



Planning

**MAJOR PROJECT ASSESSMENT:
Sydney Light Rail Extension – Stage 1
Inner West Extension
(MP10_0111)**



Director-General's
Environmental Assessment Report
Section 75I of the
Environmental Planning and Assessment Act 1979

January 2011

ABBREVIATIONS

CIV	Capital Investment Value
Department	Department of Planning
DGRs	Director-General's Requirements
Director-General	Director-General of the Department of Planning
EA	Environmental Assessment
EP&A Act	<i>Environmental Planning and Assessment Act 1979</i>
EP&A Regulation	<i>Environmental Planning and Assessment Regulation 2000</i>
EPI	Environmental Planning Instrument
EPL	Environmental Protection Licence
ESD	Ecologically Sustainable Development
LEP	Local Environmental Plan
ICNG	<i>Interim Construction Noise Guideline</i>
INP	<i>NSW Industrial Noise Policy</i>
SEPP	State Environmental Planning Policy
Minister	Minister for Planning
Part 3A	Part 3A of the <i>Environmental Planning and Assessment Act 1979</i>
PEA	Preliminary Environmental Assessment
PFM	Planning Focus Meeting
PPR	Preferred Project Report
Proponent	Transport NSW
RtS	Response to Submissions

© Crown copyright 2011
Published January 2011
NSW Department of Planning
www.planning.nsw.gov.au

Disclaimer:

While every reasonable effort has been made to ensure that this document is correct at the time of publication, the State of New South Wales, its agents and employees, disclaim any and all liability to any person in respect of anything or the consequences of anything done or omitted to be done in reliance upon the whole or any part of this document.

*NSW Government
Department of Planning*

EXECUTIVE SUMMARY

In February 2010, the NSW Government announced as part of the *Metropolitan Transport Plan*, a \$500 million commitment to extend the Sydney light rail. These extensions would comprise two stages:

- Stage 1 – an Inner West extension of 5.6 kilometres along the disused Rozelle goods line corridor from Lilyfield to Dulwich Hill; and
- Stage 2 – a CBD western corridor extension from Haymarket to Circular Quay via Barangaroo with consideration of a future light rail option from Circular Quay to Central via George Street.

Stage 1 - Inner West Extension, including the GreenWay shared walking and cycling path, are the subject of this Environmental Assessment (EA), submitted by the Proponent, Transport NSW. The Stage 1 alignment is shown in Figure 2 of this report.

The light rail extension would extend for 5.6 kilometres within the existing disused Rozelle Goods Line corridor between the existing Lilyfield stop and Dulwich Hill, and includes nine new stops at Leichhardt North, Hawthorne, Marion, Taverners Hill, Lewisham West, Waratah Mills, Arlington, Dulwich Grove, and Dulwich Hill Interchange. The GreenWay shared path component of the project would commence at Iron Cove, Dobroyd Point and continue in a southerly direction to the Cooks River, Dulwich Hill.

The project is consistent with strategic land use policy for Sydney, including the *Metropolitan Transport Plan – Connecting the City of Cities (February 2010)*, the *Metropolitan Plan for Sydney 2036*, the *State Plan – A Direction for NSW (November 2006)*, and the *NSW Bike Plan (May 2010)*. The project would give residents another option for accessing the CBD, Pyrmont and Darling Harbour, and allow commuters to connect with the Inner West and Bankstown CityRail lines.

Following a detailed assessment of the Proponent's EA and Submissions Report, and the submissions received during the exhibition period for the project, the Department has identified the project's key impacts as:

- construction and operational noise and vibration;
- traffic and transport;
- heritage;
- ecology; and
- visual impact, landscaping and urban design.

These issues were particularly reflected within the 197 submissions received from Government agencies, local councils, and the community during the exhibition of the EA.

The Department accepts that there would be construction impacts as a result of this project, in particular construction noise, traffic, and impacts to heritage and ecology, but considers that these can be managed to an acceptable level. Operational impacts, particularly noise and traffic impacts associated with accessing stops, including parking and pedestrian access, and visual impacts may also occur, but are able to be managed within acceptable environmental limits.

Potential impacts have been addressed through the design of the project and further design refinements proposed in response to issues raised by the Department and in submissions. Management and mitigation measures to minimise the impacts and disruption to the community and commuters are also available where design solutions are not possible. This is reflected within the recommended conditions of approval and the Proponent's statement of commitments.

Consequently, the Department recommends that the Minister for Planning approve the Sydney Light Rail Extension Stage 1 – Inner West Extension, subject to the recommended conditions of approval.

TABLE OF CONTENTS

1	BACKGROUND	1
2	PROPOSED PROJECT	3
	2.1 Project Description	3
	2.2 Project Need and Justification	4
3	STATUTORY CONTEXT	6
	3.1 Major Project	6
	3.2 Permissibility	6
	3.3 Environmental Planning Instruments	6
	3.4 Objects of the EP&A Act	6
	3.5 Ecologically Sustainable Development	7
	3.6 Statement of Compliance	7
4	CONSULTATION AND SUBMISSIONS	8
	4.1 Exhibition	8
	4.2 Public Authority Submissions	8
	4.3 Public Submissions	10
	4.4 Proponent's Response to Submissions	12
5	ASSESSMENT	14
	5.1 Construction Noise and Vibration	14
	5.2 Operational Noise and Vibration	17
	5.3 Traffic and Transport	20
	5.4 Heritage	26
	5.5 Ecology	28
	5.6 Visual Impact, landscaping and urban design	31
	5.7 Other issues	33
6.	RECOMMENDATION	37
APPENDIX A	ENVIRONMENTAL ASSESSMENT	38
APPENDIX B	SUBMISSIONS	39
APPENDIX C	PROPONENT'S RESPONSE TO SUBMISSIONS	40
APPENDIX D	RECOMMENDED CONDITIONS OF APPROVAL	41

1 BACKGROUND

In February 2010, the NSW Government announced as part of the *Metropolitan Transport Plan*, a \$500 million commitment to extend the Sydney light rail. These extensions would comprise two stages:

- Stage 1 – an Inner West extension of 5.6 kilometres along the disused Rozelle Goods Line corridor from Lilyfield to Dulwich Hill; and
- Stage 2 – a CBD western corridor extension from Haymarket to Circular Quay via Barangaroo with consideration of a future light rail option from Circular Quay to Central via George Street.

Stage 1 - Inner West Extension, including a GreenWay shared walking and cycling path, are the subject of this assessment. An overview of the project and the existing light rail network is shown in Figure 1 and the Stage 1 alignment is shown in Figure 2.

Figure 1: Overview of the project and the existing light rail network

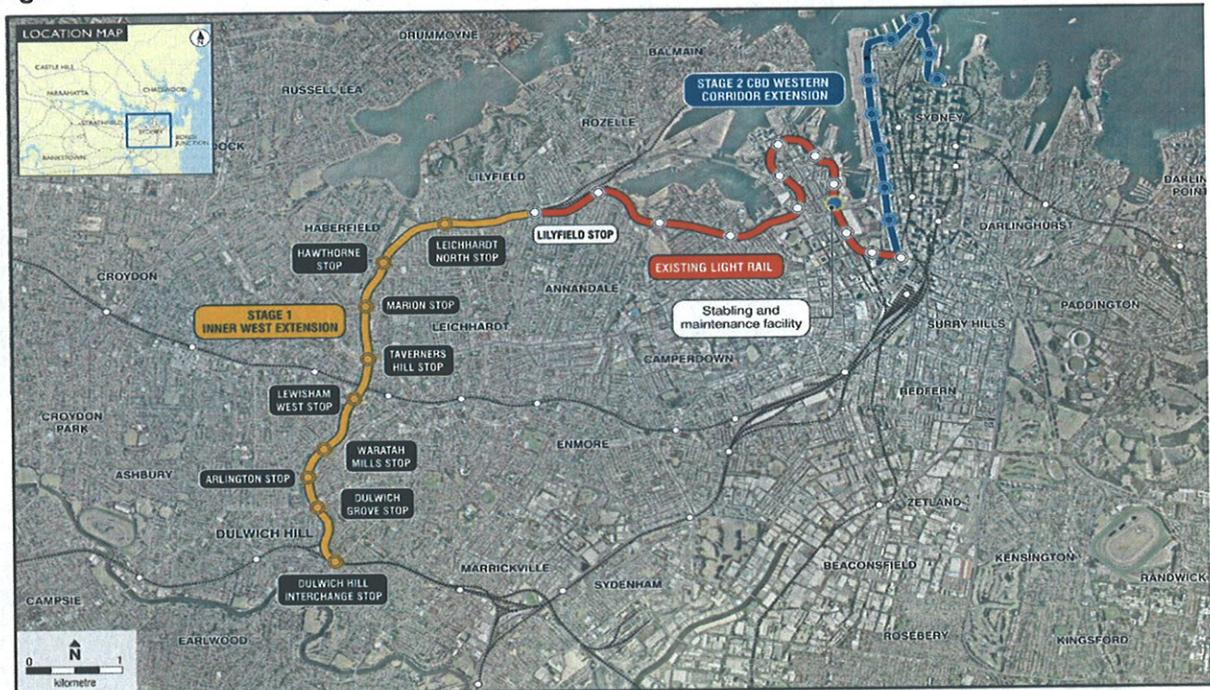


Figure 1.1 Overview of the SLRE and existing light rail network
Note: Indicative only, subject to detail design

The light rail component of the project would be located within the existing disused Rozelle Goods Line corridor between the existing Lilyfield stop at Catherine Street and Dulwich Hill Railway Station. The GreenWay component of the project would commence at Iron Cove, Dobroyd Point and continue in a southerly direction to Cooks River, Dulwich Hill. The project would pass through the local government areas of Leichhardt, Ashfield and Marrickville, with minor changes at the existing light rail maintenance facility at Pyrmont, within the City of Sydney.

Given the previous use of the corridor as a freight corridor, many adjacent land uses have been designed to 'turn away' from the rail corridor and face the adjoining street networks. Much of the corridor has residential zoning consisting of a mix of single and multiple dwellings. Other existing land uses include industrial areas, schools and child-care centres, active recreation areas, retail areas, existing CityRail lines, and open space.

Figure 2: Stage 1 alignment and GreenWay path

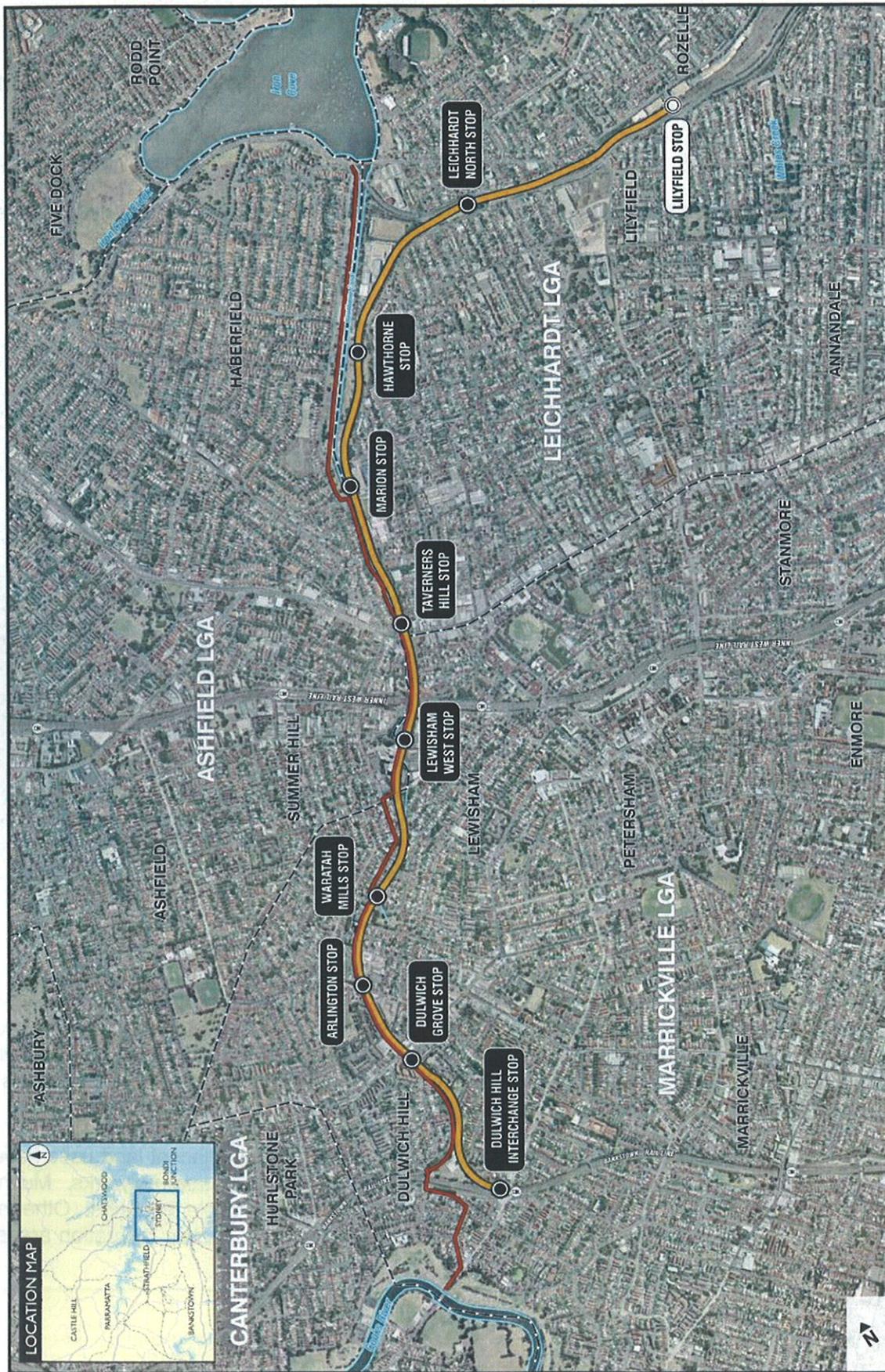


Figure 1.2 Overview of the project
 Note: Indicative only, subject to detail design.

