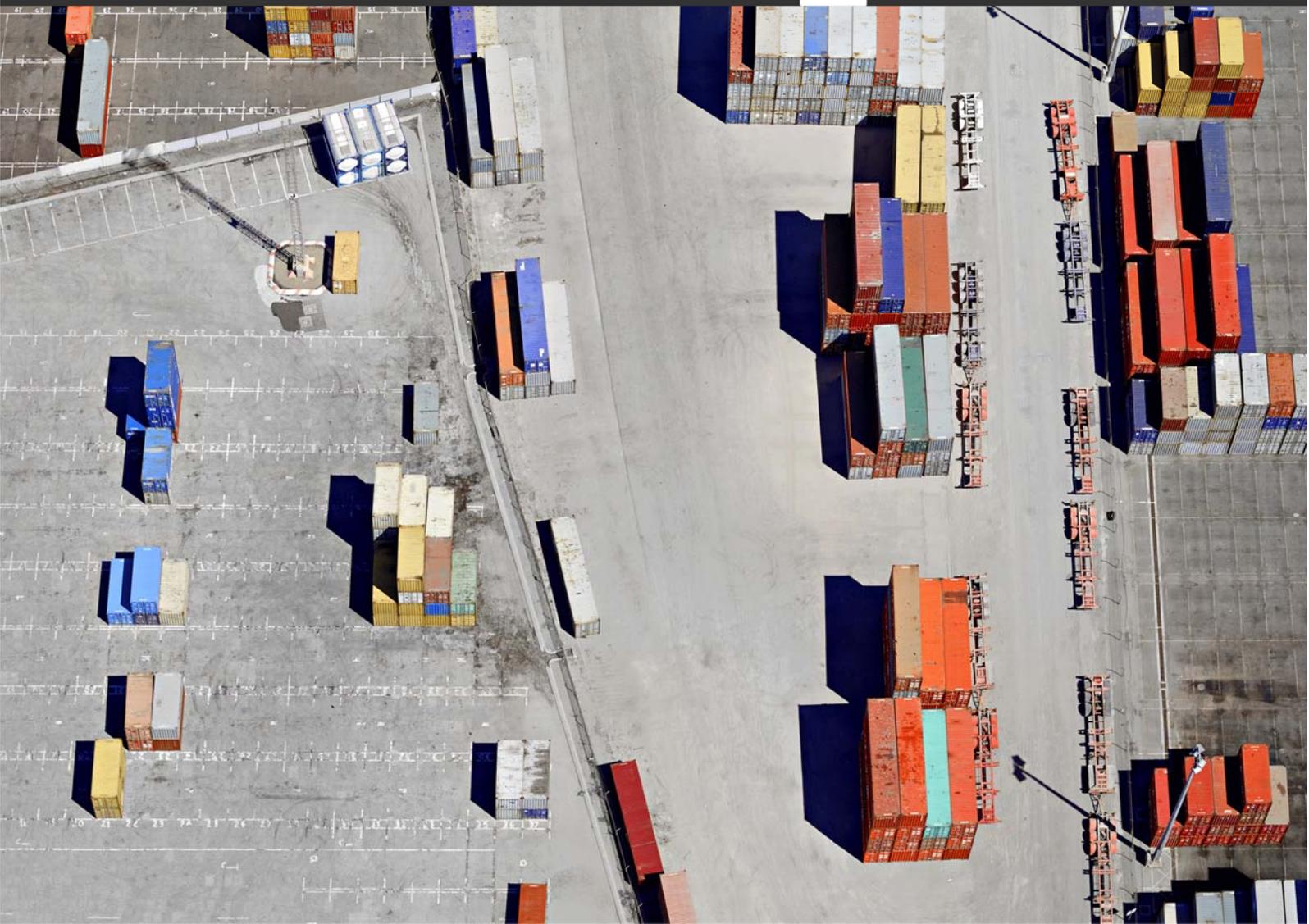


Botany Rail Duplication

STATE SIGNIFICANT INFRASTRUCTURE SCOPING REPORT

7 November 2018

ARTC





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ABBREVIATIONS AND GLOSSARY

AHIMS	Aboriginal Heritage Information Management System
ANEF	Australian Noise Exposure Forecast
ARTC	Australian Rail Track Corporation
Airports Act	Commonwealth <i>Airports Act 1996</i>
Aquifer	A groundwater bearing formation sufficiently permeable to transmit and yield groundwater or water bearing rock.
Ballast	Material such as crushed rock or stone used to provide a foundation for a railway track. Ballast usually provides the bed on which railway sleepers are laid, transmits the load from train movements and restrains the track from movement.
BC Act	NSW <i>Biodiversity Conservation Act 2016</i>
Botany Line	A dedicated freight rail line (operated by ARTC) that forms part of the Metropolitan Freight Network. The line extends from near Marrickville Station to Port Botany.
CLM Act	NSW <i>Contaminated Land Management Act 1997</i>
Construction compound	An area used as the base for construction activities, usually for the storage of plant, equipment and materials, and/or construction site offices and worker facilities.
EIS	Environmental impact statement
Embankment	A raised area of earth or other materials used to carry a rail line in certain areas.
EP&A Act	NSW <i>Environmental Planning and Assessment Act 1979</i>
EPA	NSW Environment Protection Authority
EPBC Act	Commonwealth <i>Environment Protection and Biodiversity Conservation Act 1999</i>
Existing rail line	The existing Botany Line
Formation	The earthworks/material on which the ballast, sleepers and tracks are laid.
LEP	Local environmental plan
Metropolitan Freight Network	A network of dedicated railway lines for freight in Sydney, linking NSW's rural and interstate rail networks with Port Botany. The Metropolitan Freight Network is managed by ARTC.
OEH	NSW Office of Environment and Heritage
OLS	Obstacle limitation surface

PACHCI	Procedure for Aboriginal Cultural Heritage Consultation and Investigation (Roads and Maritime 2011)
PANS-OPS	Procedures for navigational services – aircraft operations surface
Passing loop	A section of track off the main track/s that allows a train to pass another train.
PFAS	Per-and poly-fluoroalkyl substances, which are manufactured chemicals used in products that resist heat, oil, stains and water. There are many types of PFAS, with the best-known examples being perfluorooctane sulfonate (PFOS) and perfluorooctanoic acid (PFOA), which were used in some fire-fighting foams.
Podzolic soils	Infertile acidic soils with an ash-like subsurface layer and a lower dark stratum, occurring typically under temperate coniferous woodland.
Possession	A period of time during which a rail line is closed to train operations to permit work to be carried out on or near the line.
Project	The construction and operation of the Botany Rail Duplication.
Project site	The area that would be directly affected by construction (also known as the construction footprint). It includes the location of operational project infrastructure, the area that would be directly disturbed by the movement of construction plant and machinery, and the location of the storage areas/compounds sites etc, that would be used to construct that infrastructure.
Regulation	NSW Environmental Planning and Assessment Regulation 2000
Roads and Maritime	Roads and Maritime Services
SACL	Sydney Airport Corporation Limited
SEARs	Secretary's environmental assessment requirements
Sensitive receivers	Land uses and activities that are sensitive to potential noise, vibration, air and visual impacts, such as residential dwellings, schools and recreation areas.
SEPP	State environmental planning policy
SHR	State heritage register
Spoil	Material generated by excavation
State significant infrastructure	Major transport and services infrastructure considered to have State significance as a result of size, economic value or potential impacts.
Study area	The study area is defined as the wider area including and surrounding the project site, with the potential to be directly or indirectly affected by the project (eg by noise and vibration, visual or traffic impacts).
Terminal 1	Sydney Airport's international terminal

Terminal 2	One of Sydney Airport's two domestic terminals, used by number of domestic and regional airlines including Virgin Australia, Jetstar and Rex.
Terminal 3	Qantas's domestic terminal
Terminals 2/3	Sydney Airport's domestic terminals
TEU	Twenty foot equivalent units (used to describe cargo capacity)
WARR Act	NSW <i>Waste Avoidance and Resource Recovery Act 2001</i>
Waste	Waste is defined by the EPA as any matter (whether liquid, solid, gaseous or radioactive) that is discharged, emitted or deposited in the environment in such volume, constituency or manner as to cause an alteration to the environment.

EXECUTIVE SUMMARY

Overview and objectives

Australian Rail Track Corporation (ARTC) proposes to duplicate a section of the Botany Line between Mascot and Botany. The Botany Rail Duplication (the project) is an Australian Government initiative to improve freight rail capacity and reliability for freight accessing Port Botany.

The primary objective of the project is to increase capacity to meet the forecast demand for container freight transport to and from Port Botany. Secondary objectives are to:

- Provide increased operational efficiency, flexibility and reliability for freight customers
- Increase rail market share for containerised freight
- Support connection to, and operation of, intermodal terminals to meet their targeted freight capacity.

It is intended that the project would:

- Alleviate constraints and increase the capacity of Sydney's freight rail network to meet existing and future demands
- Support the operation of intermodal terminals, including Enfield, Chullora and Moorebank
- Encourage a shift in freight transport from road to rail, and support a reduced rate of growth in truck movements and associated traffic congestion around Sydney Airport and Port Botany.

The Botany Rail Duplication is one of a number of initiatives proposed to improve road and freight rail transport through the important economic gateways of Sydney Airport and Port Botany. ARTC has worked closely with the proponents of the nearby Sydney Gateway road project throughout the scoping phase. The Sydney Gateway road project is a separate project with a separate approval process. This scoping report relates to the Botany Rail Duplication project only.

Project features

The project includes the following key features:

- Track duplication – constructing a new track within the rail corridor for a distance of 2.9 kilometres
- Track realignment (slewing) and upgrading – moving some sections of track sideways (slewing) and upgrading some sections of track to improve the alignment of both tracks and minimise impacts to adjoining land uses
- New crossovers – constructing new rail crossovers to maintain and improve access at two locations
- Bridge works – constructing new bridge structures at Mill Stream, Southern Cross Drive, O'Riordan Street and Robey Street (adjacent to the existing bridges), and re-constructing the existing bridge structures at Robey and O'Riordan streets
- Embankment/retaining structures – constructing a new embankment and retaining structure adjacent to Qantas Drive between Robey and O'Riordan streets and a new embankment between the Mill Stream and Botany Road bridges.

Ancillary work would include bi-directional signalling upgrades, drainage work and protecting/relocating utilities.

The project would also require temporary facilities during construction, including compounds, laydown areas and site access.

The site where the project would be undertaken (the project site) is located in the suburbs of Mascot, Botany and Pagewood, in the Bayside local government area. The north-western extent of the project site is located in the vicinity of Qantas Drive in Mascot, to the west of the Qantas Jet Base Qantas Drive road overpass. The south-eastern extent of the project site is located just to the north of the Stephen Road bridge in Botany.

Project need

Port Botany is one of Australia and NSW's most important infrastructure assets, with Port Botany the largest container port in Australia, and NSW's largest bulk liquid and gas port and only container port.

Efficient access to Port Botany is critical to the economic growth and prosperity of Sydney, NSW and Australia. The amount of container freight handled by Port Botany is predicted to significantly increase – from 14.4 million tonnes in 2016 to 25.5 million tonnes in 2036, representing an increase of 77 per cent (Transport for NSW 2018c). The Australian and NSW Governments have identified clear objectives to increase the share of freight moved by rail – from 17.5 per cent in 2016 to 28 per cent by 2021 (Transport for NSW 2018c, Infrastructure Australia 2018). Transporting more freight to and from Port Botany by rail will place additional demands on the Botany Line, particularly the single line section of track which is an existing constraint.

ARTC undertook a capacity analysis of the Botany Line as part of the Sydney Metropolitan Freight Strategy 2015-2024 (ARTC 2015). Based on the predicted growth at the time (2014), it was concluded that the Botany Line would reach capacity by 2022. It should be noted that ARTC is in the process of updating this strategy and capacity predictions may change, particularly to address the NSW Freight and Ports Plan 2018-2023 (Transport for NSW 2018c), which brings forward rail modal share target dates.

As Sydney's only container port, it is vital that Port Botany maintains the capacity to meet freight demands over the long term. The project is needed to support improved rail connections to Port Botany and enable more freight to be moved by rail. One freight train equates to about 54 trucks. As a result, the project is a vital part of the solution to reduce congestion on the roads around Port Botany and Sydney Airport.

Planning and assessment process

The project is State significant infrastructure and needs approval from the NSW Minister for Planning in accordance with Division 5.2 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act), and by operation of clause 14(1) and Schedule 3 of State Environmental Planning Policy (State and Regional Development) 2011, and clause 79(1) of State Environment Planning Policy (Infrastructure) 2007.

This report supports an application to carry out State significant infrastructure under section 5.15 of the EP&A Act and clause 192 of the Environmental Planning and Assessment Regulation 2000. It has been prepared to assist in the formulation of the Secretary's environmental assessment requirements for the EIS pursuant to section 5.16 of the EP&A Act.

ARTC will request that the Minister for Planning declare the project as critical State significant infrastructure pursuant to section 5.13 of the EP&A Act. This is because the project is considered to be essential to the State for economic, environmental or social reasons. The declaration would be made pursuant to clause 16 of State Environmental Planning Policy (State and Regional Development) 2011.

Proposed scope of the environmental impact statement

The outcomes of initial investigations and stakeholder consultation indicate that the following key environmental issues will require further detailed assessment in the EIS and may require project specific impact mitigation measures:

- Noise and vibration
- Air quality
- Traffic, transport and access
- Non-Aboriginal heritage
- Land use, social and business impacts
- Contamination
- Hydrology, flooding and water quality
- Cumulative impacts.

A number of other potential environmental impacts are also identified in this report. These issues are considered to be of lesser consequence, taking into account the project scope, the existing environment and the implementation of standard environmental management measures and safeguards.

1 INTRODUCTION

1.1 Overview

Australian Rail Track Corporation (ARTC) proposes to duplicate a section of the Botany Line between Mascot and Botany to increase rail freight capacity to Port Botany.

Port Botany is one of Australia and NSW's most important infrastructure assets, with Port Botany the largest container port in Australia, and NSW's largest bulk liquid and gas port and only container port. Efficient access to Port Botany is critical to the economic growth and prosperity of Sydney, NSW and Australia. The amount of container freight handled by Port Botany is predicted to significantly increase. Transporting more freight to and from Port Botany by rail will place additional demands on the Botany Line, particularly the single line section of track which is an existing constraint.

The Botany Rail Duplication (the project) would involve constructing a new second track within the existing rail corridor for a distance of 2.9 kilometres and undertaking other works (such as track upgrading/realignment in some sections and works to bridge) to provide for the new track. The project would support improved rail connections to Port Botany and enable more freight to be moved by rail.

The site where the project would be undertaken (the project site) is located in the suburbs of Mascot, Botany and Pagewood, in the Bayside local government area (shown on Figure 1-1). The majority of the project site is located on land owned by the NSW Government, within the corridor for the existing rail line, which is managed and maintained by ARTC.

The strategic background and need for the project are described in section 2. Further information on the project is provided in section 4.

The Botany Rail Duplication is one of a number of initiatives proposed to improve road and freight rail transport through the important economic gateways of Sydney Airport and Port Botany. ARTC has worked closely with the proponents of the nearby Sydney Gateway road project throughout the scoping phase. The Sydney Gateway road project is a separate project with a separate approval process. This scoping report relates to the Botany Rail Duplication project only.

1.2 Statutory process

The project is considered to be State significant infrastructure in accordance with Division 5.2 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act), by operation of State Environmental Planning Policy (State and Regional Development) 2011 (the State and Regional Development SEPP) and State Environment Planning Policy (Infrastructure) 2007 (the Infrastructure SEPP).

Clause 14(1) of the State and Regional Development SEPP provides that development is State significant infrastructure if it is:

- Permissible without development consent by virtue of the operation of a State environmental planning policy, and
- It meets the definitions in Schedule 3 to the State and Regional Development SEPP.

Clause 79(1) of the Infrastructure SEPP provides that development for the purpose of a railway or rail infrastructure facilities may be carried out by or on behalf of a public authority without consent on any land. Schedule 3 (clause 3) of the State and Regional Development SEPP defines 'rail infrastructure' as

'Development for the purpose of rail infrastructure by or on behalf of the Australian Rail Track Corporation that has a capital investment value of more than \$50 million.' As the project is permissible without development consent, has a capital investment value of more than \$50 million and it is being undertaken by ARTC, it meets the requirements of clause 14(1) of the State and Regional Development SEPP.

As State significant infrastructure, the project will need approval from the NSW Minister for Planning. The application for approval will need to be supported by an environmental impact statement (EIS), prepared in accordance with the EP&A Act, the Secretary of the NSW Department of Planning and Environment's environmental assessment requirements (SEARs) and the Environmental Planning and Assessment Regulation 2000 (the Regulation). Further information on the approval requirements, including the authorisations required if the project is approved (in accordance with clause 192 of the Environmental Planning and Assessment Regulation 2000) is provided in Appendix A.

The key steps in the planning approval process for the project are shown in Figure 1-2.

At this stage, it is considered unlikely that the project will trigger the need for approval under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). However, this will be confirmed during further design and assessment work. Temporary works during construction may trigger the need for a building activity and/or controlled activity approval under the Commonwealth *Airports Act 1996* (the Airports Act). This will be confirmed in the EIS.

1.3 Purpose of this report

This report has been prepared to support a State significant infrastructure application for the project in accordance with sections 5.15 and 5.16 of the EP&A Act. The report:

- Describes the project
- Considers the potential environmental issues for the project
- Addresses the requirements of clause 192 of the Regulation, which apply to applications seeking approval of the NSW Minister for Planning to carry out State significant infrastructure (refer to Appendix A).

The study area for the purposes of the report is defined as the wider area surrounding the project site, which is the area that has the potential to be directly or indirectly affected by the project (for example, by noise and vibration, visual or traffic impacts). The study area is located in the Bayside local government area. The project site and the key features of the study area are shown on Figure 1-1.

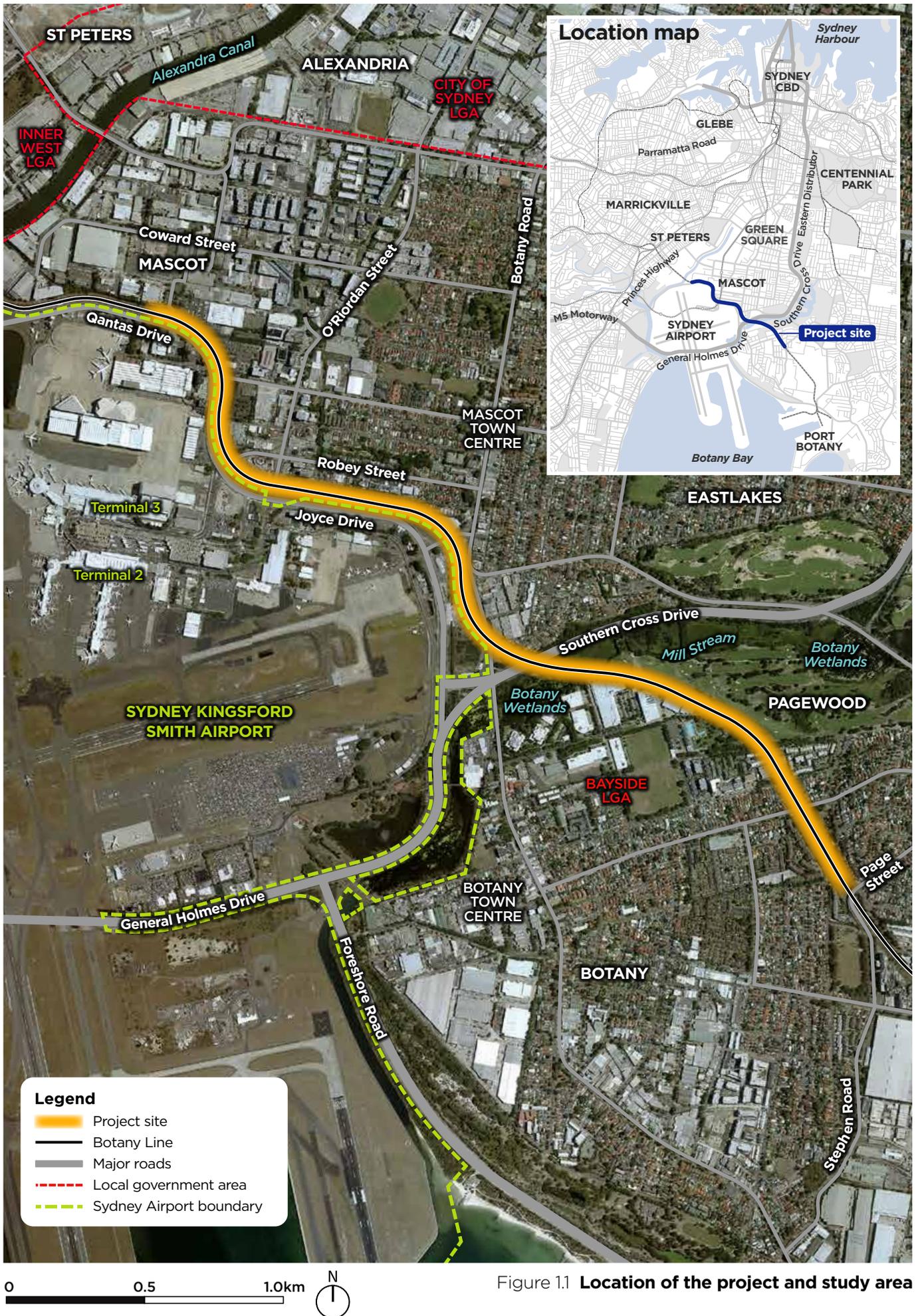


Figure 1.1 Location of the project and study area



Figure 1-2 NSW planning approvals process for State significant infrastructure

2 BACKGROUND

2.1 Strategic context and need for the project

2.1.1 Existing situation and key issues

Existing freight network

The Botany Line, which forms part of the Metropolitan Freight Network, is located between Port Botany and Marrickville. The Metropolitan Freight Network, which has a total length of about 21 kilometres, extends to Sefton Park Junction in Sydney's south-western suburbs. The network is mostly double-track, with the exception of the 2.9 kilometre long section of single-track between Mascot and Botany. ARTC proposes to duplicate this section.

The majority of the network is located within the freight rail corridor managed by ARTC. A 5.6 kilometre long section between Marrickville and Campsie is located in a rail corridor that is shared with Sydney Trains.

The Southern Sydney Freight Line, which was completed in December 2012, extends south from Sefton Park Junction to Macarthur in Sydney's south. The Southern Sydney Freight Line is a 36 kilometres long single-track bi-directional line located in a shared corridor with Sydney Trains.

Port Botany

Port Botany is one of Australia and NSW's most important infrastructure assets, with Port Botany the largest container port in Australia, and NSW's largest bulk liquid and gas port and only container port. Port Botany handles 99 per cent of NSW's container demand, moving more than 6,000 containers on average every day. The port also handles 98 per cent of NSW's consumption of liquid petroleum gas (LPG), 90 per cent of bulk chemical products, 30 per cent of refined petroleum fuels and 100 per cent of bitumen products (NSW Ports 2015).

Together, the international gateways of Port Botany and the nearby Sydney Airport directly serve the Greater Sydney area, the largest city region economy in Australia, and wider areas of NSW. Combined, these gateways generate \$10.5 billion of economic activity and handle close to \$100 billion of freight. Efficient access to and from the port and airport is critical to the economy. The area around Sydney Airport and Port Botany also has high concentrations of airport and port related businesses that are also important to the economy. The Sydney Airport and Port Botany area is the largest employment area in Sydney after the Sydney central business district (Ernst & Young 2011). As described in section 2.1.2, the amount of container freight handled by Port Botany is predicted to significantly increase.

Major freight activity precincts and intermodal distribution centres are located across Sydney (shown on Figure 2-1), generally close to strategic road and rail corridors. Over 80 per cent of containers moving through Port Botany are delivered to locations within a 40 kilometre radius of the port. This is projected to remain the dominant distribution pattern over the next 30 years (NSW Ports 2015). The key intermodal terminals and logistics centres that connect with Port Botany include:

- Cooks River Intermodal Terminal
- Yennora Intermodal Terminal
- Enfield Intermodal Logistics Centre
- Chullora Intermodal Terminal

- Macarthur Intermodal Shipping Terminal
- Villawood Intermodal Terminal
- Moorebank Intermodal Terminal (under construction).

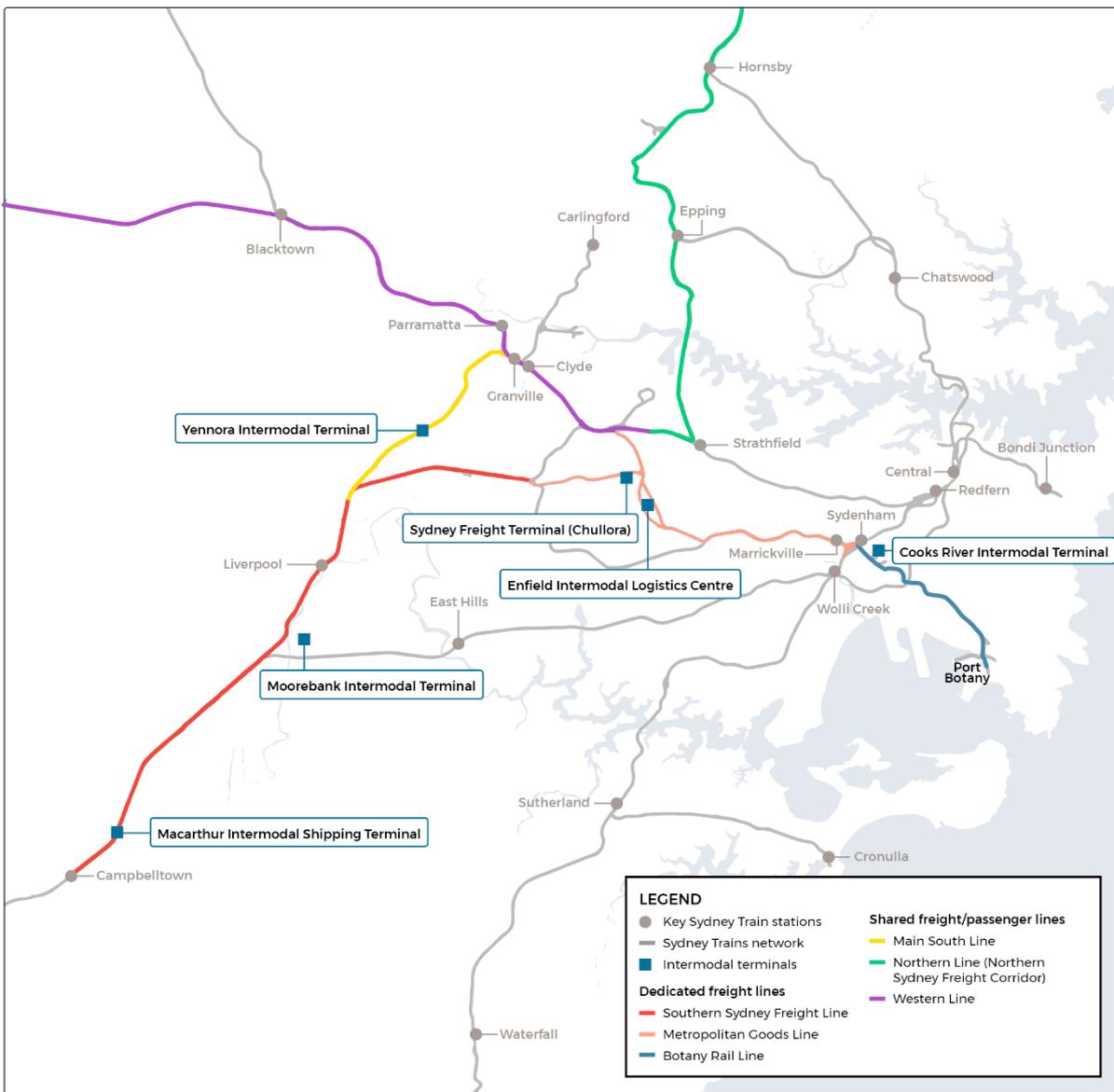


Figure 2-1 Key freight facilities in Sydney

Existing rail line constraints

The majority of the existing Botany Line comprises twin tracks, except for the section between Mascot and Botany where there is only one track. This single track section constrains the ability for freight to enter and depart from Port Botany concurrently. It acts as a bottleneck to the movement of freight services to and from the port, and affects freight movements during maintenance activities.

The single line section of track represents a major reliability risk to the freight rail network. If a train was to breakdown or be involved in an incident in this section of track, all services to/from Port Botany would stop.

Other access issues

As noted by the NSW Freight and Port Plan 2018-2023, access by both road and rail to and from freight facilities such as ports is becoming increasingly constrained. Congestion and constraints on the supporting land transport network can reduce the performance of ports (Transport for NSW 2018c).

The existing roads surrounding Sydney Airport and Port Botany are already operating near capacity. Strategic modelling undertaken as an input to planning for the Sydney Gateway road project (refer to section 2.1.4) indicates that the lack of spare road capacity on roads in Mascot will become more of an issue once St Peters interchange is operational. As such, there is a need to attract more freight movements to rail. Efficient, reliable freight transport is key to increasing the share of freight moved by rail.

Mascot and Botany town centres – traffic and amenity issues

The Mascot town centre is located on Botany Road, about 300 metres to the north of Sydney Airport. The Botany town centre is also located on Botany Road, about 500 metres to the south of the airport and 2.5 kilometres to the north of Port Botany.

Botany Road is one of the main access roads to the Port Botany area and an alternative route between the Sydney central business district and Sydney Airport. Botany town centre is affected by traffic accessing Port Botany via Botany Road.

The Mascot town centre and surrounding residential areas are substantially affected by traffic accessing Sydney Airport and Port Botany. Mascot is characterised by high volumes of through and local traffic. This contributes to congestion and access issues, and adversely affects local amenity. One of the objectives of the Sydney Gateway road project (refer to section 2.1.4) is to address these issues.

Increasing the capacity of the rail freight network and rail modal share will assist in addressing traffic issues in the Mascot and Botany town centres.

2.1.2 Future demands

Over the next 20 years, container freight, air freight, air travel and general traffic in and around the Port Botany and Sydney Airport area are expected to grow significantly. This will put more pressure on roads and other infrastructure and impact local communities. The key demands driving the need for the project are outlined below.

Freight growth

By 2036, the amount of freight moved in NSW is projected to increase significantly from 482 million tonnes (in 2016) to 618 million tonnes (Transport for NSW 2018c). The amount of container freight handled by Port Botany is predicted to significantly increase – from 14.4 million tonnes in 2016 to 25.5 million tonnes in 2036, representing an increase of 77 per cent (Transport for NSW 2018c). Providing for the forecast freight volumes at Port Botany will include:

- Port infrastructure works – including works to improve the efficiency and use of existing operations and new infrastructure at Port Botany to facilitate increases in throughput, as defined by the NSW Ports' 30 Year Master Plan (NSW Ports 2015)

- Transport infrastructure works – including works to improve the efficiency and capacity of freight movement to and from Port Botany.

In addition to the growth in container freight, air freight handled by Sydney Airport is predicted to increase by 64 per cent – from 615,378 tonnes in 2012 to 1,011,312 tonnes in 2033 (SACL 2014a). Transporting this freight to and from the airport will also place additional demands on the road network in the study area. If rail freight capacity is not increased, this growth will place additional pressure on the road network.

Increasing demands for rail freight transport

The Australian and NSW Governments have identified clear objectives to increase the share of freight moved by rail – from 17.5 per cent in 2016 to 28 per cent by 2021 (Transport for NSW 2018c, Infrastructure Australia 2018). In addition, NSW Ports has also set a target of 40 per cent of total freight volumes to be transported to/from the port by rail. This represents a substantial increase compared with the current 14 per cent share of freight moved by rail (NSW Ports 2015).

NSW Ports recognises that maximising the capacity of Port Botany requires a combined investment in, and optimisation of, both road and rail networks, and that investment in just one mode will not suffice (NSW Ports 2015).

Port Botany is the centre of operations for NSW's import/export container supply chain. As such, its efficient operation is critical to maintaining an efficient and effective supply chain. Transporting increased freight volumes to and from the port will place additional demands on the existing rail line, with freight that cannot be accommodated on rail placing additional demands on the surrounding congested road network.

The development of Moorebank Intermodal Terminal, which is currently under construction, will also place additional demands on the existing rail line. The terminal was proposed as part of the NSW and Australian's Governments long-term strategy to increase the movement of freight by rail. At full operation, the terminal will have the capacity to shuttle more than one million TEUs annually between Port Botany and Moorebank by rail. In addition, intermodal terminal volumes and growth targets for Chullora, Enfield, Villawood, Yennora, Macarthur and Cooks River, as well as other regional and interstate freight services, need to be catered for.

