent information to stakeholders along the route.

7.2.8 Door Knocking

Door Knocking of businesses and residential properties has commenced in the South East section of route. Door Knocking in the CBD will commence in June 2013.

7.2.9 Community information stands

To date, five community information stands have been hosted by Transport for NSW along the route to receive local input into the proposal at this early stage. These stands were undertaken at:

- Surry Hills Market, Crown Street, Surry Hills (Saturday 6 April 2013)
- EQ Village Markets, Lang Road, Moore Park (Saturday 13 April 2013)
- Royal Randwick Shopping Centre, Randwick (Saturday 20 April 2013)
- Kingsford Markets, Kingsford (Sunday 21 April 2013)
- The Rocks Market (Friday 31 May).

Feedback from these information stands will be incorporated into the EIS.

7.2.10 Future consultation activities

Transport for NSW commits to a high level of consultation and engagement with the community and stakeholders throughout the development of the CSELR. Community and stakeholder consultation activities will be undertaken throughout the development and exhibition of the EIS.

Transport for NSW will commit significant resources to continuing a structured program of broad based community and stakeholder engagement during the preparation for, and exhibition of, the EIS.

Key elements will include:

- a planning focus meeting in June 2013 for government stakeholders
- ongoing and regular liaison with key partners and stakeholders
- pre-lodgement community engagement activities
- presentation to community groups prior to public exhibition of the EIS including chambers of commerce and precinct committees
- briefings with key stakeholders including peak bodies and private transport operators
- establishment of a CSELR information centre
- public exhibition of the EIS for a minimum of 20 business days. Advertisements will be placed in newspapers to advise of the public exhibition and where the EIS can be viewed, as well as details on proposed community information sessions.

8. Conclusions

This Supporting Document provides an outline of the CSELR proposal and sets out the statutory and strategic context.

The report also provides a preliminary assessment of the potential environmental impacts of the proposal, including positive and negative impacts during construction and operation. This preliminary assessment has concluded that the CSELR proposal has the potential for significant impacts on the following key environmental issues:

- traffic, transport and access
- property and land use
- business and economic impacts
- social impacts
- noise and vibration
- built and non-Indigenous heritage
- urban design and visual impacts
- planted trees
- utilities and services
- cumulative impacts.

It is concluded that detailed environmental assessments are required for these issues as part of the EIS, including the development of management and mitigation strategies to minimise impacts. A number of other environmental impacts are also likely as a consequence of the proposal, and these will also require assessment as part of the EIS.

An indicative scope for the EIS has been outlined in section 6. It is expected that this Supporting Document will assist the Director-General of DP&I to formulate the environmental assessment requirements (DGRs) for the proposal.

9. References

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Appendix A

Proposed CSELR route (indicative only)

Proposed CSELR route (indicative only)