- Light rail alignment
- Proposed GreenWay shared path
- Local government area boundary
- Existing light rail stop
- Existing heavy rail stop
- Watercourse
- Proposed light rail stops

2 PROPOSED PROJECT

2.1 Project Description

Light Rail

The light rail extension would primarily utilise the existing double track in the disused Rozelle Goods Line corridor between Lilyfield and Dulwich Hill. The key components of the light rail component of the project are listed in Table 1.

Table 1: Key Project Components

Aspect	Description
Light rail	<p>A 5.6 kilometre extension of the light rail between the existing Lilyfield light rail stop and the proposed Dulwich Hill Interchange stop, located within the disused Rozelle Goods Line corridor.</p> <p>The light rail would travel through the existing tunnel under the City West Link, and include upgrade of lighting and signage, fire safety, radio, and maintenance access.</p> <p>Raising of the existing bridge over Parramatta Road, which would carry the light rail over Parramatta Road by 0.5 metres to meet current RTA clearance requirements.</p> <p>Appropriate safety fencing or separation of the project and the heavy passenger rail operations at Dulwich Hill.</p> <p>Three potential crossovers and turnbacks, including a crossover at Lilyfield and/or Leichhardt North, a turnback at Dulwich Hill Interchange, and consideration of a further crossover at Lewisham West.</p>
Light rail stops	<p>Nine new light rail stops at Leichhardt North, Hawthorne, Marion, Taverners Hill, Lewisham West, Waratah Mills, Arlington, Dulwich Grove, and Dulwich Hill Interchange.</p> <p>The stops would generally be 350 to 830 metres apart. However, there would be a distance of 980 metres between the Lilyfield and Leichhardt North stops as the corridor is in the City West Link tunnel.</p> <p>Each stop would be designed to be fully accessible with lifts provided as required, in accordance with the <i>Disability Discrimination Act 1992</i>, and the Building Code of Australia.</p> <p>Each stop would be designed to improve connectivity by allowing access to surrounding areas and interchange with rail and buses where appropriate.</p> <p>Each stop would provide a number of typical facilities, including signage, furniture, security and safety facilities, bicycle parking facilities, and kiss-and-ride provisions.</p>
Pedestrian and Cyclist linkages	<p>A new pedestrian and cycle bridge at Parramatta Road adjacent to the Parramatta Road underbridge. A new pedestrian and cycle bridge across Hawthorne Canal near the Hawthorne stop.</p> <p>New infrastructure to ensure accessibility and connectivity between the GreenWay path, local streets and light rail stops.</p>
Modifications to existing infrastructure	<p>Minor modifications to the existing Lilyfield stop and surrounding track to tie-in the new track.</p> <p>Modifications to the existing space that is used for car parking in Bedford Crescent to accommodate the Dulwich Hill Interchange stop.</p>

Aspect	Description
Associated rail infrastructure and services	New overhead wiring system would be installed for the project. Two substations would be required for the project, with location options including near the Catherine Street overbridge, near the Marion Street underbridge, or near the Lewisham West stop.
Stabling and maintenance facility	The existing light rail stabling and maintenance facility in Pyrmont would require some infrastructure changes to provide for adequate servicing of the project. This would include the extension of one rail track approximately 30 metres into the existing car park, and additional security installation such as fencing, lighting, CCTV and intruder alarms.

RailCorp commenced track reconditioning works on the double track in August 2010 to upgrade the existing infrastructure to a standard suitable for passenger light rail vehicles.

GreenWay

The GreenWay sustainability project is a partnership between the four Inner West councils of Ashfield, Leichhardt, Marrickville and Canterbury. A number of GreenWay initiatives have already commenced, and on 19 July 2010, the NSW Government announced that components of the GreenWay would be included in the Stage 1 - Inner West Extension project.

The components of the GreenWay that would be incorporated into the project include:

- provision of a three metre wide, shared pedestrian and cycle path from Iron Cove at Dobroyd Point to the northern bank of the Cooks River, with access paths connecting it to the light rail stops and local streets;
- Bushcare and vegetation remediation areas to provide for an increase to existing local fauna habitat; and
- modification of the existing road bridge structures to accommodate the GreenWay path at Hercules Street, Old Canterbury Road, Constitution Road, Davis Street and Longport Street.

The GreenWay path would be located on the western side of the light rail corridor and predominantly within the disused Rozelle Goods Line corridor, extending outside the corridor and into adjacent streets (including Weston Street, Dulwich Hill) and parklands where opportunities for local connections arise or where continuation within the corridor is highly constrained. The GreenWay path alignment is shown in Figure 2.

2.2 Project Need and Justification

The *Metropolitan Plan For Sydney 2036* identifies that Sydney's population is expanding and is expected to reach six million by 2036. The Inner West subregion is expected to experience a population increase of approximately 35% to reach 307,000 by 2036. The South subregion is expected to experience a population increase of approximately 14.8% to reach 747,600 by 2036.

The population in the subregions currently place a significant demand on the existing transport network, including road, rail and bus infrastructure. As a result, there is a current need to improve existing transport network capacity, to improve the efficiency and reliability of the network and to cater for and to respond to projected population and employment growth. The proposed Inner West Light Rail Extension will be located in an area which is undergoing housing and population growth, which includes the renewal of former industrial sites for medium and high-density residential and employment uses.

The extension of the existing light rail system has been identified in the *Metropolitan Plan for Sydney 2036* and is consistent with objective C1 – to enhance the transport system through implementation of the *Metropolitan Transport Plan*, and objective C5 – to improve the passenger

experience of public transport and promote active transport opportunities, such as the proposed GreenWay path.

The *Metropolitan Transport Plan – Connecting the City of Cities (February 2010)* recognises that travel demand will increase with population growth, economic activity and the maturity of transport systems. If no action is taken, the cost of urban traffic congestion will increase significantly. These avoidable costs include extra travel time, increased unreliability, higher vehicle and fuel costs, and poorer air quality.

The *Metropolitan Transport Plan* commits to providing an efficient light rail system to service the inner city, and which will connect with buses and the higher capacity CityRail network. The project will give residents another option for accessing the CBD, Pyrmont and Darling Harbour, and allow commuters to connect with the Inner West and Bankstown CityRail lines.

Under the objective 'better transport and liveable cities' the *State Plan* refers to improving the public transport system as one of its key objectives. The *State Plan* nominates the Inner West Light Rail Extension as key to meeting this objective. The project is consistent with the following *State Plan* priorities:

- S6 – increasing share of peak hour journeys on a safe and reliable public transport system;
- P2 – maintain and invest in infrastructure;
- E3 – cleaner air and progress on greenhouse gas reductions; and
- E8 – more people using parks, sporting and recreational facilities and participating in the arts and cultural activity.

The *NSW Bike Plan (May 2010)* focuses on the delivery of new cycling infrastructure to transform cycling and to encourage people to ride safely and more often. The plan prioritises a Dulwich Hill to Lilyfield cycleway as one of 13 major missing links within the metropolitan bike network and is intended to be provided parallel to the light rail western extension corridor. The pedestrian and cycle GreenWay shared path component of the project is consistent with the *NSW Bike Plan*. A combined light rail and pedestrian and cycle corridor would support the target of 5% travel by bike for all trips in Sydney of less than 10 kilometres by 2016.

Construction and operation of the project would bring a range of social, environmental and economic benefits that would support the NSW Government's long term vision for Sydney. Additionally, as the corridor has previously been used as a heavy goods freight railway, the project would be able to be introduced at a lower cost and construction impact.

3 STATUTORY CONTEXT

3.1 Major Project

On 19 March 2010, an order by the Minister for Planning under section 75B of the *Environmental Planning and Assessment Act 1979* (EP&A Act) was gazetted declaring four priority projects for the delivery of the *Metropolitan Transport Plan 2010*, as projects to which Part 3A of the EP&A Act applies. The declaration included the project and it is therefore a project subject to Part 3A of the EP&A Act. This declaration was subsequently amended to exclude preliminary investigations, certain minor works and maintenance activities, and gazetted on 16 July 2010. Additionally, the Minister for Planning declared the project as critical infrastructure under section 75C of the EP&A Act, as being 'essential for the State for economic, environmental or social reasons'.

3.2 Permissibility

Through the provision of Sections 75J and 75R of the EP&A Act, and the critical infrastructure declaration gazetted on 19 March 2010, the project may be approved notwithstanding any prohibition contained within an existing environmental planning instrument, including a State Environmental Planning Policy (SEPP), unless that SEPP specifically states that it applies to the critical infrastructure project. There are no SEPPs that expressly apply to and in respect of the project.

3.3 Environmental Planning Instruments

There are no environmental planning instruments applying to the proposal that substantially govern the carrying out of the development. Notwithstanding, the assessment of the project has included the consideration of relevant SEPPs, including SEPP No.19 – Bushland in Urban areas and SEPP No.55 – Remediation of Land.

3.4 Objects of the EP&A Act

Decisions made under the EP&A Act must have regard to the objects of the Act, as set out in Section 5 of the Act. The relevant objects are:

- (a) *to encourage:*
 - (i) *the proper management, development and conservation of natural and artificial resources, including agricultural land, natural areas, forests, minerals, water, cities, towns and villages for the purpose of promoting the social and economic welfare of the community and a better environment,*
 - (ii) *the promotion and co-ordination of the orderly and economic use and development of land,*
 - (iii) *the protection, provision and co-ordination of communication and utility services,*
 - (iv) *the provision of land for public purposes,*
 - (v) *the provision and co-ordination of community services and facilities,*
 - (vi) *the protection of the environment, including the protection and conservation of native animals and plants, including threatened species, populations and ecological communities, and their habitats,*
 - (vii) *ecologically sustainable development,*
 - (viii) *the provision and maintenance of affordable housing;*
- (b) *to promote the sharing of the responsibility for environmental planning between the different levels of government in the State; and*
- (c) *to provide increased opportunity for public involvement and participation in environmental planning and assessment.*

The objects stipulated under Section 5 are significant factors informing determination of the application, except for 5(a) (v) and (viii) and 5(b), as the proposal does not raise significant issues

relating to community services and facilities or affordable housing; and is not relevant to the sharing of environmental planning between different levels of government.

The Department, in its assessment, has considered the need to encourage the proper management and conservation of artificial resources for the purposes of promoting the social welfare of the community and a better environment; the orderly development of land; the protection of communication and utility services; the provision of land for public purposes and the protection of the environment. In addition, the agency and community consultation undertaken as part of the assessment process (see Chapter 4 of this report), address object 5(c).

3.5 Ecologically Sustainable Development

The EP&A Act adopts the definition of Ecologically Sustainable Development (ESD) found in the *Protection of the Environment Administration Act 1991*. Section 6(2) of that Act states that ESD requires the effective integration of economic and environmental considerations in decision-making processes and that ESD can be achieved through the implementation of:

- (a) *the precautionary principle,*
- (b) *inter-generational equity,*
- (c) *conservation of biological diversity and ecological integrity,*
- (d) *improved valuation, pricing and incentive mechanisms.*

The principles of ESD have been addressed in the EA prepared for the project. The EA includes detailed studies in the form of Technical Reports prepared by specialists in the areas of Traffic and Transport, Noise and Vibration, Heritage, Ecology, Visual, and Socioeconomic impacts.

The results of these reports have been summarised within the main body of the EA to ensure that the principles of ESD have been adequately addressed as part of the assessment of the project. Mitigation and management measures have been committed to by the Proponent and would be implemented as part of the project to ensure that project impacts are minimised to the greatest extent possible.