Infrastructure Australia has identified the Botany Rail Duplication as a high priority initiative (Infrastructure Australia 2018).

2.1.3 Strategic planning and policy context

Over the last twenty years, Australia's need for a more strategic approach to managing and investing in land freight networks has become apparent. The project is influenced by industry strategic planning and policies to provide the infrastructure necessary to service demand for freight accessing Port Botany, intermodal terminals and key supply chains in a reliable, safe and efficient manner. If infrastructure cannot service future demands, planning and policies for freight related activities by the NSW government and private industry cannot be met. To adequately cater for future growth and demand, all industries in the freight supply chain need to have cohesive future planning, objectives and goals to deliver a whole logistics solution.

The strategic context of the project is influenced by the following strategic plans for transport, land use planning and freight that have been prepared at the national, state and regional/local levels.

National

- Inquiry into National Freight and Supply Chain Priorities (Commonwealth of Australia 2018)
- Australian Infrastructure Plan (Infrastructure Australia 2016) and the Infrastructure Priority List (Infrastructure Australia 2018)
- National Ports Strategy (Infrastructure Australia and the National Transport Commission 2011)

NSW

- Future Transport Strategy 2056 (Transport for NSW 2018a)
- State Infrastructure Strategy 2018-2038 (Infrastructure NSW 2018)
- NSW Freight and Ports Plan 2018-2023 (Transport for NSW 2018c)

Metropolitan/regional

- Sydney Metropolitan Freight Strategy 2015-2024 (ARTC 2015).
- NSW Ports' 30 Year Master Plan (NSW Ports 2015)
- A Metropolis of Three Cities – the Greater Sydney Region Plan (Greater Sydney Commission 2018a)
- Eastern City District Plan (Greater Sydney Commission 2018b)
- Greater Sydney Services and Infrastructure Plan (Transport for NSW 2018b)

2.1.4 Related and complementary projects***Cabramatta Loop project***

ARTC is also proposing to construct a 1.4 kilometre long passing loop at Cabramatta (the Cabramatta Loop project) to improve the movement of trains between intermodal terminals in western Sydney and Port Botany. The Australian Government has recognised the need for this project (Botany Rail Duplication) and the Cabramatta Loop Project and announced a funding commitment of \$400 million in the 2018 budget for both projects.

ARTC is currently progressing the environmental assessment for the Cabramatta Loop project based on the SEARs issued in May 2018.

Track upgrading project

ARTC is currently undertaking track upgrading works between Botany and Sefton to improve the condition of the Metropolitan Freight Network, which incorporates the Botany Line. Designs for track upgrading works and the proposed Botany Duplication Project have been integrated to minimise re-work.

Sydney Gateway road project

The NSW and Australian governments are making major investments in the transport network in the vicinity of Sydney Airport and Port Botany to provide reliable access to the airport and port, and efficient connections to Sydney's strategic hubs. New road and freight rail options are being investigated to cater for the forecast growth in passengers and freight through Sydney Airport and Port Botany.

The Sydney Gateway road project (shown on Figure 2-2), which is being proposed by Roads and Maritime Services (Roads and Maritime) and Sydney Airport Corporation Limited (SACL), would comprise new direct

high capacity road connections linking the Sydney motorway network at St Peters interchange with Sydney Airport Terminal 1 and Airport Drive in the south, and Qantas Drive and Sydney Airport Terminals 2/3 in the east.

The Sydney Gateway road project is subject to a separate application and approval process, which is currently being progressed by Roads and Maritime.

Sydney Airport precinct road upgrades

Roads and Maritime is currently undertaking a number of road upgrade projects around Sydney Airport to:

- Improve access to Sydney Airport, Mascot and the eastern suburbs
- Improve the movement of freight to and from Port Botany
- Support future growth and access to Sydney Airport
- Improve traffic flow around Sydney Airport and to Port Botany.

Projects being undertaken in the vicinity of the project site for the Botany Rail Duplication are described below.

Airport North Precinct Upgrade

The Airport North Precinct Upgrade is being undertaken along O’Riordan Street between Joyce Drive and Bourke Road, Mascot. It involves upgrading roads north of Sydney Airport.

This upgrade is intended to tie in to the recently completed, reconfigured Robey and O’Riordan streets as one-way streets. This reconfiguration was undertaken to accommodate upgrades to the new one-way road system through Terminals 2/3 and improve traffic flow around Sydney Airport.

Early work on the upgrade started at the beginning of July 2018 and included service and pavement investigation work. In October 2018 demolition required to enable the start of major work and utility relocations was underway.

Airport East Precinct Upgrade

The Airport East Precinct Upgrade is being undertaken in the area covering Wentworth Avenue, Botany Road, Mill Pond Road, Joyce Drive and General Holmes Drive in Mascot. It involves upgrading roads east of Sydney Airport, removing the rail level crossing at General Holmes Drive, and constructing a road underpass and new rail bridge along a new section of Wentworth Avenue.

Major work started in February 2017 and is expected to finish in 2019. In October 2018 construction of the road underpass and rail bridge was completed. The Joyce Drive widening and the terminal intersection work are close to completion. The Botany Road and Wentworth Avenue intersection reconstruction is planned to commence in late 2018.

The Airport East road upgrades will complement the Botany Rail Duplication project. Removing the level crossing will increase the efficiency of operation of the Botany Line and complement the capacity improvements that would be provided by the project and other recent upgrades to the rail line (described below).

Those elements of the Sydney Gateway road project located at Qantas Drive and the entrance to Terminals 2/3 would adjoin the western end of the project site for the Botany Rail Duplication.

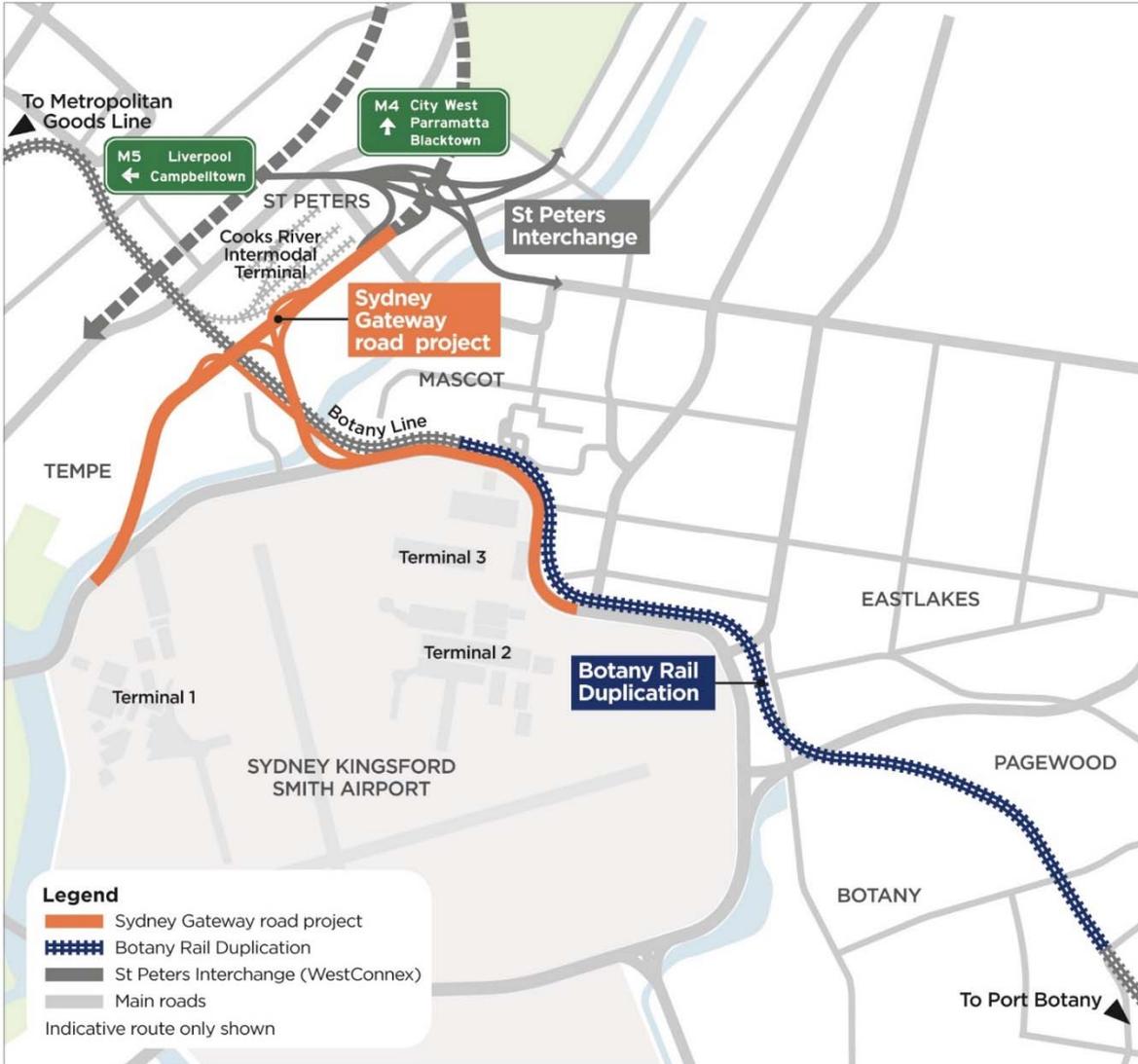


Figure 2-2 Sydney Gateway road project

2.2 Project objectives and benefits

The primary objective of the project is to increase capacity to meet the forecast demand for container freight transport to and from Port Botany. Secondary objectives are to:

- Provide increased operational efficiency, flexibility and reliability for freight customers
- Increase rail market share for containerised freight
- Support connection to, and operation of, intermodal terminals to meet their targeted freight capacity.

It is intended that the project would:

- Alleviate constraints and increase the capacity of Sydney's freight rail network to meet existing and future demands
- Support the operation of intermodal terminals, including Enfield, Chullora and Moorebank
- Encourage a shift in freight transport from road to rail, and support a reduced rate of growth in truck movements and associated traffic congestion around Sydney Airport and Port Botany.

2.3 Selection of the preferred project

2.3.1 Strategic options review

ARTC's Sydney Metropolitan Freight Strategy (ARTC 2015) identified the need to increase the capacity of the Botany Line by 2023 to meet the demand for, and facilitate growth in, rail freight movements. The need to duplicate this section of line was confirmed by the strategies listed in section 2.1.3.

As the project is predominately constrained to the existing rail corridor (as a result of surrounding development, land use, infrastructure and environmental constraints) further development of the project focused on refining the design rather than route options.

ARTC, Roads and Maritime and Transport for NSW continued to further develop the rail component of Sydney Gateway throughout 2016. An integrated approach was required due to the constraints, complexities and interaction between the road component (the Sydney Gateway road project) and the Botany Rail Duplication.

A concept design for the Botany Rail Duplication was prepared in 2015, and a feasibility design was prepared in 2016. An outline of the options considered as part of these designs is provided in the following sections.

2.3.2 Concept design

The concept design considered three options that had been previously identified by ARTC:

- Option 1 – a 900 metre track extension at the south-eastern (Botany) end to reduce the length of the single line section
- Option 2 – a 800 metre track extension at the north-western (Mascot) end to reduce the length of the single line section
- Option 3 – duplication of the single track section for the entire 2.9 kilometre length between Mascot and Botany.

Initial operational modelling was undertaken in mid-2014. Preparation of the concept design, which commenced in late 2014, included investigation of a number of sub-options within the options listed above. As a result of design activities and investigation works on the project since the initial modelling, it was recommended that feasibility design of the three options proceed with re-modelling to be undertaken, based on updated information, to identify a preferred option.

2.3.3 Feasibility design

In 2015-2016, ARTC prepared a feasibility design for the project to build on the previous concept design. Re-modelling of updated information was undertaken. The performance of the three options was assessed in terms of cost, capacity and potential impacts on reliability and service frequency. The assessment concluded that option three performed best, from both a capacity perspective (well beyond 2030) and based on a proportionate additional cost to reduce the remaining risk.

During this time, Roads and Maritime approached ARTC to deliver the road and rail projects as Sydney Gateway. ARTC, Roads and Maritime and Transport for NSW collaboratively considered various aspects of the design including:

- Vertical and horizontal alignment to accommodate operational requirements
- Impacts to existing bridge and culvert structures, with particular attention to the Robey Street bridge
- Retaining wall locations and heights
- Interaction between the rail line and high pressure gas mains in the project site
- Drainage, other service utilities and signalling.

At the completion of the feasibility design a number of unresolved issues were identified. These issues, which are currently being reviewed, include options for upgrading bridges, drainage provision, utilities protection/relocation, the design and location of embankments and retaining walls, and the potential for any impacts to the advertising billboards located along/adjacent to the existing rail corridor. Further information on the options considered and issues identified will be provided in the EIS.

3 CONSULTATION

3.1 Engagement approach and objectives

To date, Roads and Maritime has led consultation for the Sydney Gateway road project and the Botany Rail Duplication. Going forward, ARTC will lead stakeholder engagement and community consultation for the project. Consultation will follow ARTC's processes and procedures for stakeholder management along with applicable guidelines.

The approach to stakeholder engagement will be to build trust and seek to understand stakeholder wants, needs and drivers. Key principles to the approach include:

- Communicating early and often
- Inform stakeholders and the community of impacts and timeframes
- Seek feedback and input from stakeholders and the community
- Explain how feedback and input is used in the development of the project and ongoing opportunities for participation.

It is recognised that several stakeholders will potentially be interested in both the Botany Rail Duplication and the Sydney Gateway road project. In these instances, ARTC and Roads and Maritime will work closely together to engage stakeholders and establish consistent approaches across both projects.

The consultation process will ensure relevant stakeholders are proactively engaged and informed about the project and given opportunities to provide feedback. Regular briefings will be held as the project evolves to ensure stakeholders (including the community) are informed and issues are addressed as appropriate. Engagement activities will potentially include one-on-one meetings, regular communication of project information and review of stakeholder feedback. Issues raised during consultation will be forwarded to the project design and environmental teams to inform project development and environmental assessment.

The primary objective of stakeholder engagement is to make stakeholders feel that they have valid input to the project and to inform the project risk management strategy. The consultation objectives for the project include:

- Communicating the justification for the project
- Ensuring stakeholders are consulted on the parts of the project that impact them
- Providing clear, concise and targeted information that is readily accessible to all stakeholders, with dedicated channels for providing feedback and discussion on issues
- Building and maintaining positive relationships with the community and other stakeholders
- Providing information about the planning approval process and encouraging participation.

3.2 Key stakeholders

A number of key stakeholders have been identified for the project. These stakeholder and their relationship to the project is outlined in Table 3-1.

Table 3-1 Key stakeholders for the project

Stakeholder	Relationship to project – likely key interests
Roads and Maritime	Collaboration in relation to the Sydney Gateway road project Traffic management during construction
NSW Ports	Benefits and potential impacts to Port Botany
Sydney Airport Corporation Limited	Project information, objectives, targets and completion Construction methodology Approvals in relation to the requirements of the Airports Act
Businesses and landowners	Project information, objectives, targets and completion Land requirements and negotiations Potential impacts during construction and operation
Transport and freight industry representatives	Project information, objectives, targets and completion Potential impacts during construction
Community members, groups and community infrastructure managers	Project information, objectives, targets and completion Potential impacts during construction and operation
Service/utility owners	Potential impacts and need for service relocations and/or protection during construction
Bayside Council	Project information, objectives, targets and completion Potential impacts during construction and operation
Transport agencies: <ul style="list-style-type: none"> • Transport for NSW • RailCorp • Sydney Trains • Freight and Regional Development 	Project information, objectives, targets and completion Rail corridor landowner Rail corridor authority for property impacts and agreement amendments between Transport for NSW, RailCorp and ARTC Collaboration in relation to the Sydney Gateway road project
Office of National Rail Safety Regulator	Regulator and approval authority for changes in rail operations
Civil Aviation and Safety Authority (CASA)	Potential aviation risk matters and advice
Australian Government departments/agencies, including: <ul style="list-style-type: none"> • Department of Infrastructure and Regional Development of Cities (DIRDC) • Infrastructure Australia 	Project information, objectives, targets and completion Funding authority

Stakeholder	Relationship to project – likely key interests
NSW Government departments/agencies, including: <ul style="list-style-type: none"> • Department of Planning and Environment • Office of Environment and Heritage • EPA 	Project information, objectives, targets and completion As approval authorities and/or regulators
Emergency services	Potential impacts during construction, project timeframes
Australian and NSW members of Parliament	Project awareness – objectives, targets, completion, impacts

3.3 Information available to stakeholders and the community

ARTC is in the process of establishing a dedicated project webpage, email and phone contacts. These will be available around the time of receipt of the SEARs to facilitate stakeholder and community engagement during preparation of the EIS.

As noted above, information on the Botany Rail Duplication has been made available to stakeholders and the community through the following Roads and Maritime channels:

- Webpage: <https://www.rms.nsw.gov.au/projects/sydney-south/sydney-gateway/index.html>
- Email: sydneygateway@rms.nsw.gov.au
- Phone: 1800 654 446

Information available on Roads and Maritime’s Sydney Gateway webpage includes a description of the project, the location, benefits and the target construction program. An opportunity to provide feedback was provided through these channels.

To date, Roads and Maritime has forwarded enquiries and feedback regarding the Botany Rail Duplication to ARTC and Roads and Maritime has provided responses to enquiries and feedback received. Going forward, enquiries and feedback regarding the Botany Rail Duplication can be made directly to ARTC via the project’s dedicated web page, email and phone contacts. ARTC will respond directly enquiries and feedback received.

ARTC and Roads and Maritime will continue to work collaboratively for consultation across both projects. Collaboration will continue throughout all project stages including construction.

3.4 Consultation and engagement activities to date

3.4.1 Agency consultation

During 2015 – 2016, ARTC undertook a capacity assessment of the freight rail network to determine capacity enhancements required to meet predicted demand for freight accessing Port Botany. During this early concept stage ARTC consulted with a number of key stakeholders as outlined in Table 3-2.

Table 3-2 Summary of previous consultation undertaken for the project

Stakeholder	Timeline	Engagement detail
Department of Infrastructure and Regional Development	2015-2016	Regular consultation regarding the capacity assessment funding and progress. This included regular Project Control Group meetings and consultation regarding milestone commitments.
Transport for NSW	May 2015 June 2015	Notification regarding the project and provision of background information. Briefing provided to the Projects and Freight divisions, including option concept designs. No objections or issues have been raised.
Sydney Trains	May 2015	Notification of the project and provision of background information with a briefing provided to executive staff.
Roads and Maritime – Airport East Precinct Upgrade	2015 - 2018	Various consultation including regular meetings, emails and phone discussions for the new bridge being built at Wentworth Avenue. Consultation has included agreeing works and scope to allow for the future duplication of the track. Design information has been shared between the parties to ensure consistency in planning.
WestConnex Delivery Authority and Roads and Maritime	Mid-2015 - 2018	Consultation regarding interfaces between the WestConnex, Sydney Gateway road project and the Botany Rail Duplication. ARTC and Roads and Maritime are currently working collaboratively on the Botany Rail Duplication and the Sydney Gateway road project. Regular consultation includes meetings, site visits and exchange of information.
Moorebank Intermodal Company/ Sydney Intermodal Terminal Alliance	Mid-2014	Consultation regarding capacity analysis.
SACL	Mid-2015	ARTC was involved in consultation with SACL during development of the Airport East Precinct Upgrade project.
NSW Ports	February 2015	Project briefing provided to NSW Ports representatives. Consultation included information exchange, meetings and communication. NSW Ports and ARTC work together on an ongoing basis to ensure future requirements of are planned collaboratively.
Sydney Water	September 2015	Project briefing provided identifying potential impacts to Sydney Water assets. Sydney Water provided copies of available as built drawings and confirmed that they will work with ARTC to implement methods of managing service impacts.

Stakeholder	Timeline	Engagement detail
Ausgrid	November 2015	Project briefing provided identifying potential impacts to Ausgrid assets. Ausgrid provided additional information, layout plans and initial estimates for investigation works.
Jemena	2015-2016	A number of site visits have been held with Jemena representatives regarding investigation and field survey works in the areas where gas services interface with the project.
APA Group	March 2016	Site visit held to brief APA representatives of the project and clarify the positioning of the ethane gas pipeline for field investigation works.

3.4.2 Community and stakeholder participation during scoping stage

In May 2018, the Australian Government announced its funding commitment for the Botany Rail Duplication. In September 2018, the NSW Government announced its commitment to develop Sydney Gateway. To ensure a consistent approach for stakeholders and the community, ARTC and Roads and Maritime undertook joint consultation and engagement activities during the scoping stage.

Key consultation activities undertaken since the announcement of Sydney Gateway are summarised in Table 3-3.

Table 3-3 Engagement activities during scoping stage

Activity	Timeline	Detail
Initial briefings	September 2018	Stakeholder briefings to provide information on the Botany Rail Duplication and Sydney Gateway road projects and set up meetings for more detailed discussions.
Contact with affected landowners	September 2018	Briefings to provide information on potential land impacts and set up meetings for more detailed discussions
Sydney Gateway webpage	Ongoing	A dedicated webpage (https://www.rms.nsw.gov.au/projects/sydney-south/sydney-gateway/index.html) was set up to provide information on the Botany Rail Duplication and Sydney Gateway road projects, including updates and announcements.
1800 number and email	Ongoing	Contact mechanisms have been set up to enable community members to contact the project via the Sydney Gateway project team: Email: sydneygateway@rms.nsw.gov.au Phone: 1800 654 446 Contacts made with regard to the Botany Rail Duplication are forwarded to ARTC for action.

Activity	Timeline	Detail
Community update	September 2018	A community update is available via the Sydney Gateway webpage. Copies of the update were distributed by Roads and Maritime to 27,000 residents and businesses.
Online community engagement map	Ongoing	An online community consultation feedback mapping tool is available via the Sydney Gateway webpage. This tool provides the opportunity for people to provide feedback and comments directly on the online map.
Community information displays	October 2018	Project displays at key locations to provide information on the Botany Rail Duplication and Sydney Gateway road project.
Door knocking local residents and businesses	September and October 2018	Door knocking with local residents and businesses to provide information on Sydney Gateway and seek feedback. Included a survey of businesses in relation to project impacts.

3.5 Community feedback

During consultation undertaken to date, minimal issues have been raised in relation to the Botany Rail Duplication. Table 3-4 provides a summary of the issues raised.

Issues raised will be considered as part of ongoing development of the project including the design and environmental assessment process.

Table 3-4 Issues raised by the community during consultation to date

Category	Issue raised
General impacts/design	Interest in the exact dimensions of the project. Interest in impacts along Ellis Street in Botany.
Project program	Interest in the commencement and completion dates.
Property	Concern regarding how duplication would be achieved. Interest in the need for property acquisition in Bay Street.
Noise	Interest in whether an acoustic wall near the residential area in Banksia Street, Botany will form part of the project.
Operational impacts	Interest in whether the project will extend to Tempe and concern regarding impacts of more trains during the night.

3.6 Input to design development

Comments received will be considered during the scoping and development of the environmental assessment, as well as during development of the design and mitigation for the project as appropriate. As the project is predominantly contained within an existing rail corridor, there is no scope to change the overall route or alignment.

3.7 Consultation during the EIS process

ARTC is committed to ensuring appropriate consultation is undertaken as the project progresses. A range of consultation and engagement activities will occur while the EIS is prepared and placed on exhibition. These activities will provide information to, and collect feedback from, the community and other stakeholders. The consultation activities will also inform the project design and management of environmental issues. Key elements of this consultation will include:

- Informing the community via notifications and the webpage about the project, need and strategic context and potential impacts
- Written communication to all property owners/occupants close to the project site
- Ongoing consultation with affected landowners and stakeholders
- Seeking feedback from the community and other stakeholders
- Public exhibition of the EIS, which would be expected to occur in late 2019. This would be for a minimum of 30 days but may extend if appropriate (such as due to exhibition during school holidays). Advertisements will be placed in newspapers advising of the public exhibition and where the EIS can be viewed. These will also provide advice about making a submission on the project, and will outline how submissions would be considered and responded to during the planning process.
- Community information sessions during the exhibition period, depending on the level of interest.

The ARTC project website will be updated with new information throughout the planning process and will promote opportunities for comments and input. Consistent points of information and contact, including the project webpage, email and 1800 telephone number, will be maintained.

Updates on the project and engagement with the community and other stakeholders will occur while the EIS is prepared. Information will be sought regarding the potential impacts of the project (during construction and operation) and ideas on how impacts could be avoided, mitigated or managed.

A Community and Stakeholder Engagement Plan is being prepared to guide communication, consultation and engagement throughout the EIS process. If the project is approved, the plan will be updated to reflect engagement activities during construction, including that required by the conditions of consent.

The expected outcomes of engagement activities during the EIS process are:

- Stakeholders gain an overall understanding of the project and understand the participation opportunities and timeframes
- Application of consistent stakeholder engagement between ARTC and Roads and Maritime
- Early identification, consideration and effective resolution of community and stakeholder issues
- Involvement and feedback from the community and other stakeholders
- Regular engagement, consultation, feedback, coordination and information.

4 THE PROJECT

4.1 Overview

4.1.1 Key features

The existing Botany Line forms part of the Metropolitan Freight Network (also part of the National Freight Network), which is a dedicated freight rail network operated by ARTC. The line extends from Port Botany to near Marrickville Station, where it connects to the Metropolitan Goods Line.

The majority of the existing rail line comprises twin tracks. The exception to this is the section between Mascot and Botany, which is 2.9 kilometres long, where there is only one bidirectional track. ARTC proposes to duplicate this section to increase rail freight capacity to Port Botany. The key features of the project, as shown on Figure 4-1, include:

- Track duplication – constructing a new track within the rail corridor for a distance of 2.9 kilometres
- Track realignment (slewing) and upgrading – moving some sections of track sideways (slewing) and upgrading some sections of track to improve the alignment of both tracks and minimise impacts to adjoining land uses
- New crossovers – constructing new rail crossovers to maintain and improve access at two locations
- Bridge works – constructing new bridge structures at Mill Stream, Southern Cross Drive, O’Riordan Street and Robey Street (adjacent to the existing bridges), re-constructing the existing bridge structures at Robey and O’Riordan streets
- Embankment/retaining structures – constructing a new embankment and retaining structure adjacent to Qantas Drive between Robey and O’Riordan streets and a new embankment between the Mill Stream and Botany Road bridges.

Ancillary work would include bi-directional signalling upgrades, drainage work and protecting/relocating utilities.

These features of the project are described in more detail in section 4.2. The design of the project will continue to evolve through the design development, consultation and environmental assessment process. The final concept design would be presented in the EIS.

4.1.2 Location and land ownership

The project is predominantly located within the rail corridor for the existing rail line, about eight kilometres south of the Sydney central business district (as shown on Figure 1-1), in the suburbs of Mascot, Botany and Pagewood. The north-western extent of the project site is located in the vicinity of Qantas Drive in Mascot, to the west of the Qantas Jet Base Qantas Drive road overpass. The south-eastern extent of the project is located just to the north of the Stephen Road bridge in Botany.

The rail corridor is owned by the NSW Government (RailCorp) and leased to ARTC. The design alignment of the project is predominantly within the existing rail corridor, as shown on Figure 1-1, however some temporary leases and acquisition of land outside the corridor may be required in some areas.



Figure 4.1 Key Features

4.2 Description of the key design features

Key features of the project are outlined below. These features are subject to further refinement, including completion of ongoing geotechnical and other environmental and design investigations.

4.2.1 Track duplication

A new track would be installed within the rail corridor for the length of the project site. The new track would generally be located on the southern side of the corridor. The new track would include track formation (the material on which the ballast and tracks are laid), ballast and rail infrastructure.

4.2.2 Track realignment (slewing) and upgrading

To make room for the new second track, some sections of existing track would be moved sideways (slewed) within the rail corridor. Some sections of the existing track would be upgraded in situ as required. Track realignment would generally be undertaken in the north-western portion of the project site (in Mascot). Track upgrading (where required) would generally be undertaken in the south-eastern portion of the project site (in Botany and Pagewood).

Subject to ongoing design, it is estimated that about 1.4 kilometres of slewing and 1.5 kilometres of track upgrading (in place) is needed. The works would generally involve:

- Preparing new (or upgrading existing) track formation and localised drainage and capping layer repairs
- Placing new (or reconditioned) ballast on the track formation
- Installing new (or reusing existing) concrete sleepers on top of the formation and ballast
- Reinstating existing (or new) rail on the new formation and ballast.

4.2.3 New crossovers

New crossovers would be constructed at two locations within the rail corridor to enable trains to change direction or move from one track to another. One crossover is the equivalent of two turnouts, with one required for each track (direction) to allow a train to move to the other track (direction).

One crossover would be located midway between O’Riordan Street and General Holmes Drive in Mascot. The other would be located between Bay and Banksia streets in Botany.

Constructing the crossovers would involve providing new formation between the main line tracks, installing the crossover tracks/sleepers and associated signalling works.

4.2.4 New bridges

Four rail bridges that pass over roads are located within the project site. These bridges are located over Robey and O’Riordan streets, Botany Road and Southern Cross Drive. There is also a rail bridge located over Mill Stream. A new rail bridge over an extension of Wentworth Avenue has been constructed by Roads and Maritime to replace the previous level crossing at General Holmes Drive as part of the Airport East Precinct Upgrade (described in section 2.1.4).

At this stage of the design process, the project includes:

Constructing new bridge structures (footings, abutments and decks) adjacent to the existing structures to accommodate the new tracks over Robey and O’Riordan streets, Southern Cross Drive and Mill Stream

Replacing the existing bridges over Robey and O’Riordan streets (adjacent to the proposed new bridges structures) due to the age and condition of these structures.

No works are proposed to the new bridge (under construction) over the extension of Wentworth Avenue. The proposed works at each bridge are currently being confirmed and will be described in the EIS.

The design of the proposed bridge works will be influenced by the following:

- Maintaining appropriate clearances above and below the tracks and associated infrastructure.
- Future-proofing the corridor for possible future electrification of the line.
- The locations of existing utilities in the vicinity of the bridges that need to be avoided, adjusted or protected.

The methodology that would be used to undertake the works (constructability).

4.2.5 Embankment/retaining structures

New or modified embankments and retaining walls are proposed between Mill Stream and towards the Botany Road bridge, and between Ewan Street (in Mascot) and 200 metres west of O’Riordan Street.

4.2.6 Ancillary works

Ancillary works are likely to be required both within and outside the existing rail corridor, particularly in relation to existing utilities and drainage, embankments and rail corridor access points.

New bi-directional signalling, signalling power and communications systems would be provided along the project site. These works would predominantly be below ground with the exception of a new signal hut proposed to be located between O’Riordan Street and General Holmes Drive (to the north of the existing track).

Utilities such as water, drainage, sewer, electrical, gas and telecommunications infrastructure located within or crossing the rail corridor may need to be adjusted depending on the design and in accordance with the requirements of the relevant asset owner. Further details of key utilities identified to date are provided in section 4.3.5.

Existing drainage within the rail corridor would also be adjusted as required to suit the new track levels and address any drainage issues identified.

There is an existing service track within the rail corridor. This road would need to be extended to provide access along the project site. Adjustments to some corridor entry points and gates would also be required to ensure access is available for construction and maintenance vehicles.

4.3 Construction

4.3.1 Indicative methodology

Indicative construction activities and methodologies include:

- Enabling and temporary works, including utilities protection, construction power, construction water supply and site establishment
- Installing environmental management and erosion control facilities
- Clearing vegetation in the corridor where required

- Temporary realignment or protection of utilities as required, including ARTC assets
- Civil, embankment and retaining structures works, including construction of the new bridges and any track access provisions
- Track construction works, including new formation, concrete sleepers, rail and ballast installation
- Track slewing works including new formation and realignment of sleepers, ballast and rail.
- Trenching, erection and connection of signalling and communications equipment
- Other ancillary works as required
- Landscaping
- Finishing work, including installing fencing, signage and lighting
- Demobilisation activities, including removing construction equipment, compounds and site tidy up.
- Construction works would be conducted to minimise operational impacts on the existing rail line. It is anticipated that some construction activities would be undertaken at a sufficient distance from the tracks so as not to interfere with rail operations. Some works may also need to be undertaken during programmed rail possession periods. These include construction of the tie-ins, new bridges and crossovers, works that cannot be undertaken safely while trains are operating, or those that may affect operations.
- Works that may affect the operation of the road network or require access to space within road corridors may need to be undertaken outside peak traffic periods (such as at night) to avoid the potential for significant traffic disruption. Such activities could include removing the existing bridges over Robey and O'Riordan streets, lifting large objects over the rail line, and installing precast bridge sections and utility adjustment works.

Works would also be undertaken to minimise impacts to Sydney Airport's prescribed airspace. The prescribed airspace consists of the obstacle limitation surface and the Procedures for Air Navigation Services – Aircraft Operations (PANS-OPS) surface (further information is provided in section 6.7). The Airports Act (section 183) defines any activity that intrudes into an airport's prescribed airspace to be a 'controlled activity', which requires approval. A controlled activity approval would be obtained prior to undertaking any works that would be defined as a controlled activity under the Airports Act.

4.3.2 Work areas and compounds

Surface disturbance during construction would include:

- Construction work areas along the rail corridor
- Construction compounds used to store materials and support construction, and provide worker facilities and vehicle parking.

The potential impacts of construction compounds would be minimised, where reasonable and feasible, by:

- Selecting locations as close as possible to work areas
- Avoiding sensitive environmental and community locations
- Maximising opportunities for direct access to arterial roads for construction traffic and avoiding the need to use local residential streets
- Minimising property disturbance, particularly in residential areas.

The location and size of construction compounds will be described in the EIS.

4.3.3 Timing

It is estimated that the project would take about three years to construct, commencing in the third quarter of 2020 with a target completion of the end of 2023.

To minimise impacts on existing rail operations, the project would be constructed while the existing rail line continues to operate. Other features of the project would need to be constructed during programmed weekend rail possession periods when rail services along the line cease to operate. Possession periods typically occur for 48 hours four times per year.

During possession periods, and potentially during other times, out-of-hours work (work during weekends, evenings and at night) is likely to be required for safety reasons and to minimise impacts to road operations and access and operation impacts to Sydney Airport.

4.3.4 Temporary diversions

Temporary diversions for road traffic, pedestrians and cyclists may be required at the interfaces between construction work areas and public roads (such as the works to the bridges over Robey and O'Riordan streets and Southern Cross Drive). In some locations, property accesses may be temporarily affected.

4.3.5 Utility interactions

The project would potentially interact with a number of utilities within the project site, including:

- High pressure gas main (Jemena)
- Ethylene pipeline (Qenos)
- Moomba to Sydney ethane pipeline (APA Group)
- High voltage power (AusGrid)
- Stormwater assets (Council)
- Potable water and wastewater assets (Sydney Water)
- Telecommunication utilities.

Potential impacts on utilities would be minimised as far as practicable.

Utilities with the potential to be affected by the project, and the approach to managing them, will be confirmed during the design process in consultation with the relevant utility authority or owner. The approach to managing utilities will be described in the EIS.

5 KEY ENVIRONMENTAL ISSUES

5.1 Overview

Key issues are defined as those where there is the potential for a high or moderate impact (actual or perceived) and where assessment is required to determine the level of the potential impact and the measures required to mitigate and/or manage the impact. The outcomes of preliminary environmental investigations and feedback received from the community and other stakeholders indicate that the following are the key environmental issues for the project:

- Noise and vibration
- Air quality
- Traffic, transport and access
- Non-Aboriginal heritage
- Land use, social and business impacts
- Contamination
- Hydrology, flooding and water quality
- Cumulative impacts.

Further information on these issues is provided in sections 5.2 to 5.7. The information provided in these sections is based on a desktop review of relevant databases, mapping and other publicly available information on the study area, and the results of previous investigations and assessments.

A number of other environmental issues have also been identified. These issues, which are outlined in section 6, are considered to be of lesser consequence based on the project scope, the existing environment and the implementation of standard management measures. It is expected that these other issues are not likely to be key issues for the project. However these issues will still be assessed in the EIS.

Sensitive receivers in the vicinity of the project site are described in section 5.2.1.

5.2 Noise and vibration

5.2.1 Overview

The project site is located in a highly developed urban area with a mix of transport, industrial, residential, commercial and recreational land uses. The noise environment is highly influenced by existing rail and road noise, and noise associated with the operation of Sydney Airport (both aircraft noise and noise associated with ground operations).

The approach to providing information on aircraft noise in Australia involves publishing Australian Noise Exposure Forecast (ANEF) contours. The ANEF provides a land use planning tool to manage noise sensitive land uses around airports. ANEF modelling gives a forecast of aircraft noise exposure for a future year. The results of ANEF modelling are drawn onto maps as noise exposure contours displayed in 20, 25, 30, 35 and 40 ANEF units, with higher contour numbers representing larger cumulative amounts of aircraft noise over an average one-year period. The production of ANEF contour maps is required at federally leased airports as part of the airport master planning process under the Airports Act.

Aircraft noise is generally considered to become progressively more severe within the 25 ANEF contour. The Airports Act defines 'significant ANEF levels' to mean 'a noise above 30 ANEF levels'.

The majority of the study area is located within the 25 and 30 ANEF contours, which are shown in the Sydney Airport Master Plan (SACL 2014a). Two sections of the study area, from Southern Cross Drive to Wentworth Avenue, and along Qantas Drive between O'Riordan Street and King Street, fall between the 30 and 35 contours. In terms of existing aircraft noise, the study area is located in an area that experiences more than 100 noise events above 70 decibels per day (Airservices Australia 2017).

Other influences on the noise environment include the movement of freight trains along the existing rail line and traffic using the roads described in section 5.4.1, particularly the movement of heavy vehicles and container trucks travelling to and from Port Botany along these roads.

Sensitive receivers and structures in the vicinity of the project site include:

- Residential land uses near the rail corridor in the suburbs of Mascot, Botany and Pagewood (shown on Figure 5-3 and described in section 5.6) with the closest residences including those located:
 - In Mascot, north of the rail corridor on Baxter Road (about 10 to 30 metres from the project site), east of the rail corridor on Botany Road (about 40 metres from the project site) and north of the rail corridor on McBurney Avenue (about 30 metres from the project site)
 - In Botany, west of the rail corridor between Myrtle and Victoria streets (about 20 metres from the project site)
 - In Pagewood, east of the rail corridor between Myrtle and Page streets (about 20 metres from the project site)
- Heritage listed structures (shown on Figure 5-2 and described in section 5.5)
- Hotels in Mascot (shown on Figure 5-3 and described in section 5.6), particularly those on land adjoining or close to the rail corridor (such as the Stamford Plaza, Felix and Branksome hotels)
- Community and recreation facilities in Mascot, Pagewood and Botany (shown on Figure 5-3 and described in section 5.6).

5.2.2 Summary of potential issues

Construction

Noise and vibration would be generated during construction. Potential noise and vibration sources include:

- Operation of mobile and stationary construction plant and equipment
- Fixed sources such as construction compounds
- Construction vehicle movements.

The level of impact would depend on the relative exposure of sensitive receivers and the type, timing, duration and location of construction activities.

As described in section 4.3.3, some works may be required during operational possessions of the rail line, which would include weekends and evenings. Some out-of-hours work (work during weekends, evenings and at night) is likely to be required for safety reasons (to enable work to be undertaken at times trains do

not operate along the line) and to minimise impacts to road operations and access and operation impacts to Sydney Airport.

Potential noise and vibration issues include:

- Noise and vibration resulting from activities at construction sites, compounds, site accesses and haul routes
- Noise associated with out-of-hours work
- Impacts on amenity, particularly for residents, employees, hotel guests and users of recreation and other community facilities
- Vibration impacts (structural or cosmetic) on buildings and other structures, including heritage listed items and utilities
- Vibration impacts on the operation of any sensitive equipment located near the project site
- Cumulative noise impacts taking into account other projects in the study area (described in section 5.7) and the operation of Sydney Airport.

Operation

Sources of operational noise and vibration include:

- Noise from locomotive diesel engines, both while stationary at idle or mobile under load, and various other train components (including the exhaust, traction motors and gearboxes, brakes and cooling systems)
- Wheel rail interactions
- Structure-borne noise from trains moving over reinforced concrete structures (eg bridges)
- Bunching at wagon coupling (during braking and acceleration at signals)
- Horn noise
- Ground vibrations from moving trains
- Vibration transmitted to building structures resulting in regenerated noise.

The main operational noise and vibration issues would arise from:

- Additional freight trains using the rail line as a result of the additional capacity provided by the project – this would increase the frequency of noise experienced by sensitive receivers in the vicinity of the project site
- The movement of trains along the new sections of track within the rail corridor, which could be located closer to receivers than the existing track.

5.2.3 Proposed further assessment

A detailed noise and vibration assessment will be undertaken to assess the potential impacts of construction and operation. It will include:

- Identifying noise and vibration sensitive receivers
- Background monitoring to characterise the local noise environment
- Establishing project-specific construction noise management levels and vibration criteria
- Identifying of construction rating background noise levels.
- Identifying and assessing potential airborne and ground-borne noise and vibration impacts on sensitive receivers during construction, including the impact of out-of-hours work
- Assessing potential road traffic noise impacts during construction
- Establishing operational noise criteria
- Identifying and assessing potential noise and vibration impacts during operation, at the year of opening and 10 years after opening, for the 'build' and 'no build/do nothing' scenarios
- Considering cumulative noise and vibration impacts.
- Identifying safeguards and management measures to address the impacts identified.

The assessment will be undertaken in accordance with relevant guidelines, including:

- Interim Construction Noise Guideline (DECC 2009)
- NSW Road Noise Policy (DECCW 2011)
- Rail Infrastructure Noise Guideline (EPA 2013)
- Assessing Vibration: A Technical Guideline (DEC 2006).

5.3 Air quality

5.3.1 Overview

The project site is located in a highly developed urban area with a mix of transport, industrial, residential, commercial and recreational land uses. Sensitive receivers in the vicinity of the project site are described in section 5.2.1.

Key influences on air quality include:

- Emissions associated with the movement of freight trains along the line, with diesel locomotives and train movements emitting oxides of nitrogen and particulate matter
- Emissions associated with industrial, commercial and freight operations (including dust and other pollutants) in Mascot, Botany, Pagewood and surrounding suburbs
- Vehicle emissions from the surrounding road network
- Aircraft movements and other operational activities at Sydney Airport.

A review of the National Pollution Inventory (2016/2017 reporting year) identified the following air pollution sources within three kilometres of the project site:

- Sydney (Kingsford Smith) Airport, Mascot
- Viva Energy, Mascot
- Qantas Sydney, Mascot
- Sydney Trains Sydenham Maintenance Centre, Sydenham
- Alexandra Asphalt Plant, Alexandria
- Monroe Springs, Alexandria
- Australian Refined Alloys, Alexandria
- Spotless Facility Services, Rosebery
- Kellogg's Botany Plant, Botany
- Allnex Resins, Botany
- Orora Cartons, Botany
- Qenos Alkathene and Alkatuff Plants, Matraville
- Botany Chloralkali Plant, Matraville
- United Initiators, Banksmeadow
- Australian Perlite, Banksmeadow
- Solvay Interox, Banksmeadow.

The impact of these emission sources on local air quality will vary depending on their location and prevailing climatic conditions.

5.3.2 Summary of potential issues

Construction

Construction has the potential to affect air quality in the vicinity of the project site and construction vehicle haul routes. Potential sources of temporary air quality impacts include:

- Temporary increases in dust as a result of:
 - Earthworks and ground disturbance
 - Vegetation removal
 - Removal of existing bridge structures and other materials
 - Stockpiling of construction materials
 - Wind erosion from exposed soils or stockpiles
 - Heavy vehicle movements

- Temporary increases in emissions associated with the use of construction plant and equipment and the movement of vehicles
- Cumulative air quality impacts taking into account other projects in the study area (described in section 5.7).

Operation

Once the project is operational, the main potential source of air quality impacts would be rail exhaust emissions, with the main emissions for consideration being oxides of nitrogen and particulate matter. The main air quality issues would arise from:

- Additional freight trains using the rail line as a result of the additional capacity provided by the project
- The movement of trains along the new section of track in the rail corridor, which would be located closer to some receivers than the existing track.

5.3.3 Proposed further assessment

A detailed air quality assessment will be undertaken to assess the potential impacts of construction and operation. It will include:

- Identifying sensitive receivers
- Characterising the local air quality environment
- Establishing project-specific air quality criteria
- Identifying and assessing potential impacts on sensitive receivers in accordance with the Approved Methods for the Modelling and Assessment of Air Pollutants in NSW (DEC 2005)
- Predicting direct pollutant emission levels, indirect emissions from changes in traffic, and assessing the potential impacts of these emissions on surrounding sensitive receivers
- Considering cumulative air quality impacts
- Identifying safeguards and management measures to address the impacts identified.

5.4 Traffic, transport and access

5.4.1 Overview

The main features of the transport network in the study area are shown on Figure 5-1 and described below.

Botany Line

The existing rail line is a freight only rail line that forms part of the Metropolitan Freight Network. The line extends from near Marrickville Station to Port Botany.

At the north-western end of the project site, the rail corridor runs adjacent to (and on the northern side of) Qantas and Joyce drives. The rail corridor crosses Robey and O'Riordan streets via bridges. The level crossing at General Holmes Drive is being replaced by a road underpass as part of Roads and Maritime's Airport East Precinct Upgrade (described in section 2.1.4).

The rail corridor is aligned north–south between the level crossing on General Holmes Drive and Southern Cross Drive. In this section, the rail line crosses Botany Road and Southern Cross Drive via bridges.

South of Southern Cross Drive, the rail corridor crosses Mill Stream (part of the Botany Wetlands) via a bridge. It then passes adjacent to recreation facilities, commercial and residential areas in Botany and Pagewood. A pedestrian overbridge crosses the corridor at Banksia Street in Botany. South of Banksia Street, the rail line consists of two tracks. This location is the south-eastern extent of the project site.

Roads

Key roads in the vicinity of the project site are described in Table 5-1. These roads are classified main roads under the NSW *Roads Act 1993*, except for Qantas and Airport drives, which are located on Sydney Airport land, and Robey Street.

In addition to providing access to Sydney Airport and Port Botany, the roads around the airport also play a role in providing an east–west arterial function within the regional road network.

Table 5-1 Description of key roads

Road corridor	Description	Annual average daily traffic ¹
General Holmes Drive (M1)	<p>In the vicinity of Sydney Airport, General Holmes Drive is a major divided road that forms part of the Sydney Orbital Network and Highway 1. Motorway sections of Highway 1 are designated the M1.</p> <p>General Holmes Drive extends from Joyce Drive to Ramsgate in Sydney’s south. The road passes under the southern end of Sydney Airport via a tunnel under the north–south runway and taxiways to the third runway. General Holmes Drive provides access to the M5 to the west, Southern Cross Drive to the east, Foreshore Road and Port Botany to the south and Joyce Drive to the north.</p> <p>The existing level crossing at General Holmes Drive is currently being removed and replaced by a rail overbridge over an extension of Wentworth Avenue as part of Roads and Maritime’s Airport East Precinct Upgrade project.</p>	<p>Northbound: 24,660 Southbound: 27,053</p>
Southern Cross Drive (M1)	<p>Southern Cross Drive is a major divided road that forms part of the Sydney Orbital Network and Highway 1. It provides access between Sydney Airport and the Sydney central business district via the Eastern Distributor to the east and General Holmes Drive to the west.</p> <p>The rail corridor crosses Southern Cross Drive via an overbridge.</p>	<p>Northbound: 65,418 Southbound: 54,302</p>

Road corridor	Description	Annual average daily traffic ¹
Airport Drive Qantas Drive Joyce Drive	<p>These roads are located along the northern boundary of Sydney Airport, between Marsh Street in the west and General Holmes Drive in the east. They all form part of the same roadway, with the road name changing from west to east (from Airport Drive to Qantas Drive to Joyce Drive).</p> <p>Airport Drive provides access to Terminal 1. Qantas and Joyce drives provide access to Terminals 2/3, intersecting with Robey and O’Riordan streets and Sir Reginald Ansett Drive.</p>	No data
O’Riordan Street	<p>O’Riordan Street extends roughly north–south for a distance of about 3.5 km between Alexandria and Sydney Airport. The northern end of O’Riordan Street is located at the intersection of Botany Road and Bourke Street. The southern end intersects with Qantas, Joyce and Sir Reginald Ansett drives at the main access to Terminals 2/3.</p> <p>O’Riordan Street provides an alternative access between the Sydney central business district and Sydney Airport. It is also a key access route for businesses and commuters travelling between Alexandria, Mascot and Sydney Airport.</p> <p>The rail corridor crosses O’Riordan Street via an overbridge.</p>	Northbound: 29,944 Southbound: 22,231
Robey Street	<p>Robey Street is a local road that extends roughly east–west for a distance of about 1 km between Qantas Drive and Botany Road, crossing O’Riordan Street.</p> <p>The rail corridor crosses Robey Street via an overbridge.</p>	No data
Wentworth Avenue	<p>Wentworth Avenue extends roughly east–west for a distance of about 3.5 km between Mascot and Eastgardens. Wentworth Avenue is currently being extended to the east to intersect with General Holmes Drive as part of Roads and Maritime’s Airport East Precinct Upgrade project. This project also includes provision of a new rail overbridge over Wentworth Avenue to replace the General Holmes Drive level crossing.</p> <p>The rail corridor will cross the new extension of Wentworth Avenue via the new overbridge (under construction).</p>	Eastbound: 27,070 Westbound: 23,847
Botany Road	<p>Botany Road extends roughly north–south from Redfern through Mascot and Botany to Port Botany (a distance of about 10 km). The road provides an alternative access between the Sydney central business district, Sydney Airport and Port Botany.</p> <p>The rail corridor crosses Botany Road via an overbridge.</p>	Northbound: 16,282 Southbound: 15,284

Road corridor	Description	Annual average daily traffic¹
Mill Pond Road	Mill Pond Road is a short section of divided road providing access between General Holmes Drive and Botany Road, and between General Holmes Drive and Southern Cross Drive.	Eastbound: 22,773 Westbound: No data
Banksia Street	To the west of the rail corridor, Banksia Street extends roughly east–west for a distance of about 1 km between Botany Road and Ellis Street. To the east of the rail corridor, Banksia Street extends for a distance of about 750 metres between the rail corridor and Page Street in Pagewood.	No data
Foreshore Road	Foreshore Road is one of the main access roads to and within Port Botany. It intersects with General Holmes Drive in the north and Botany Road in the south.	Northbound: 11,376 Southbound: 13,437

Note 1: Data source: Roads and Maritime Traffic Volume Viewer, latest data available shown

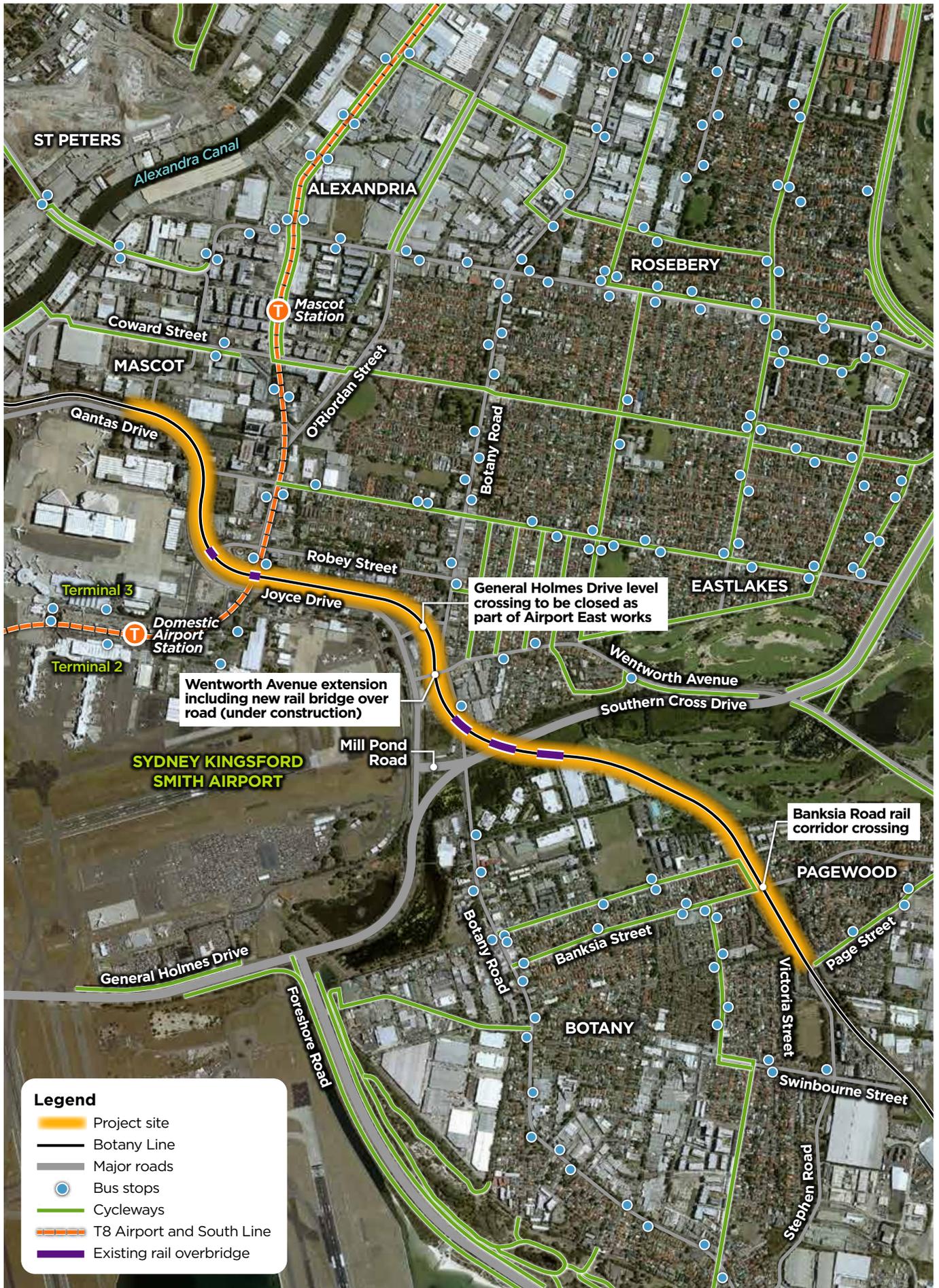


Figure 5.1 Transport features

Port Botany

Port Botany, which is located about two kilometres to the south of the southern extent of the project site, plays a major role in terms of the movement of freight in Sydney, NSW and Australia. Port Botany is the second largest container port in Australia and NSW's only container port, moving more than 6,000 containers on average per day (NSW Ports 2015). Port Botany also handles 98 per cent of the State's consumption of liquid petroleum gas, 90 per cent of bulk chemical products, 30 per cent of refined petroleum fuels and 100 per cent of bitumen products (NSW Ports 2015).

Sydney Airport

Sydney Airport, which is located to the south and west of the majority of the project site, is one of Australia's most important pieces of transport infrastructure. As well as serving passengers travelling to and from Sydney, it is also Australia's largest transport and logistics hub. Some 34 international, six domestic and six regional airlines operate from the airport to 97 destinations, including 11 international and eight regional destinations not served by any other Australian airport (SACL 2014a). The airport also generates significant traffic volumes associated with employee traffic movements.

There is a network of roads on the airport site that intersect with Qantas and Joyce drives.

Public transport

Rail

The Sydney Trains T8 Airport and South Line passes through the study area via a tunnel, with stations at Mascot (Mascot Station), Terminal 1 (International Airport Station) and Terminals 2/3 (Domestic Airport Station). The T8 line crosses under Joyce Drive and the existing rail line and follows the alignment of O'Riordan Street to the north. The T8 line is operated by Sydney Trains. Stations in the study area are privately owned.

Bus

The bus routes listed in Table 5-2 operate along many of the key roads in the study area. Route 400, which stops at Sydney Airport, travels under the Robey Street and O'Riordan Street bridges. Many of the other routes travel under the Botany Road bridge.

Table 5-2 Bus routes in the study area and key roads used

Route no	Route
303	Sans Souci to City Circular Quay via Mascot (Botany Road)
305	Stamford Hotel to Central (Robey and O’Riordan streets)
309	Port Botany Depot to Central (Botany Road)
310	Eastgardens to Central via Botany Road (Botany Road)
400	Burwood to Bondi Junction via Eastgardens (Robey and O’Riordan streets, Botany Road)
M20	Botany to Gore Hill (Botany Road)
L09	Port Botany to Redfern (Botany Road)
X09	Banksmeadow to Central Railway Square (Botany Road)
X10	Eastgardens to Central Railway Square (Botany Road)

Pedestrian and cyclist facilities

A pedestrian bridge crosses the rail corridor (and project site) near the south-eastern end of the project site, connecting Banksia Street on either side of the corridor.

In the vicinity of the project site, on-road cycleways are located along:

- King, Hardie and Hollingshed streets in Mascot
- Bay, Ellis, Banksia and William streets in Botany
- Page Street in Pagewood.

5.4.2 Summary of potential issues

Construction

The main potential for traffic and transport issues during construction would relate to construction of/works to the rail bridges across:

- Robey Street
- O’Riordan Street
- Botany Road
- Southern Cross Drive.

The rail overbridges over Robey and O’Riordan streets are very close to the intersection of these streets with Qantas, Joyce and Sir Reginald Ansett drives. These roads are critical in terms of access to Sydney Airport. Careful management of the works would be required to minimise the potential impacts on access to the airport, surrounding land uses and the road network more generally.

During construction, heavy vehicles would deliver construction plant, equipment and materials, and would remove excess spoil from work areas and compounds. There would be an increase in heavy vehicle volumes on roads used as haul routes and an increase in light vehicle movements associated with smaller deliveries and construction worker transport.

Construction and the movement of construction vehicles would have the potential to result in:

- Changes to intersection and traffic performance due to heavy vehicle movements,
- Temporary roadway adjustments (including lane closures) to facilitate bridge and other works
- Disruptions and delays to traffic and public transport
- Disruptions to pedestrian and cyclist access where modifications are required to accommodate access to construction areas
- Temporary disruption to property accesses in the immediate vicinity of work areas
- Cumulative traffic and transport impacts taking into account other projects in the study area (described in section 5.7).

Construction would be conducted to minimise operational impacts on the existing rail line. Works that have the potential to affect operations, or which cannot be undertaken safely while trains are operating along the line (such as track tie-ins and bridge works), would be undertaken during programmed track maintenance possession periods (as described in section 4.3.3). Some works may need to be undertaken outside the recommended standard construction working hours to minimise traffic disruption.

Operation

The project would not result in any changes to the operation of the road, pedestrian or cycle network during operation.

The project would provide additional rail freight capacity to and from Port Botany, improving operational flexibility and network resilience, and allowing a greater volume of freight to be transported by rail.

This would assist in facilitating a shift in container freight transported by road onto rail. This has the potential for traffic and transport benefits, including reducing the proportion of heavy vehicles on Foreshore and Botany roads as well as local roads in Botany and Mascot.

5.4.3 Proposed further assessment

A detailed traffic, transport and access assessment will be undertaken to assess the potential impacts of the project. It will include:

- Confirming the existing traffic and transport environment and existing and future rail freight volumes
- Identifying and assessing potential construction traffic impacts, including haul routes, construction traffic volumes and potential temporary roadway adjustments, lane closures and/or diversions
- Identifying and assessing other potential construction transport impacts, including impacts on public and active transport
- Identifying and assessing potential access impacts during construction
- Considering the potential for cumulative construction and operation benefits and impacts
- Identifying safeguards and management measures to address the impacts identified.

5.5 Non-Aboriginal heritage

5.5.1 Overview

The study area has a long history of settlement and development, with significant historical features and activities including agriculture, Sydney's drinking water supply, dredging and reclamation, development of Sydney Airport and Port Botany, industrial development and other transport infrastructure, and residential and commercial development.

Heritage list and database searches

The following heritage lists and databases were searched in April 2018:

- World Heritage List
- Australian heritage lists (under the EPBC Act):
 - National Heritage List
 - Commonwealth Heritage List
- Register of the National Estate (it is noted that this is now an archival list and is not a statutory heritage register)
- NSW heritage lists (under the *Heritage Act 1977*):
 - NSW State Heritage Register (SHR)
 - Section 170 (s170) NSW Government agency heritage and conservation registers
- Local heritage lists – *Botany Bay Local Environmental Plan 2013* (the Botany Bay LEP).

Heritage listed items

No items listed on the World, Commonwealth or National heritage lists are located within or close to the project site. The closest of these items is the Sydney Airport Air Traffic Control Tower, which is located about 1.5 kilometres southwest of the project site (refer to item 11 on Figure 5-2). This item is listed on the EPBC Act's Commonwealth Heritage List.

Heritage listed items of State and local significance within and in the vicinity of the project site (within about 100 metres) are summarised in Table 5-3. The locations of these items are shown on Figure 5-2. Three items listed on the Transport for NSW (Railcorp) s170 register are located within the project site – the Robey Street, O'Riordan Street and Botany Road bridges. The Botany Road bridge is also listed by the Botany Bay LEP. The bridges are locally significant.

One listed item of State and local significance, the Botany Water Reserves/Botany Wetlands, is located directly adjacent to the project site. This item is listed on the State heritage register, Sydney Water's s170 register and the Botany Bay LEP. The listed boundary of the item excludes the rail corridor.

There is considered to be potential for sub-surface archaeology associated with this item.

Items on the Register of the National Estate located within and in the vicinity of the project site are also summarised in Table 5-3 and shown on Figure 5-2.

No listed heritage conservation areas are located within or close to the project site.

Table 5-3 Heritage listed items

Name	Listings	Location	Approx. distance to project site	Map ref (Figure 5-2)
Items listed on the State Heritage Register				
Botany Water Reserves/Botany Wetlands	SHR (01317) ('Botany Water Reserves') Sydney Water s170 register (4570025) ('Botany Wetlands') Botany Bay LEP (I2) ('Botany water reserves')	Botany, Pagewood, Eastlakes and Kensington	Adjacent to the project site	1
Other listed items				
Railway bridge over Botany Road/Mascot (Botany Road) underbridge	Botany Bay LEP Transport for NSW s170 register (RailCorp) ¹	Botany Road at the rail corridor	In project site	2
Mascot (O'Riordan Street) underbridge	Transport for NSW s170 register (RailCorp) ¹	O'Riordan Street at the rail corridor	In project site	3
Mascot (Robey Street) underbridge	Transport for NSW s170 register (RailCorp) ¹	Robey Street at the rail corridor	In project site	4
Single storey terrace group	Botany Bay LEP (I48)	1239-1245 Botany Road, Mascot	100 m	5
House	Botany Bay LEP (I50)	1289 Botany Road, Mascot	30 m (item appears to have been demolished - to be confirmed)	6
House	Botany Bay LEP (I51)	1291 Botany Road, Mascot	30 m (item appears to have been demolished - to be confirmed)	7
Beckenham Memorial Church	Botany Bay LEP (I52)	1293-1295 Botany Road, Mascot	30 m	8

Name	Listings	Location	Approx. distance to project site	Map ref (Figure 5-2)
Booralee Park	Botany Bay LEP (I61)	Bounded by Sydenham Railway Line and Daniel, Bay, Lord, Myrtle and Jasmine Streets	100 m	9
Streetscape – verge plantings of Canary Island Date Palm (<i>Phoenix canariensis</i>)	Botany Bay LEP (I65)	Brown Avenue, Botany	90 m	10

Items on the Register of the National Estate

Sydney (Kingsford Smith) Airport Group	Register of the National Estate (interim) ²	Mascot	Adjacent to the project site	Sydney Airport
Botany Swamps	Register of the National Estate	Southern Cross Drive, Mascot	Adjacent to the project site	1

Notes 1. Management of rail bridges was transferred to ARTC from Railcorp
2. Item is listed as 'interim' as it was proposed to be included on the register prior to its closure

Other items of heritage significance

The Sydney Airport Master Plan 2033 (SACL 2014a) notes that Sydney Airport is one of the oldest continually operating airports in the world (operating since 1924). The master plan notes that there is heritage value associated with the land on which the airport is located, and that airport land has played host to a number of significant pieces of industrial and water supply infrastructure. The master plan and the Sydney Airport Environment Strategy 2013 – 2018 (SACL 2014b) note the need to consider the potential for impacts on identified items of heritage value on the airport site. These items are identified in the heritage management plan for Sydney Airport prepared by Godden Mackay Logan in 2009.

Other items of potential heritage significance may also be identified during the non-Aboriginal heritage assessment. There is also the potential for archaeological remains of earlier habitation and development/land uses to be located within or close to the project site. This would be confirmed during the assessment.



Figure 5.2 Non-Aboriginal heritage items

5.5.2 Summary of potential issues

Construction

The project would directly impact the heritage listed Robey Street and O’Riordan Street bridges, as it would involve replacing the bridges.