The EA outlines sustainability principles for the project for energy use, climate change adaptation, materials and waste, water conservation, biodiversity, heritage, pollution control, and community benefit. The key sustainable objectives for the project include:

- encouraging sustainable travel with greater use of active transport; and
- delivering a safe and reliable project in a sustainable and environmentally friendly way.

On this basis, and the Department's assessment of key issues outlined in Chapter 5 of this report, the Department is satisfied that the proposal promotes the principles of ESD.

3.6 Statement of Compliance

In accordance with section 75I of the EP&A Act, the Department is satisfied that the Director-General's environmental assessment requirements have been complied with.

4 CONSULTATION AND SUBMISSIONS

4.1 Exhibition

Under section 75H(3) of the EP&A Act, the Director-General is required to make the EA of an application publicly available for at least 30 days. After accepting the EA as adequate, the Department publicly exhibited it from 13 October until 15 November 2010 on the Department's website and offices, and at the Nature Conservation Council, and Leichhardt, Ashfield and Marrickville Councils.

The Department also advertised the public exhibition of the EA in the Sydney Morning Herald and Inner Western Suburbs Courier on 12 and 13, and 26 and 27 October 2010.

The Department received 197 submissions during the exhibition of the EA, including 9 submissions from public authorities and 188 submissions from the general public and special interest groups.

A summary of the issues raised in submissions is provided below.

4.2 Public Authority Submissions

The State Transit Authority (STA) agrees in principle with the project, and made the following comments:

- STA bus stops identified as interchange bus stops between buses and light rail need to be compliant with the requirements of the *Disability Discrimination Act 1992*;
- the installation of kiss and ride parking facilities should not reduce bus zones length and/or impede the safe operation of STA buses; and
- STA should be consulted on any proposed bus stop and/or bus zone changes, during the detailed design with regards to kiss and ride facilities and pedestrian and cycle facilities, and during the preparation of the Construction Traffic Management Plans and Traffic Control Plans.

The Department of Environment, Climate Change and Water (DECCW) considers the key environmental issues to be:

- noise and vibration – in particular determination of appropriate operational noise goals, and construction noise and vibration management;
- biodiversity impacts – in particular regarding the Long-nosed Bandicoot, Microbats (Eastern Bent-wing Bat and Eastern False Pipistrelle Bat), and assessment of impacts including impacts from ancillary facilities and temporary worksites; and
- further investigation of potential contaminated sites.

The project includes no activities that are scheduled under the *Protection of the Environment Operations Act 1997* and will therefore not require licensing during construction or operation. However, the proposal will require a licence under s91 of the *Threatened Species Conservation Act 1995*.

RailCorp supports additional investment in public transport infrastructure and considers that the project strategically augments the existing light rail network by expanding the network into new and developing residential areas. RailCorp advised that it will continue to work with Transport NSW and stakeholders to resolve issues involving land ownership, RailCorp infrastructure, interface with CityRail stations and the active heavy rail corridor, and compliance with RailCorp Standard ESC-530 – Cycleways within the Rail Corridor.

The Road and Traffic Authority (RTA) submission raised a number of matters relating to traffic and transport issues, to be considered in conditions of approval for the project. These related to:

- raising the existing rail bridge over Parramatta Road;
- approval requirements for any road or lane closures of State or Regional Roads; and
- traffic flow, functionality and road safety requirements.

Department of Planning – Heritage Branch considers that the project's statement of commitments and provisions made in Construction Environmental Management Plans should be robust and clearly guide the approach to mitigation. The Heritage Branch has therefore provided a number of suggestions for further assessment to inform and refine final design outcomes and mitigation measures to minimise and manage impacts to heritage items.

Leichhardt Council strongly supports the extension of the existing light rail service to Dulwich Hill, including the associated GreenWay path. Leichhardt Council's submission requested consideration of a range of issues to assist the Government in creating a safe, efficient and community friendly light rail system, including:

- further consideration of design and location of light rail stops, including public transport integration, pedestrian and cyclist access, landscaping, safety, and built form elements;
- the proposed pedestrian bridge across Hawthorne Canal should be constructed as a shared pedestrian / cycle bridge with a minimum width of four metres and guard rails sufficiently high to ensure safety for cyclists;
- concern over the justification for and selection of the northern option for the light rail stop at Marion Street, and it is requested that consideration of the southern option for the Marion stop be re-examined;
- the impact of the light rail on Battle Bridge, in particular care should be taken to design and construct structures which sympathise with the historic character of the bridge and surrounds; and
- during construction, it is necessary that environmental and biodiversity issues be considered, in particular dust, dirt and soil waste, noise and vibration, construction traffic, drainage and overflow, impact on wetland areas, and damage to existing habitats.

Ashfield Council supports the project, and provided the following comments:

- the report fails to properly assess the requirements for commuter parking at each stop;
- the rail link will generate additional traffic in local areas, and in order to address safety, traffic management plans and appropriate measures should be implemented;
- the receipt of complaints from residents due to noise may require the allocation of Council resources in dealing with the issue;
- where the track is elevated, appropriate screening needs to be provided to protect privacy of residents;
- recommended design considerations for access and configuration of light rail stops;
- consideration should be given to energy efficient lighting and fencing requirements along the GreenWay path;
- clarification is necessary regarding the existence of remnant vegetation within the corridor, and further consideration of important habitat in the Inner West;
- existing community Bushcare sites should be preserved and additional sites implemented where possible, and considers that soil testing for contamination is recommended before any new Bushcare sites are established; and
- needs to know how trees and vegetation will be affected, as removal of some trees may be of concern to residents and therefore need to be relocated/re-established.

Marrickville Council supports the project and commented on the thorough assessment and consultation process undertaken by Transport NSW and provided comment on the following key issues:

- further assessment is needed to determine the precise locations of the Lewisham West and Dulwich Hill Interchange stops, with further consideration given to the Ecotransit idea for a direct link between the Lewisham West stop and Lewisham Railway Station;
- stops and access routes to stops must be carefully designed so as to minimise impacts on residents living very close to these stops;
- further consideration should be given of the option of constructing the GreenWay path within the corridor between Waratah Mills Station and Old Canterbury Road instead of along Weston Street;
- need for careful co-ordination between Transport NSW, Department of Planning, Marrickville and Ashfield Councils and the developers of the Lewisham Estate and Allied Mills sites in relation to Lewisham West Station to ensure this station maximises opportunities created by those developments and vice-versa;
- further consideration of the location of Dulwich Hill Interchange stop in light of comments from local residents and the Ecotransit proposal for an elongated station design on Bedford Crescent;
- minimise impacts on existing bush regeneration areas at both the construction and post-construction stages;
- further consideration of all issues raised by the GreenWay Steering Committee, including the need in the immediate term for a suitable low-cost walk/cycle crossing at the Wardell Road bridge over the Cooks River;
- ensure that all components of the 'access chain' for people with mobility difficulties to and from light rail stations and light rail vehicles have been identified and suitably designed;
- ensure that the findings of the Tennyson Street subcatchment stormwater management project are adopted to promote best practice stormwater management;
- ticketing for the whole light rail system should be fully integrated with the MyZone ticketing and fare structure; and
- kiss and ride, mobility parking and bicycle parking should be provided, but not general park and ride.

The City of Sydney provided a submission primarily focused on the GreenWay element, which the City strongly supports due to its potential to act as a key feeder route bringing riders from other parts of Sydney onto the City of Sydney's new cycle network. The City of Sydney considers the GreenWay path should be design as a quality piece of infrastructure, at the same grade as the light rail tracks for the entirety of the route and is concerned with the northern alignment of the GreenWay path and its divergence away from the light rail corridor. Council also considers that the GreenWay provides an opportunity for biodiversity conservation and restoration with linkages to connecting green corridors within the area.

4.3 Public Submissions

A total of 188 submissions were received from the public. This included submissions from the following interest groups:

- Marion Street Light Rail Committee;
- The Blacktown Transport Coalition – light rail and trolley bus division;
- EcoTransit Sydney Inc;
- BIKESydney;
- Friends of the GreenWay;
- Leichhardt Precinct Committee;
- GreenWay Steering Committee;
- GreenWay Sustainability Project;
- Leichhardt Bicycle Users Group;
- Inner West Environment Group;

- Bicycle NSW; and
- Physical Disability Council of NSW.

Of the 188 public submissions, 25 (13.5%) objected to the project (or a particular element of the project), 83 (44%) supported the project and 80 (42.5%) provided general comments. The key issues raised in public submissions are listed in Table 3.

Table 3: Summary of Key Issues Raised in Public Submissions

Issue	Proportion of submissions (%)
<p><i>Station location</i></p> <p>Hawthorne stop – concerns that the immediate neighbourhood would be adversely affected by increased traffic and parking impacts.</p> <p>Marion stop – concerns over increased traffic flow, increased crime rates, and insufficient parking to accommodate commuters and locals. Discussion over options to locate the station at Marion Street north or Marion Street south.</p> <p>Taverners Hill stop – concerns the proposed stop will result in an increase in both vehicular and pedestrian accident rates, an increase in noise from additional vehicles, pedestrians and trains, and will affect parking availability for residents. Also concerns about privacy for residents.</p> <p>Arlington and Waratah Mills stops – a total of 43 submissions support keeping the Arlington and Waratah stops instead of consolidating into only one stop. A total of 29 submissions support the proposal put forward by the Better Light Rail Resident Action Group to merge the Waratah and Arlington stops, with just one station at Terry Street.</p> <p>Dulwich Hill Interchange stop and Lewisham West stop – consider the stops should be moved to more closely integrate with Dulwich Hill Railway Station and Lewisham Railway Station respectively.</p>	46%
<p><i>GreenWay path at Weston Street</i></p> <p>A total of 51 submissions objected outright to the detour of the GreenWay path from the light rail corridor into Weston Street.</p> <p>A significant number of submissions raised concern regarding impact to the amenity of Weston Street as a result of the alignment, including noise impacts, visual impacts, traffic and parking impacts, safety issues, privacy and amenity impacts, and the cumulative impact of imposing the GreenWay path detour, light rail and light rail stop within one small area at Weston Street.</p>	32%
<p><i>Station access</i></p> <p>Access points – concerns raised over safety at station access points, and need for disabled and pram access, and bicycle storage. Concerns also raised over possible traffic congestion, particularly around Marion Street, Hawthorn Parade, and Hathern Street.</p> <p>Taverners Hill stop – potential for conflicts which may occur between passengers of the light rail and GreenWay path users, in particular, suggested design changes for pedestrian ramp at Taverners Hill stop.</p> <p>Marion stop – a total of 20 submissions raised issues relating to the pedestrian and cyclist crossing of Marion Street, and options for a signalised crossing or overbridge. Five of these supported the bridge crossing over Marion Street.</p> <p>Parking – concerns primarily related to concerns that light rail users would park on residential streets thereby adversely impacting residents by removing on-street parking in the streets around the light rail stops.</p>	17%

Issue	Proportion of submissions (%)
<p><i>GreenWay Path</i></p> <p>Design – the majority of submissions provided additional design suggestions, such as alignment options, design of the pathway, and possible extensions to the CBD and over the Cooks River.</p> <p>Safety – concern for the safety of pedestrians on the path, with cyclists who may be travelling fast.</p> <p>Amenity – concerns regarding noise, privacy and effects on flora and fauna.</p>	13%
<p><i>Biodiversity</i> – Oppose the unnecessary destruction of existing Bushcare sites. Where impact is unavoidable suggest compensatory sites, protection of areas of remnant local species, management measures for rehabilitation, weed and pest management. Suggest the Proponent consult with those who have on the ground knowledge to map out future sites, and devise management and access procedures.</p>	9%
<p><i>Rail line noise and privacy</i> – High number of rail trips will mean significant rise in noise levels, including bell noise when train leaves the station. Also concerns about loss of privacy due to passengers being able to look into backyards and therefore screening for noise and privacy is required.</p>	8%
<p><i>Transport integration</i> – Suggest integrated ticketing and similar pricing as for buses and rail. Need for an integrated public transport network in the Inner West, including timetabled operation.</p>	7%

4.4 Proponent's Response to Submissions

The Proponent provided a response to the issues raised in submissions (see Appendix C). The response included proposed design changes for the Dulwich Hill Interchange stop location and the lift at the Waratah Mills stop.