In addition, construction has the potential to impact the heritage listed items described in section 5.5.1 and any areas of archaeological significance within or in the vicinity of the project site. Potential impacts include:

- Physical impact on an item or its curtilage
- Indirect impacts as a result of any changes to the environment during construction
- Impacts to the fabric of the items as a result of vibration generated by construction in the vicinity of the item
- Temporary impacts to views to or from an item.

The project also has the potential to impact the State heritage listed Botany Water Reserves/Botany Wetlands, as it would involve constructing a new bridge over Mill Stream (adjacent to the existing bridge). Although the rail corridor is not within the boundary of the listed item, it directly adjoins the item. The nature of any impacts (whether direct as a result of the placement of a bridge structure or indirect as a result of any changes to hydrology) would be determined as an outcome of the design and assessment process.

The consistency of the project with the conservation management plan for the Botany Water Reserves (prepared by Sydney Water Corporation in 2003) and the significance of the item will be key considerations during development of the design and EIS.

Construction works and any compound sites would be located and configured to minimise impacts to the Botany Water Reserves/Botany Wetlands.

Operation

There is limited potential for additional heritage impacts during operation. The main issues for consideration include the potential for impacts on:

- Views to or from heritage items as a result of the presence of operational infrastructure
- The curtilage of any item.

5.5.3 Proposed further assessment

A non-Aboriginal heritage impact assessment will be undertaken to assess the potential impacts of construction and operation. It will involve:

- Searches of heritage databases and a review of literature, including consideration of the conservation management plan for the Botany Water Reserves/Botany Wetlands
- Identifying areas of potential archaeological significance
- Assessing heritage significance in accordance with relevant guidelines including the Burra Charter (Australia ICOMOS 2013), Assessing Heritage Significance (Heritage Office 2001), Statements of Heritage Impact (Heritage Office 2002) and Assessing Significance for Historical Archaeological Sites and Relics (NSW Heritage Division 2009)

- Assessing potential impacts to items of local, state, National and Commonwealth heritage significance, including the Botany Water Reserves/Botany Wetlands and the Robey Street, O’Riordan Street and Botany Road bridges
- Carrying out an archaeological assessment, where required, to determine the presence of potential non-Aboriginal archaeological items and the potential impacts of the project
- Consulting with relevant stakeholders, including the Office of Environment and Heritage (NSW Heritage Division), Sydney Water, Transport for NSW and Bayside Council
- Identifying safeguards and management measures to address the impacts identified.

5.6 Land use, social and business impacts

5.6.1 Overview

Characteristic of its inner urban location, the study area includes a varied mix of transport, industrial, commercial, residential and recreation land uses and facilities. The study area is located in three suburbs (Mascot, Botany and Pagewood), each with differing characteristics, community structures and resources. The populations of these suburbs, based on data from the Australian Bureau of Statistics 2016 Census, are:

- Mascot – 14,772 people
- Botany – 10,817 people
- Pagewood – 3,805 people.

Land use

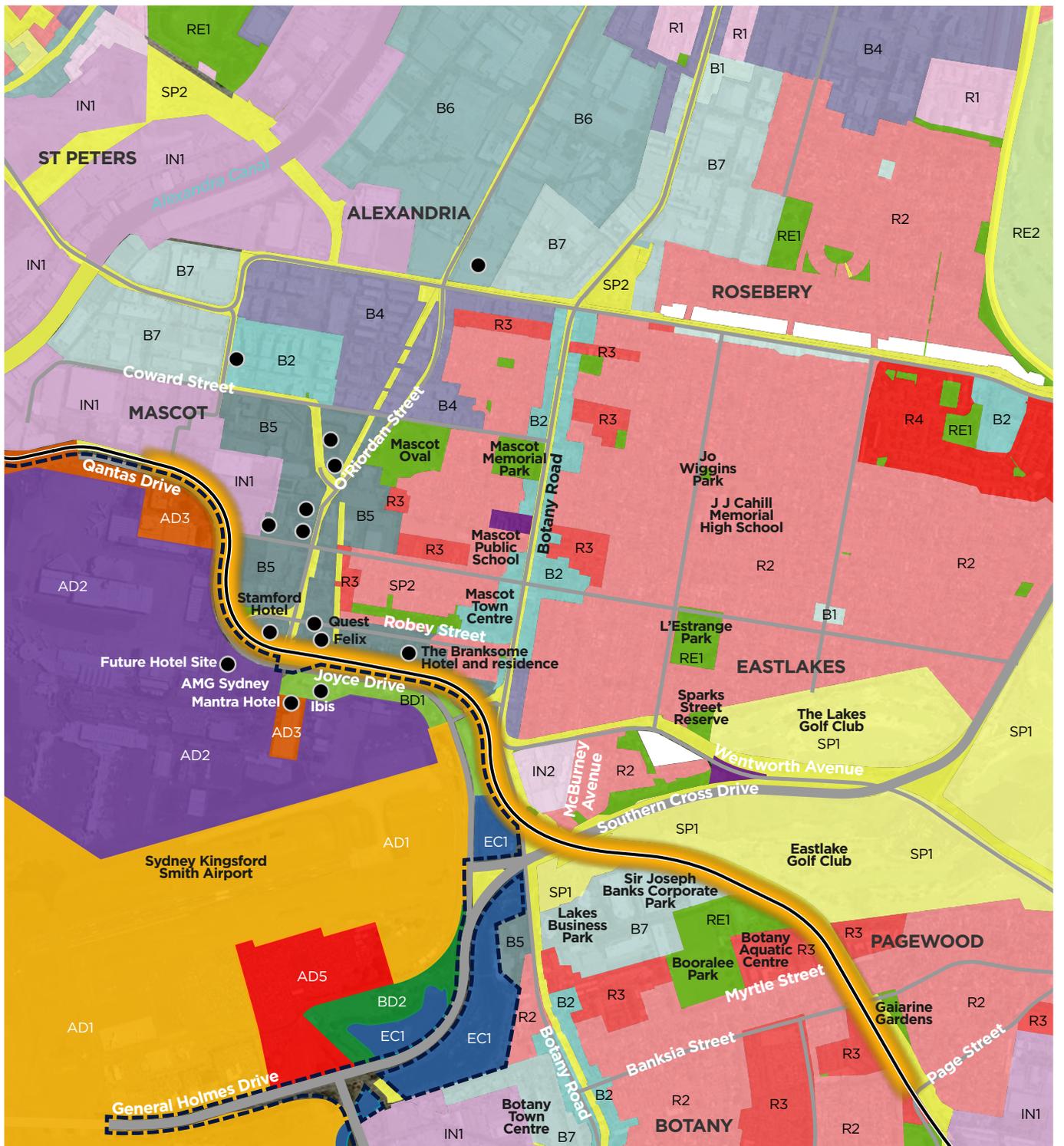
The main land uses in the study area are described below and are shown on Figure 5-3.

Transport and freight related uses

Sydney Airport is generally located to the south and west of the project site. Since 1921, when the Commonwealth Government purchased land in Mascot for the purpose of creating a public airfield, the airport has been progressively modified and expanded. Sydney Airport now occupies an area of around 907 hectares. The north-western end of the project site adjoins Qantas and Joyce drives, which are located on Sydney Airport land.

Development and land use within Sydney Airport land must occur in accordance with the Sydney Airport Master Plan. The Preliminary Draft Sydney Airport Master Plan 2039 (SACL 2018) was released in August 2018. When finalised, it will replace the Sydney Airport Master Plan 2033 (SACL 2014a).

Other transport and freight related land uses in the study area include roads, passenger rail (the Sydney Trains T8 Airport and South Line) and Port Botany. Further information is provided in section 5.4.1.



Legend		Sydney Airport Master Plan	
	Project site		AD1 Aviation Activity and Aviation Support Facilities
	Botany Line		AD2 Airport Terminal and Support Services
	Major roads		AD3 Airport Logistics and Support
LEP Land Zoning			AD5 Aviation Reservation
	Hotels		BD1 Business Development
	B1 Neighbourhood Centre		BD2 Enviro-Business Park
	B2 Local Centre		EC1 Environmental Conservation
	B4 Mixed Use		Airport boundary
	B5 Business Development		
	B6 Enterprise Corridor		
	B7 Business Park		
	IN1 General Industrial		
	IN2 Light Industrial		
	R1 General Residential		
	R2 Low Density Residential		
	R3 Medium Density Residential		
	R4 High Density Residential		
	RE1 Public Recreation		
	RE2 Private Recreation		
	SP1 Special Activities		
	SP2 Infrastructure		
	W3 Working Waterways		
	UL Unzoned Land		
	DM Deferred Matter		



Figure 5.3 Land use

Commercial and industrial

A range of commercial and industrial land uses, including a number of airline and freight related businesses and premises, are located in the north-western part of the study area in Mascot, broadly to the east of Alexandra Canal, north of the rail corridor and west of O’Riordan Street. Other commercial/light industrial areas in the vicinity of the project site are located in:

- Mascot – to the east of the project site in the area bounded by Wentworth Avenue, Botany Road and McBurney Avenue
- Botany – to the south of the project site in the area bounded by Mill Stream, Botany Road, Lord Street and the rail corridor (the Sir Joseph Banks Corporate Park)
- Banksmeadow – to the south of the southern end of the project site.

Accommodation

A number of hotels are located directly adjacent or close to the project site in Mascot. In the immediate vicinity of the project site these include:

- Stamford Plaza, located at the intersection of Qantas Drive and O’Riordan Street on the northern side of the rail corridor
- Felix and Quest hotels, located close to the project site at the intersection of O’Riordan Street and Baxter Road
- Branksome Hotel & Residences, located close to the project site on Baxter Road.

The locations of these and other hotels in the vicinity of the project site are shown on Figure 5-3.

Residential

The main areas of residential land use are located near the north-western end of the project site in Mascot and at the south-eastern end in Botany and Pagewood. As noted in section 5.2.1, the closest residences are located about 10 to 20 metres from the project site.

In Mascot, areas of traditional detached housing interspersed with low rise apartment buildings are located to the east of O’Riordan Street. Areas to the west of O’Riordan Street, particularly in the vicinity of Mascot Station, are undergoing urban renewal, with a number of apartment and mixed use buildings developed, proposed or under construction. South of Southern Cross Drive, residential land uses consist mainly of traditional detached housing interspersed with low rise apartment buildings.

Open space/recreation

An area of Botany Wetlands, managed by Sydney Water, is located on either side of the project site just to the south of Southern Cross Drive. Further information on the heritage and biodiversity significance of Botany Wetlands is provided in sections 5.5.1 and 6.2.1.

Other areas of open space and recreation facilities are located south of Mill Stream at the south-eastern end of the project site in Botany and Pagewood. These include Eastlake golf course, Botany Aquatic Centre, The Lakes and Bonnie Doon golf courses, Booralee Park, Gaiarine Gardens and Garnet Jackson Reserve.

Land use zones

The Botany Bay Local Environmental Plan 2013 (the Botany Bay LEP) applies to the land in which the project site is located. Under the Botany Bay LEP, the majority of the existing rail corridor is zoned SP2 Infrastructure (Railway). Other areas within the corridor are zoned SP2 Infrastructure (Airport), B5 Business Development and SP2 Infrastructure (Classified Road). Land adjoining the rail corridor is located in a number of zones, including SP2, B5, IN1 General Industrial, R2 Low Density Residential, R3 Medium Density Residential, B7 Business Park and RE1 Public Recreation. Land use zones under the Botany Bay LEP are shown on Figure 5-3.

The Sydney Airport Master Plan (SACL 2014a) provides land use zonings for Sydney Airport land. Sydney Airport land to the south of the project site (west of Botany Road) includes land zoned by the master plan as AD2 Airport Terminal and Support Services, AD3 Airport Logistics and Support, BD1 Business Development and EC1 Environmental Conservation. These zones are shown on Figure 5-3.

Community facilities

Community facilities near the project site are shown on Figure 5-3. The main community facilities in the immediate vicinity of the project are the recreation facilities described above. The Eastlake golf course adjoins the project site to the east and the Botany Aquatic Centre adjoins the project site to the west. Gaiarine Gardens is located adjacent to the eastern side of the rail corridor at the south-eastern end of the project site.

Business and economic characteristics

As described in section 2.1, Sydney Airport and Port Botany are two of the most important economic and infrastructure assets in Sydney and Australia as a whole. The airport, port and businesses in the surrounding area are significant generators of economic activity. The area around and including Sydney Airport and Port Botany is one of the largest employment areas in Sydney. Further information on the economic significance of the airport and port, and the predicted growth in passengers, freight and employment, is provided in section 2.1.

A number of commercial/industrial premises and businesses are located adjacent to the project site in Mascot and Botany. In addition, a number of large advertising billboards are located near Sydney Airport between Qantas and Joyce drives and the existing rail line. These billboards generate significant income for their owners and lessees as a result of advertising revenue and are an important commercial enterprise located close to the project site.

5.6.2 Summary of potential issues

Pre-construction

The design alignment of the project is predominantly within the existing rail corridor, however some acquisition of land outside the corridor may be required in some areas. Full or partial property acquisition to accommodate construction of the proposed infrastructure and ancillary facilities would occur prior to construction commencing. The amount of acquisition and associated property impacts would be refined and confirmed during detailed design in consultation with landowners and occupants.

Temporary use of some areas may also be required to facilitate construction and the location of work areas and construction facilities. Existing land uses, site accessibility and potential opportunities to co-locate

temporary use areas with permanent operation facilities would be considered when determining the size and location of construction facilities.

Construction

The need to occupy land for construction purposes would result in a temporary change in land use, with existing land uses making way for construction uses.

Construction has the potential to result in the following social and business issues:

- Impacts/changes associated with property acquisition
- Temporary changes to connectivity and access for some residents, visitors, businesses and employees, including as a result of diversions/changes to access in the immediate vicinity of the project site and any road closures associated with bridge works along the rail line
- Impacts to community and business amenity, including as a result of changes to traffic, noise, air quality and the visual environment
- Employment and business opportunities as a result of the generation of construction related jobs, revenue for businesses providing construction facilities and resources, and increased patronage for some businesses providing services for employees in the vicinity of the project site
- Disruptions to utilities
- Any disruptions to trains using the existing rail line and any flow on effects to the operation of Port Botany.

Operation

As a result of the location of the project within an existing rail corridor, there is limited potential for operational land use, social and business impacts. Potential issues include impacts to community and business amenity, including as a result of changes to noise, air quality and the visual environment.

As described in section 2.1, the project has the potential to offer access and economic benefits for Port Botany and the wider economy. It is intended that the project would:

- Alleviate constraints and increase the capacity of Sydney's freight rail network to meet existing and future demands
- Support the operation of intermodal terminals, including Enfield, Chullora and Moorebank
- Encourage a shift in freight transport from road to rail, and support a reduced rate of growth in truck movements and associated traffic congestion around Sydney Airport and Port Botany.

5.6.3 Proposed further assessment

Land use and property

A land use and property assessment will be undertaken to assess the potential impacts of construction and operation. It will include:

- Identifying land uses, ownership and existing access arrangements
- Reviewing relevant planning instruments, regional plans and land use strategies

- Assessing potential impacts of the project on land use and property
- Identifying safeguards and management measures to address the impacts identified.

Socio-economic impacts

A socio-economic impact assessment will be undertaken to assess the potential impacts of construction and operation on the social and economic environment, including impacts on businesses. It will include:

- Analysing available community data, including from the Australian Bureau of Statistics 2016 Census, Transport for NSW's Transport Performance and Analytics unit, NSW Bureau of Crime Statistics and Research and Bayside Council
- Reviewing the characteristics of communities in the study area and preparing a profile of communities with the potential to be affected by the project
- Describing the existing social, economic and business environment
- Identifying community facilities in the study area
- Identifying businesses with the potential to be impacted by the project and describing how they might be impacted, including a survey of representative businesses
- Analysing the outcomes of consultation in relation to community values (including the values attached to places or facilities), issues and concerns
- Reviewing the results of other specialist assessments
- Assessing the potential impacts and benefits of the project
- Identifying safeguards and management measures to address the impacts identified
- Considering cumulative impacts from construction and operation of the project and other projects within the same time period and/or area.

5.7 Contamination

5.7.1 Overview

Listed contaminated sites (EPA)

A review of the NSW Environment Protection Authority's contaminated land record indicated that there are two sites within 200 metres of the project site for which written notices under the NSW *Contaminated Land Management Act 1997* (CLM Act) have been issued. A review of the list of contaminated sites notified to the Environment Protection Authority (EPA) indicated that there is one notified site within 200 metres of the project site. These sites are listed in Table 5-4 and shown on Figure 5-4

Table 5-4 Contaminated sites

Site name	Location	Contamination status	Location in relation to the project site
Former Mascot Galvanising	336-348 King Street, Mascot	Regulated under the CLM Act	About 100 m east
Alexandra Canal Sediments	Off Huntley Street, Alexandria	Regulated under the CLM Act	About 200 m west
Sokol Corporation	50-56 Robey Street, Mascot	Notified site – regulation under the CLM Act not required	About 100 m north

Groundwater contamination

There is the potential that groundwater may be intercepted during works involving excavation. Groundwater in the study area is particularly vulnerable to contamination as a result of the permeability and shallow depth of the aquifer. Historical industrial uses in Mascot, Botany and surrounding suburbs have included chemical manufacturing, fuel storage, tanneries, metal electroplaters, service stations and depots, landfills, dry cleaners and wool scorers. These industries have resulted in the potential and known occurrence of a wide range of pollutants in groundwater.

Due to the extent of known contamination and to ensure that public health is not put at risk, the NSW Government has placed controls on the extraction and use of groundwater in some areas within the study area (via a Temporary Water Restrictions Order). The north-western and south-eastern ends of the project site are located in Botany Groundwater Management Area 2. Domestic bore water use and the extraction of groundwater for industrial purposes is prohibited in this area.

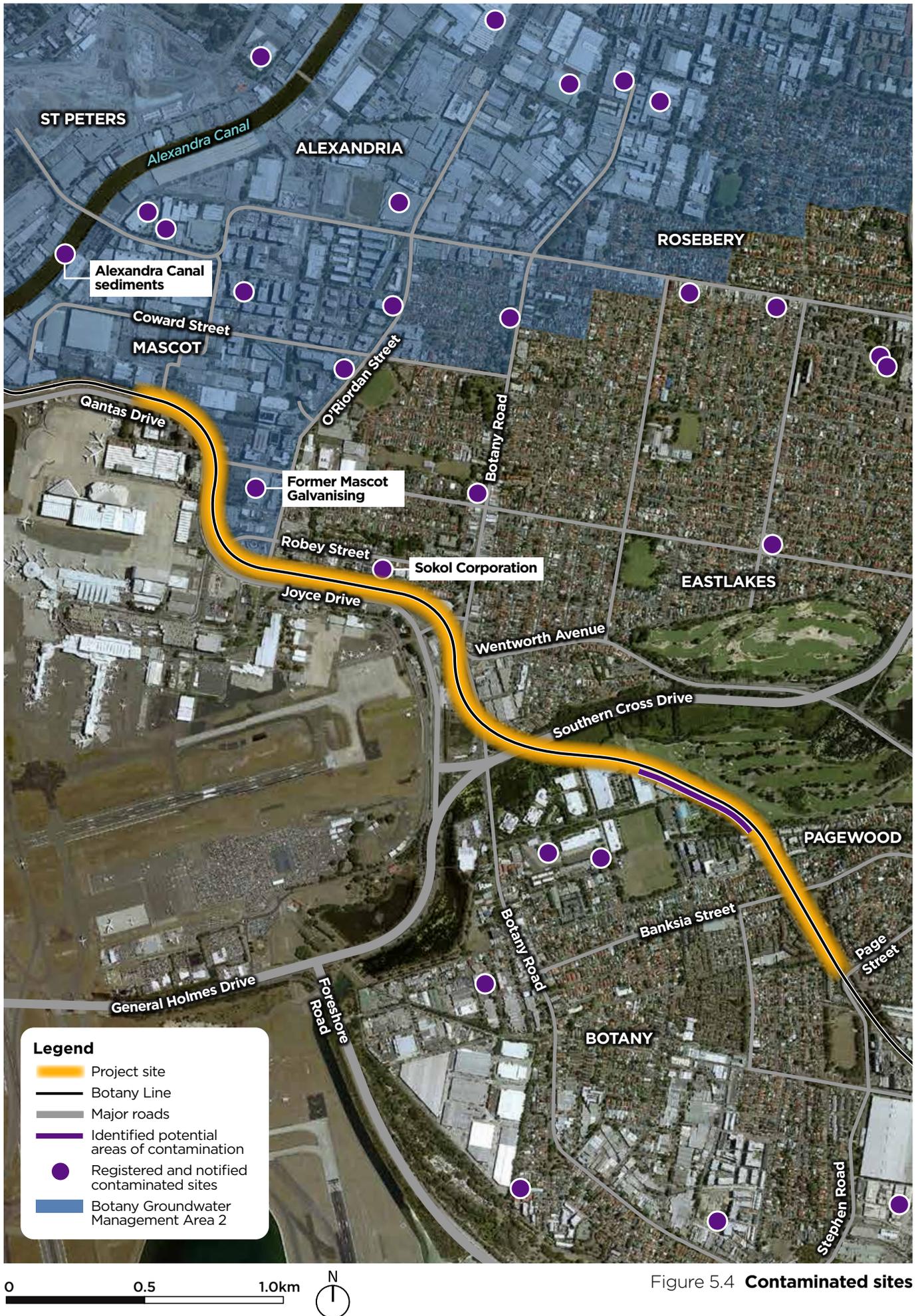


Figure 5.4 Contaminated sites

Other contamination issues

Per- and poly-fluoroalkyl substances (PFAS)

Sydney Airport has been identified as one of several airport sites that have had extensive historical use of PFAS within aqueous film forming foams. Preliminary results of sampling within the Sydney Airport and Botany industrial area, undertaken as part of the EPA's state-wide PFAS investigation program, have indicated the presence of PFAS within surface water, groundwater, sediments and animal biota (eg fish). While the historical use of PFAS-containing firefighting foam at Sydney Airport has contributed to the presence of PFAS in this area, the EPA has noted that the number of potential sources of PFAS makes it difficult to attribute the presence of PFAS to individual sources.

Asbestos

Preliminary investigations have identified the presence of buried asbestos containing materials in some locations in the rail corridor.

Other potential contamination

A number of other potentially contaminating activities and land uses are located within or around the project site, including:

- Contamination associated with rail activities that may be present in ballast and formation materials and soils within and next to the rail corridor (such as heavy metals, polycyclic aromatic hydrocarbons and asbestos). Typical contamination sources associated with rail corridors include:
 - Spills and leaks of fuels and lubricants from trains
 - Use of fill material of unknown origin in the railway corridor
 - Presence of asbestos associated with historical structures such as brake shoes
 - Fuel and chemical usage associated with railway infrastructure maintenance
- Historical landfilling operations, which have potentially resulted in the importation of fill material containing metals, asbestos and other contaminants
- Use of land in the study area for industrial or other potentially contaminating activities including, but not limited to, service stations and car rental facilities with fuel pumps, workshops, recycling facilities, chemical and dangerous goods storage, which have the potential to cause soil and groundwater contamination due to leaks, spills and other poor operational practices.

5.7.2 Summary of potential issues

Construction

Potential contamination issues include:

- Disturbance (during activities such as excavation) of soils and ballast potentially containing contamination within and around the rail corridor, and potential migration of contaminants
- Disturbance of contaminated groundwater and potential migration of contaminants
- Disturbance and mobilisation of any previously unknown contaminated materials that may be present

- Mobilisation and migration of surface and subsurface contaminants via leaching, runoff and/or subsurface flow has the potential to impact nearby soils, surface water and groundwater, and sensitive environments (including Botany Wetlands and the Botany Sand Beds aquifer)
- Dewatering, management and disposal of contaminated groundwater
- Management and disposal of contaminated soils and ballast, including soils containing asbestos contaminated material
- Contamination of soils and groundwater due to spills or leaks of fuels, oils or other hazardous substances
- Direct contact and/or inhalation of contaminated soil and/or groundwater by site workers (potential hazard and risk impacts are considered further in section 6.7).

Operation

There is the potential that rail freight transport and maintenance activities could result in contamination as a result of any spills or leaks of fuels and lubricants. No other ongoing soil or groundwater contamination issues are anticipated.

5.7.3 Proposed further assessment

A detailed assessment will be undertaken to assess the potential impacts of construction and provide the necessary measures to manage contamination. The assessment will involve:

- Confirming areas of contamination including known contaminated sites and areas of potential contamination
- Soil, sediment and groundwater sampling at select locations in accordance with the requirements of the EPA, Sydney Water and relevant guidelines (listed below)
- Assessing the potential impacts of disturbing contaminated sites, considering potential receptors and exposure pathways
- Identifying mitigation measures to address potential contamination impacts consistent with relevant regulations and guidelines
- Preparing a conceptual remedial action plan to detail how contamination would be managed.
- The assessment will be undertaken in accordance with relevant guidelines and requirements, including:
 - Contaminated Sites: Sampling Design Guidelines (EPA 1995)
 - Guidelines for the Assessment and Management of Groundwater Contamination (DEC 2007)
 - Guidelines for Consultants Reporting on Contaminated Sites (OEH 2011)
 - Guidelines on the Duty to Report Contamination under the *Contaminated Land Management Act 1997* (EPA 2015)
 - National Environment Protection (Assessment of Site Contamination) Measure 1999 (as amended in 2013)
 - PFAS National Environmental Management Plan (Heads of EPAs Australia and New Zealand (HEPA) 2018).

5.8 Hydrology, flooding and water quality

5.8.1 Overview

Catchments and watercourses

The study area is located in the Botany Bay catchment area, which includes two river catchments – the Cooks River catchment and the Georges River catchment. Some areas within the Botany Bay catchment also drain directly to the bay (as shown on Figure 5-5).

The Cooks River catchment has an area of about 102 square kilometres, of which the majority is highly developed. Cooks River is about 23 kilometres long, and flows from Chullora in the west to Botany Bay, where it discharges near Sydney Airport. The Georges River catchment has an area of about 960 square kilometres. It is one of the most highly urbanised catchments in Australia. Georges River is about 96 kilometres long, and flows from Appin to Botany Bay, where it discharges to the south of the bay between Sans Souci and Kurnell.

The existing rail corridor (including the project site) crosses Mill Stream on a viaduct about 200 metres to the southeast of Southern Cross Drive. Mill Stream, which is located in the Botany Wetlands (described in section 6.2.1), discharges to Botany Bay near Sydney Airport and Foreshore Beach. Downstream of the project site Mill Stream flows into Mill Pond and Engine Pond, which are located in the Sydney Airport Wetlands.

Alexandra Canal, which is located about 200 metres to the west of the project site, is one of the main tributaries of Cooks River. The canal is a four kilometre long constructed watercourse located between Huntley Street in Alexandria and Cooks River in Tempe. It discharges to Cooks River on the western side of Sydney Airport, near the Tempe Recreation Reserve. The canal's catchment is fully developed.

Groundwater

The study area is underlain by the Botany Sand Beds aquifer, an extensive alluvial and coastal sand bed aquifer extending north and east from Botany Bay to Surry Hills and Centennial Park. The groundwater within the aquifer is relatively shallow (about one to two metres below the ground surface) and the aquifer is readily recharged by rainfall. Groundwater generally flows in a northeast to southwest direction, from around Centennial Park to Botany Bay.

Groundwater in the study area is particularly vulnerable to contamination as a result of the permeability and shallow depth of the aquifer. As described in section 5.7.1, groundwater in parts of the study area is contaminated and some areas are subject to a Temporary Water Restrictions Order. Groundwater in the study area is regulated by the Water Sharing Plan for the Greater Metropolitan Region Groundwater Sources 2011.

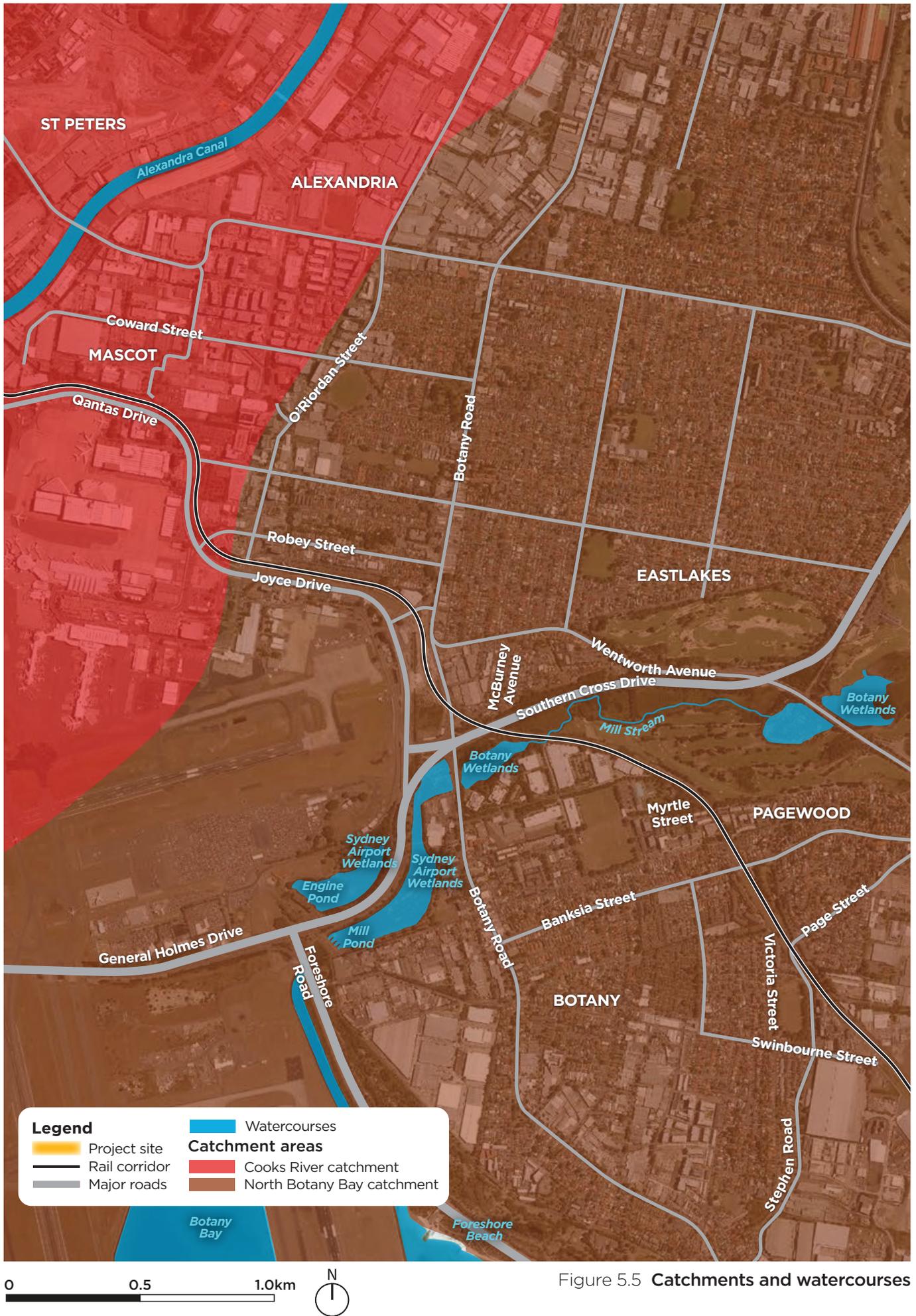


Figure 5.5 Catchments and watercourses

Flooding

Flood risk areas are associated with low lying areas around watercourses, with the main risk associated with short term 'flash flooding' due to overland flow (Cardno 2014).

Preliminary modelling indicates that significant flooding would occur adjacent to the rail corridor at the following locations during a 100 year average recurrence interval storm event:

- At the southern edge of the rail corridor, north of the interface between Airport and Qantas drives, where inundation in the range of 0.2 to 0.5 metres is predicted
- West of General Holmes Drive, where inundation in the range of 0.1 to 0.6 metres is predicted.

Water quality

Water quality in the Cooks River and Georges River catchments has been affected by historical land uses, particularly industrial activities. Sewage overflows, rubbish dumping and stormwater pollution continue to affect water quality.

Water quality in Cooks River is generally considered to be poor and unfit for contact by humans (Cooks River Alliance 2014). The main sources of poor water quality within the river are wastewater overflows, illegal dumping and litter. The Cooks River Alliance Management Plan 2014 targets, amongst other objectives, the improvement of water quality.

Water quality at Foreshore Beach (located to the southwest of the project site) is monitored as part of OEH's Beachwatch Program. The most recent annual Beachwater report (OEH 2017b) noted that water quality at Foreshore Beach is very poor.

As described in section 5.7.1, sampling undertaken within the Sydney Airport and Botany industrial area has indicated the presence of PFAS within surface water, groundwater, sediments and animal biota (eg fish).

5.8.2 Summary of potential issues

Construction

Potential surface water and groundwater quality issues as a result of the presence of contamination are considered in section 5.7.2.

Surface water

Potential issues during construction include:

- Sedimentation of local and downstream watercourses and waterbodies, including Alexandra Canal, Mill Stream, Mill Pond, Engine Pond and Botany Bay, due to soil disturbance, erosion and sediment-laden runoff
- Exposure of actual or potential acid sulfate soils (described in section 6.3.1), which may generate acidic runoff and affect water quality
- Impacts on surface and groundwater quality as a result of the contamination issues considered in section 5.7.

The project includes upgrading the bridge across Mill Stream. Works within the stream, including any structures required within the stream, would have the potential to disturb sediments in the bed of the stream and impact water quality.

Groundwater

There is the potential for shallow groundwater to be encountered during excavation and the construction of sub-surface infrastructure. Dewatering of excavations may cause temporary local drawdown of the groundwater table, impacting sub-surface flows and potentially the stability of any nearby structures.

Flooding

Construction has the potential to result in the following issues:

- Changes to overland flows and drainage pathways as a result of the disruption of existing flow patterns and infrastructure
- Changes to flooding regimes and behaviour upstream or downstream of the location of temporary construction infrastructure and compounds
- Impairment or modification of existing drainage network infrastructure.

Construction may impact the behaviour of local surface water systems. These impacts could include a temporary loss of floodplain storage and temporary redistribution of flood flows as a result of the presence of stockpiles and other works within flow paths. These impacts would be short term and temporary.

Flooding of sections of the project site may occur during high intensity rainfall events.

Operation

Surface water

Potential operational issues include leaks of fuels, lubricants and other hydrocarbons, and deposition of heavy metals from rail operations, resulting in contaminated stormwater runoff entering local waterways. These issues already occur under and would be managed in accordance with existing operating procedures.

Groundwater

The project would be designed to minimise the potential for operational impacts to groundwater.

Flooding

The key operational issue relates to the presence of additional infrastructure within or in the vicinity of watercourses or areas of flood risk, which may exacerbate existing flood conditions. This is an issue for the design of modifications to the bridge over Mill Stream. The presence of new structures such as bridge piers, embankments, culverts and drainage infrastructure could affect upstream and downstream flows and flood behaviour, change the duration and extent of inundation, and lead to scouring downstream. Any changes to flows in Mill Stream have the potential to affect Botany Wetlands and Sydney Airport Wetlands. The project would be designed to minimise the potential for these impacts.

5.8.3 Proposed further assessment

Surface water

A water quality assessment will be undertaken to assess the potential impacts of construction and operation. It will include:

- Reviewing historical surface water quality, with consideration of any supplementary data collected specifically for the project
- Considering potential changes to surface water quality, including the effectiveness of water sensitive urban design features and the potential disturbance of sediments in watercourses from any new structures
- Assessing modified discharge volumes, durations and velocities, and the associated potential impacts to surface water hydrology, including natural processes within waterways that affect the health of any aquatic systems and landscape health
- Identifying safeguards and management measures to address the impacts identified.

Groundwater

A groundwater assessment will be undertaken focussing on the potential impacts during construction. It will include:

- Reviewing historical groundwater levels and quality data, with consideration of additional supplementary data collected specifically for the project
- Considering the Water Sharing Plan for the Greater Metropolitan Region Groundwater Sources 2011 and the NSW Aquifer Interference Policy (NSW Office of Water 2012b)
- Assessing the potential impacts to sensitive receptors, including groundwater dependent ecosystems, and the interaction of surface water, groundwater and flooding impacts
- Identifying safeguards and management measures to address the impacts identified.

Flooding

A hydrology and flooding assessment will be undertaken to assess the potential impacts of construction and operation. It will include:

- Describing baseline flooding characteristics and behaviour, including flood depth and velocities in key watercourses
- Modelling a range of storm events, with consideration of climate change effects
- Describing any changes resulting from the project relative to baseline conditions
- Considering applicable council floodplain risk management plans and the NSW Government's Floodplain Development Manual (DIPNR 2005)
- Identifying safeguards and management measures to address the impacts identified.

5.9 Cumulative impacts

5.9.1 Overview

Sydney Gateway road project

As described in section 2.1.4 elements of the Sydney Gateway road project located on Qantas Drive and at the entrance to Terminals 2/3 would adjoin the project site for the Botany Rail Duplication. As such, ARTC is continuing to interface closely with Roads and Maritime in relation to design development, construction planning and the assessment of potential impacts for both projects.

The assessment of cumulative impacts needs to consider issues specific to the project and the Sydney Gateway road project when grouped together. The approach will differ according to the characteristics of each issue, and for construction and operation.

The overall approach will be to consider the following cumulative scenarios:

- Construction of both projects together
- Both projects operating concurrently.

Other major infrastructure projects

Other major infrastructure projects occurring within and around the study area and the broader transport network would also have the potential for cumulative impacts with the project.

Table 5-5 lists the proposed or approved projects that would be considered as part of the cumulative impact assessment. Other projects or programs that would also be considered (consistent with the level of information available) include larger developments around the project site and developments identified by the Sydney Airport Master Plan.

Table 5-5 Major infrastructure projects

Project	Description	Project status
Sydney Gateway road project	New direct high capacity road connections linking the Sydney motorway network at St Peters interchange with Sydney Airport Terminal 1 and Airport Drive in the south, and Qantas Drive and Sydney Airport Terminals 2/3 in the east (further information is provided in section 2.1.4)	Design development and environmental assessment underway
WestConnex New M5	A new section of the M5 South Western Motorway including a new interchange at St Peters	Construction ongoing to 2020
WestConnex M4-M5 Link	A new inner western bypass of the Sydney central business district connecting the M4 and M5.	Construction ongoing to 2023

Project	Description	Project status
Airport East Precinct Upgrade	Upgrading roads east of Sydney Airport, and replacing the rail level crossing at General Holmes Drive with a new rail bridge over a new section of Wentworth Avenue (further information is provided in section 2.1.4)	Construction ongoing in 2019
Airport North Precinct Upgrade	Upgrading roads to the north of Sydney Airport (further information is provided in section 2.1.4)	Construction ongoing in 2019

5.9.2 Summary of potential issues

Construction

Concurrent construction of the Botany Rail Duplication and the projects outlined in Table 5-5 has the potential to result in adverse cumulative impacts. Cumulative impacts would be largely related to traffic, transport and access, noise and vibration, air quality, social and business impacts and visual impacts.

Operation

The simultaneous operation of the Botany Rail Duplication and other significant infrastructure projects has the potential to generate cumulative benefits. This would include benefits for the transport of freight and access to Port Botany and Sydney Airport from the regional road and rail network.

There may also be some local adverse cumulative impacts, largely related to amenity impacts on the local community. This may potentially include noise and vibration, impacts to air quality and visual amenity.

5.9.3 Proposed further assessment

The EIS will include an assessment of potential cumulative impacts and benefits. The assessment will consider the potential for cumulative impacts from the project together with the Sydney Gateway road project, as well as other key proposed or approved projects.

Any impacts or interrelationships identified will be used to develop mitigation strategies to minimise and manage cumulative impacts during construction and operation.

6 OTHER ENVIRONMENTAL ISSUES

6.1 Overview

Other environmental issues listed in this section are considered to be of lesser consequence taking into account the scope of the project, the existing environment and the implementation of standard and best practice mitigation measures. It is considered unlikely these would be key issues for the project. However, further assessment of these issues will be carried out as part of the EIS. Measures to minimise and mitigate the potential impacts will be documented in the EIS.

6.2 Biodiversity

6.2.1 Overview

Most of the study area consists of disturbed land, which has been subject to historical vegetation clearing, reclamation, development, landscaping and weed invasion. The main areas of biodiversity value near the project site are located at the Botany Wetlands.

Table 6-1 provides an overview of biodiversity values in the study area. Figure 6-1 shows the locations of threatened communities mapped within the study area. Appendix B provides a summary of threatened flora and fauna (listed under the NSW *Biodiversity Conservation Act 2016* (BC Act) and/or the EPBC Act mapped within 10 kilometres of the project site.

Table 6-1 Overview of biodiversity values

Category	Description
Threatened fauna	<p>Seventy-five threatened fauna species and two threatened fauna populations listed under the EPBC Act and/or the BC Act, or potential habitat for these species, have been recorded or are predicted to occur within 10 km of the project site. Key listed threatened fauna populations and species include:</p> <ul style="list-style-type: none"> • The Green and Golden Bell Frog (<i>Litoria aurea</i>), which is listed as an endangered species under the BC Act and a vulnerable species under the EPBC Act. A key population of this species is located within the wetlands near Marsh Street in Arncliffe. The key population also incorporates the Lower Cooks River Delta, which is associated with the Botany Wetlands (described below). There have been historic sightings of the species at Engine Pond and Mill Pond in the Botany Wetlands. However, the species was not recorded during recent surveys in this area • The Long-nosed Bandicoot population in inner western Sydney (<i>Perameles nasuta</i>), which is listed as an endangered population under the BC Act. The species has been mainly recorded at Dulwich Hill, Lewisham and Leichhardt • Species previously recorded within Botany Wetlands include the Little Tern (<i>Sterna albifrons</i>), Green and Golden Bell Frog (<i>Litoria aurea</i>), Great Knot (<i>Calidris tenuirostris</i>), Black-tailed Godwit (<i>Limosa limosa</i>), Terek Sandpiper (<i>Xenus cinereus</i>), Great Sand Plover (<i>Charadrius leschenaultii</i>) and the Large-footed Myotis (<i>Myotis macropus</i>).
Threatened flora	<p>Forty-three threatened flora species and one threatened flora population have been recorded or are predicted to occur within 10 km of the project site.</p>

Category	Description
Threatened ecological communities	<p>Twenty-three listed threatened ecological communities have been recorded or are predicted to occur within 10 km of the project site. The location of threatened communities is shown on Figure 6-1. Communities near the project site are described below.</p> <p>Swamp Oak Floodplain Forest</p> <p>One threatened ecological community has been mapped in the project site – Swamp Oak Floodplain Forest. The project site crosses a patch of this community near Mill Stream in the Botany Wetlands.</p> <p>The community ‘Swamp Oak Floodplain Forest of the NSW North Coast, Sydney Basin and South East corner bioregions’ is listed under the BC Act as an endangered ecological community. Better condition stands of this community have recently been listed under the EPBC Act as ‘Coastal Swamp Oak (<i>Casuarina glauca</i>) Forest of South-east Queensland and New South Wales endangered ecological community’. Vegetation in the project site may also be commensurate with the EPBC Act listed community. Detailed surveys are required to confirm the extent, condition and conservation status of this community.</p> <p>Coastal Freshwater Wetland</p> <p>Patches of Coastal Freshwater Wetland, which is commensurate with the ‘Sydney Freshwater Wetlands in the Sydney Basin Bioregion’ community listed under the BC Act, are located in the Botany Wetlands to the northeast and west of the project site.</p>
Migratory species	<p>Twenty-four listed migratory and/or marine species have been recorded or are predicted to occur within 10 km of the project site. There are many records of migratory waders in the Botany Wetlands (described below).</p>
Wetlands	<p>The project site crosses the Botany Wetlands to the south of Southern Cross Drive. The Botany Wetlands (also known as Botany Water Reserves or Botany Swamps) is the largest coastal freshwater lakes complex and largest freshwater wetland in Sydney. The Botany Wetlands is a nationally important wetland, listed in the Directory of Important Wetlands in Australia. It is listed as ‘a good example of a wetland type occurring within a biogeographic region in Australia’ and ‘of outstanding historical or cultural significance.’</p> <p>The Botany Wetlands consist of several inter-connected ponds and 64 hectares of wetlands, which stretch over a 4 km corridor between Botany Bay and Eastlakes. The wetlands are of regional environmental importance as a major recharge source for the Botany Sands Aquifer. The wetlands also have regional ecological value as native animal habitat and movement corridors, and may include animal species of conservation significance.</p> <p>Sydney Water manages the wetlands in the vicinity and to the east of the project site. Sydney Airport manages the wetlands to the west of Botany Road, including Mill Pond, Engine Ponds East and West, and areas of Mill Stream. Collectively, these areas are known as the ‘Sydney Airport Wetlands’.</p>

Category	Description
Aquatic habitat	The project site is located about two kilometres to the northeast of Botany Bay at its nearest point. Botany Wetlands and Botany Bay are mapped as key fish habitat.
Groundwater dependent ecosystems	The Freshwater Wetlands at Eastlakes is the closest groundwater dependent ecosystem to the project site, located about 1 km to the east of the project site within the Lakes Golf Course and Botany Wetlands.
Mature trees	There are a number of mature planted trees between the rail corridor and Qantas Drive. These trees may provide some feeding and roosting resources for wildlife.
Priority weeds	There is the potential for a range of priority weeds declared under the <i>Biosecurity Act 2015</i> as well as environmental weeds to be present in and around the project site.

6.2.2 Summary of potential issues

Construction

Given the developed nature of the majority of the study area, the project would have limited potential to impact biodiversity. The main potential for impacts would be to the Botany Wetlands, including the mapped area of Swamp Oak Floodplain Forest and the mature trees along Qantas Drive. The project site passes through the southern section of the Botany Wetlands, crossing Mill Stream (to the north of Mill Pond). The existing rail bridge across the stream would be upgraded as part of the project. Potential biodiversity issues include:

- Potential for direct and indirect impacts to Botany Wetlands, both upstream and downstream of the project site, including as a result of changes to hydrology, water quality and groundwater
- Potential impacts on habitat for the Green and Golden Bell Frog key population and migratory species
- Impacts on mature street trees and associated impacts on potential foraging habitat for Grey-headed Flying-fox
- Impacts to connectivity between habitat areas
- Potential injury to/mortality of fauna
- Indirect impacts on areas downstream of the project site
- Introduction and/or spread of priority weeds and other invasive species.

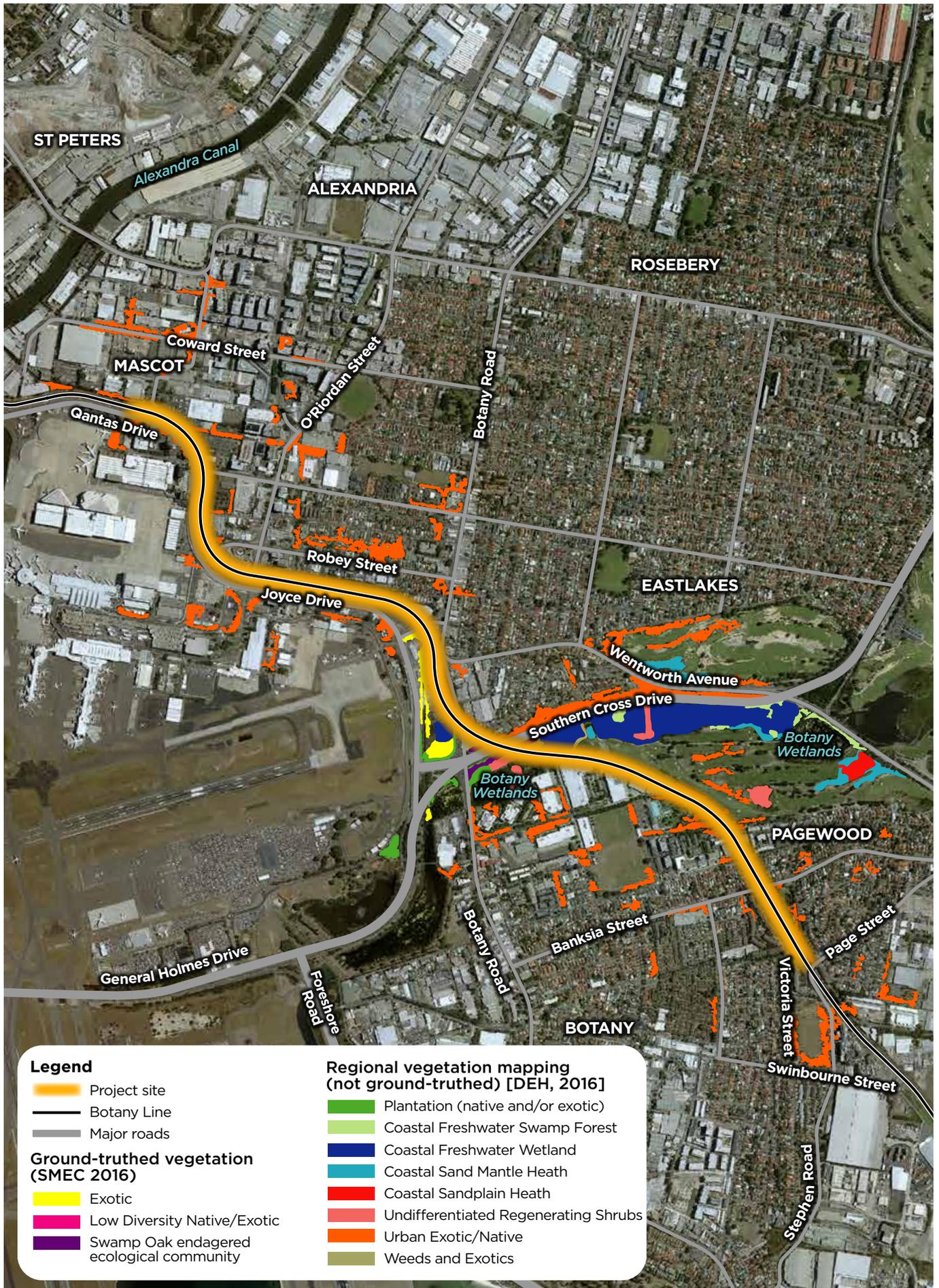


Figure 6.1 Threatened ecological communities

Operation

Potential biodiversity issues during operation include:

- Increase in any polluted runoff or contamination from spills within the rail corridor, which could affect Mill Stream, Botany Wetlands or downstream areas
- Potential for biodiversity impacts in the Botany Wetlands as a result of any changes to flooding or hydrology
- Spread or introduction of weeds into remnant vegetation and wetland areas near the project site.

6.2.3 Proposed further assessment

A biodiversity development assessment report will be prepared in accordance with the provisions of the BC Act, the Biodiversity Assessment Method (Office of Environment and Heritage (OEH) 2017a) and other relevant guidelines and requirements, including:

- Policy and guidelines for fish habitat conservation and management (DPI 2013)
- Matters of National Environmental Significance – Significant impact guidelines 1.1 (Department of the Environment 2013)
- Risk assessment guidelines for groundwater dependent ecosystems (NSW Office of Water 2012a)
- Requirements under legislation (as relevant), including the EPBC Act and the NSW *Fisheries Management Act 1994*.

The assessment will include:

- Reviewing existing information and database records
- Conducting staged field surveys, including vegetation mapping, plot/transects, threatened flora searches and flora and fauna habitat surveys
- Identifying the extent of native vegetation within and adjoining the project site
- Assessing the potential impacts on biodiversity, including impacts on threatened species, populations and ecological communities and habitat
- Identifying safeguards and management measures to address the impacts identified
- Identifying impacts requiring offsetting, and the requirements and options for offsetting
- Conducting assessments of significance pursuant to the EPBC Act significant impact guidelines for impacts on matters of national environmental significance, and the *Fisheries Management Act 1994* for threatened aquatic biota (if required).

6.3 Soils, landform and geology

6.3.1 Overview

Topography and geology

The study area is relatively flat and low lying, with gentle undulations ranging in elevation from about zero to 10 metres Australian Height Datum.

The study area is in the Botany Basin, which is a subregion of the Sydney Basin. The underlying geology consists of a mixture of peat, sandy peat, mud and coarse quartz sand with varying amounts of shell fragments, and medium to fine grained marine sand with podzols. This geology reflects the mixed marine and river delta history of the area.

Reclamation and stabilisation of the Sydney Airport lands have had a significant impact on geology and landforms in the study area. Other influences include drainage and reclamation of the original swamps, estuaries and wetlands that surrounded Botany Bay, landfill activities and extensive cut/fill works.

Most of the study area is mapped as ‘disturbed terrain’, which extends across Mascot and includes Sydney Airport land and the rail corridor. Disturbed terrain is described as areas extensively disturbed by human activity, including complete disturbance, removal or burial of original soils. Introduced fill, including dredged estuarine sand and mud, demolition rubble, industrial and household waste is also found in many areas.

Areas of the project site near Qantas, Joyce and Southern Cross drives are located on fill associated with Sydney Airport. To the south of Southern Cross Drive, the project site is located on Quaternary deposits consisting of marine sand.

Soils

Soil landscapes within the study area predominantly consist of disturbed terrain, with the exception of areas to the north, which is underlain by the Tuggerah soil landscape. The key characteristics of these soil landscapes are listed in Table 6-2.

Table 6-2 Soil landscapes

Soil landscape	Characteristics	Erosion/mass movement potential
Disturbed terrain	Original soil materials have been removed, greatly disturbed or buried and landfill including soil, rock, building and waste materials may have been added. Variable relief and slopes.	Dependent on the nature of the disturbed soil or fill. Could result in mass movement hazard, low fertility, soil impermeability and poor drainage. Source of sedimentation and groundwater contamination.
Tuggerah (Aeolian landscape)	Podzolic soils deep (greater than two metres). Gently undulating to rolling coastal dunefield landscape.	Extreme wind erosion hazard, non-cohesive and highly permeable soil. Localised flooding and permanently high water table.

Saline soils

Areas prone to salinity are usually at low positions in the landscape, such as in valley floors and along floodplains. The OEH NSW Soil and Land Information System contains data points identifying evidence of soil salinity where soils have been sampled previously. A review of this database indicated that no salting was evident at sample locations in the vicinity of the project site (within one kilometre).

Acid sulfate soils

Most of the low-lying areas surrounding Mill Stream are mapped as featuring acid sulfate soils. Acid sulfate soils and potential acid sulfate soils are naturally occurring soils containing iron sulfides. On exposure to air, iron sulfides oxidise and create sulfuric acid. This increase in acidity can result in the mobilisation of aluminium, iron and manganese from the soils.

Table 6-3 lists the acid sulfate classification of land within and in the vicinity of the project site. The classifications are based on the NSW Government's acid sulfate soil risk mapping.

Table 6-3 Acid sulfate soil classifications

Location	Class	Work which would potentially expose acid sulfate soils
Qantas Drive – Qantas link bridge to O’Riordan Street	2	Work below the natural ground surface and works which are likely to lower the water table.
O’Riordan Street through Mascot, Botany and Pagewood (to end of project site), with the exception of Mill Stream	3	Work beyond one metre below natural ground surface and work by which the water table is likely to be lowered beyond one metre below the natural ground surface.
Mill Stream	1	Work on and below the natural ground surface.

6.3.2 Summary of potential issues

Construction

Potential issues associated with excavation and ground disturbance activities include:

- Erosion of exposed soil and stockpiled materials
- Exposure of soil containing acid sulfides to oxygen, resulting in the production and mobilisation of sulfuric acid
- Dust generation from excavation, backfilling and vehicle movements over exposed soil.

Potential issues associated with the disturbance and exposure of contaminated soils are considered in section 5.7. Potential water quality issues are discussed in section 5.8.

Operation

Operation is not likely to result in any significant impacts on soils, topography or geology. The risk of soil erosion during operation would be minimal as all areas impacted during construction would be covered with ballast or rehabilitated to prevent soil erosion from occurring.

6.3.3 Proposed further assessment

The assessment will include:

- Assessing of the risk of erosion and sedimentation
- Assessing the potential impact and management of acid sulfate soils in accordance with the Acid Sulfate Soil Manual (NSW Acid Sulfate Soil Management Advisory Committee 1998) and Part 4 (Acid sulfate soils) of the Waste classification guidelines (EPA 2014b)

- Considering the potential impacts of soil exposure during earthworks, which may result in soil erosion and off-site transport of eroded sediments to receiving waterways
- Identifying safeguards and management measures to address the impacts identified.

6.4 Aboriginal heritage

6.4.1 Overview

Aboriginal heritage context

The study area is located within the traditional country of the Darug language group. Darug territory extends from the Hawkesbury River in the north to Appin in the south, and west into the Blue Mountains. Gameygal (or Camerigal) is the band of the Darug group that are believed to have occupied the areas around Botany Bay in the vicinity of the project site. The study area is on the lands of the Metropolitan Local Aboriginal Land Council and the La Perouse Local Aboriginal Land Council.

Since early European settlement the study area has been subject to significant disturbance and development. Items and sites of Aboriginal heritage significance are most likely to occur in areas associated with water sources. As a result, there is the potential for Aboriginal sites/items to be located in the vicinity of Alexandra Canal and the Botany Wetlands. The greatest potential for intact features of conservation significance would occur in undisturbed soils buried beneath fill material.

Existing recorded items

A search of the NSW Aboriginal Heritage Information Management System (AHIMS), undertaken in March 2018, did not identify any previously recorded sites within 200 metres of the project site.

Areas of potential archaeological deposits

As part of the previous design stages for Sydney Gateway, Roads and Maritime undertook an Aboriginal archaeological survey of the project site in accordance with Stage 2 of Roads and Maritime's Procedure for Aboriginal Cultural Heritage Consultation and Investigation (PACHCI). The results of the survey and assessment concluded that the project site did not contain any areas of potential archaeological deposits (PADs).

Native title

There are no native title claims relevant to the study area.

6.4.2 Summary of potential issues

Construction

Potential impacts would be limited to the construction phase. Based on the results of the surveys and assessment undertaken to date, the project is unlikely to impact any listed Aboriginal sites or areas of potential archaeological deposits. This will be confirmed by the Aboriginal cultural heritage due diligence assessment to be undertaken for the EIS. A key issue for further consideration by this assessment will be the potential for impacts on Aboriginal cultural heritage values.

Operation

No impacts are predicted during operation.

6.4.3 Proposed further assessment

An Aboriginal cultural heritage assessment will be undertaken for the project, in accordance with the Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales (DECCW 2010a) and Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010 (DECCW 2010b). The assessment will focus on identifying potential impacts to cultural heritage values and will involve:

- Undertaking consultation with Aboriginal stakeholders
- Completing updated database searches and reviewing previous investigations/assessments
- Reviewing geomorphological data, land use history and other relevant information
- Assessing potential impacts with a focus on cultural heritage values
- Identifying safeguards and management measures to address the impacts identified.

6.5 Landscape character and visual amenity

6.5.1 Overview

The landscape and visual environment of the study area is characterised by its highly developed, urbanised nature, presence of significant transport infrastructure and the variety of land uses including the presence of open space areas.

The landscape in the north-western part of the study area is dominated by Sydney Airport and its facilities, which include large expanses of open and paved areas (the runways and surrounding land), roads, large terminal and freight facilities, and various other buildings and infrastructure. The airport is highly visible from numerous viewpoints in the study area. Further to the southeast, areas of open space, including parks, three golf courses and Botany Wetlands, contribute to the visual character of this part of the study area.

The existing rail line is also a key feature in the study area. The elevated rail bridges associated with the line are highly visible and contribute to the character of the area around the airport. As described in section 5.5.1, the bridges over Robey and O'Riordan streets and Botany Road are heritage listed.

Other landscape and visual characteristics are influenced by the existing land uses described in section 5.6. Key influences on the character of the project site and study area include:

- Adjacent roadways, including Botany Road and Qantas, Joyce, General Holmes and Southern Cross drives
- The mixed use character of Mascot, west of O'Riordan Street
- Low-rise residential areas in eastern Mascot, Botany and Pagewood
- Large commercial and industrial buildings in Mascot and Botany.

Sensitive visual receivers in the vicinity of the project site include:

- Motorists, pedestrians and cyclists using roads around the project site (described in section 5.4.1)
- Residents within dwellings that have clear views of the project site
- Guests staying at hotels that have clear views of the project site

- Workers in commercial buildings that have clear views of the project site
- Users of recreation areas adjoining the project site (Eastlake Golf Course, Botany Aquatic Centre and Gaiarine Gardens).

6.5.2 Summary of potential issues

Construction

The project would result in temporary visual impacts during construction. These impacts would be experienced by sensitive visual receivers in the vicinity of the construction works and from areas with views of the project site.

During construction, visible elements would include work areas, operational infrastructure under construction, machinery and equipment, fencing, stockpiles, waste materials, site compounds and lighting (during night works).

Operation

The project would introduce new tracks and associated rail infrastructure within an existing operational rail corridor. It would involve upgrading five of the existing rail bridges, which would result in changes to the appearance of the bridges. It would also introduce new retaining walls in the vicinity of Robey and O'Riordan streets and embankments in a number of places.

Although this new infrastructure would be visible from a number of viewpoints, it would be consistent with the existing rail infrastructure already visible from these viewpoints. Potential visual issues include:

- Impacts on the visual character and appearance of the existing rail bridges, including the heritage listed bridges, as a result of the construction of new bridges
- The visibility and appearance of new/upgraded infrastructure from sensitive receivers, particularly:
 - Rail overbridges
 - New embankments and retaining walls
 - Additional rail infrastructure (such as additional track and widening of the ballasted area)
 - Changes to existing embankments or cuttings
 - Any permanent noise management measures, such as noise barriers
- Removal of mature trees and vegetation in some areas
- Integration with the design of the Sydney Gateway road project.

The visual impact would depend on the proposed design features and treatments and the location of sensitive receivers.

The upgraded rail overbridges, new retaining walls and embankments would be the dominant visual features of the project. An urban design and landscape concept is being prepared to support the design of the project. The urban design and landscape concept will define the urban design vision and objectives, and provide design concepts, strategies and principles to guide the design of the project.

6.5.3 Proposed further assessment

A landscape character and visual impact assessment will be undertaken to assess the potential impacts of construction and operation. It will include:

- Identifying the existing landscape and features, including the existing landscape character, visual catchments and sensitive viewpoints and receivers
- Reviewing the urban design considerations and principles, and the design features of the project
- Assessing potential impacts on existing views and landscapes
- Identifying safeguards and management measures to address the impacts identified.

6.6 Resources and waste

6.6.1 Overview

Resources

Various materials would be required to construct the project, including fill, ballast, concrete sleepers, steel, precast concrete units, ready mix concrete and water. The majority of these materials would be used during track formation works, with the exception of precast concrete units and ready mix concrete which would be used to construct concrete structures such as the bridges. Water would also be required for activities such as dust suppression.

The materials required would be confirmed during the design process.

Waste

The majority of waste associated with the project would be generated during construction and may include:

- Excavation waste (spoil)
- Demolition waste
- Wastewater
- Hazardous waste/contaminated spoil
- Vegetation waste
- Liquid waste (potentially including contaminated groundwater)
- General wastes, from site workers and personnel
- Other construction waste.

6.6.2 Summary of potential issues

Construction

Wastes would be managed in accordance with the waste provisions contained within the POEO. Any offsite reuse would comply with relevant EPA resource recovery exemptions.

As described in section 5.7, contaminated soil may be encountered within the project site, including materials potentially containing asbestos. Contaminated materials and sediments would be managed in accordance with the recommendations of the contamination assessment (described in section 5.7). Other issues include:

- Identifying waste management and disposal options that meet legislative and stakeholder requirements
- Developing a waste management strategy for the project
- Aligning the approach to resource and waste management with the sustainability drivers for the project (described in section 6.8)
- Potential impact on resource availability as a result of resource use requirements.

Operation

The main waste generating activity during operation would be maintenance. Waste would be generated during general track and corridor maintenance, including vegetation control and the maintenance of other rail infrastructure. These activities already occur under existing operational conditions and similar wastes would be generated.

6.6.3 Proposed further assessment

The EIS will provide further details on resource and waste management for the project, including:

- Estimating the quantity of the main waste types that may be generated during construction
- Identifying approximate resource and material requirements, including potential sources and availability
- Identifying opportunities to use recycled materials provided they are fit for purpose and meet engineering requirements
- Describing the proposed approach to waste management, including the waste management hierarchy and the approach to managing contaminated material
- Identifying measures to avoid, minimise or manage resource consumption and waste generation to ensure that all wastes generated during construction and operation are stored, handled, treated, reused, recycled and/or disposed of lawfully and in a manner that protects human health and environmental values.

6.7 Risks and safety

6.7.1 Overview

Construction and operation of the project has the potential to create hazard and risk issues, which could affect the surrounding environment and human health.

The existing environment presents an existing risk associated with the movement of trains along the rail corridor. As described in section 4.3.3, some features of the project would be constructed while trains operate. If inadequately managed, this could result in risks to the safety of site workers, visitors and the surrounding community.