An alternative design scheme to that presented in the EA is to be included as part of the project for the Dulwich Hill Interchange stop. The new design would result in less environmental impacts compared to the base case presented in the EA and would not require the excavation of the cliff face on Bedford Crescent resulting in less vegetation clearing and less resumption of commuter parking on Bedford Crescent. The new design would also provide a pedestrian link to Jack Shanahan Park improving access to the stop. However, the new design would include an increase in the walking distance to approximately 135 metres and a walking time of approximately 1 ½ minutes between the Dulwich Hill Railway Station and the light rail stop, which is considered acceptable, particularly compared with other schemes. Other design changes include:

- provision of a single, four metre wide platform;
- stair and lift from Bedford Crescent down to a new path, providing access to the stop platform and to Jack Shanahan Park;
- a new footpath on the southern side of Bedford Crescent;
- a new small pocket park at the far western end of Bedford Crescent;
- a disabled parking space provided close to the stop and the retention of commuter parking on the southern side of Bedford Crescent;
- a security fence between the proposed light rail corridor and the existing heavy rail corridor; and
- totem signage installed at the junction of Bedford Crescent and the Wardell Street bridge, at the stop entrance and in Jack Shanahan Park.

To improve accessibility to the Waratah Mills stop and to provide an additional access point to the stop away from Weston Street, a lift access to Davis Street bridge from the Waratah Mills stop would be included in the project. The final location, design and configuration of the additional access point would be determined during detailed design.

An environmental impact assessment of any new or modified impacts as a result of the design changes was undertaken as part of the Submissions Report, which determined that these design changes would have relatively minor and manageable impacts.

The Department undertook further consultation with key agencies following the receipt of the submissions report. DECCW restated its concerns in relation to fauna surveys, relocation of threatened fauna, vegetation clearance, fauna monitoring and operational vibration.

The Department also received submissions from Councils and community groups following making the Submissions Report publicly available. A key matter raised in these submissions was a request for the Department to consider the continuation of the GreenWay path along the rail corridor from the Hawthorne Canal to the Anzac Bridge. These submissions and those raised during the exhibition of the project have been considered by the Department in its assessment of the project.

5 ASSESSMENT

5.1 Construction Noise and Vibration

Issue

The project is located in an established urban environment with a variable ambient noise environment, influenced in some locations by road traffic noise and rail traffic noise from the existing Inner West and Bankstown lines. Due to the close proximity to Sydney's Kingsford Smith Airport, noise from aircraft is also audible. Some locations are also subject to noise from industrial sources.

Sensitive receivers adjacent to the project corridor include residential, recreational, film industry, commercial (café), nursing home, and educational receivers. A number of heritage items are also considered to be vibration sensitive receivers. Most commercial and industrial receivers are less sensitive to noise and vibration.

Construction noise

Construction noise and vibration goals have been determined based on relevant government guidelines and industry standards. Noise and vibration emission levels have been determined based on expected activities, and where exceedances are predicted, feasible and reasonable mitigation measures considered.

The project would be constructed over approximately 12 months. Although it is anticipated that most works would be completed during standard daytime construction hours, at some locations night time works would also be required.

Noise management levels (NMLs) for sensitive residential and other receivers are as described in Table 4.

Table 4: Noise management levels for sensitive receivers

Receiver	Noise management level
Residential – daytime (7.00am to 6.00pm)	RBL or L_{A90} Background + 10dBA
Residential – evening (6.00pm to 10.00pm)	RBL or L_{A90} Background + 5dBA
Residential – night (10.00pm to 7.00am)	RBL or L_{A90} Background + 5dBA
Land use	Noise management level $L_{Aeq(15minute)}$
Classrooms at schools and other educational institutions	Internal noise level 45dBA*
Hospital wards and operating theatres	Internal noise level 45dBA*
Places of worship	Internal noise level 45dBA*
Active recreation areas	External noise level 65dBA*
Passive recreation areas	External noise level 60dBA*
Commercial premises	External noise level of 70dBA
Industrial premises	External noise level of 75dBA

* Noise management level applies when properties are being used.

Based on the noise management levels for sensitive receivers, and as measured at key monitoring locations, residential noise management levels would be between:

- 49 to 63 dBA (daytime);
- 44 to 54 dBA (evening); and
- 36 to 47 dBA (night-time).

In addition, where construction would be required during the night-time period the potential for sleep disturbance is considered with an initial screening criterion of background plus 15dBA.

Construction works would take place along the full length of the project and would be transient for many activities. The key fixed construction sites would include nine light rail stop construction sites, the Parramatta Road underbridge site and bridge underpass excavation work sites to accommodate the GreenWay path, and the stabling and maintenance facility at Pyrmont.

Construction at the stop sites would occur during the daytime only. Construction at the bridge and underpass sites would occur during the daytime and night-time as required to maintain daytime bridge operations. The impacts of noise at the construction sites and to upgrade bridge structures or excavate underpasses to accommodate the GreenWay path are summarised in Table 5.

Table 5: Predicted noise impacts – construction sites

<i>Construction site</i>	<i>Affected receiver</i>	<i>NML predicted exceedance (day)</i>	<i>NML predicted exceedance (night)</i>
Lilyfield site	Residents south on Brenan St	up to 10dBA	n/a
Leichhardt North stop	Residents south on Darley Rd Commercial south on Darley Rd	up to 10dBA up to 3dBA	n/a
Hawthorne stop	Residents to the west / east	11dBA / 21dBA	n/a
Marion stop	Residents to the west / east	5dBA / 14dBA	n/a
Taverners Hill stop	Residents / Commercial	15dBA / 4dBA	n/a
Lewisham West	Residents / Commercial	5dBA / 11dBA	n/a
Waratah Mills site	Residents to the west / east	32dBA / 28dBA	n/a
Arlington site	Residents to the west / east / Commercial	14dBA / 23dBA 25dBA	n/a
Dulwich Grove	Residents to the west Commercial to the east School	20dBA 22dBA 32dBA	n/a
Dulwich Hill Interchange	Residents / Commercial	12-23dBA / 6dBA	n/a
Parramatta Road rail overbridge	Residents / Commercial	18dBA / 9dBA	22dBA
Longport St underpass	Residents to the east / remaining	19dBA / 7dBA	24dBA / 13dBA
Old Canterbury Rd underpass	Residents	37dBA	37dBA
Davis St underpass	Residents northeast / northwest	38dBA / 34dBA	42dBA / 37dBA
Constitution Rd underpass	Residents west / east	31dBA / 18dBA	37dBA / 30dBA
Hercules St underpass	Residents west School	33dBA 22dBA	38dBA

Construction of the GreenWay would require works along the length of the alignment, during the daytime only. Indicative worst case construction noise along the GreenWay is shown in Table 6.

Table 6: Predicted noise impacts – GreenWay construction

<i>Receiver distance</i>	<i>Earthworks LAeq noise level</i>	<i>Piling LAeq noise level</i>
10 metres	83dBA	80dBA
20 metres	77dBA	74dBA
30 metres	73dBA	70dBA
40 metres	71dBA	68dBA
50 metres	69dBA	66dBA

The Works at the Pymont Stabling Facility would be conducted during standard daytime hours. Predicted noise levels for construction activities comply with the noise management levels at all receivers.

The project is not anticipated to generate any significant daytime traffic noise impacts as a result of traffic associated with construction. Night-time works are proposed for the Parramatta Road bridge and further investigation would take place to confirm the number of existing sleep disturbing events that occur, as well as the external to internal noise reduction achieved at these locations.

Management of impacts during construction would include implementing time restrictions for construction activities, sound level restrictions, and feasible and reasonable mitigation measures in accordance with DECCW's *Interim Construction Noise Guideline*.

Construction vibration

Some items of equipment proposed to be used to construct the project could result in exceedances of the human comfort criteria at distances of up to around 40 metres, depending on the duration and nature of the construction activity. Any exceedances would, however, be expected to be of short duration.

The cosmetic damage threshold for structures could be exceeded and vibration monitoring would be undertaken to confirm safe working distances at specific vibration sensitive sites, such as heritage items, to minimise impacts on these structures.

Consideration

The Proponent has committed to minimising construction noise and vibration impacts at sensitive receivers and where feasible meeting noise management levels, and where this is not possible, scheduling work to provide respite periods from the noisiest activities. The Proponent has also committed to restricting work hours, and preparation of site specific Construction Noise and Vibration Management Plans where construction noise exceeds 75dBA.

The Department acknowledges that construction noise impacts are likely to occur due to the nature of the construction works required and accepts that meeting noise management levels can generally not be achieved for infrastructure projects, particularly when receivers are in close proximity to the works. The Department also notes that the noisiest activities would not occur for the entire construction period at one location, and considers the preparation and implementation of construction noise and vibration management plans as an appropriate mechanism for the identification and implementation of appropriate noise management and mitigation measures. This approach allows mitigation measures to respond to detailed design and in consideration of DECCW recommendations, the Department has recommended conditions of approval to reiterate and further address the following issues to ensure construction works are managed to 'best practice' procedures:

- appropriate construction hours and out-of-hours construction requirements;
- a land use survey to identify potentially critical working areas that are sensitive to vibration and ground-borne noise impacts;
- the preparation and implementation of a Construction Noise and Vibration Management Plan which would include the implementation of reasonable and feasible mitigation measures to reduce noise emissions as much as possible, consistent with the DECCW *Interim Construction Noise Guidelines*; and
- the preparation of an out-of-hours work (OOHW) protocol for the assessment, management and approval of works outside of standard construction hours, including a risk assessment process under which an Environmental Representative would approve out-of-hour construction activities deemed to be of low environmental risk and refer high risk works for the Director-General's approval. The OOHW protocol would detail standard assessment, mitigation and community notification requirements for high and low risk out-of-hour works, and detail a standard protocol for referring applications to the Director-General.

The Construction Noise and Vibration Management Plan would also be complemented by a comprehensive Community Communication Strategy to facilitate the dissemination of information on construction activities to the community and to receive and action community complaints and enquiries. Therefore, based on the Proponent's proposed management and mitigation measures and the Department's recommended conditions of approval, the Department considers that the project can be constructed within acceptable acoustic and vibration limits.

5.2 Operational Noise and Vibration

Issue

Rail noise

The main sources of airborne noise from light rail vehicles originate at the wheel-rail interface and the existing light rail system has shown that noise generated from equipment mounted to the light rail vehicles is typically minimal, with the exception of warning bells used to signal impending departure of the vehicles from stops. Current operating procedure during the night-time period is for warning bells to be used only when in the opinion of the driver there is considered to be a danger to public safety.

The residential receivers predicted to experience the highest noise levels along the alignment are summarised in Table 7. This table is intended to indicate noise levels at different times of day at the facades of the residences closest to the route.

Table 7: Predicted operational noise levels at residential receivers

<i>Noise Catchment Area</i>	<i>Maximum predicted noise levels at residential receivers</i>			
	<i>L_{Aeq(day)}</i>	<i>L_{Aeq(evening)}</i>	<i>L_{Aeq(night)}</i>	<i>L_{Amax}</i>
Residential noise goal	60dBA	55dBA	50dBA	82dBA
Lilyfield – Leichhardt North	56	55	50	80
Leichhardt North – Hawthorne	53	52	47	75
Hawthorne – Marion	52	52	46	74
Marion – Taverners Hill	51	50	45	74
Taverners Hill – Lewisham West	53	53	48	77
Lewisham West – Waratah Mills	59	59	54	86
Waratah Mills – Arlington	58	57	52	83
Arlington – Dulwich Grove	55	54	49	78

Noise Catchment Area	Maximum predicted noise levels at residential receivers			
	$L_{Aeq(day)}$	$L_{Aeq(evening)}$	$L_{Aeq(night)}$	L_{Amax}
Residential noise goal	60dBA	55dBA	50dBA	82dBA
Dulwich Grove – Dulwich Hill Interchange	56	55	50	81

Minor exceedances of the operational noise goals of up to 4dB have been predicted at seven residential locations between the Lewisham West and Arlington stops and are at locations where light rail vehicles are expected to reach their top speed. No exceedances of the noise goals have been identified for sensitive non-residential receivers.

Potential mitigation options for these receivers include:

- source control measures, such as optimised track design and rail dampers;
- operational measures, such as reduced speeds or reducing the number of rail movements;
- path control measures, such as acoustic shielding between the railway line and the receiver locations; and
- receiver controls at existing developments, such as building façade treatments or property noise barriers (fences).

Attended measurement of operational noise limits is recommended after commencement of operations at affected residents to confirm if mitigation measures are required. Attended measurements would also be undertaken at other representative locations across the project area to validate the noise predictions and determine if any additional mitigation measures would be required.

Substation noise

Two new enclosed substations are proposed to be constructed as part of the project. Three locations have been identified as potentially suitable, at Catherine Street near the existing Lilyfield stop, at Marion Street near the Marion stop, and at the Lewisham West stop. Detailed design would confirm the final locations.

The major noise sources at substations would be electric transformers, which vibrate due to expansion and contraction of the transformer core, and operate continually throughout the day and night. Other noise sources at substations are transformer cooling fans which operate when required, and circuit breakers which operate only when fault conditions cause over-current trips.