Another issue associated with the existing environment relates to the potential for any safety issues that could affect the operation of Sydney Airport. Obstructions and lighting in the vicinity of Sydney Airport have

the potential to create air safety hazards and affect aviation operations. The most critical areas of concern are the immediate approach and take-off areas. The airspace around Sydney Airport is protected by a series of invisible 'surfaces' at varying altitudes, which include the OLS and the PANS-OPS surface. These surfaces form part of the airport's prescribed airspace, which is regulated by the Airports Act. The OLS provides a protected space that is free of obstructions for aircraft flying into and out of the airport. It defines the lower limits of an airport's airspace, which should be kept free of obstacles during the initial and final stages of flight or manoeuvring. Intrusions into the OLS require approval under the Airports Act.

The PANS-OPS protects aircraft flying into and out of the airport when the flight is guided solely by instruments in conditions of poor visibility. The PANS-OPS surface is generally situated above the OLS. Intrusions into the PANS-OPS surface are prohibited.

The potential for intrusion into these surfaces as a result of construction activities or the presence of operational infrastructure need to be considered. This is particularly relevant for the bridges over Botany Road and Southern Cross Drive, which are located to the east of Sydney Airport's east-west runway, and for the bridges over O'Riordan and Robey streets.

6.7.2 Summary of potential issues

Construction

Potential risks and hazards during construction include:

- Intrusion into the OLS as a result of use of large plant and machinery such as cranes and piling rigs
- Interference with navigational aids as a result of light spill from construction areas
- Risks associated with the accidental release of dangerous goods or hazardous materials due to improper handling or storage, or in the event of a vehicle incident resulting in release of material
- Risks of exposure to increased levels of noise and dust from work areas and construction vehicles
- Risks associated with accidental interference and damage to live underground services
- Changed vehicle, cyclist and pedestrian routes and access resulting in unsafe conditions or potentially affecting emergency services access
- Risks associated with unauthorised access to the rail corridor or construction sites
- Flash flooding or inundation of construction work areas during heavy rainfall
- Potential for health impacts associated with changes to the noise and air environment.
- Potential aviation safety issues, including:
 - Temporary lighting or light spill, which may result in an aviation hazard
 - Interference with navigational aids such as radar and airport lighting
 - Accidental disruptions to utilities and services.

Construction activities could result in impacts to the health and safety of site workers, users, visitors and the local community if improperly managed. These include:

- Working within an operating rail environment
- Operation of vehicles and construction equipment on site

- Transportation of equipment, excavated spoil and material to and from site
- Construction failures or incidents resulting in flooding, inundation and/or excavation collapse
- Exposure of, and contact with, live utilities
- Exposure to hazardous materials and any contaminated soil or groundwater
- Potential for risks to pedestrians/public safety resulting from unauthorised access to construction work areas.

NSW workplace safety laws require construction sites to have adequate site security, which includes appropriate fencing. All construction work would be isolated from the general public. Construction sites would need to be secure at all times to prevent entry by unauthorised persons.

Health and safety risks during construction would be managed by the implementation of standard workplace health and safety requirements. A work health and safety management plan and safe work method statements would be developed in accordance with regulatory requirements.

Operation

Elevated structures associated with the project are being designed to not intrude into the OLS and PANS-OPS surfaces.

Potential risk and safety issues during operation would be similar to the existing situation, and would be managed in accordance with existing operational procedures.

The potential for operational health impacts or benefits associated with changes to the noise and air environment would be considered in the EIS.

The project is not expected to generate any additional risk or safety issues compared with the existing situation.

6.7.3 Proposed further assessment

A risks and hazards assessment will be undertaken for the EIS. The assessment will include:

- Reviewing the relevant regulatory framework and applicable guidelines, including:
 - Australian Code for the Transport of Dangerous Goods by Road & Rail (National Transport Commission 2017)
 - NSW Dangerous Goods (Road and Rail Transport) Regulation 2009
 - Managing asbestos in or on soil (WorkCover NSW 2014)
 - Hazardous and Offensive Development Application Guidelines: Applying SEPP 33 (Department of Planning 2011) (Applying SEPP 33)
- Identifying construction and operational activities with the potential to cause impacts to off-site receivers
- Considering the potential impacts associated with hazardous materials, as defined by Applying SEPP 33
- Describing the design features and approaches to managing risks and hazards during operation

- Qualitatively assessing potential health impacts, including reviewing the results of the noise and vibration assessment and the air quality assessment in relation to the potential for health impacts
- Identifying safeguards and management measures to address the impacts identified.

6.8 Sustainability and climate change

6.8.1 Overview

In NSW, the concept of ecologically sustainable development (ESD) was introduced into planning and development legislation by the EP&A Act. One of the objectives of the EP&A Act is 'to facilitate ecologically sustainable development by integrating relevant economic, environmental and social considerations in decision-making about environmental planning and assessment'.

In accordance with schedule 2 (clause 7(1)(f)) of the Regulation, an EIS is required to include 'the reasons justifying the carrying out of the development, activity or infrastructure in the manner proposed, having regard to ... the principles of ecologically sustainable development set out in subclause (4)'.

Climate change has the potential to alter the frequency, intensity and distribution of extreme weather-related natural hazards, including more intense and frequent heat waves, droughts, floods and storm surges. The risk of climate change impacts on infrastructure (including the project) needs to be considered as part of the design process, as structures need to be designed to last for long periods and therefore need to be resilient to climate change.

ARTC's approach to sustainability and climate change for the project includes identifying opportunities to achieve sustainability outcomes aligned with best practice, and designing and constructing the project to be resilient to climate change impacts.

6.8.2 Summary of potential issues

Construction

Due to the relatively short timeframe of the construction phase, the impacts of climate change are expected to be minimal. However, there are several key climate change risks to rail projects associated with increasing ambient temperatures and rainfall intensity which may result in the following:

- Damage to rail infrastructure during extreme temperature events
- Increased potential for localised flooding impact on rail infrastructure and potential increases in maintenance activities and costs
- Increased risk of rail line closures
- Drainage and stormwater impacts, including sediment loss from the site.

Construction issues relating to sustainability and climate change outcomes include:

- Minimising environmental impacts, including by avoidance and design options that prefer lower impact solutions and respond to identified climate change risks
- Maximising recycling and reuse, including of tracks, sleepers and ballast, and minimising the generation/disposal of wastes
- Reducing resource consumption and greenhouse gas emissions

- Appropriate management and disposal of contaminated soils and groundwater
- Reducing social and community impacts, including amenity, access and health and safety impacts
- Sustainable procurement of goods and services with consideration of whole of life impacts and opportunities to maximise social benefits
- Communication and engagement with the community and other stakeholders.

Operation

Risks to infrastructure associated with climate change may also generate knock-on effects or additional risks such as:

- Risks to rail user health and safety
- Risks to road user health and safety at locations where the rail line crosses the road network
- Interruption or delays to commercial activities depending on rail transport
- Increased maintenance and replacement costs
- Increased liability resulting from damage to rail infrastructure.

Operational issues relating to sustainability and climate change outcomes include:

- Reducing consumption of fuel and materials during maintenance
- Ongoing sustainable procurement and climate change mitigation and adaptation measures over the life of the project
- Ongoing management of contamination
- Ongoing social considerations
- Potential benefits of the project in terms of sustainability and climate change (potential benefits of the project are considered in section 2.2).

6.8.3 Proposed further assessment

A sustainability assessment will be undertaken as an input to the design and EIS. The assessment will provide a framework to implement sustainability objectives and targets during design, construction and operation. The assessment will consider the application of sustainability principles to the project and the opportunities to achieve sustainability targets and outcomes that are aligned with best practice infrastructure projects. Additionally, an Infrastructure Sustainability Council of Australia (ISCA) target rating for the project will be nominated.

A climate change risk assessment will also be undertaken to inform the design process and the measures that may need to be implemented to manage the potential for climate change impacts.

7 CONCLUSION

ARTC proposes to duplicate a section of the Botany Line between Mascot and Botany to increase rail freight capacity to Port Botany. The project would involve constructing a new track within the existing rail corridor for a distance of 2.9 kilometres. This section of rail line would be converted from one track to two tracks. In addition, some sections of the existing track would be realigned (slewed) and/or upgraded to improve the alignment of both tracks. To provide for the new track the project would also involve constructing four new rail bridges (adjacent to the existing bridges) at Mill Stream, Southern Cross Drive, O’Riordan Street and Robey Street, and re-constructing the existing bridges over Robey and O’Riordan streets.

The project is State significant infrastructure in accordance with Division 5.2 of the EP&A Act and requires approval from the NSW Minister for Planning. The application for approval needs to be supported by an EIS.

As part of the first step in the approvals process for the project, this report supports an application to the Minister for Planning seeking SEARs for the EIS. ARTC will prepare the EIS in accordance with the SEARs and the minimum form and content requirements set out in clauses 6 and 7 of Schedule 2 of the Regulation.

This report has identified that the key environmental issues for the project are:

- Noise and vibration
- Air quality
- Traffic, transport and access
- Non-Aboriginal heritage
- Land use, social and business impacts
- Contamination
- Hydrology, flooding and water quality
- Cumulative impacts.

These issues, together with the other issues identified by the report, will be assessed in the EIS.

8 REFERENCES

- Airservices Australian, 2017, *Sydney Airport N501 Australian Noise Exposure Index 1 January to 31 December 2016*, April 2017
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APPENDIX A

REQUIREMENTS OF THE ENVIRONMENTAL PLANNING AND ASSESSMENT
REGULATION 2000

Requirements of the Environmental Planning and Assessment Regulation 2000

Clause 192 of the Environmental Planning and Assessment Regulation 2000 requires that an application for approval of the Minister to carry out State significant infrastructure must include:

- Details of any approvals that would, but for section 5.23 of the *Environmental Planning and Assessment Act 1979* (EP&A Act), be required for the carrying out of the State significant infrastructure, and
- Details of any authorisations that must be given under section 5.24 of the EP&A Act if the application is approved, and
- A statement as to the basis on which the proposed infrastructure is State significant infrastructure, including, if relevant, the capital investment value of the proposed infrastructure.

These requirements are addressed below.

Approvals that would otherwise apply

Approvals that may be required to carry out State significant infrastructure, if not for section 5.23 of the EP&A Act, include:

- A permit under section 201, 205 or 219 of the Fisheries Management Act 1994
- An approval under Part 4, or an excavation permit under section 139 of the Heritage Act 1977
- An Aboriginal heritage impact permit under section 90 of the National Parks and Wildlife Act 1974
- A water use approval under section 89, a water management work approval under section 90 or an activity approval under section 91 of the Water Management Act 2000.

Section 5.23 does not remove the need to obtain an aquifer interference approval under the *Water Management Act 2000*.

Authorisations if the application is approved

Authorisations that may be required for the project under section 5.24 of the EP&A Act include:

- An environment protection licence under Chapter 3 of the Protection of the Environment Operations Act 1997 (POEO Act)
- Consent under section 138 of the Roads Act 1993.

It is noted in relation to the requirement for an environment protection licence that ARTC currently has a licence (number 3142) that authorises the carrying out of railway systems activities (as defined by Schedule 1 of the POEO Act). This includes construction of new track in the network in the metropolitan area less than three kilometres in length, including associated ancillary works.

State significant infrastructure statement

Clause 14(1) of State Environmental Planning Policy (State and Regional Development) 2011 (the State and Regional Development SEPP) provides that development is State significant infrastructure, pursuant to section 5.12(2) of the EP&A Act, if it is permissible without development consent under Part 4 of the Act by virtue of the operation of a State environmental planning policy, and it is specified in the categories of development in Schedule 3.

Clause 79(1) of State Environmental Planning Policy (Infrastructure) 2007 permits development for the purpose of a railway or rail infrastructure facilities to be carried out by or on behalf of a public authority without consent.

Schedule 3 (clause 3) of the State and Regional Development SEPP defines 'rail infrastructure' as 'Development for the purpose of rail infrastructure by or on behalf of the Australian Rail Track Corporation that has a capital investment value of more than \$50 million.' As the project is permissible without development consent, has a capital investment value of more than \$50 million and it is being undertaken by ARTC, it meets the requirements of clause 14(1) of the State and Regional Development SEPP.

On this basis, the project is State significant infrastructure. Approval from the Minister for Planning is required under section 5.14 of the EP&A Act.

APPENDIX B
THREATENED SPECIES SEARCH RESULTS

Table B.1 Threatened ecological communities known or predicted to occur within 10 kilometres of the project site

Name	BC Act status	EPBC Act status	Habitat association
Agnes Banks Woodland in the Sydney Basin Bioregion	CE	E	Most remnants occur near Agnes Banks in Penrith LGA, on eastern bank of the Hawkesbury River. Occurs on aeolian sands overlaying Tertiary alluviums. Structure varies from low woodland on higher ridges to sedgeland in low-lying depressions. Characteristic species include Hard-leaved Scribbly Gum, Narrow-leaved Apple and Old-man Banksia.
Bangalay Sand Forest of the Sydney Basin and South East Corner bioregions	E		Associated with coastal sand plains on deep, freely draining to damp sandy soils on flat to moderate slopes within a few km of the sea and below 100 masl. Known from Sutherland south to Bega Valley LGA. Variable structure with a dense to open tree canopy from 5 - 20 m tall, dependant on exposure and disturbance history. Characteristic species include Bangalay and Coast Banksia over an open sclerophyllous or mesophyllous shrub stratum, with an understorey of grasses, forbs and/or sedges.
Blue Gum High Forest in the Sydney Basin Bioregion	CE	CE	Occurs on the Hornsby Plateau, north eastern edge of the Cumberland Plain with most remnants in Hornsby, Ku-ring-gai and Baulkham Hills LGAs. Typically occurs in high rainfall areas on fertile soils derived from Wianamatta shale. Grades into Sydney Turpentine-Ironbark Forest at lower rainfall areas. Moist, tall open forest characterised by Sydney Blue Gum and Blackbutt. Usually has small tree layer of Native Daphne, Blueberry Ash and Forest Oak over a low, open shrub layer and an understorey of grasses, herbs and ferns.
Blue Mountains Shale Cap Forest in the Sydney Basin Bioregion	E	CE	Found on deep fertile soils formed on Wianamatta Shale, on moist sheltered sites at lower to middle altitudes of the Blue Mountains and Wollemi areas. Extensive occurrences of shale are at Springwood, Berambing to Kurrangong Heights, Mountain Lagoon and Colo Heights. Characteristic tree species of this ecological community are Mountain Blue Gum, Monkey Gum and Turpentine. The structure of the community was originally tall open forest to open forest, depending on site conditions and history, but as a result of partial clearance may now exist as woodland or as groups of remnant trees.
Castlereagh Scribbly Gum Woodland in the Sydney Basin Bioregion	V	E	Occurs almost exclusively on soils derived from Tertiary alluvium, or on sites located on adjoining shale or Holocene alluvium, with known occurrences in the Bankstown, Blacktown, Campbelltown, Hawkesbury, Liverpool and Penrith LGAs. Typically on sandy soils and on slightly higher ground than Castlereagh Ironbark Forest or Shale Gravel Transition Forest (Tozer 2003). Dominated by Parramatta Red Gum, Narrow-leaved Apple and Hard-leaved Scribbly Gum. A small tree stratum of Melaleuca decora is sometimes present, generally in areas with poorer drainage. It has a well-developed sclerophyllous shrub stratum over a diverse range of forbs.
Castlereagh Swamp Woodland Community	E		Occurs Castlereagh and Holsworthy areas on the Cumberland Plain on alluvial soils, often in poorly drained depressions. Low woodland characterised by dense stands of Melaleuca decora along with other canopy trees, such as Parramatta Red Gum. Poorly developed shrub layer of juvenile Melaleucas over waterlogging tolerant groundcover species such as Indian Pennywort, Juncus usitatus and Branched Goodenia.
Coastal Saltmarsh in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	E	V	Occurs on landward side of mangrove stands in intertidal zones along the shores of estuaries and lagoons that are permanently or intermittently open to the sea. Characterised by Baumea juncea, Sea Rush, Samphire, Sand Couch, Streaked Arrowgrass, Isolepis nodosa, Creeping Brookweed, Swamp Weed, Seablite and Prickly Couch, with occasional scattered mangroves occurring throughout the saltmarsh. Saltpans and tall reeds may also occur.

Name	BC Act status	EPBC Act status	Habitat association
Coastal Upland Swamp in the Sydney Basin Bioregion	E	E	Includes open graminoid heath, sedgeland and tall scrub associated with periodically waterlogged soils on the Hawkesbury sandstone plateaus. Generally associated with soils that are acidic and vary from yellow or grey mineral sandy loams with a shallow organic horizon to highly organic spongy black peat soils with pallid subsoils. May include tall open scrubs, tall closed scrubs, closed heaths, open graminoid heaths, sedgelands and fernlands.
Cooks River/Castlereagh Ironbark Forest in the Sydney Basin Bioregion	E	CE	Occurs on the Cumberland Plain with the most extensive stands in Castlereagh and Holsworthy areas. Smaller remnants in Kemps Creek area and eastern section of the Cumberland Plain. Ranges from open forest to low woodland, with a canopy dominated by Red Ironbark and <i>Melaleuca decora</i> along with other species of eucalypt. Dense shrubby understorey of Prickly-leaved Paperbark, Peach Heath and Fabaceae sp. over sparse ground layer of grasses and herbs.
Cumberland Plain Woodland in the Sydney Basin Bioregion	CE	CE	Grassy woodland/forest endemic to the hills and plains of the Cumberland Plain. Canopy typically dominated by Grey Box, and Forest Red Gum, with Narrow-leaved Ironbark, Spotted Gum and Thin-leaved Stringybark occurring less frequently. Shrub layer dominated by Blackthorn, and grasses such as <i>Themeda australis</i> and Weeping Grass.
Duffys Forest Ecological Community in the Sydney Basin Bioregion	E		Extensively fragmented distribution, occurring primarily within Warringah, and Ku-ring-gai Local Government Areas (LGA) with minor occurrences in the Pittwater, Manly and Hornsby LGAs. Occurs in association with shale lenses and lateritic soils in Hawkesbury Sandstone. Rock outcrops are usually absent from this community, except on the fringes, where it adjoins typical sandstone vegetation, generally characterised by extensive sandstone outcrops. Situated on ridgetops, plateaus and upper slopes, but may also occur on mid-slopes or benches downslope of Sydney Sandstone Ridgetop Woodland.
Eastern Suburbs Banksia Scrub in the Sydney Basin Bioregion	E	E	Surviving stands total 146 hectares. Found in the LGA's of Botany, Randwick, Waverly and Manly. Occurs in disjunct patches of nutrient poor aeolian dune sand (OEH 2013). Predominantly a sclerophyllous heath or scrub community with some remnants containing small patches of woodland (OEH 2013).
Freshwater Wetlands on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	E		Occurs in coastal areas subject to periodic flooding with standing fresh water for at least part of the year. Typically on silts, muds or humic loams below 20 m elevation in low-lying parts of floodplains, alluvial flats, depressions, drainage lines, backswamps, lagoons and lakes. Structure and composition varies spatially and temporally depending on the water regime, though is usually dominated by herbaceous plants and has few woody species.
Hygrocybeae Community of Lane Cove Bushland Park in the Sydney Basin Bioregion	CE		Hygrocybeae Community of Lane Cove Bushland Park is an assemblage of more than 20 species of fungi in the family Hygrophoraceae (Fungi, Basidiomycota, Agaricales, Hygrophoraceae; OEH 2014). Restricted to a core zone along Gore Creek catchment and Lane Cove LGA. Most of the species live in warm temperate gallery rainforest centred on the banks of the north-eastern arm of Gore Creek and its tributaries in Lane Cove Bushland Park (OEH 2014).
Kurnell Dune Forest in the Sutherland Shire and City of Rockdale	E		Occurs within the Kurnell Peninsula, near Bundeena and at Leo Smith Reserve. A low open sclerophyll forest community with a distinctive moist forest component in its flora. The community occupies coastal dune sand and is often found in association with areas of sclerophyll heath and scrub. Characteristic sclerophyll tree and shrub species include Sydney Red Gum, Heath-leaved Banksia, Old-man Banksia,

Name	BC Act status	EPBC Act status	Habitat association
			Bangalay, Swamp Mahogany, Coast Teatree and Tree Broom-heath. The moist component of the flora is characterised by species including Coffee Bush, Kangaroo Vine, Water Vine, Hairy Clerodendrum, Tuckeroo, Blueberry Ash, Hard Corkwood, Cheese Tree, Cockspur Thorn, Large Mock-Olive, Rapanea variabilis and Snake Vine.
Littoral Rainforest in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	E	CE	Occurs along the NSW coast, usually within 2 km of the ocean on a variety of substrates. Variable structure and composition, typically with closed canopy. Generally rainforest species with vines a major component.
Lowland Rainforest in the NSW North Coast and Sydney Basin Bioregions	E	CE	Occurs north of the Hawkesbury River to the Qld border. Associated with a range of high-nutrient geological substrates, notably basalts and fine-grained sedimentary rocks, on coastal plains and plateaux, footslopes and foothills. Includes subtropical rainforest and related, structurally complex forms of dry rainforest. In undisturbed state has a closed canopy with high tree diversity. A range of plant growth forms are present in Lowland Rainforest, including palms, vines and vascular epiphytes. Scattered eucalypt emergents (e.g. Flooded Gum, Sydney Blue Gum) may occasionally be present.
Moist Shale Woodland in the Sydney Basin Bioregion	E	CE	Occurs on clay soils from Wianamatta Shale in the southern half of the Cumberland Plain, and is intermediate between Cumberland Plain Woodland and Western Sydney Dry Rainforest. Similar to Cumberland Plain Woodland but with more mesic shrub understorey. Dominant canopy trees include Forest Red Gum, Grey Box, Narrow-leaved Ironbark and Spotted Gum. Small trees, such as Hickory Wattle and Sydney Green Wattle are also common. The shrub layer includes Coffee Bush, Hairy Clerodendrum and Indian Weed.
Pittwater and Wagstaffe Spotted Gum Forest in the Sydney Basin Bioregion	E		Occurs entirely within Pittwater LGA on the Barrenjoey Peninsula and Western Pittwater Foreshores (OEH 2013). Remnants are typically small and on private properties and council reserves. Associated with shale derived soils and high rainfall on lower hillslopes on the Narrabeen Group. Structural form - typically open forest but may now exist as woodland or remnant trees (OEH 2013).
River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	E		Occurs on flats, drainage lines and river terraces of coastal floodplains where flooding is periodic and soils generally rich in silt, lack deep humic layers and have little or no saline (salt) influence. Occurs south from Port Stephens in the NSW North Coast, Sydney Basin and South East Corner bioregions. Characterised by a tall open canopy layer of eucalypts with variable species composition.
Shale Gravel Transition Forest in the Sydney Basin Bioregion	E	CE	Primarily in the northern section of the Cumberland Plain, also found in Liverpool/Holsworthy, Bankstown, Yennora, Villawood and Kemps Creek areas. Occurs primarily where shallow deposits from ancient river systems overlay shale soils, but also associated with localised concentrations of iron-hardened gravel. Open forest with canopy dominated by Red Ironbark, Grey Box and Forest Red Gum, often with small tree layer of Melaleuca decora over a sparse shrub layer. Grades into Cumberland Plain Woodland where the influence of gravel soil declines, and into Cooks River/Castlereagh Ironbark Forest or Castlereagh Scribbly Gum Woodland where gravel deposits are thick.
Shale Sandstone Transition Forest in the Sydney Basin Bioregion	CE	CE	Occurs on the edges of the Cumberland Plain where clay soils on shale intergrade with sandstone soils, or where shale caps overlay sandstone. Species composition variable depending on soil influences. Dominant tree species include Forest Red Gum, Grey Box, White Stringybark, Thin-leaved Stringybark,

Name	BC Act status	EPBC Act status	Habitat association
			Red Ironbark and Narrow-leaved Ironbark. Areas with a low sandstone influence have an understorey closer to Cumberland Plain Woodland.
Southern Sydney sheltered forest on transitional sandstone soils in the Sydney Basin Bioregion	E		Restricted to sheltered heads and upper slopes of gullies on transitional zones where sandstone outcrops may exist, but where soils are influenced by lateral movement of moisture, nutrients and sediment from more fertile substrates in an area bounded by Hurstville, Carss Park, Bundeena, Otford, Stanwell Tops, Darkes Forest, Punchbowl Creek and Menai. Open forest dominated by Sydney Red Gum, Sydney Peppermint and occasional Blackbutt over scattered subcanopy trees, a diverse shrub layer and well-developed groundcover of ferns, forbs, grasses and graminoids. Variable species composition.
Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	E		Typically occurs below 20m asl on waterlogged or periodically inundated flats, drainage lines, lake margins and estuarine fringes on coastal floodplains of NSW. Associated with grey-black clay-loams and sandy loams, saline or sub-saline groundwater. Structure variable from open forests to scrubs or reedlands with scattered trees. Canopy dominated by Casuarina glauca (north of Bermagui) or Melaleuca ericifolia (south of Bermagui). Understorey characterised by frequent occurrences of vines, a sparse cover of shrubs, and a continuous groundcover of forbs, sedges, grasses and leaf litter.
Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	E		Usually occurs below 20m asl (sometimes up to 50m). Associated with humic clay loams and sandy loams, on waterlogged or periodically inundated alluvial flats and drainage lines associated with coastal floodplains. Characterised by open to dense tree layer of eucalypts and paperbarks, with trees up to or higher than 25 m. Includes areas of fern land and tall reed or sedge land, where trees are sparse or absent.
Sydney Freshwater Wetlands in the Sydney Basin Bioregion	E		Occurs on sand dunes and low-nutrient sandplains along coastal areas in Sydney Basin bioregion. Known from Lake Macquarie, Wyong, Gosford, Pittwater, Warringah, Woollahra, Waverly, Botany, Rockdale, Randwick, Sutherland and Wollongong LGA's. Largely restricted to freshwater swamps and swales and depressions on sand dunes and low nutrient sandplains (OEH 2013).
Sydney Turpentine-Ironbark Forest	E	CE	Occurs on the Cumberland Plain, with most remnants in Baulkham Hills, Hawkesbury, Hornsby, Kuring-gai, Parramatta, Ryde, Sutherland and Wollondilly LGAs. Open forest characterised by Turpentine, Grey Gum, Grey Ironbark and E. Thin-leaved Stringybark. In areas of high rainfall (over 1050 mm per annum) Sydney Blue Gum is more dominant. Sparse shrub stratum of Native Daphne and Elderberry Panax.
The Shorebird Community occurring on the relict tidal delta sands at Taren Point	E		Occurs on the relict marginal shoal of the Georges River between Taren Point and Shell Point in Botany Bay. Some species identified within this community can also be found foraging and roosting at other locations within Botany Bay. Includes the characteristic assemblage of the following 20 species: Bar-tailed Godwit (<i>Limosa lapponica</i>), Red Knot (<i>Calidris canutus</i>), Great Knot (<i>Calidris tenuirostris</i>), Sharp-tailed Sandpiper (<i>Calidris acuminata</i>), Curlew Sandpiper (<i>Calidris ferruginea</i>), Red-necked Stint (<i>Calidris ruficollis</i>), Common Sandpiper (<i>Actitis hypoleucos</i>), Terek Sandpiper (<i>Xenus cinereus</i>), Latham's Snipe (<i>Gallinago hardwickii</i>), Grey-tailed Tattler (<i>Heteroscelus brevipes</i>), Grey Plover (<i>Pluvialis squatarola</i>), Pacific Golden Plover (<i>Pluvialis fulva</i>), Common Greenshank (<i>Tringa nebularia</i>), Masked Lapwing (<i>Vanellus miles</i>), Marsh Sandpiper (<i>Tringa stagnatilis</i>), Ruddy Turnstone (<i>Arenaria interpres</i>), Pied Oystercatcher (<i>Haematopus longirostris</i>), Sooty Oystercatcher (<i>Haematopus fuliginosus</i>), Whimbrel (<i>Numenius phaeopus</i>), and Eastern Curlew (<i>Numenius madagascariensis</i>).

Name	BC Act status	EPBC Act status	Habitat association
Themeda grassland on seacliffs and coastal headlands in the NSW North Coast, Sydney Basin and South East Corner Bioregions	E		Themeda australis is the dominant species in the Themeda Grassland on seacliffs and coastal headlands. The EEC is found on a range of substrates. Themeda australis is an extremely widespread species, but in this community it may have a distinctive appearance, being prostrate and having glaucous leaves. Coast Banksia, Coastal Rosemary and Acacia sophorae occurs as an emergent shrub or as a dense cover where they have recruited over grasslands. Smaller shrubs occur often as prostrate to dwarf forms.
Western Sydney Dry Rainforest in the Sydney Basin Bioregion	E	CE	Restricted to hilly country where it occurs on clay soils derived from Wianamatta shale on sheltered lower slopes and gullies. Very restricted and occurs mostly in the Razorback Range near Picton. Outlying occurrences at Grose Vale and Cattai. Canopy trees include Prickly-leaved Tea Tree, Hickory Wattle and Native Quince. Shrub layer includes rainforest species Large Mock-olive, Hairy Clerodendrum and Wild Yellow Jasmine. The shrub layer combines with vines to form dense thickets in sheltered locations.

Table B.2 Threatened flora species known or predicted to occur within 10 kilometres of the project site

Scientific Name	Common Name	BC Act status	EPBC Act status	Source	Habitat association
<i>Acacia bynoeana</i>	Bynoe's Wattle	E	V	1 record within 10km (OEH 2018a); Species or species' habitat may occur within 10km (DOE 2018a)	Endemic to central eastern NSW, currently known from only 34 locations, many of only 1-5 plants. Grows mainly in heath/ dry sclerophyll forest on sandy soils, prefers open, sometimes slightly disturbed sites such as trail margins, road edges, and in recently burnt open patches. Flowers September to March, and fruit matures in November.
<i>Acacia prominens</i>	Gosford Wattle, Hurstville and Kogarah Local Government Areas	EP		1 record within 10km (OEH 2018a)	Occurs at a few sites along the railway line at Penshurst, at Carss Bush Park, Carss Park and there is an unconfirmed sighting at Oatley Park, Oatley. Grows in open situations on clayey or sandy soils. Habitats mostly cleared and occurs as isolated or small groups of trees.
<i>Acacia pubescens</i>	Downy Wattle	V	V	510 records within 10km (OEH 2018a); Species or species' habitat known to occur within 10km (DOE 2018a)	Occurs mainly in Bankstown-Fairfield-Rookwood and Pitt Town areas, with outliers at Barden Ridge, Oakdale and Mountain Lagoon. Grows on alluviums, shales and shale/sandstone intergrades. Soils characteristically gravelly, often with ironstone. Occurs in open woodland and forest, in communities including Cooks River/ Castlereagh Ironbark Forest, Shale/ Gravel Transition Forest and Cumberland Plain Woodland. Flowers August to October.
<i>Acacia terminalis subsp. terminalis</i>	Sunshine Wattle	E	E	121 records within 10km (OEH 2018a); Species or species' habitat known to occur within 10km (DOE 2018a)	Occurs in near-coastal areas from northern shores of Sydney Harbour south to the northern and western shores of Botany Bay. Occurs on sandy soil on creek banks, hillslopes of in shallow soil in rock crevices and sandstone platforms on cliffs. Grows in scrub and open eucalypt woodland or forest.
<i>Allocasuarina glareicola</i>		E	E	Species or species' habitat may occur within 10km (DOE 2018a)	Primarily restricted to small populations in and around Castlereagh NR (NW Cumberland Plain), but with an outlier population at Voyager Point, Liverpool. Also reported from Holsworthy Military Area. Grows on tertiary alluvial gravels, with yellow clayey subsoil and lateritic soil. Occurs in Castlereagh open woodland.
<i>Allocasuarina portuensis</i>	Nielsen Park She-oak	E	E	50 records within 10km (OEH 2018a); Species or species' habitat may occur within 10km (DOE 2018a)	Restricted to within Nielsen Park (part of Sydney Harbour NP) in Woollahra. Cultivars have been planted throughout Sydney Harbour NP e.g. Gap Bluff, Hermit Point and Vacluse House. Originally found on a sandstone shelf approximately 20 m above the harbour, on shallow sandy soils in tall closed woodland. Has been planted in a variety of habitats.