As the proposed substations are fixed facilities, noise emissions were assessed in accordance with the NSW *Industrial Noise Policy* (INP). The predicted noise levels at the nearest sensitive receiver to each of the proposed substations are presented in Table 8. A 5dBA correction factor for tonal/low frequency noise has been added to the predicted L_{Aeq} levels in accordance with the INP.

The predicted noise levels show a high level of compliance with the intrusiveness and amenity criteria at all existing residences for scenarios 1 and 2, which reflect normal operations and noise emissions. For scenario 3, which includes circuit breaker events, the sleep disturbance screening criteria are exceeded at all locations by up to 10dBA. However, taking account of the existing noise environment and the low frequency of circuit breaker events, sleep disturbance due to the substation circuit breakers is considered unlikely at any nearby residential receivers and additional mitigation of the substation noise, beyond the proposed enclosure is not considered to be required.

Table 8: Operational noise goals and predicted substation noise levels

Substation	Nearest receiver	Operational noise goal			Predicted noise level (dBA)		
		Intrusive criteria $L_{Aeq}(15min)$	Amenity criteria $L_{Aeq}(period)$	Sleep disturbance criteria $L_{Ae1}(60secs)$	Scenario 1 L_{Aeq}	Scenario 2 L_{Aeq}	Scenario 3 L_{Amax}
Lewisham West	60 metres	47	49	57	16	25	64
Catherine Street	80 metres	47	49	57	14	23	62
Marion	90 metres	41	43	51	13	22	61

Scenario 1 – Transformer (continuous)

Scenario 2 – Transformer (continuous with fans operating)

Scenario 3 – Circuit breakers (maximum)

Vibration

Two residential receivers (1 and 4 Short Street, Dulwich Hill) have been identified as potentially exceeding the 103dB vibration design goal, by a minor 2dB. No exceedances of the vibration criteria are expected for commercial or other sensitive receivers. The vibration source levels assumed in the assessment are considered conservative and it is expected that actual peak vibration levels due to any one light rail vehicle passby would lie in a range up to 10dB below the predicted maximum levels. It is also noted that the design goal is lower than heavy rail projects and accordingly, attended measurements of operational vibration are recommended at Short Street after operations start to confirm the predicted vibration levels.

With respect to operational vibration impacts on heritage receivers, it is noted that vibration levels from the light rail would be much lower than vibration levels generated by the freight vehicles that used the line previously, and structural damage is therefore unlikely.

Consideration

The Proponent has committed to minimising operational noise and vibration impacts. This includes determining the need for mitigation at selected locations on the basis of attended measurements after operations start, and ensuring that warning bells are only used between 10pm and 7am if the driver considers there to be a danger to public safety.

The Department is generally satisfied with the noise assessment and notes that the previous use of the corridor was for freight train movements, and that the operational noise associated with the light rail movements is not a new noise source in this area. The exception is the warning bell used to signal impending departure of the vehicles from stops. The Department considers that the current night time operating procedure is appropriate to ensure minimal sleep disturbance events occur. With regards to operation of the GreenWay path, including along Weston Street, the Department considers that noise from pedestrian and cyclists use would be negligible.

The Department also notes that the assessment is conservative and considers that the predicted noise and vibration exceedances are minor and generally will not be perceptible and that exceedances can be further addressed through detailed design or the implementation of mitigation measures. Accordingly the Department recommends that the rail line and associated facilities are designed to satisfy project specific noise and vibration levels, generally consistent with DECCW recommendations, including that:

- light rail stops, electrical substations, and the Pyrmont train stabling facility shall be designed and operated, where feasible and reasonable, to satisfy project specific noise and vibration levels, as prescribed in the INP; and
- the activity of light rail vehicles operating on track, shall be designed and operated to satisfy the air borne and ground borne noise criteria, and vibration criteria as specified, where feasible and reasonable, at noise sensitive receiver locations.

To ensure appropriate noise and vibration levels are met, the Department considers that the Proponent should prepare an Operational Noise and Vibration Review based on detailed design, to identify project specific noise and vibration levels applicable to each facility and operation of the light rail, and the means by which the noise and vibration levels will be satisfied. Additionally, a noise and vibration compliance assessment to confirm the predictions of the noise assessment referred to in the Operational Noise and Vibration Review is recommended to be undertaken within three months of the commencement of operation of the project.

Therefore, based on the Proponent's proposed management and mitigation measures and the Department's recommended conditions of approval, the Department considers that the project would be operated within acceptable acoustic and vibration limits.

5.3 Traffic and Transport

Issue

The project is within an area well served by public transport, with numerous bus routes providing a mix of frequent line-haul services from inner-west suburbs to Sydney CBD; and feeders to local rail stations including Dulwich Hill and Lewisham Stations, on the CityRail Inner West line and Bankstown Line, which provide frequent train services to CBD stations, as well as Burwood, Strathfield and further west; and the existing Sydney Light rail which runs from Lilyfield to Central Station via Pyrmont.

The road network surrounding the project is mostly comprised of local streets with a typical Annual Average Daily Traffic (AADT) volume between 300 and 600 vehicles per day, which are low volumes. The local roads fit within a coarser grid of distributor and arterial roads. Traffic volumes on the distributor and arterial road network are high with many of these roads approaching capacity, with Parramatta Road carrying up to 70,000 vehicles and City West Link carrying up to 50,000 vehicles per day.

The GreenWay path will become a link between the Iron Cove shared path and the Cooks River shared path. Both these off road facilities are important regional cycle facilities. The GreenWay path would contribute another key link in the regional cycle network and will allow better cycle access for a number of areas, while at the same time raising the profile of cycling through the association with a major project like the light rail extension.

Construction Traffic

Construction activity would be mostly focused around individual stops and along the GreenWay, with most of the material needed to construct the stops and the GreenWay being transported by road. Construction traffic impacts include:

- Construction worker vehicle trips and parking - The project is expected to require up to 350 workers with most of these workers expected to be working from the main site compound at the Rozelle Goods Yard, accessed by the City West Link. The use of public transport, shared journeys and use of contractor's mini buses would be promoted and where practical, construction workers would park within the worksites or within site compounds to limit traffic and parking impacts. During the working day the majority of staff trips are expected to be within the light rail corridor instead of on roads;

- Construction heavy vehicle trips - On average an estimated 4.9 truck trips per day during the peak six month period could be added to the road network along the light rail corridor alignment. This increase in truck traffic is unlikely to have a significant effect on traffic performance. The construction traffic impact of heavy vehicles would be reduced by limiting AM and PM peak hour movements, avoiding the use of residential streets, and where practical, combining deliveries and undertaking multi drop deliveries;
- Construction compounds and access - None of the construction accesses would remove parking except at the Dulwich Hill Interchange stop. The site compounds and worksite access locations minimise the use of local roads, and can be managed to maintain good levels of amenity and road safety; and
- Temporary lane and road closures - Some temporary lane or road closures may be required, and would be managed and coordinated so that accessibility on local roads is maintained and the Proponent would need to coordinate any lane or road closures with the relevant Council and the RTA. The proposed construction methodology could require:
 - o overnight road closures of Parramatta Road during the lifting of the pedestrian / cycle bridge span and lane closures during the realignment of the rail bridge;
 - o road closures of Davis Road and Constitution Road for ground strengthening works prior to tunnelling for the GreenWay path;
 - o lane closures of Marion Street to facilitate the construction of the signalised crossing;
 - o lane closures on Hercules Street to provide a construction compound and access for construction of the GreenWay path; and
 - o lane closures on the southern side of Bedford Crescent to allow for the construction of the light rail stop.

Operational traffic generation and parking

The majority of people expected to use the light rail would walk or cycle to stops and car use to access stops is expected to be modest. A preliminary 2016 weekday forecast of passengers boarding the light rail at each of the proposed stops is included in Table 9. The forecast estimates the total number of passengers boarding at each of the proposed stops and the transport mode used to access the stop.

Table 9: Light rail weekday passenger boarding forecast 2016

<i>Light Rail stop</i>	<i>Total passengers boarding</i>	<i>Walk</i>	<i>Bus</i>	<i>Car (Kiss & Ride)</i>	<i>Car (Park & Ride)</i>	<i>Rail</i>
Leichhardt North	415	375	10	15	15	-
Hawthorne	375	360	-	5	10	-
Marion	390	160	180	35	15	-
Taverners Hill	255	150	95	5	5	-
Lewisham West	275	140	5	10	5	115
Waratah Mills	225	215	-	5	5	-
Arlington	182	170	-	10	5	-
Dulwich Grove	445	275	140	20	10	-
Dulwich Hill Interchange	540	160	30	20	30	300
Total	3105	2005	460	125	100	415
Percentage	100%	65%	15%	4%	3%	13%

Traffic generation that could result from operation of the light rail is not expected to be significant. The stops where most traffic is expected to be generated, Marion, Dulwich Hill Interchange, and Dulwich Grove, are located close to arterial or sub arterial roads that already carry significant daily

traffic volumes. The small increase in traffic that could occur because of the light rail would have little impact on the traffic conditions and performance of these streets and fall within normal daily variations of traffic.

Currently, a pedestrian refuge island is provided across Marion Street to assist pedestrians cross this road and aid the movement along the existing Hawthorne canal shared cycle path. Because of the increased pedestrian and cycle activity that is expected to result from the light rail and the GreenWay path, a signalised pedestrian crossing is proposed to replace the existing pedestrian refuge. This is unlikely to have a significant impact on traffic and would operate in both peak hours at a level of service B or better, consistent with existing operations.

The main parking impact is likely to be from potential all day commuter parking. No dedicated commuter parking would be provided as part of the project due to the low numbers of vehicles expected to be involved and the existing availability of on-street parking. Parking on the arterial road network is generally highly regulated and controlled with kerbside space provided for a variety of users, and limited spare capacity. The parking on local roads is varied and depends on the attributes of the area.

All of the stops would have a demand for kiss-and-ride spaces, but this is not expected to exceed three parking spaces. It is likely that kerbside parking for kiss-and-ride could be found close to each of the stops within existing short-stay parking supplies, so no dedicated spaces would need to be provided.

The provision and management of parking in the vicinity of the proposed light rail stops has been guided by the Draft Light Rail Parking Strategy provided in the EA, which recommends a strategy for car parking associated with the light rail, on the basis of relevant parking policies and plans. These include the Draft *Metropolitan Parking Policy*, the *Leichhardt Municipal Council – 2020+ Strategic Plan*, and the *Marrickville Council – Integrated Transport Strategy 2007*. Taken together, these policies and strategies are aimed at minimising parking demand and encouraging sustainable transport. Accordingly, the parking impacts are not expected to be significant and the Proponent has proposed to monitor parking demand in consultation with Councils. The Department also notes that potential loss of car parking at Dulwich Hill Station has been significantly reduced as a result of adopting the alternate scheme.

Transport Integration

The operation of the light rail would see a substantial proportion of passengers arrive at stops by bus and train, almost one-third as shown in Table 9. The study area is well served by public transport, with numerous bus routes providing a mix of frequent services from the inner west suburbs to the Sydney CBD, and feeders to local rail stations including Dulwich Hill and Lewisham Stations, and the existing Sydney Light rail which runs from Lilyfield to Central station via Pymont. Table 10 identifies existing public transport at each light rail stop.

Table 10: Existing public transport network at each light rail stop

Light Rail stop	Bus routes	Train services	Cycle network
Leichhardt North	5 bus routes	None	On street & on path cycle network
Hawthorne	None	None	On street & on path cycle network
Marion	6 bus routes	None	On street & on path cycle network
Taverners Hill	3 bus routes	None	On street & on path cycle network
Lewisham West	1 bus route	Inner West line	No close network
Waratah Mills	None	None	On street & on path cycle network
Arlington	5 bus routes	None	On street & on path cycle network
Dulwich Grove	6 bus routes	None	On street & on path cycle network

Light Rail stop	Bus routes	Train services	Cycle network
Dulwich Hill Interchange	1 bus route	Bankstown line	On street & on path cycle network

The light rail would provide additional access between Dulwich Hill, Leichhardt and Pymont not easily achieved by the current public transport network. The light rail would also provide an opportunity to capture some of the new trips generated from the proposed developments at Dulwich Grove, Arlington, Waratah Mills, Lewisham West and Marion.

The Proponent has considered the potential to relocate bus stops to minimise walking distances between stops, but has generally concluded that based on expected interchange numbers and physical and operational constraints of moving stops, there is limited potential to do so. Notwithstanding, the Proponent has identified that during the detailed design process, the relocation of bus stops would be further reviewed.

Consideration

Construction Traffic

The Department accepts that there will be construction traffic impacts as a result of this project and that it is an unavoidable impact of major infrastructure construction, which requires appropriate management to ensure that impacts are minimised. Notwithstanding, the Department considers that the level of impact associated with this project is relatively minor when compared with other major transport projects due to the project's attributes, such as minimal spoil production and removal, multiple site access points and good access to major roads.

The Department notes that the Proponent has committed to minimise the impact of construction traffic, including managing any temporary road closures and to preparing a detailed construction methodology for crossing the Parramatta Road in consultation with the RTA. In this respect, the Department is generally satisfied that these measures can and will minimise a local and regional traffic impacts.

Notwithstanding, the Department considers that the Proponent could implement further measures to minimise construction impacts on the road network. The Department has therefore recommended a range of conditions to ensure that use of local roads, including parking and queuing of construction vehicles on local public roads is minimised, and that pedestrian and cyclist access, and property access is maintained. It is also recommended that the Proponent prepare a Construction Traffic Management Plan in consultation with the RTA and Councils to ensure traffic and access controls are implemented to minimise impacts on traffic and the amenity of the surrounding environment.

Operation Traffic

Access to light rail stops will be primarily through walking and public transport interchange and therefore traffic growth and impacts are considered negligible. Traffic growth as a result of the light rail project has been identified as predominantly occurring in the vicinity of the Marion, Dulwich Hill Interchange, Dulwich Grove and Leichhardt North stops. However, this growth is limited, with traffic volumes generated in the AM peak hour at the Marion Stop (being the most utilised stop for kiss and ride stops) being 40 vehicle trips and the majority of stops generating less than 30 inbound car trips during the AM peak hour. Therefore, from a traffic impact perspective, the Department considers that predicted traffic volumes are considered acceptable at these stops and adjacent feeder roads.

Parking

Based on the forecast parking demand for the light rail and the availability of parking surrounding stops, the Department considers that the impacts will be relatively minor and would be able to be managed with appropriate signage. Accordingly, the Department accepts the parking strategy proposed by the Proponent and has recommended conditions to reinforce this provision. The Department has also considered parking losses at the existing Pymont maintenance and stabling facilities and considers that these impacts are acceptable, as the losses would be confined to evenings, with parking available to staff during the day.

Whilst parking impacts are not expected to be significant, the Department notes community concern that there is potential for some unexpected parking impacts, including parking infiltration into adjoining residential areas at stops. Accordingly, the Department has recommended that the Proponent prepare a Parking Management Strategy, which would include the provision of the proposed on street parking spots, monitoring of parking impacts and the identification of measures to address parking impacts, such as resident parking schemes, should monitoring identify a significant detrimental impact on local parking supply.

Transport and Land Use Integration

The Department recognises that the key modes of transport to the light rail include pedestrians and public transport users and considers that the project should facilitate a high level of transport integration with minimal infrastructure and service barriers between transport modes. Such integration would also minimise parking impacts. In this respect the Department notes that the stops have been designed to connect with and enhance existing pedestrian and cycle networks. The Proponent has also reviewed the potential to minimise walking distances between light rail stops and bus stops, but has concluded, based on patronage demand and the physical and operational constraints of the surrounding road network, the scope for improving walking distances is limited.

The Department notes that in relation to integration with the City Rail network, submissions were made in relation to improving the connection between Lewisham West Stop and the Lewisham Railway station through moving the stop location and improving pedestrian linkages between the two transport nodes. The Proponent has advised that the location of the Lewisham West stop has been determined with respect to both interchange with the Lewisham Railway Station and future development in the locale. In this respect, the Department is satisfied with the location of the stop, but does consider there is scope to improve pedestrian linkages to the Lewisham Railway Station where pedestrian paths are currently constrained, particularly along Longport Street, Railway Terrace and Hudson Street. The Department also notes that the preferred stop design at Dulwich Hill Railway Station will result in a longer distance of 80m between the stop and the station. However, this is considered acceptable, particularly when the revised design will minimise commuter parking losses at Dulwich Hill Railway Station.

To further improve access to stops, the Department has recommended the Proponent undertake a comprehensive review of pedestrian access to stops in consultation with the State Transit Authority, RailCorp and Councils. The review would consider improvements to pedestrian access and priority, the provision of pedestrian links to other transport modes and improvements in the level of personal mobility and safety for pedestrians and compliance with the *Disability Discrimination Act 1992* (DDA), including accessible paths of travel from interchange bus stops and railway stations, and disabled and kiss-and-ride parking spots associated with light rail stops.

With regards to improvements to cycle access, the Department notes that light rail stops will be highly accessible to cyclists with the delivery of the GreenWay path and cycle racks will be provided at light rail stops. Notwithstanding, to further improve cycle connectivity between the light rail, GreenWay path and cycle networks in the locale, the Department has recommended the

Proponent review cycle access to light rail stops and the GreenWay path, and cycle facilities at light rail stops.

Whilst submissions advocated further extensions of the GreenWay path to further improve the regional cycle network, including between Leichhardt and the Anzac Bridge and across the Cooks River, the Department agrees with the Proponent, that extensions are outside the project scope. With regard to an extension of the GreenWay path between Leichhardt and Anzac Bridge, the Department notes the project as proposed integrates with the existing regional cycle network, including along Lilyfield Road, which provides a connection to Victoria Road and Anzac Bridge and considers that further extensions of the GreenWay path within the light rail corridor should be pursued at the discretion of Transport NSW as the lead agency in transport matters.

The Department has also considered comments received in relation to alternative stop locations and the integration of the project with future development adjoining the light rail corridor, and in particular the Lewisham West stop. In this respect, the Department considers that the location and design of stops and the GreenWay path will facilitate existing and future land use and transport integration and that future development should respond appropriately to the opportunities provided by the project. In addition, the pedestrian and traffic reviews advocated by the Department, should further enhance integration with existing and future development.

GreenWay Path

The location of the GreenWay path along Weston Street between Davis Street and Old Canterbury Road raised a relatively significant number of submissions, with adjoining residents requesting that the GreenWay path be retained in the rail corridor to remove potential amenity and road safety impacts associated with the proposed on street cycleway. The Proponent undertook further assessment of the feasibility of locating the GreenWay path in this constrained section of the rail corridor. This assessment, whilst identifying that the GreenWay path could be constructed in the rail corridor, found that construction would involve project implementation and environmental costs, including adverse impacts on vegetation, privacy and risks associated with flooding and to the Hawthorne Canal. The option would also have significantly higher construction and maintenance costs than the on street option, with the in corridor option being costed at approximately \$6.1 million.

The Department has carefully considered this matter and considers that the provision of the proposed on street cycleway can be constructed to meet relevant road and safety standards and will have minimal amenity impacts to the residents of Weston Street. Therefore in considering the associated environmental risks and project implementation costs of locating the Greenway path in the rail corridor at this location, the Department does not consider that this option should be further pursued.

A significant number of submissions, including from the RTA and bicycle groups advocated the provision of a grade separated crossing of Marion Street to minimise traffic impacts, improve road safety and improve the performance of the GreenWay path. In the absence of a grade separated crossing, the RTA advocated integrating the signalised crossing with a signalised intersection of Marion Street and Hawthorne Parade.

Whilst the Department acknowledges the overall benefits of providing a grade separated crossing at Marion Street, the need for a grade separated crossing is not considered warranted as improvements to road safety will be delivered through the proposed signalling crossing, whilst maintaining acceptable traffic performance. Notwithstanding, the Department agrees that further consideration should be given to the location of the crossing to optimise its location. Accordingly, the Department has recommended that the Proponent ensure that the location and design for the crossing is undertaken in consultation with the RTA and Council, and includes the consideration of a signalised intersection at the intersection of Marion Street and Hawthorne Parade.

The Department is satisfied that the Proponent's Statement of Commitments, and the Department's recommended conditions of approval, provide the necessary measures for mitigating and managing the impacts of construction and operation transport impacts, whilst ensuring that the project meets its and the Government's transport objectives.

5.4 Heritage

Issue

Non Aboriginal Heritage

The project site and surrounding area's non-indigenous heritage is influenced by the progressive development of transport systems and in particular the ongoing expansion and upgrading of both passenger and freight rail networks and associated development. Between 1911 and 1924, the Metropolitan Goods Lines were constructed to separate the transportation of goods from passenger rail transport. The double track line from Dulwich Hill to Rozelle and Glebe Island, known as the Rozelle Goods Line, opened on 30 June 1916. The construction of the goods line and the containment of Long Cove Creek as the Hawthorne Canal, provided an incentive for industrial development along the corridor, including developments such as the Waratah and Mungo Scott flour mills. Other infrastructure with heritage significance in the area includes various rail and road bridges, the Sydney Water Pressure Tunnel, and the Lewisham Sewage Aqueduct. The project is also within the vicinity of the Haberfield and Lewisham Conservation areas.

There are 29 identified heritage items located in the vicinity of the study area and there is expected to be a short-term effect on heritage items adjacent to and within the rail corridor during construction, including potential impacts on heritage structures arising from the effects of vibration. Table 11 provides a summary of those identified heritage items which would potentially be impacted by the project.

Table 11: Potential impacts on heritage items during construction and operation of the project

Item	Listing*	Potential Impact
Hawthorne Canal Stormwater Channel No. 62 (& Leichhardt Branch	S.170	Direct and Indirect – construction of the Hawthorne stop and the pedestrian/cycle bridge over the canal may result in a loss of original fabric associated with the canal. Excavations associated with the construction of the Hawthorne, Marion, Taverners Hill and Lewisham West stops have the potential to expose subsurface canal fabric or relics associated with its construction.
Leichhardt (Marion St) underbridge	S.170	Direct and Indirect – siting of the Marion stop would need to take into account the potential for impacts on the abutments of the underbridge.
Lewisham (Parramatta Rd) underbridge	S.170	Direct and Indirect – the siting and construction of the Taverners Hill stop and associated infrastructure upgrades have the potential to have an adverse impact on the fabric of the underbridge. The proposal to raise the rail bridge would have an impact on the fabric and historic significance of the underbridge.
Lewisham Railway Viaducts over Long Cove Creek	SHR /LEP /S.170 /National Trust	Direct and Indirect – the construction of the GreenWay path has the potential to damage the fabric of the remnant Whipple trusses. Construction of the GreenWay path also has the potential to have an adverse effect on the historic and technical significance of the viaducts.

Item	Listing*	Potential Impact
Lewisham Sewage Aqueduct	SHR /LEP /S.170 /National Trust	Direct – construction of the GreenWay path has the potential to have an adverse effect on the sandstone piers supporting the aqueduct.
Street names marked in cement paving	LEP	Indirect – care should be taken to ensure that cement paving is not affected during construction.
Battle Bridge over Hawthorne Canal	LEP /S.170	Indirect – potential to impact on historic and technical significance of the Battle Bridge arising from the changed environment and the potential for damage to the item.
Haberfield Conservation Area	LEP /RNE /National Trust	Indirect – works will not have a significant adverse effect on the Conservation Area.
Leichhardt (Charles St) underbridge	S.170	Indirect – care should be taken to avoid adverse indirect construction impacts on the historic fabric of the bridge.
Street trees – avenue of Brush Box, Allen Street, Leichhardt	LEP	Indirect – potential damage to trees as a result of construction access / traffic along Allen Street.
Former Mungo Scott Flour Mills, 2-32 Smith Street, Summer Hill	LEP	Indirect – it is unlikely that the proposed works would adversely affect the former flour mills site.

*RNE - Register of the National Estate
 LEP – Local Environmental Plan
 S.170 – section 170 of the *Heritage Act 1977*
 SHR – State Heritage Register

As part of ongoing project development, a Heritage Management Plan and an Interpretation Strategy has been proposed, based on detailed design and on framework documents prepared and included in the EA. In addition, liaison with relevant stakeholders, including the GreenWay Steering Committee, local Councils and Department of Planning (Heritage Branch) would be undertaken.

Aboriginal Heritage

Prior to the arrival of the Europeans, the area is thought to have been occupied by the Wangal people, who would have probably belonged to the Darug language group, speaking a coastal dialect that was in use between Botany Bay and Port Jackson. 52 registered Aboriginal sites were identified within approximately 3km of the study area, with the most common site types being shell middens and camp sites, in both shelter and open contexts (shelters with midden and/or deposit, and open camp sites). However, there are no registered Aboriginal sites within the study area and the lack of Aboriginal heritage sites identified during the assessment is considered to reflect the major disturbance of the study area, following which no Aboriginal sites are likely to remain.

Consideration

The Department considers that the ongoing use of the Former Rozelle Goods Line and associated infrastructure as light rail is a positive outcome and makes a contribution to the historic significance of the railway system; and notes that the Proponent has committed to the preparation and implementation of a Heritage Management Plan, which would include further assessment of the heritage impact mitigation and management requirements in relation to directly impacted heritage items, including the Hawthorne Canal, Battle Bridge, and Lewisham Sewage Aqueduct. Additionally, an Interpretation Strategy would be prepared that recognises the historical and technical significance of the disused Rozelle Goods Line corridor.