Scientific Name	Common Name	BC Act status	EPBC Act status	Source	Habitat association
<i>Asterolasia elegans</i>		E	E	Species or species' habitat may occur within 10km (DOE 2018a)	Occurs north of Sydney, in the Baulkham Hills, Hawkesbury and Hornsby LGAs, may also occur in the western part of Gosford LGA. 7 known populations. Occurs on Hawkesbury sandstone, commonly amongst rocky outcrops and boulders in sheltered forests on mid- to lower slopes and valleys.
<i>Caladenia tessellata</i>	Thick Lip Spider Orchid	E	V	1 record within 10km (OEH 2018a); Species or species' habitat likely to occur within 10km (DOE 2018a)	Occurs from Central Coast NSW to southern Victoria. Mostly coastal but extends inland to Braidwood in southern NSW. In NSW grows in grassy dry sclerophyll woodland on clay loam or sandy soils, and less commonly in heathland on sandy loam soils (Duncan 2010).
<i>Callistemon linearifolius</i>	Netted Bottle Brush	V		10 records within 10km (OEH 2018a)	Recorded from the Georges to Hawkesbury Rivers in Sydney, and north to Nelson Bay. There is also a recent record from the northern Illawarra. In Sydney, recent records are limited to the Hornsby Plateau area near the Hawkesbury River. Grows in dry sclerophyll forest on the coast and adjacent ranges.
<i>Cryptostylis hunteriana</i>	Leafless Tongue Orchid	V	V	1 record within 10km (OEH 2018a); Species or species' habitat likely to occur within 10km (DOE 2018a)	Occurs in coastal areas from East Gippsland to southern Queensland. Habitat preferences not well defined. Grows mostly in coastal heathlands, margins of coastal swamps and sedgelands, coastal forest, dry woodland, and lowland forest. Prefers open areas in the understorey and is often found in association with Large Tongue Orchid and the Bonnet Orchid. Soils include moist sands, moist to dry clay loam and occasionally in accumulated eucalypt leaves. Flowers November-February.
<i>Darwinia biflora</i>		V	V	1 record within 10km (OEH 2018a); Species or species' habitat likely to occur within 10km (DOE 2018a)	Known from north and north-western Sydney, in the Ryde, Baulkham Hills, Hornsby and Ku-Ring-Gai LGAs. Grows on the edges of weathered shale-capped ridges, at the intergrade with Hawkesbury Sandstone. Occurs in woodland, open forest and scrub/heath. Associated overstorey species include Scribbly Gum, Red Bloodwood and/or Scaly Bark.
<i>Dillwynia tenuifolia</i>		V		3 records within 10km (OEH 2018a)	Bounded by Western Road, Elizabeth Drive, Devonshire Road and Cross Street, Kemps Creek in the Liverpool Local Government Area. This population occurs on a small outlier of the Berkshire Park Soil Landscape; the site supports a transition from Castlereagh Ironbark Forest to Castlereagh Scribbly Gum Woodland.
<i>Diuris arenaria</i>	Sand Doubletail	E		1 record within 10km (OEH 2018a)	Known from Tomaree Peninsula near Newcastle, in three locations. Inhabits coastal heath and dry grassy eucalypt forest on sandy flats on clay soil.

Scientific Name	Common Name	BC Act status	EPBC Act status	Source	Habitat association
<i>Doryanthes palmeri</i>	Giant Spear Lily	V		2 records within 10km (OEH 2018a)	Giant Spear Lily occurs in far north-east NSW and south-east Queensland. In NSW, it occurs on the coastal ranges that are part of the Mt Warning Caldera. Its southern distributional limit is Mount Billen. The species is currently known from eleven sites within NSW, five of which are conservation reserves. Most populations consist of only a few hundred individuals. Giant Spear Lily occurs on exposed rocky outcrops on infertile soils or on bare rock. It grows in a narrow band of vegetation along the cliff-tops and on steep cliff-faces or rocky ledges in montane heath next to subtropical rainforest, warm temperate rainforest or wet eucalypt forest.
<i>Epacris purpurascens</i> <i>var. purpurascens</i>		V		20 records within 10km (OEH 2018a)	Occurs from Gosford in the north, Narrabeen in the east, Silverdale in the west and Avon Dam vicinity in the South. Grows in a range of sclerophyll forest, scrubs and swamps, most of which have a strong shale soil influence.
<i>Eucalyptus camfieldii</i>	Camfield's Stringybark	V	V	1 record within 10km (OEH 2018a); Species or species' habitat likely to occur within 10km (DOE 2018a)	Occurs from Raymond Terrace to Waterfall, with populations known from Norah Head (Tuggerah Lakes), Peats Ridge, Mt Colah, Elvina Bay Trail (West Head), Terrey Hills, Killara, North Head, Menai and the Royal NP. Occurs in exposed situations on sandstone plateaus, ridges and slopes near the coast, often on the boundary of tall coastal heaths or low open woodland. It grows in shallow sandy soils overlying Hawkesbury sandstone.
<i>Eucalyptus leucoxydon</i> <i>subsp. pruinosa</i>	Yellow Gum	V		3 records within 10km (OEH 2018a)	Restricted to several small areas between Barham and Euston. This species is not known from any protected area within NSW, though some remnants occur within State Forests along the Murray River, particularly within Campbells Island and Euston State Forests. It occurs at the bases of sandy rises and on loamy clay flats on the floodplains of the Murray River and its tributaries in the Riverina Bioregion.
<i>Eucalyptus nicholii</i>	Narrow-leaved Black Peppermint	V	V	18 records within 10km (OEH 2018a)	Naturally occurs only in New England Tablelands from Nundle to north of Tenterfield. Widely planted as urban street tree. Grows in dry grassy woodland, on shallow and infertile soils, mainly on granite.
<i>Eucalyptus scoparia</i>	Wallangarra White Gum	E	V	25 records within 10km (OEH 2018a)	Occurs mostly in Queensland with only three known occurrences in NSW near Tenterfield. In NSW it is found on well-drained granitic hilltops, slopes and outcrops, often as scattered trees in open forest and woodland.
<i>Genoplesium baueri</i>	Bauer's Midge Orchid	E	E	1 record within 10km (OEH 2018a); Species or species' habitat likely to occur within 10km (DOE 2018a)	Occurs from Ulladulla to Port Stephens, with only 13 known extant populations. Grows in sparse sclerophyll forest and moss gardens over sandstone

Scientific Name	Common Name	BC Act status	EPBC Act status	Source	Habitat association
<i>Grevillea beadleana</i>	Beadle's Grevillea	E	E	1 record within 10km (OEH 2018a)	Four disjunct populations in north-east NSW: Torrington west of Tenterfield, Oxley Wild Rivers NP, Guy Fawkes River NP and Shannon Creek southwest of Grafton. Grows in open eucalypt forest with shrubby understorey, usually on steep granite slopes at high altitudes.
<i>Hypsela sessiliflora</i>			X	1 record within 10km (OEH 2018a)	Currently known from a single location less than 10x15m on the Cumberland Plain in western Sydney. Known to grow in damp places, on the Cumberland Plain, including freshwater wetland, grassland/alluvial woodland and an alluvial woodland/shale plains woodland (Cumberland Plain Woodland) ecotone. May be an early successional species that benefits from some disturbance. Possibly out competed when overgrown by some species such as Couch.
<i>Leptospermum deanei</i>		V	V	1 record within 10km (OEH 2018a)	Occurs in NW Sydney, in the Hornsby, Warringah, Ku-ring-gai and Ryde LGAs. Grows in woodland on lower hill slopes or near creeks, in sandy alluvial soil or sand over sandstone. Occurs in riparian scrub, woodland and open forest.
<i>Macadamia tetraphylla</i>	Rough-shelled Bush Nut	V	V	4 records within 10km (OEH 2018a)	Confined chiefly to the Richmond and Tweed Rivers in north-east NSW, extending just across the border into Queensland. Grows in subtropical rainforest, usually near the coast.
<i>Melaleuca biconvexa</i>	Biconvex Paperbark	V	V	1 record within 10km (OEH 2018a); Species or species' habitat may occur within 10km (DOE 2018a)	Scattered, disjunct populations in coastal areas from Jervis Bay to Port Macquarie, with most populations in the Gosford-Wyong areas. Grows in damp places, often near streams or low-lying areas on alluvial soils of low slopes or sheltered aspects.
<i>Melaleuca deanei</i>	Deane's Paperbark	V	V	1 record within 10km (OEH 2018a)	Occurs from Nowra- St Albans and west to the Blue Mountains, with most records in Ku-ring-gai / Berowra and Holsworthy/Wedderburn areas. Mostly grows on broad flat ridgetops, dry ridges and slopes and strongly associated with low nutrient sandy loam soils, sometimes with ironstone. Grows in heath-open forest, often in sandstone ridgetop woodland communities.
<i>Pelargonium sp. Striatellum</i>	Omeo Stork's-bill	E	E	Species or species' habitat may occur within 10km (DOE 2018a)	Omeo Storksbill <i>Pelargonium</i> sp. (G.W. Carr 10345), syn. <i>P. striatellum</i> , is a tufted perennial forb known from only 3 locations in NSW, with two on lakebeds on the basalt plains of the Monaro and one at Lake Bathurst. It has a narrow habitat that is usually just above the high-water level of irregularly inundated or ephemeral lakes, in the transition zone between surrounding grasslands or pasture and the wetland or aquatic communities.
<i>Persoonia hirsuta</i>	Hairy Geebung	E	E	1 record within 10km (OEH 2018a)	Occurs within the Blue Mountains, Southern Highlands and Sydney coastal regions from Hilltop to Glen Davis and Royal NP to Gosford. Population within

Scientific Name	Common Name	BC Act status	EPBC Act status	Source	Habitat association
					the Hills Shire particularly important due to high density of plants. Grows on sandy soils in dry sclerophyll open forest, woodland and heath on sandstone up to 600m above sea level.
<i>Pimelea curviflora</i> var. <i>curviflora</i>		V	V	1 record within 10km (OEH 2018a); Species or species' habitat likely to occur within 10km (DOE 2018a)	Confined to area between north Sydney in the south and Maroota in the north-west. Former range extended to Parramatta River including Five Dock, Bellevue Hill and Manly. Grows on shale/lateritic soils over sandstone and shale/sandstone transition soils on ridgetops and upper slopes amongst woodlands. Often grows amongst dense grasses and sedges. Flowers October to May.
<i>Pimelea spicata</i>	Spiked Rice-flower	E	E	Species or species' habitat may occur within 10km (DOE 2018a)	Disjunct populations within the Cumberland Plain (from Mount Annan and Narellan Vale to Freemans Reach and Penrith to Georges Hall) and Illawarra (from Mt Warrigal to Gerroa) (DEC 2005). In the Cumberland Plain region, restricted to areas which support or historically supported Cumberland Plain Woodland. Grows on well-structured clay soils derived from Wianamatta Shale. In the Illawarra, grows on variable soils in close proximity to the coast on hills or coastal headlands. Inhabits coastal woodland or grassland with emergent shrubs (DEC 2005).
<i>Pomaderris prunifolia</i>	P. prunifolia in the Parramatta, Auburn, Strathfield and Bankstown Local Government Areas	EP		9 records within 10km (OEH 2018a)	Known from only 3 sites within population range: at Rydalmere, within Rookwood Cemetery and at The Crest of Bankstown. At Rydalmere occurs along a road reserve near a creek, among grass species on sandstone. At Rookwood Cemetery occurs in small gully of degraded Cooks River / Castlereagh Ironbark Forest on shale soils.
<i>Prostanthera marifolia</i>	Seaforth Mintbush	CE	CE	1 record within 10km (OEH 2018a)	Only known from a 2 x 2 km area in Seaforth, northern Sydney. Associated with the endangered Duffys Forest ecological community. Grows on deeply weathered clay-loam soils associated with ironstone and scattered shale lenses.
<i>Pterostylis saxicola</i>	Sydney Plains Greenhood	E	E	1 record within 10km (OEH 2018a); Species or species' habitat likely to occur within 10km (DOE 2018a)	Occurs in western Sydney between Picton and Freemans Reach. Grows in small pockets of shallow soil in depressions on sandstone rock shelves above cliff lines. Associated vegetation above these rock shelves is sclerophyll forest or woodland on shale or shale/sandstone transition soils.
<i>Pterostylis</i> sp. <i>Botany Bay</i>	Botany Bay Bearded Orchid	E	E	12 records within 10km (OEH 2018a); Species or species' habitat likely to	Restricted to the Sydney region where it is known from a small number of sites within Botany Bay National Park on the Kurnell Peninsula. Occupies moist level sites on skeletal sandy soils derived from sandstone. Associated

Scientific Name	Common Name	BC Act status	EPBC Act status	Source	Habitat association
				occur within 10km (DOE 2018a)	vegetation includes coastal heath dominated by <i>Melaleuca nodosa</i> and <i>Baeckea imbricata</i> . Flowering occurs from August to September.
<i>Senecio spathulatus</i>	Coast Groundsel	E		3 records within 10km (OEH 2018a)	Coast Groundsel occurs in Nadgee Nature Reserve (Cape Howe) and between Kurnell in Sydney and Myall Lakes National Park (with a possible occurrence at Cudmirrah). Grows on frontal dunes.
<i>Senna acclinis</i>	Rainforest Cassia	E		1 record within 10km (OEH 2018a)	Coastal districts and adjacent tablelands of NSW from the Illawarra in NSW to Queensland. Grows in or on the edges of subtropical and dry rainforest (OEH 2012).
<i>Syzygium paniculatum</i>	Magenta Lilly Pilly	E	V	124 records within 10km (OEH 2018a); Species or species' habitat known to occur within 10km (DOE 2018a)	Occurs in narrow coastal strip from Bulahdelah to Conjola State Forest. Grows in rainforest on sandy soils or stabilised Quaternary sand dunes at low altitudes in coastal areas, often in remnant littoral or gallery rainforests.
<i>Tetradlea glandulosa</i>		V		1 record within 10km (OEH 2018a)	Restricted to The Hills, Gosford, Hawkesbury, Hornsby, Ku-ring-gai, Pittwater, Ryde, Warringah, and Wyong LGAs. Associated with shale-sandstone transition habitat (shale-cappings over sandstone). Occupies ridgetops, upper-slopes and to a lesser extent mid-slope sandstone benches. Soils generally shallow, yellow, clayey/sandy loam, commonly with lateritic fragments. Vegetation varies from heath to open forest and is broadly equivalent to Sydney Sandstone Ridgetop Woodland community.
<i>Tetradlea juncea</i>	Black-eyed Susan	V	V	1 record within 10km (OEH 2018a)	Regarded as extinct within the Sydney area, current range from Wyong north to Bulahdelah and inland 50km to edge of Sugarloaf Range. Occurs predominately in areas of over 1000 mm annual rainfall, within dry sclerophyll forest, and sometimes heath and moist forest, with a preference for Coastal Plains Smooth-barked Apple Woodland and Coastal Plains Scribbly Gum Woodland.
<i>Thesium australe</i>	Austral Toadflax	V	V	1 record within 10km (OEH 2018a); Species or species' habitat may occur within 10km (DOE 2018a)	Found in small, scattered populations along the east coast, northern and southern tablelands. Occurs in grassland or grassy woodland, and is often found in association with Kangaroo Grass.
<i>Tinospora tinoporoides</i>	Arrow-head Vine	V		1 record within 10km (OEH 2018a)	North from the Richmond River in north-east NSW, where it is locally common in some parts of its range. Also recorded from a single location in south-east

Scientific Name	Common Name	BC Act status	EPBC Act status	Source	Habitat association
					Queensland. Wetter subtropical rainforest, including littoral rainforest, on fertile, basalt-derived soils.
<i>Wahlenbergia multicaulis</i>	Tadgell's Bluebell in the local government areas of Auburn, Bankstown, Baulkham Hills, Canterbury, Hornsby, Parramatta and Strathfield	EP		50 records within 10km (OEH 2018a)	Found in disturbed sites and grows in a variety of habitats including forest, woodland, scrub, grassland and the edges of watercourses and wetlands. Typically occurs in damp, disturbed sites (with natural or human disturbance of various forms), typically amongst other herbs rather than in the open.
<i>Wilsonia backhousei</i>	Narrow-leafed Wilsonia	V		75 records within 10km (OEH 2018a)	In NSW it is scattered along the coast with a northern limit of Wamberal, north of Sydney. Most extensive stands at Jervis Bay. Grows on the margins of saltmarshes and lakes.
<i>Zannichellia palustris</i>		E		5 records within 10km (OEH 2018a)	Known from the Lower Hunter and Sydney Olympic Park. A submerged aquatic plant that grows in fresh or slightly saline water.

Key: CE – critically endangered, E – endangered, EP – endangered population, V – vulnerable, X - extinct

Table B.3 Threatened fauna species known or predicted to occur within 10 kilometres of the project site

Scientific name	Common name	BC Act status	EPBC Act status	Source	Habitat association
<i>Botaurus poiciloptilus</i>	Australasian Bittern	E	E	11 records within 10km (OEH 2018a); Species or species' habitat known to occur within 10km (DOE 2018a)	Widespread but uncommon over most NSW except the northwest. Favours permanent freshwater wetlands with tall dense reedbeds particularly <i>Typha</i> spp. and <i>Eleocharis</i> spp., with adjacent shallow, open water for foraging. Roosts during the day amongst dense reeds or rushes and feeds mainly at night on frogs, fish, yabbies, spiders, insects and snails.
<i>Sternula nereis nereis</i>	Australian Fairy Tern		V	1 record within 10km (OEH 2018a); Breeding likely to occur within area (DOE 2018a)	Occurs along NSW coast. Inhabit offshore, estuarine or lake islands, wetlands, beaches and spits. Nests on coral shingle on continental islands or coral cays, on sandy islands and beaches inside estuaries and on open sandy beaches.
<i>Rostratula australis</i>	Australian Painted Snipe	E	E	4 records within 10km (OEH 2018a); Species or species' habitat likely to occur within 10km (DOE 2018a)	Normally found in permanent or ephemeral shallow inland wetlands, either freshwater or brackish. Nests on the ground amongst tall reed-like vegetation near water. Feeds on mudflats and the water's edge taking insects, worm and seeds. Prefers fringes of swamps, dams and nearby marshy areas with cover of grasses, lignum, low scrub or open timber.
<i>Ninox connivens</i>	Barking Owl	V		1 record within 10km (OEH 2018a)	Occurs from coast to inland slopes and plains, though is rare in dense, wet forests east of the Great Dividing Range and sparse in higher parts of the tablelands and in the arid zone. Inhabits eucalypt woodlands, open forest, swamp woodlands, and, especially in inland areas, timber along watercourses. Roosts along creek lines in dense, tall understorey foliage (e.g. in Acacia and Casuarina), or dense eucalypt canopy. Nests in hollows of large, old eucalypts including <i>Eucalyptus camaldulensis</i> , <i>Eucalyptus albens</i> , <i>Eucalyptus polyanthemos</i> and <i>Eucalyptus blakelyi</i> . Birds and mammals important prey during breeding. Territories range from 30 to 200 hectares.
<i>Esacus magnirostris</i>	Beach Stone-curlew	CE		2 records within 10km (OEH 2018a)	In NSW occurs regularly from the Manning River north, with occasional vagrants to South-east NSW and VIC. Inhabit a range of beaches, islands, reefs and in estuaries. Often seen near mangroves. Forage in the intertidal zone of beaches and estuaries, on islands, flats, banks and spits of sand, mud, gravel or rock, and among mangroves. Nests in shallow scrapes above the littoral zone, among low vegetation of grass, scattered shrubs or low trees; also among open mangroves or on sandbanks.

Scientific name	Common name	BC Act status	EPBC Act status	Source	Habitat association
<i>Ixobrychus flavicollis</i>	Black Bittern	V		6 records within 10km (OEH 2018a)	Occurs from southern NSW to Cape York and the Kimberley, and southwest WA. Inhabits terrestrial and estuarine wetlands, generally in areas of permanent water and dense vegetation. May occur in flooded grassland, forest, woodland, rainforest and mangroves as long as there is permanent water. Roosts by day in trees or within reeds on the ground. Nests in branches overhanging water and breeds from December to March.
<i>Ephippiorhynchus asiaticus</i>	Black-necked Stork	E		1 record within 10km (OEH 2018a)	In NSW, becomes increasingly uncommon south of the Northern Rivers region, and rarely occurs south of Sydney. Breeding recorded as far south as Buladelah, though most breeding in NSW occurs in the north-east. Primarily inhabits permanent freshwater wetlands and surrounding vegetation including swamps, floodplains, watercourses and billabongs, freshwater meadows, wet heathland, farm dams and shallow floodwaters. Will also forage in inter-tidal shorelines, mangrove margins and estuaries. Feeds in shallow, still water. Breeds during summer, nesting in or near a freshwater swamp.
<i>Limosa limosa</i>	Black-tailed Godwit	V	C,J,K	8 records within 10km (OEH 2018a)	The Black-tailed Godwit is a migratory wading bird that breeds in Mongolia and Eastern Siberia and flies to Australia for the southern summer, arriving in August and leaving in March. In NSW, it is most frequently recorded at Kooragang Island (Hunter River estuary), with occasional records elsewhere along the north and south coast, and inland. Records in western NSW indicate that a regular inland passage is used by the species, as it may occur around any of the large lakes in the western areas during summer, when the muddy shores are exposed. It is usually found in sheltered bays, estuaries and lagoons with large intertidal mudflats and/or sandflats. It has also been found around muddy lakes and swamps, wet fields and sewerage treatment works.
<i>Limicola falcinellus</i>	Broad-billed Sandpiper	V	C,J,K	3 records within 10km (OEH 2018a)	Breeds in the northern hemisphere. In the non-breeding season most common in north and north west of Australia, but is a regular visitor in small numbers to the NSW coast from Ballina to Shoalhaven Heads. Occurs on sheltered parts of the coast, favouring estuarine mudflats but also occasionally in saltmarshes, freshwater lagoons, saltworks and sewerage farms. Forage on exposed mudflats or wet sand.
<i>Burhinus grallarius</i>	Bush Stone-curlew	E		5 records within 10km (OEH 2018a)	Scattered distribution across NSW. Inhabits lowland grassy woodland and open forest and, in coastal areas, Casuarina and Melaleuca woodlands, saltmarsh and mangroves. Requires a low, sparse groundcover, some fallen timber and leaf litter, and a general lack of a shrubby understory (DEC 2006).

Scientific name	Common name	BC Act status	EPBC Act status	Source	Habitat association
<i>Calidris ferruginea</i>	Curlew Sandpiper	E	CE,C,J,K	378 records within 10km (OEH 2018a); Species or species' habitat known to occur within 10km (DOE 2018a)	Breeds in northern hemisphere. In Australia generally occupies littoral and estuarine habitats. In NSW mainly found in intertidal mudflats on sheltered coasts. Roosts on beaches, spits or islands on the coast/in wetlands, or in saltmarsh on rocky shores.
<i>Stagonopleura guttata</i>	Diamond Firetail	V		2 records within 10km (OEH 2018a)	Typically found west of the Great Dividing Range, but populations also occur in drier coastal areas including W Sydney, Hunter, Clarence and Snowy River valleys. Occurs in grassy eucalypt woodlands including Box Gum and Snow Gum communities, as well as open forest, mallee and natural and derived grasslands. Often found in riparian areas and occasionally in lightly wooded farmland. Nests in shrubby understorey or higher up under nests of other species.
<i>Artamus cyanopterus</i>	Dusky Woodswallow	V		19 records within 10km (OEH 2018a)	The Dusky Woodswallow is widespread from the coast to inland, including the western slopes of the Great Dividing Range and farther west. It is often recorded in woodlands and dry open sclerophyll forests, and has also been recorded in shrublands, heathlands regenerating forests and very occasionally in moist forests or rainforests. The understorey is typically open with sparse eucalypt saplings, acacias and other shrubs, often with coarse woody debris. It is also recorded in farmland, usually at the edges of forest or woodland or in roadside remnants or wind breaks with dead timber. The nest is an open shallow untidy cup frequently built in an open hollow, crevice or stump. Although Dusky Woodswallows have large home ranges, individuals may spend most of their time in about a 2 ha range and defend an area about 50 m around the nest. Dusky Woodswallows prefer larger remnants over smaller remnants. Competitive exclusion by Noisy Miners (<i>Manorina melanocephala</i>) is a significant threat to this species.
<i>Dasyornis brachypterus</i>	Eastern Bristlebird	E	E	Species or species' habitat likely to occur within 10km (DOE 2018a)	Occurs in three disjunct areas of south-eastern Australia: southern Queensland/northern NSW, the Illawarra Region and in the vicinity of the NSW/Victorian border. Illawarra population comprises an estimated 1600 birds, mainly from Barren Grounds Nature Reserve, Budderoo National Park and the Jervis Bay area. Habitat characterised by dense, low vegetation including heath and open woodland with a heathy understorey. The fire history of habitat is important, and the Illawarra and southern populations reach maximum densities in habitat that have not been burnt for over 15 years.

Scientific name	Common name	BC Act status	EPBC Act status	Source	Habitat association
<i>Numenius madagascariensis</i>	Eastern Curlew		CE,C,J,K	589 records within 10km (OEH 2018a); Species or species' habitat known to occur within 10km (DOE 2018a)	Within Australia, the species has a primarily coastal distribution. The species is found in all states, particularly the north, east, and south-east regions including Tasmania. Breeds in Russia and north-eastern China. Most commonly associated with sheltered coasts, especially estuaries, bays, harbours, inlets and coastal lagoons, with large intertidal mudflats or sandflats, often with beds of seagrass. Occasionally, the species occurs on ocean beaches (often near estuaries), and coral reefs, rock platforms, or rocky islets. The birds are often recorded among saltmarsh and on mudflats fringed by mangroves, and sometimes use the mangroves. The birds are also found in saltworks and sewage farms.
<i>Tyto longimembris</i>	Eastern Grass Owl	V		17 records within 10km (OEH 2018a)	Most common in N and NE Australia, but recorded in all mainland states. In NSW most likely to be resident in the NE. Inhabit areas of tall grass, including grass tussocks, in swampy areas, grassy plains, swampy heath, and in cane grass or sedges on flood plains. Nests on the ground in trodden grass, and are often accessed by tunnels through vegetation.
<i>Pezoporus wallicus wallicus</i>	Eastern Ground Parrot	V		2 records within 10km (OEH 2018a)	Occurs in high rainfall coastal and near coastal low heathlands and sedgelands, generally below one metre in height and very dense (up to 90% projected foliage cover). Ground Parrots can re-colonise burnt habitat after 1-2 years and reach maximum densities after 15-20 years without fire. Home ranges of adult birds is typically 10 ha and overlapping with other birds, while juveniles have a significantly larger home range. Ground Parrots feed mostly on seeds from a large range of plant species, which varies seasonally. eggs are laid in a shallow bowl of fine sticks and grass, well hidden under overhanging tall, coarse grass, sedge or low, heathy shrubs.
<i>Pandion cristatus</i>	Eastern Osprey	V		16 records within 10km (OEH 2018a)	Favours coastal areas, especially the mouths of large rivers, lagoons and lakes. They feed on fish over clear, open water. Breeding takes place from July to September in NSW, with nests being built high up in dead trees or in dead crowns of live trees, usually within one kilometre of the sea, though there are a handful of records from inland areas.
<i>Pachyptila turtur subantarctica</i>	Fairy Prion		V	Species or species' habitat known to occur within 10km (DOE 2018a)	The fairy prion (southern) breeds on Macquarie Island and a number of other subantarctic islands outside of Australia. The subspecies digs burrows among rocks or low vegetation in which to nest. Burrows may be dug below mat forming herbs. Fairy Prion feed by plucking food from the ocean surface. Some individuals may migrate towards New Zealand and southern Australia in winter.
<i>Petroica phoenicea</i>	Flame Robin	V		1 record within 10km (OEH 2018a)	Breeds in upland moist eucalypt forests and woodlands, often on ridges and slopes, in areas of open understorey. Migrates in winter to more open

Scientific name	Common name	BC Act status	EPBC Act status	Source	Habitat association
					lowland habitats such as grassland with scattered trees and open woodland on the inland slopes and plains. Forages from low perches, feeding on invertebrates taken from the ground, tree trunks, logs and other coarse woody debris. Fallen logs and coarse woody debris are important habitat components. Open cup nest of plant fibres and cobweb is often built near the ground in a sheltered niche, ledge or shallow cavity in a tree, stump or bank.
<i>Stictonetta naevosa</i>	Freckled Duck	V		2 records within 10km (OEH 2018a)	Breeds in large, ephemeral swamps in the Murray-Darling, particularly along the Paroo and Lachlan Rivers and other Riverina rivers. In drier times moves to more permanent waters. Disperses during extensive inland droughts and may be found in coastal areas during such times. Prefers freshwater swamps/creeks with dense Cumbungi, Lignum or tea-tree. Nests in dense vegetation at or near water level.
<i>Calyptorhynchus lathamii</i>	Glossy Black-Cockatoo	V		4 records within 10km (OEH 2018a)	Widespread but uncommon from coast to southern tablelands and central western plains. Feeds almost exclusively on the seeds of Allocasuarina species. Prefers woodland and open forests, rarely away from Allocasuarina. Roost in leafy canopy trees, preferably eucalypts, usually <1km from feeding site. Nests in large (approx. 20cm) hollows in trees, stumps or limbs, usually in Eucalypts (Higgins 1999).
<i>Calidris tenuirostris</i>	Great Knot	V	CE,C,J,K	13 records within 10km (OEH 2018a); Foraging, feeding or related behaviour known to occur within area (DOE 2018a)	Breeds in northern hemisphere. In Australia, prefers sheltered coastal habitats with large intertidal mud or sandflats, including inlets, bays, harbours, estuaries and lagoons. Occasionally found on exposed reefs or rock platforms, mangroves, saltwork ponds, near-coastal swamps, saltlakes and non-tidal lagoons. Rarely occurs on inland lakes and swamps. Roosts in large groups in open areas, often at the water's edge or in shallow water close to feeding areas.
<i>Charadrius leschenaultii</i>	Greater Sand-plover	V	V,C,J,K	5 records within 10km (OEH 2018a); Foraging, feeding or related behaviour known to occur within area (DOE 2018a)	Does not breed in Australia. In NSW, recorded between the northern rivers and the Illawarra, with most records coming from the Clarence and Richmond estuaries. Occurs mainly on sheltered sandy, shelly or muddy beaches or estuaries with large intertidal mudflats or sandbanks. Roosts during high tide on sandy beaches and rocky shores; forage on wet ground at low tide.
<i>Thinornis rubricollis</i>	Hooded Plover	CE	V	1 record within 10km (OEH 2018a)	The Hooded Plover is endemic to southern Australia and is nowadays found mainly along the coast from south of Jervis Bay. In the late 1920s and early 1930s the species was recorded from Port Stephens but are now considered locally extinct. It has not been seen in the Sydney area since the 1940s. Occasionally, individual birds are sighted slightly further north to the

Scientific name	Common name	BC Act status	EPBC Act status	Source	Habitat association
					Shoalhaven River and Comerong Beach and one bird was sighted at Lake Illawarra in March 2001. Hooded Plovers prefer sandy ocean beaches backed by sparsely vegetated sand-dunes for shelter and nesting. Hooded Plovers display high nest site fidelity and nest solitarily. Occasionally Hooded Plovers are found on tidal bays and estuaries, rock platforms and rocky or sand-covered reefs near sandy beaches, and small beaches in lines of cliffs. They regularly use near-coastal saline and freshwater lakes and lagoons, often with saltmarsh.
<i>Charadrius mongolus</i>	Lesser Sand-plover	V	E,C,J,K	33 records within 10km (OEH 2018a); Foraging, feeding or related behaviour known to occur within area (DOE 2018a)	Does not breed in Australia. Found along the entire coast of Australia, most common in northern NSW, QLD and the Gulf of Carpentaria. Rarely recorded south of the Shoalhaven. In NSW almost entirely coastal, on beaches of sheltered bays, harbours and estuaries with large intertidal sand or mudflats, occasionally on sandy beaches, coral reefs and rock platforms.
<i>Hieraaetus morphnoides</i>	Little Eagle	V		5 records within 10km (OEH 2018a)	Occurs throughout NSW except most densely forested parts of the Dividing Range escarpment. Occupies habitats rich in prey within open eucalypt forest, woodland or open woodland. Sheoak or acacia woodlands and riparian woodlands of interior NSW are also used. For nest sites it requires a tall living tree within a remnant patch, where pairs build a large stick nest in winter and lay in early spring.
<i>Glossopsitta pusilla</i>	Little Lorikeet	V		4 records within 10km (OEH 2018a)	Occurs from coast to western slopes of the Great Dividing Range. Inhabits dry, open eucalypt forests and woodlands. Occurrence is positively associated with patch size, and with components of habitat complexity including canopy cover, shrub cover, ground cover, logs, fallen branches and litter. Feed primarily on profusely-flowering eucalypts and a variety of other species including melaleucas and mistletoes. On the western slopes and tablelands <i>Eucalyptus albens</i> and <i>E. melliodora</i> are particularly important food sources for pollen and nectar respectively. Mostly nests in small (opening approx. 3cm) hollows in living, smooth-barked eucalypts, especially <i>Eucalyptus viminalis</i> , <i>E. blakelyi</i> and <i>E. dealbata</i> . Most breeding records are from the western slopes.
<i>Sternula albifrons</i>	Little Tern	E	C,J,K	1110 records within 10km (OEH 2018a)	In NSW occurs mainly north of Sydney, with smaller numbers south to VIC. Almost exclusively coastal, preferring sheltered environments; may occur several kilometres from the sea in harbours, inlets and rivers. Nests in low dunes or sandy beaches just above high tide mark near estuary mouths/ adjacent to coastal lakes and islands. Forage in shallow waters of estuaries,

Scientific name	Common name	BC Act status	EPBC Act status	Source	Habitat association
					coastal lagoons and lakes, also along open coasts, less often at sea, and usually within 50 m of shore.
<i>Lophochroa leadbeateri</i>	Major Mitchell's Cockatoo	V		2 records within 10km (OEH 2018a)	Occupies habitat in arid semi-desert scrublands, savannahs and sparse woodlands, where there is fresh surface water and large hollow trees for nesting. These birds have been recorded in forest, woodland and shrub land, including mulga, mallee, Acacia, Eucalyptus and Callitris associations. It has also been recorded in cropping areas throughout its range (Queensland Government EPA Agency, 2007). Large areas of suitable habitat are required for a viable population to exist (Webster et al undated).
<i>Tyto novaehollandiae</i>	Masked Owl	V		2 records within 10km (OEH 2018a)	Occurs across NSW except NW corner. Most common on the coast. Inhabits dry eucalypt woodlands from sea level to 1100 m. Roosts and breeds in large (>40cm) hollows and sometime caves in moist eucalypt forested gullies. Hunts along the edges of forests and roadsides. Home range between 500 ha and 1000 ha. Prey mostly terrestrial mammals but arboreal species may also be taken.
<i>Limosa lapponica menzibieri</i>	Northern Siberian Godwit		CE	Species or species' habitat may occur within 10km (DOE 2018a)	Has been recorded in the coastal areas of all Australian states. It is widespread in the Torres Strait and along the east and south-east coasts of Queensland, NSW and Victoria, including the offshore islands. Breeds in the north of Scandinavia, Russia and north-west Alaska. Found mainly in coastal habitats such as large intertidal sandflats, banks, mudflats, estuaries, inlets, harbours, coastal lagoons and bays.
<i>Neophema chrysogaster</i>	Orange-bellied Parrot	CE	CE	1 record within 10km (OEH 2018a)	Breeds in Tasmania and migrates in winter to SE South Australia and southern Victoria. There are occasional reports from NSW, including Shellharbour, Maroubra and the Shoalhaven. In winter, usually found within 3 km of the coast in saltmarsh and strandline/ foredune vegetation. May also occur on golf-courses and other grassy areas, including improved pasture.
<i>Grantiella picta</i>	Painted Honeyeater	V	V	Species or species' habitat may occur within 10km (DOE 2018a)	Nomadic, occurring in low densities across most of NSW. Highest concentrations and almost all breeding occur on inland slopes of the Great Dividing Range. Inhabits Boree, Brigalow and Box Gum woodlands and Box-Ironbark forests. Specialist forager on the fruits of mistletoes, preferably of the <i>Amyema</i> genus. Nests in outer tree canopy.
<i>Haematopus longirostris</i>	Pied Oystercatcher	E		901 records within 10km (OEH 2018a)	Scattered along NSW coast. Favours intertidal flats of inlets and bays, open beaches and sandbanks. Forages on exposed sand, mud and rock at low tide. Nests mostly on coastal or estuarine beaches; occasionally saltmarsh or grassy areas.