The Department considers that the EA provides a broad assessment of potential impacts to heritage items and considers that the construction of the project could impact on the values of a number of heritage items, particularly if appropriate management measures are not undertaken. Of particular note are potential impacts associated with the Taverners Hill stop, with associated heritage impacts on the Parramatta Road Underbridge, Hawthorne Canal and Battle Bridge over the Canal, including the raising of the Underbridge.

To ensure that these impacts are appropriately managed, the Department agrees with the Proponent, that during the detailed design of the project, it should undertake further assessment and design to minimise impacts. Accordingly, the Department has recommended conditions to reinforce the Proponent's commitments, including further assessment being undertaken by an appropriately qualified heritage consultant and in consultation with the Department's Heritage Branch. The findings of this further assessment would then be incorporated into a Construction Heritage Management Plan.

Due to the historic nature of the Rozelle Goods Line, associated infrastructure and adjoining development, the Department considers there is significant potential for archaeological relics associated with these activities. These relics have the potential to enhance the understanding of methods and materials of construction and accordingly the Department recommends that further archaeological assessment and professional archaeological excavation and recording be undertaken prior to construction. In recognition of the historical significance of the Rozelle Goods Line, the Proponent has also committed to the preparation of a Heritage Interpretation Strategy. The Department supports this initiative and has reinforced this commitment with recommended conditions of approval.

With respect to the Haberfield and Lewisham Conservation areas, the Department considers that due to the relatively low scale of light rail stops and the GreenWay, that impacts are minimal and can be further minimised through appropriate landscaping. The Department considers that implementation of the requirements outlined in the Proponent's Statement of Commitments and the Department's recommended conditions of approval will ensure appropriate management of potential impacts on heritage items.

5.5 Ecology

Issue

The study area is highly urbanised, has been generally cleared of native vegetation and has areas of extensive weed infestation, providing limited habitat for fauna with the exception of disturbance tolerant species. No threatened species of plant has been recorded in recent surveys of the study area, however, the study area does contain Bushcare sites that have been revegetated with native plant species, as well as urban gardens, parks, and street plantings. No remnants of any threatened ecological communities have been recorded within the study area, however, Bushcare sites in Dulwich Hill have been revegetated with species that exist within the Turpentine – Ironbark Forest community. Waterways in the study area consist of concrete stormwater channels and do not support significant endemic aquatic biodiversity.

Taking into account the results of past biodiversity surveys combined with the survey undertaken for the project, 87 species of vertebrate animal have been recorded in the study area. This includes 74 native species (85%), with birds the most diverse group of terrestrial fauna followed by mammals, reptiles and amphibians. Feral and domestic animals including the European Red Fox and domestic dogs and cats are also common throughout the study area.

One threatened species, the Grey-headed Flying-fox, was recorded during surveys undertaken for the project. The threatened Eastern Bentwing-bat has also been recorded within the study area during previous surveys and based on preferred habitats and known

distributions, two Threatened species (Little Lorikeet and Swift Parrot), have a moderate likelihood of occurrence within the study area.

Previous surveys have also identified the presence of the Long-nosed Bandicoot, which is listed as an endangered population under the *Threatened Species Conservation Act 1995* within inner western Sydney. The Long-nosed Bandicoot was thought to have disappeared from the inner west of Sydney in the late 1950's, until rediscovered in 2007. Further surveys undertaken by DECCW identified and mapped locations of Long-nosed Bandicoots based on sightings of individuals and diggings. Areas of sightings included Petersham, Lewisham and Dulwich Hill, and the Inner West Environment Group (IWEG) has also reported opportunistic sightings of Long-nosed Bandicoots in these areas.

The study area also forms part of the Cooks River to Iron Cove GreenWay corridor that extends five kilometres from Iron Cove at Haberfield in the north to the Cooks River at Earlwood in the south. The GreenWay is an example of an almost continuous vegetated corridor, and although dominated by weed growth, studies of fauna populations within various areas of the GreenWay suggest that it possesses much higher levels of biodiversity compared to adjacent urbanised environments. Therefore the GreenWay is considered a landscape linkage that is of importance for the dispersal of fauna and flora in this highly fragmented landscape.

The project would result in a range of direct impacts to biodiversity within the construction corridor and potential indirect impacts on biodiversity in the surrounding landscape. These impacts include:

- clearing of vegetation – this would be the major direct impact of the project, with approximately 1.78 hectares of vegetation being cleared, including 1.7 hectares of weeds, and the remaining 0.8 hectares being Bushcare sites and planted trees;
- removal of fauna habitats – the vegetation removed, including dense weed growth provides suitable habitat for the Long-nosed Bandicoot and approximately 0.05 hectares of foraging habitat for threatened species;
- habitat fragmentation – the project may result in the severing of the vegetated corridor as a result of fragmentation caused by the station stops. The additional fragmentation resulting from the project would be unlikely to have a significant impact on the viability of species that occur, with the exception of the Long-nosed Bandicoot, for which the project may form a barrier to movement;
- direct mortality to plants and less mobile animals – fauna injury or death could occur as a result of construction activities; and
- invasion and establishment of weeds – the project has the potential to disperse weeds into Bushcare areas and cleared areas within the study area.

The potential operational impacts of the project would include noise disturbance from light rail operations, light disturbance at stations, potential for light rail collision, and barrier effects for ground dwelling species.

The Proponent undertook impact assessments against the endangered and threatened species likely to be impacted by the project, including the Long-nose Bandicoot (*Perameles nasuta*), Grey-headed Flying-fox (*Pteropus poliocephalus*), Eastern Bentwing-bat (*Miniopterus schreibersii* *Oceanensis*), Swift Parrot (*Lathamus discolor*), and the Little Lorikeet (*Glossopsitta pusilla*). The assessment concluded that the project would not have a significant impact on these species.

In relation to the Long-nose Bandicoot, the impact assessment concluded that it is unlikely that the project will have a significant impact on the species, inner western Sydney population. Some removal of habitat (approximately 1.7 ha) and fragmentation will occur. However, the revegetation and establishment of Bushcare sites along the rail alignment will

create a greater area of habitat for the Long-nosed Bandicoot in the long-term and the current disturbance regimes will not be interfered with and critical habitat will not be affected.

Consideration

The Proponent's assessment, based on previous and current surveys, has identified that a range of endangered and threatened species could be potentially impacted, however these impacts would not be significant and could be managed through flora and fauna mitigation measures, which would be developed as part of a Flora and Fauna Management Plan and offset strategy.

DECCW provided advice regarding the limitations of the survey work undertaken for the Long-nosed Bandicoot, and microchiropteran bat species, and its view that there should be further survey work undertaken to better inform impacts on these species. It also raised concerns in relation to the importance of protecting the Long-nosed Bandicoot and its habitat and the need to maintain as much habitat at any one time during vegetation clearing. In response, the Proponent has committed to the preparation of pre-clearing surveys and should any Long-nosed Bandicoots be located during these surveys, they would be relocated to an appropriate location within the rail corridor that would not be cleared. In relation to microchiropteran bat species, pre-clearing surveys of bridges and tunnels would be undertaken and any bats found roosting would be relocated and excluded from roosting in the structures until works have finished.

The Department has carefully considered the matters raised by DECCW, the Proponent's response and the assessment of impacts to potentially present threatened and endangered species. This has included consideration of past and current surveys, the existing highly modified environment, potential project impacts and the future provision of Bushcare sites as part of the project. Consequently, the Department generally accepts the Proponent's conclusion that the project can be constructed and operated without significant impacts to threatened species through the implementation of the proposed flora and fauna management measures, including pre-clearing surveys, which will allow for the appropriate relocation of endangered and threatened species should they be detected before construction commences.

The Department also notes Council's and community submissions related to the need to minimise vegetation clearing and impacts to existing Bushcare sites; ongoing bush care management, including access to existing and future Bushcare sites; threatened species management; and the need for ongoing consultation with Councils and the community on these matters.

In considering these matters, the Department notes that the majority of vegetation clearing is related to the clearing of weeded areas and that there is only minimal impact to existing Bushcare sites, with the proposed clearing of 0.07 ha out of a total of 5 ha of existing Bushcare vegetation. Whilst it would be preferable that Bushcare sites were not impacted, the Department considers that the impact is unavoidable with consideration of the transport objectives of the project and that the Proponent has committed to offsetting the majority of cleared vegetation (including weeds), and the provision of new Bushcare sites consistent with the *Greenway Bushcare Management Plan*.

The Department has also considered indirect impacts related to construction activities, including the need to protect areas not directly impacted by construction and the need to implement staged clearing processes and relocation measures to facilitate fauna movement out of impacted areas. In this respect, the Department has recommended that the Proponent prepare a Construction Flora and Fauna Management Plan, with the objective of detailing measures to avoid residual habitat loss and to minimise or eliminate time lags between the removal and subsequent replacement of habitat. The Proponent would also be required to ensure that as much potential Long-nosed Bandicoot habitat as possible is maintained along the rail corridor at any one time during construction, and undertake sequential revegetation

and rehabilitation works and the strategic placement of alternative shelter and the enhancement of existing shelter suitable for use of by Long-nosed Bandicoots preceding any proposed clearing.

To address the community's concerns in relation to the establishment and ongoing management of compensatory measures and to reinforce the Proponent's commitments on this matter, the Department has also recommended the preparation of a comprehensive Revegetation and Biodiversity Compensation and Monitoring Package to outline how ecological impacts will be compensated for and habitat managed and monitored within the corridor, Bushcare and other appropriate sites. The Package would be prepared in consultation with GreenWay Steering Committee and the Inner West Environment Group and give consideration to the *GreenWay Revegetation and Bushcare Plan*. Any land offset would be enduring and include a conservation mechanism which protects and manages the land in perpetuity.

The Department considers that through the implementation of the requirements outlined in the Proponent's Statement of Commitments and the Department's recommended conditions of approval, ecological impacts will be minimised and appropriately compensated.

5.6 Visual Impact, landscaping and urban design

Issue

The study area is typical of inner Sydney metropolitan suburban areas with single detached residential developments interspersed with multi-unit residential developments. Other land uses include general and light industrial, commercial, special use and open space. There are few natural features remaining within the rail corridor, with the exception of the sandstone outcrops at the Cooks River end and along the Iron Cove shoreline. Urban landscape elements of note include Hawthorne Canal and Richard Murden Reserve, Cadigal Reserve, and the existing shared path which runs from Richard Murden Reserve to Parramatta Road.

Established vegetation located within the rail corridor provides elements of visual screening for residents, predominantly residential dwellings that back on to or front the corridor. The vegetation adjacent to the Hawthorne Canal Reserve and vegetation running from Longport Street to Marion Street is of particular note.

The visible project elements associated with the new stops include:

- light rail stops configured based on the dimensions of 3m width and 30 metre length;
- shelters which will be approximately 12m long with glazed panels and roofed;
- approach paths;
- bicycle parking facilities provided near platforms and /or edges of approach paths;
- lighting; and
- a lift where new stops occur in a cutting or in a raised embankment.

The visible project elements associated with the GreenWay include:

- a shared pathway of minimum 3m width predominantly on the western side of the existing rail corridor;
- new on street shared pathway, predominantly along a section of Weston Street, and a new integrated shared pathway from Jack Shanahan Park to the Cooks River through the existing street network;
- modification of the existing road bridge structures, namely at Hercules Street, Old Canterbury Road, Constitution Road, Davis Street and Longport Street;
- new pedestrian / cycle bridge at Parramatta Road adjacent to the light rail overbridge, and across the Hawthorne Canal near Hawthorne stop;
- provision of sites for Bushcare and vegetation remediation areas; and
- an integrated public art and interpretation strategy.

Construction

The construction of the project would temporarily reduce visual amenity for surrounding residents, adjacent businesses and road users nearby. The visual amenity impacts would be temporary, for a period of up to 12 months depending on staging of construction works, and dependent on the location of the works and whether receivers have an unscreened view of the project. In particular, works to raise the Parramatta Road underbridge and to construct the GreenWay path bridge over Parramatta Road are anticipated to result in highly visible construction activities.

Landscape and visual mitigation measures to be implemented through construction include the protection of trees to be retained, clearly delineated construction compound sites, and restoration of construction compound sites once construction is completed.

Operation

The operation of the project would have a low to moderate visual impact on the current visual character of the rail corridor, mainly associated with the new stops and substations, vegetation clearing, light rail vehicles travelling along the track, the GreenWay path, and an increase in pedestrians and cyclists along the GreenWay path. Locations having a moderate visual impact include the Hawthorne, Marion, Taverners Hill, Arlington, Dulwich Grove and Dulwich Hill Interchange stops.

Potential privacy impacts may be experienced by some sensitive receivers who adjoin the project corridor. These would include passengers being able to see into the rear of adjoining properties, and GreenWay path users being able to see into adjoining properties.

Management of impacts during operation of the project would include detailed stop design requirements, privacy screening, lighting design, landscaping and revegetation, ancillary design requirements, and the provision of public art.

Consideration

The visual amenity impacts associated with the construction of the project would be temporary in nature and the Department is therefore generally satisfied that the Proponent has identified a range of design and landscape solutions that would assist towards mitigating construction visual and landscaping impacts. In particular the Proponent has committed to providing visual screening where construction compounds and access roads would be visible from surrounding areas.

The Department notes that the majority of the project is located within the existing Rozelle Goods Line, and considers that the new elements introduced into the environment as a result of the project, including light rail stops, substations and the GreenWay path are not considered to adversely impact on the visual amenity of the corridor or adjacent areas, and are considered typical built elements within an urban environment.

Notwithstanding, the Department recognises that further improvements to the design and landscaping of the project can be undertaken to mitigate impacts during detailed design. To reflect this, the Department has recommended conditions of approval that require the Proponent to minimise visual impacts of infrastructure and hard landscaping elements, and that landscaping impacts are minimised, including impacts to landscaping at Richard Murden Reserve undertaken as part of the City West Link project.

The Department also considers that the project has the potential to impact on the privacy of adjoining land uses through overlooking from patrons of the light rail. Whilst this impact is generally low and transient in nature, the Department considers there is scope to minimise these impacts and has therefore recommended that the Proponent landscape the corridor and where this is not feasible, consider other design elements such as screens and fencing in consultation with adjoining property owners.

To ensure that the project is designed and implemented in a holistic manner, the Department recommends that the Proponent's commitment to prepare a landscape and urban design strategy, be reinforced and linked with reviews to be undertaken for both pedestrian and cycle access and ecological impacts. The Department has therefore recommended that the Proponent prepare and implement an Urban Design and Stop Access Plan, which would be approved by the Director-General. The preparation of the Plan would be undertaken in consultation with local councils, the GreenWay Steering Committee and the community. The Plan would consider amongst other matters, design principles and standards, based on:

- local environmental values,
- urban design context,
- sustainable design and maintenance (including consideration of anti graffiti materials),
- transport and land use integration and system functionality,
- passenger and community safety and security,
- community amenity and privacy, and
- relevant design standards and guidelines.

Based on the Proponent's proposed management and mitigation measures, and the Department's recommended conditions of approval, the Department considers that the project can be designed and constructed so as not to have significant impacts on the visual amenity and landscape of the locality. The residual impacts associated with the project are considered acceptable when compared to the overall benefits the project will achieve.

5.7 Other issues

Hydrology and groundwater

There are four major watercourses near the project: Whites creek, Hawthorne Canal, Cooks River and the Lower Parramatta River and the project lies mainly within the Hawthorne Canal catchment. The Hawthorne Canal, a concrete waterway, runs alongside the proposed light rail and GreenWay alignment from Iron Cove to the Arlington stop.

Groundwater is present within the unconfined, unconsolidated fill and estuarine sediments along Hawthorne Canal, and in the underlying Ashfield Shale and Hawkesbury Sandstone. Groundwater levels along the project are typically shallow, ranging between 1.4 and 6 metres below ground level. The shallowest groundwater levels across the project area are expected within the composite fill next to Hawthorne Canal.

The project's construction and operation is not anticipated to affect existing flooding due to the limited nature of the works in the existing corridor and through the implementation of standard construction management procedures and drainage facilities. However, there is a risk of the alignment flooding in locations where it is at or below surrounding land levels, with three areas identified:

- Lilyfield stop to Leichhardt North stop – Part of this alignment is flooded at the five year ARI event and upwards, however the flood depths and velocities are low in this area, with depths not exceeding 0.01 metre for the probable maximum flood (PMF). Given that the flood depths are very low, it is unlikely operations would be affected significantly, even during major storms and low depth surface water ponding could be managed through upgrading and/or restoring the longitudinal drainage system.
- Lewisham West stop – The key flood risk area is an approximately 80 metre section of the light rail and GreenWay directly adjacent to the flour mill building, which is at risk of flooding for the 20 year ARI event and upwards. Flood depths range from 0.3 to 1.5 metres for the 100 year ARI event in this area.
- GreenWay path east of Hawthorne stop – The GreenWay path is at risk of tidal flooding where it runs along Hawthorne Canal east of the proposed Hawthorne stop due to still water

surge tides. For most of the GreenWay path length, the ground levels are around 2 metre AHD, which is below the 100 year ARI still water tidal surge level of 2.4 metres AHD. Under these conditions, most of the parkland and adjacent roads would also be flooded.

The Proponent has committed to finalising any flood mitigation required for the project during detailed design. However, the Department considers that due to the risk of potential flooding of the project corridor, a Flood and Drainage Management Study should be prepared to improve the flood protection of the corridor and ensure that the project does not worsen existing characteristics within the vicinity of the project. The Study would include:

- the identification of flood risks to the project and adjoining areas, including the consideration of local drainage catchment assessments, and climate change implications on rainfall, drainage and tidal characteristics;
- the identification of design and mitigation measures that would be implemented to protect proposed operations and not worsen existing flooding characteristics during construction and operation, including soil erosion and scouring;
- the consideration of Water Sensitive Urban Design measures to protect adjoining waterways; and
- the preparation of a flood/emergency management plan.

Given the rail line is already constructed, the impact of the project on groundwater is expected to be minimal as no new tunnels or major cuttings are required. Likely impacts may be associated with platform construction where excavations for lift shafts, stairs or other infrastructure may intersect the watertable, however, these impacts can be managed through standard construction management measures.

Soils and Contaminated land

The disused Rozelle Goods Line was operating from the early 1900s, and the section between Lilyfield and Dulwich Hill ceased operation in 2009. The area surrounding the rail corridor has a history of predominantly low to medium density residential development, with some commercial and industrial sites. The most likely sources of contamination within the project area would be associated with imported fill, operation of the former goods rail line and nearby industrial sites. Potential identified sources of contamination of concern are listed in Table 12.

Table 12: Potential contaminant sources

Area	Details	Risk of contamination		
		Light Rail	Stops / access	GreenWay
Open space/parks	<ul style="list-style-type: none"> - uncontrolled fill - use of weed and pest control - use of fertilisers 	Low	Low	Moderate to high
Rail corridor	<ul style="list-style-type: none"> - fill and ballast material - asbestos fibres from train breaks - use of weed and pest control - fuels, oils and greases - asbestos and lead paint residues from former buildings - electrical transformers 	High	High	High
Three service stations and workshops	<ul style="list-style-type: none"> - fuels, oils, waste and greases - use of weed and pest control 	Low	Low	Moderate to high
Electricity substations	<ul style="list-style-type: none"> - fuels oils and greases - transformer oil, metal corrosion 	Low	Low	Moderate to high

Area	Details	Risk of contamination		
		Light Rail	Stops / access	GreenWay
Flour Mills and former industrial building at 7 Darley Road, Leichhardt and Rozelle Goods Yard	<ul style="list-style-type: none"> - fuels oils and greases - asbestos and lead paint residues from former buildings - use of weed and pest control - rail sidings - metal corrosion 	Moderate to high	Moderate to high	Moderate to high
Hawthorne Canal	<ul style="list-style-type: none"> - reclaimed land, contaminated water and sediments, illegal dumping, contaminated stormwater, acid sulfate soils 	Low	Low	Moderate
Roads and road reserves	<ul style="list-style-type: none"> - bitumen, fuels, oils and greases - use of weed and pest control - uncontrolled fill material - metal abrasion and corrosion 	Low	Low	Moderate

Potential impacts that may occur as a result of the project with regards to contaminated land during the construction phase of the project, include:

- disturbance of ground surface in contaminated areas could disperse contaminated materials into the surrounding receiving environment, including air and water;
- demolition of structures could disperse hazardous materials to the receiving environment, particularly the former industrial building off Darley Road, Leichhardt; and
- construction activities associated with spills and leaks of potentially contaminating materials could contaminate soil and or water.

Operational impacts in relation to contamination are not considered significant. It is not anticipated that the project's operation would result in any further contamination of the local area.

The Department considers that the Proponent has undertaken an appropriate assessment of land based, sediment and groundwater contaminants in the locality. The Proponent has further committed to undertaking a Phase 2 contamination assessment to identify the extent or presence of contamination or hazardous materials within the project construction footprint, and managing any contaminated material in accordance with all relevant legislation and guidelines.

The Department is of the opinion that such measures would contribute to the safe handling and management of contaminated materials and thus reduce the likelihood of adverse health and environmental impacts. The Department has further recommended a number of conditions of approval to ensure appropriate management in areas of moderate to high risk of contamination, or for elements of the project which could contribute to contamination of the environment, including the following:

- preparation of a Soil Contamination Report detailing the outcomes of Phase 2 contamination investigations;
- all liquid and/or non-liquid waste generated and/or stored on site to be assessed and classified in accordance with the *Waste Classification Guidelines* (DECC, 2009); and disposal of waste materials to a waste management facility lawfully permitted to accept the materials;
- ensure that the transport, handling and management of hazardous substances does not result in a potentially hazardous storage environment or present a significant risk to human health, life or property; and
- the preparation of a Construction Earthworks and Water Quality Management Plan to detail how excavated and imported materials will be managed to protect environmental amenity and watercourses, including groundwater, throughout construction.

Based on the proposed management measures, legislative requirements and the Department's recommended conditions of approval, the Department considers that construction of the project would not compromise human health or the environment and there would be no long term contamination impacts.

Other Matters

The Department has also assessed project impacts in relation to land use integration; sustainability and sustainable design; air quality, greenhouse gas and climate change adaptation; social and economic; hazards and risks; services and utilities; and cumulative impacts and considers that these matters have been adequately addressed in the Environmental Assessment, Response to Submissions, the Proponent's Statement of Commitments and the Department's recommended conditions of approval.

6. RECOMMENDATION

The Inner West subregion is expected to experience a population increase of approximately 35% and the South subregion expected to experience a population increase of approximately 15% by 2036. The existing population places considerable pressure on the transport network, including road, rail and bus infrastructure. As a result there is a current and future need to improve Sydney's transport network capacity, efficiency and reliability in order to respond to existing transport demand and accommodate the projected population growth.

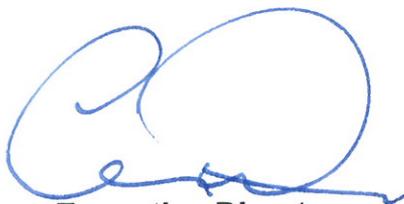
The project is located in an area which is undergoing housing and population growth, including the renewal of former industrial sites for medium and high-density residential and employment uses. The project will give residents another option for accessing the CBD, Pyrmont and Darling Harbour, and allow commuters to connect with the Inner West and Bankstown CityRail lines. It will also provide active transport options to cyclists and pedestrians with the inclusion of the GreenWay path and connections to key recreational and commuter cycle and pedestrian networks.

The Department considers that the project is justified on the basis that it is vital transport infrastructure project, and in the public's interest and represents an opportunity to assist in improving Sydney's transport network. Construction and operation of the project would bring a range of social, environmental and economic benefits that would support the NSW Government's long term vision for Sydney. Additionally, as the corridor has previously been used as a heavy goods freight railway, the project would be able to be introduced at a lower cost and construction impact.

Following a detailed assessment of the Proponent's Environmental Assessment and Submissions Report, and the submissions received from agencies, councils and the public during the exhibition period for the project, the Department is satisfied that the impacts of the project can be appropriately mitigated or managed to acceptable environmental levels.

The Department considers that the recommended conditions of approval for the project would provide for the mitigation and management of key impacts associated with the project during the detailed design, construction and operational phases of the project. These include specific environmental conditions for noise and vibration impacts, traffic and transport impacts, biodiversity impacts, impacts to heritage items, as well as hydrology, earthworks, waste management, infrastructure and property, hazards and risk, and urban design and landscaping requirements.

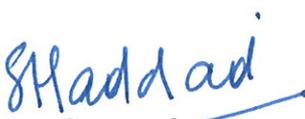
Consequently, the Department recommends that the Minister for Planning approve the Sydney Light Rail Extension Stage 1 – Inner West Extension, subject to the recommended conditions of approval.



**Executive Director
Major Projects Assessment**



**Deputy Director-General
Development Assessment &
Systems Performance**



Director General

APPENDIX A ENVIRONMENTAL ASSESSMENT

See the Department's website at

http://majorprojects.planning.nsw.gov.au/index.pl?action=view_job&job_id=4097

APPENDIX B SUBMISSIONS

See the Department's website at

http://majorprojects.planning.nsw.gov.au/index.pl?action=view_job&job_id=4097

APPENDIX C PROPONENT'S RESPONSE TO SUBMISSIONS

See the Department's website at

http://majorprojects.planning.nsw.gov.au/index.pl?action=view_job&job_id=4097

APPENDIX D RECOMMENDED CONDITIONS OF APPROVAL