Scientific name	Common name	BC Act status	EPBC Act status	Source	Habitat association
<i>Ninox strenua</i>	Powerful Owl	V		254 records within 10km (OEH 2018a)	Occurs from the coast to the western slopes. Solitary and sedentary species. Inhabits a range of habitats from woodland and open sclerophyll forest to tall open wet forest and rainforest. Prefers large tracts of vegetation. Nests in large tree hollows (> 0.5 m deep), in large eucalypts (dbh 80-240 cm) that are at least 150 years old. Pairs have high fidelity to a small number of hollow-bearing nest trees and defend a large home range of 400 - 1,450 ha. Forages within open and closed woodlands as well as open areas.
<i>Calidris canutus</i>	Red Knot		E,C,J,K	86 records within 10km (OEH 2018a); Species or species' habitat known to occur within 10km (DOE 2018a)	Breeds in northern hemisphere. Occurs in coastal areas around Australia, with important sites in VIC, SA, WA, NT and Qld. Mainly inhabits intertidal mudflats, sandflats and sandy beaches. Occasionally seen in terrestrial saline wetlands but rarely in freshwater wetlands. Forage in soft substrates in intertidal areas.
<i>Anthochaera phrygia</i>	Regent Honeyeater	CE	CE	1 record within 10km (OEH 2018a); Species or species' habitat known to occur within 10km (DOE 2018a)	In NSW confined to two known breeding areas: the Capertee Valley and Bundarra-Barraba region. Non-breeding flocks occasionally seen in coastal areas foraging in flowering Spotted Gum and Swamp Mahogany forests, presumably in response to drought. Inhabits dry open forest and woodlands, particularly Box-Ironbark woodland and riparian forests of River Sheoak, with an abundance of mature trees, high canopy cover and abundance of mistletoes.
<i>Ptilinopus regina</i>	Rose-crowned Fruit-Dove	V		1 record within 10km (OEH 2018a)	Occurs from Newcastle north to Cape York, with vagrants occasionally as far south as Victoria. Occur mainly in sub-tropical and dry rainforest and occasionally in moist eucalypt forest and swamp forest, where fruit is plentiful. Thought to be locally nomadic in response to fruit availability.
<i>Calidris alba</i>	Sanderling	V	C,J,K	18 records within 10km (OEH 2018a)	Sanderlings occur along the NSW coast, with occasional inland sightings. Often found in coastal areas on low beaches of firm sand, near reefs and inlets, along tidal mudflats and bare open coastal lagoons; individuals are rarely recorded in near-coastal wetlands. Roosts on bare sand, behind clumps of beach-cast kelp or in coastal dunes.
<i>Petroica boodang</i>	Scarlet Robin	V		1 record within 10km (OEH 2018a)	In NSW occurs from coast to inland slopes. Breeds in drier eucalypt forests and temperate woodlands, often on ridges and slopes, within open understorey of shrubs and grasses and sometimes in open areas. In autumn and winter it migrates to more open habitats such as grassy open woodland or paddocks with scattered trees. Abundant logs and coarse woody debris are important habitat components.

Scientific name	Common name	BC Act status	EPBC Act status	Source	Habitat association
<i>Tyto tenebricosa</i>	Sooty Owl	V		1 record within 10km (OEH 2018a)	Occurs in the coastal, escarpment and tablelands regions of NSW. More common in the north and absent from the western tablelands and further west. Inhabits tall, moist eucalypt forests and rainforests, and are strongly associated with sheltered gullies, particularly those with tall rainforest understorey. Roosts in tree hollows, amongst dense foliage in gullies or in caves, recesses or ledges of cliffs or banks. Nest in large (>40cm wide, 100cm deep) tree hollows in unlogged/unburnt gullies within 100m of streams or in caves.
<i>Haematopus fuliginosus</i>	Sooty Oystercatcher	V		182 records within 10km (OEH 2018a)	Evenly distributed along NSW coast, including offshore islands. Favours rocky headlands, rocky shelves, exposed reefs with rock pools, beaches and muddy estuaries. Forages on exposed rock or coral at low tide. Breeds almost exclusively on offshore islands, and occasionally on isolated promontories.
<i>Onychoprion fuscata</i>	Sooty Tern	V		3 records within 10km (OEH 2018a)	Occurs over tropical and subtropical seas and islands around northern NSW. Occasionally seen along coastal NSW, especially after cyclones. Breeds in sand or coral scrapes on offshore islands and cays including Lord Howe and Norfolk Islands.
<i>Circus assimilis</i>	Spotted Harrier	V		3 records within 10km (OEH 2018a)	Occurs throughout Australian mainland, except in densely forested or wooded habitats of the coast, escarpment and ranges, and rarely in Tasmania. Individuals disperse widely in NSW and comprise a single population. Inhabits grassy open woodland including acacia and mallee remnants, inland riparian woodland, grassland and shrub steppe (e.g. chenopods). Most commonly in native grassland, but also in agricultural land, foraging over open habitats including edges of inland wetlands. Builds a stick nest in a tree and lays eggs in spring (or sometimes autumn).
<i>Lophoictinia isura</i>	Square-tailed Kite	V		5 records within 10km (OEH 2018a)	Occurs across NSW, resident in North, northeast and along west-flowing rivers. Summer breeding migrant to southeast of state. Inhabits a variety of habitats including woodlands and open forests, with preference for timbered watercourses. Favours productive forests on the coastal plain, box-ironbark-gum woodlands on the inland slopes, and Coolibah/River Red Gum on the inland plains. In Sydney area nests in mature living trees within 100m of ephemeral/permanent watercourse. Large home range > 100 km ² .
<i>Ptilinopus superbus</i>	Superb Fruit-Dove	V		1 record within 10km (OEH 2018a)	Occurs mainly north from NE NSW, much less common further south and largely confined to pockets of habitat south to Moruya. Vagrants occur south to VIC and TAS. Inhabits rainforest and closed forests, may also forage in eucalypt or acacia woodland with fruit-bearing trees. Nests 5-30 m above

Scientific name	Common name	BC Act status	EPBC Act status	Source	Habitat association
					ground in rainforest/rainforest edge tree and shrub species. Part of the population migratory/nomadic.
<i>Lathamus discolor</i>	Swift Parrot	E	CE	6 records within 10km (OEH 2018a); Species or species' habitat known to occur within 10km (DOE 2018a)	Migratory, travelling to the mainland from March to October. Breeds in Tasmania from September to January. On the mainland, it mostly occurs in the southeast foraging on winter flowering eucalypts and lerps, with records of the species between Adelaide and Brisbane. Principal over-winter habitat is box-ironbark communities on the inland slopes and plains. Eucalyptus robusta, Corymbia maculata and C. gummifera dominated coastal forests are also important habitat.
<i>Xenus cinereus</i>	Terek Sandpiper	V	C,J,K	38 records within 10km (OEH 2018a)	The two main sites for this species in NSW are the Richmond River and Hunter River estuaries. Inhabits coastal mudflats, lagoons, creeks and estuaries. Favours mudbanks and sandbanks near mangroves, also observed on rocky pools and reefs and up to 10 km inland around brackish pools. Roost communally in mangroves or dead trees. Forages in open intertidal mudflats.
<i>Neophema pulchella</i>	Turquoise Parrot	V		1 record within 10km (OEH 2018a)	Occurs from coast to inland slopes. In coastal area, most common between Hunter and Northern Rivers, and further south in S Coast. Inhabits open eucalypt woodlands and forests, typically with a grassy understorey. Favours edges of woodlands adjoining grasslands or timbered creek lines and ridges. Feeds on the seeds of native and introduced grasses and other herbs. Grasslands and open areas provide important foraging habitat for this species while woodlands provide important roosting and breeding habitat. Nests in tree hollows, logs or posts from August to December.
<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle	V	C	323 records within 10km (OEH 2018a)	Primarily coastal but may extend inland over major river systems. Breeds close to water, mainly in tall open forest/woodland but also in dense forest, rainforest, closed scrub or remnant trees. Usually forages over large expanses of open water, but also over open terrestrial habitats (e.g. grasslands).
<i>Epthianura albifrons</i>	White-fronted Chat	V		245 records within 10km (OEH 2018a)	This species occurs from southern Queensland to Western Australia and down to Tasmania, mostly in temperate to arid climates and very rarely in sub-tropical areas. It is found in damp open habitats, particularly wetlands containing saltmarsh areas that are bordered by open grasslands. Along the coast they are found in estuarine and marshy habitats with vegetation <1m tall, and in open grasslands and areas bordering wetlands. Inland, they are often observed in grassy plains, saltlakes and salt pans along waterway margins.

Scientific name	Common name	BC Act status	EPBC Act status	Source	Habitat association
<i>Epthianura albifrons</i>	White-fronted Chat population in the Sydney Metropolitan Catchment Management Area	EP		245 records within 10km (OEH 2018a)	There are two isolated sub-populations of White-fronted Chats currently known from the Sydney Metropolitan CMA: at Newington Nature Reserve and at Towra Point NR. This species is unlikely to cross the 25km separating these areas, or the greater distances separating other colonies outside the CMA.
<i>Petrogale penicillata</i>	Brush-tailed Rock-wallaby	E	V	Species or species' habitat may occur within 10km (DOE 2018a)	Occurs from the Shoalhaven north to the Queensland border. Now mostly extinct west of the Great Dividing Range, except in the Warrumbungles and Mt Kaputar. Occurs on rocky escarpments, outcrops and cliffs with a preference for complex structures with fissures, caves and ledges facing north. Diet consists of vegetation in adjacent to rocky areas eating grasses and forbs as well as the foliage and fruits of shrubs and trees.
<i>Miniopterus schreibersii oceanensis</i>	Eastern Bentwing-bat	V		157 records within 10km (OEH 2018a)	Generally occurs east of the Great Dividing Range along NSW coast (Churchill 2008). Inhabits various habitats from open grasslands to woodlands, wet and dry sclerophyll forests and rainforest. Essentially a cave bat but may also roost in road culverts, stormwater tunnels and other man-made structures. Only 4 known maternity caves in NSW, near Wee Jasper, Bungonia, Kempsey and Texas. Females may travel hundreds of kilometres to the nearest maternal colony (Churchill 2008).
<i>Falsistrellus tasmaniensis</i>	Eastern False Pipistrelle	V		1 record within 10km (OEH 2018a)	Occurs on southeast coast and ranges. Prefers tall (>20m) and wet forest with dense understorey. Absent from small remnants, preferring continuous forest but can move through cleared landscapes and may forage in open areas. Roosts in hollow trunks of Eucalypts, underneath bark or in buildings. Forages in gaps and spaces within forest, with large foraging range (12km foraging movements recorded) (Churchill 2008, Law et al 2008).
<i>Mormopterus norfolkensis</i>	Eastern Freetail-bat	V		13 records within 10km (OEH 2018a)	Occurs in dry sclerophyll forest and woodland east of the Great Dividing Range. Forages in natural and artificial openings in vegetation, typically within a few kilometres of its roost. Roosts primarily in tree hollows but also recorded from man-made structures or under bark (Churchill 2008).
<i>Scoteanax rueppellii</i>	Greater Broad-nosed Bat	V		3 records within 10km (OEH 2018a)	Occurs on the east coast and Great Dividing Range. Inhabits a variety of habitats from woodland to wet and dry sclerophyll forests and rainforest, also remnant paddock trees and timber-lined creeks, typically below 500m asl. Forages in relatively uncluttered areas, using natural or man-made openings in denser habitats. Usually roosts in tree hollows or fissures but also under exfoliating bark or in the roofs of old buildings. Females congregate in maternal roosts in suitable hollow trees (Hoye and Richards 2008, Churchill 2008).

Scientific name	Common name	BC Act status	EPBC Act status	Source	Habitat association
<i>Petauroides volans</i>	Greater Glider		V	Species or species' habitat may occur within 10km (DOE 2018a)	The greater glider is restricted to eastern Australia, occurring from the Windsor Tableland in north Queensland through to central Victoria (Wombat State Forest), with an elevational range from sea level to 1200 m above sea level. It prefers taller montane, moist eucalypt forest with relatively old trees and abundant hollows.
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	V	V	536 records within 10km (OEH 2018a); Roosting known to occur within 10km (DOE 2018a)	Roosts in camps within 20 km of a regular food source, typically in gullies, close to water and in vegetation with a dense canopy. Forages in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths, swamps and street trees, particularly in eucalypts, melaleucas and banksias. Highly mobile with movements largely determined by food availability (Eby and Law 2008). Will also forage in urban gardens and cultivated fruit crops.
<i>Phascolarctos cinereus</i> (combined populations of Qld, NSW and the ACT)	Koala	V	V	Species or species' habitat known to occur within 10km (DOE 2018a)	Occurs from coast to inland slopes and plains. Restricted to areas of preferred feed trees in eucalypt woodlands and forests. Home range varies depending on habitat quality, from < 2 to several hundred hectares.
<i>Chalinolobus dwyeri</i>	Large-eared Pied Bat,	V	V	Species or species' habitat likely to occur within 10km (DOE 2018a)	Occurs from the coast to the western slopes of the divide. Largest numbers of records from sandstone escarpment country in the Sydney Basin and Hunter Valley. Roosts in caves and mines and most commonly recorded from dry sclerophyll forests and woodlands. An insectivorous species that flies over the canopy or along creek beds. In southern Sydney appears to be largely restricted to the interface between sandstone escarpments and fertile valleys.
<i>Miniopterus australis</i>	Little Bentwing-bat	V		6 records within 10km (OEH 2018a)	Occurs from Cape York to Sydney. Inhabits rainforests, wet and dry sclerophyll forests, paperbark swamps and vine thickets. Only one maternity cave known in NSW, shared with Eastern Bentwing-bats at Willi Willi, near Kempsey. Outside breeding season roosts in caves, tunnels and mines and has been recorded in a tree hollow on one occasion. Forages for insects beneath the canopy of well-timbered habitats.
<i>Perameles nasuta</i>	Long-nosed Bandicoot population in inner western Sydney	EP		25 records within 10km (OEH 2018a)	Occurs within Marrickville and Canada Bay LGAs, and may also occur in the Canterbury, Ashfield and Leichhardt LGAs. Shelter mostly under older houses and buildings, and forage in parkland and backyards.
<i>Pseudomys novaehollandiae</i>	New Holland Mouse		V	Species or species' habitat may occur	Occurs in disjunct, coastal populations from Tasmania to Queensland. In NSW inhabits a variety of coastal habitats including heathland, woodland, dry sclerophyll forest with a dense shrub layer and vegetated sand.

Scientific name	Common name	BC Act status	EPBC Act status	Source	Habitat association
				within 10km (DOE 2018a)	Populations may recolonise/ increase in size in regenerating native vegetation after wildfire, clearing and sandmining. Presence strongly correlated with understorey vegetation density, and high floristic diversity in regenerating heath (Lock and Wilson 1999).
<i>Isoodon obesulus obesulus</i>	Southern Brown Bandicoot	E	E	Species or species' habitat likely to occur within 10km (DOE 2018a)	Occurs mainly in 2 areas: Ku-ring-gai Chase and Garigal National Parks N of Sydney, and far SE NSW including Ben Boyd National Park, East Boyd State Forest, Nadgee Nature Reserve, Nadgee State Forest, South East Forest and Yambulla State Forest but also occurs between these areas. Inhabits scrubby vegetation, including heath, shrubland, and heathy forest and woodland. Often associated with well-drained soils and dry heathland communities, and prefers periodically burnt areas as this increases insect abundance.
<i>Petaurus norfolcensis</i>	Southern Brown Bandicoot	V		1 record within 10km (OEH 2018a)	Occurs along the drier inland slopes as well as coastal habitats. Inhabits woodland and open forest with a Eucalyptus, Corymbia or Angophora overstorey and a shrubby understorey of Acacia or Banksia. Key habitat components include reliable winter and early-spring flowering Eucalypts, Banksia or other nectar sources, and hollow-bearing trees for roost and nest sites (van der Ree and Suckling 2008, Quin et al 2004), with social groups moving between multiple hollows. Social groups include one or two adult males and females with offspring, and have home ranges of 5-10ha within NSW (van der Ree and Suckling 2008, Kavanagh 2004).
<i>Myotis macropus</i>	Southern Myotis	V		501 records within 10km (OEH 2018a)	Mainly coastal but may occur inland along large river systems. Usually associated with permanent waterways at low elevations in flat/undulating country, usually in vegetated areas. Forages over streams and watercourses feeding on fish and insects from the water surface. Roosts in a variety of habitats including caves, mine shafts, hollow-bearing trees, stormwater channels, buildings, under bridges and in dense foliage, typically in close proximity to water (Campbell 2011). Breeds November or December (Churchill 2008).
<i>Dasyurus maculatus</i>	Spotted-tailed Quoll	V	E	1 record within 10km (OEH 2018a); Species or species' habitat known to occur within 10km (DOE 2018a)	Inhabits a range of environments including rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline. Den sites are in hollow-bearing trees, fallen logs, small caves, rock crevices, boulder fields and rocky-cliff faces. Females occupy home ranges of up to 750 ha and males up to 3,500 ha, usually traversed along densely vegetated creek lines.
<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheath-tail-bat	V		6 records within 10km (OEH 2018a)	Migrates from tropics to south-east Australia in summer. Forages across a range of habitats including those with and without trees, from wet and dry

Scientific name	Common name	BC Act status	EPBC Act status	Source	Habitat association
					sclerophyll forest, open woodland, Acacia shrubland, mallee, grasslands and desert. Roosts communally in large tree hollows and buildings.
<i>Hoplocephalus bungaroides</i>	Broad-headed Snake	E	V	Species or species' habitat likely to occur within 10km (DOE 2018a)	Nocturnal, sheltering in rock crevices and under flat sandstone rocks on exposed cliff edges during autumn, winter, and spring, moving to shelters in hollows of large trees within 200m of escarpments in summer. Feeds mostly on geckos and small skinks, and occasionally on frogs and small mammals.
<i>Heleioporus australiacus</i>	Giant Burrowing Frog	V	V	Species or species' habitat may occur within 10km (DOE 2018a)	Occurs along the coast and eastern slopes of the Great Dividing Range south from Wollemi National Park. Appears to exist as 2 populations with a 100km gap in records between Jervis Bay and Eden. Northern population occurs on sandy soils supporting heath, woodland or open forest. Breeds in ephemeral to intermittent streams with persistent pools. Only infrequently moves to breeding sites, most commonly found on ridges away from creeks, several hundred metres from water.
<i>Litoria aurea</i>	Green and Golden Bell Frog	E	V	13077 records within 10km (OEH 2018a); Species or species' habitat known to occur within 10km (DOE 2018a)	Formerly occurred from Brunswick Heads to Victoria, but >80% populations now extinct. Inhabits marshes, natural and artificial freshwater to brackish wetlands, dams and in stream wetlands. Prefers sites containing cumbungi (<i>Typha</i> spp.) or spike rushes (<i>Eleocharis</i> spp.), which are unshaded and have a grassy area and/or rubble as shelter/refuge habitat nearby. <i>Gambusia holbrooki</i> is a key threat as they feed on green and Golden Bell Frog eggs and tadpoles.
<i>Litoria raniformis</i>	Growling Grass Frog	E	V	Species or species' habitat may occur within 10km (DOE 2018a)	Currently, the species is known to exist only in isolated populations in the Coleambally Irrigation Area, the Lowbidgee floodplain and around Lake Victoria. Usually found in or around permanent or ephemeral Black Box/Lignum/Nitre Goosefoot swamps, Lignum/Typha swamps and River Red Gum swamps or billabongs along floodplains and river valleys. They are also found in irrigated rice crops, particularly where there is no available natural habitat.
<i>Pseudophryne australis</i>	Red-crowned Toadlet	V		44 records within 10km (OEH 2018a)	Restricted to Sydney Basin, from Nowra to Pokolbin and west to Mt Victoria. Inhabits heathland and open woodland on Hawkesbury and Narrabeen Sandstones, within 100m of ridgelines. Breeds in ephemeral feeder creeks or flooded depressions, requiring unpolluted water between 5.5 and 6.5 pH. Shelters under rocks, amongst masses of dense vegetation or leaf litter. Populations restricted to immediate vicinity of breeding areas.
<i>Mixophyes balbus</i>	Stuttering Frog	E	V	Species or species' habitat likely to	Occurs along the east coast of Australia. Has undergone a massive range reduction particularly in the south of its range: within the Sydney Basin, White (2008a) located only 3 populations south of Sydney and Daly et al. (2002, in White 2008a) found only 2 extant populations between Macquarie

Scientific name	Common name	BC Act status	EPBC Act status	Source	Habitat association
				occur within 10km (DOE 2018a)	Pass and Victoria. Inhabits rainforest and wet, tall, open forest. Shelter in deep leaf litter and thick understorey vegetation on the forest floor. Feeds on insects and smaller frogs, breeding in streams during summer after heavy rain. The species does not occur in areas where the riparian vegetation has been disturbed or where there have been significant upstream human impacts.
<i>Crinia tinnula</i>	Wallum Froglet	V		19 records within 10km (OEH 2018a)	Inhabits acid paperbark swamps and sedge swamps along the northern and central coast regions of NSW. It is generally not associated with disturbed habitats.
<i>Prototroctes maraena</i>	Australian Grayling		V	Species or species' habitat likely to occur within 10km (DOE 2018a)	Occurs in coastal rivers and streams south from the Shoalhaven River. Inhabits estuarine waters and coastal seas as larvae/juveniles, and freshwater rivers and streams as adults. Most of their lives are spent in freshwater rivers and streams in cool, clear waters with a gravel substrate and alternating pool and riffle zones, however can also occur in turbid water. The species can penetrate well inland, being recorded over 100 km inland from the sea. (Backhouse et al 2008).
<i>Epinephelus daemeli</i>	Black Rockcod		V	Species or species' habitat likely to occur within 10km (DOE 2018a)	Found in warm temperate/sub-tropical parts of south-western Pacific. Naturally occur along NSW Coast including Lord Howe Island. Adults generally found on rocky reefs. Juveniles found in coastal rock pools and around rocky shores in estuaries. (DPI 2013).
<i>Macquaria australasica</i>	Macquarie Perch	V	E	Species or species' habitat may occur within 10km (DOE 2018a)	Occurs in the upper reaches of the Lachlan, Murrumbidgee and Murray Rivers, and in parts of the Hawkesbury and Shoalhaven catchment areas. Inhabits river and lake habitats, especially the upper reaches of rivers and their tributaries. Requires clear water with deep, rocky holes and abundant cover (including aquatic vegetation, woody debris, large boulders and overhanging banks). Spawning occurs in spring and summer in shallow upland streams or flowing sections of river systems.
<i>Pommerhelix duralensis</i>	Dural Land Snail	E	E	Species or species' habitat likely to occur within 10km (DOE 2018a)	This species is a shale-influenced habitat specialist, which occurs in low densities along the northwest fringes of the Cumberland Plain on shale-sandstone transitional landscapes. The majority of confirmed records for the species occur within The Hills Shire Local Government Area. The species is also found within the Local Government Areas of Blue Mountains City, Penrith City, Hornsby Shire and Parramatta City

Key: CE – critically endangered, E – endangered, EP – endangered population, V – vulnerable, X - extinct

Table B.4 Migratory species known or predicted to occur within 10 kilometres of the project site

Scientific name	Common name	EPBC Act status	Source
<i>Limosa lapponica</i>	Bar-tailed Godwit	C,J,K	Species or species' habitat known to occur within 10km (DOE 2018a)
<i>Monarcha melanopsis</i>	Black-faced Monarch		Species or species' habitat known to occur within 10km (DOE 2018a)
<i>Limosa limosa</i>	Black-tailed Godwit	C,J,K	Foraging, feeding or related behaviour known to occur within 10km (DOE 2018a)
<i>Limicola falcinellus</i>	Broad-billed Sandpiper	C,J,K	Foraging, feeding or related behaviour known to occur within 10km (DOE 2018a)
<i>Tringa nebularia</i>	Common Greenshank	C,J,K	Species or species' habitat known to occur within 10km (DOE 2018a)
<i>Actitis hypoleucos</i>	Common Sandpiper	K	Species or species' habitat known to occur within 10km (DOE 2018a)
<i>Calidris ferruginea</i>	Curlew Sandpiper	C,J,K	Species or species' habitat known to occur within 10km (DOE 2018a)
<i>Charadrius bicinctus</i>	Double-banded Plover		Foraging, feeding or related behaviour known to occur within 10km (DOE 2018a)
<i>Numenius madagascariensis</i>	Eastern Curlew	C,J,K	Species or species' habitat known to occur within 10km (DOE 2018a)
<i>Calidris tenuirostris</i>	Great Knot	C,J,K	Foraging, feeding or related behaviour known to occur within 10km (DOE 2018a)
<i>Charadrius leschenaultii</i>	Greater Sand Plover	C,J,K	Foraging, feeding or related behaviour known to occur within 10km (DOE 2018a)
<i>Pluvialis squatarola</i>	Grey Plover	C,J,K	Foraging, feeding or related behaviour known to occur within 10km (DOE 2018a)
<i>Tringa brevipes</i>	Grey-tailed Tattler	C,K	Foraging, feeding or related behaviour known to occur within 10km (DOE 2018a)
<i>Gallinago hardwickii</i>	Latham's Snipe	J,K	Foraging, feeding or related behaviour known to occur within 10km (DOE 2018a)
<i>Charadrius mongolus</i>	Lesser Sand Plover	C,J,K	Foraging, feeding or related behaviour known to occur within 10km (DOE 2018a)
<i>Numenius minutus</i>	Little Curlew	C,J,K	Foraging, feeding or related behaviour likely to occur within 10km (DOE 2018a)
<i>Calidris subminuta</i>	Long-toed Stint	C,J,K	Foraging, feeding or related behaviour known to occur within 10km (DOE 2018a)
<i>Tringa stagnatilis</i>	Marsh Sandpiper	C,J,K	Foraging, feeding or related behaviour known to occur within 10km (DOE 2018a)
<i>Cuculus optatus</i>	Oriental Cuckoo	C	Species or species' habitat may occur within 10km (DOE 2018a)
<i>Charadrius veredus</i>	Oriental Plover	C,J,K	Foraging, feeding or related behaviour known to occur within 10km (DOE 2018a)
<i>Pandion haliaetus</i>	Osprey		Species or species' habitat known to occur within 10km (DOE 2018a)
<i>Pluvialis fulva</i>	Pacific Golden Plover	C,J,K	Foraging, feeding or related behaviour known to occur within 10km (DOE 2018a)
<i>Calidris melanotos</i>	Pectoral Sandpiper	J,K	Species or species' habitat known to occur within 10km (DOE 2018a)
<i>Gallinago stenura</i>	Pin-tailed Snipe	C,J,K	Foraging, feeding or related behaviour likely to occur within 10km (DOE 2018a)
<i>Calidris canutus</i>	Red Knot	C,J,K	Species or species' habitat known to occur within 10km (DOE 2018a)
<i>Calidris ruficollis</i>	Red-necked Stint	C,J,K	Foraging, feeding or related behaviour known to occur within 10km (DOE 2018a)

Scientific name	Common name	EPBC Act status	Source
<i>Arenaria interpres</i>	Ruddy Turnstone	C,J,K	Foraging, feeding or related behaviour known to occur within 10km (DOE 2018a)
<i>Philomachus pugnax</i>	Ruff	C,J,K	Foraging, feeding or related behaviour known to occur within 10km (DOE 2018a)
<i>Rhipidura rufifrons</i>	Rufous Fantail		Species or species' habitat known to occur within 10km (DOE 2018a)
<i>Calidris alba</i>	Sanderling	C,J	Foraging, feeding or related behaviour known to occur within 10km (DOE 2018a)
<i>Myiagra cyanoleuca</i>	Satin Flycatcher		Species or species' habitat known to occur within 10km (DOE 2018a)
<i>Calidris acuminata</i>	Sharp-tailed Sandpiper	C,J,K	Foraging, feeding or related behaviour known to occur within 10km (DOE 2018a)
<i>Monarcha trivirgatus</i>	Spectacled Monarch		Species or species' habitat may occur within 10km (DOE 2018a)
<i>Gallinago megala</i>	Swinhoe's Snipe	C,J,K	Foraging, feeding or related behaviour likely to occur within 10km (DOE 2018a)
<i>Xenus cinereus</i>	Terek Sandpiper	C,J,K	Foraging, feeding or related behaviour known to occur within 10km (DOE 2018a)
<i>Tringa incana</i>	Wandering Tattler	J	Foraging, feeding or related behaviour known to occur within 10km (DOE 2018a)
<i>Numenius phaeopus</i>	Whimbrel	C,J,K	Foraging, feeding or related behaviour known to occur within 10km (DOE 2018a)
<i>Hirundapus caudacutus</i>	White-throated Needletail	K	Species or species' habitat known to occur within 10km (DOE 2018a)
<i>Motacilla flava</i>	Yellow Wagtail	C,J,K	Species or species' habitat known to occur within 10km (DOE 2018a)

Key: C – China-Australia Migratory Bird Agreement, J – Japan-Australia Migratory Bird Agreement, K – Republic of Korea-Australia Migratory Bird Agreement