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CABRAMATTA LOOP PROJECT

ENVIRONMENTAL IMPACT STATEMENT

VOLUME 1 —
MAIN REPORT

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APPENDIX B EIS form and content requirements – Environmental Planning and Assessment Regulation 2000

APPENDIX C Strategic planning context

APPENDIX D Environmental risk assessment

APPENDIX E Projects with potential for cumulative impacts

Volumes 2 to 5 – Technical reports

The following technical reports informed preparation of the EIS.

VOLUME 2	Technical Report 1	Traffic, transport and access impact assessment
	Technical Report 2	Noise and vibration impact assessment
VOLUME 3	Technical Report 3	Air quality impact assessment
	Technical Report 4	Biodiversity development assessment report
	Technical Report 5	Hydrology and flooding impact assessment
VOLUME 4	Technical Report 6	Soils and contamination impact assessment
	Technical Report 7	Surface water and groundwater quality impact assessment
	Technical Report 8	Historical heritage assessment and statement of heritage Impact
VOLUME 5	Technical Report 9	Aboriginal and cultural heritage impact assessment
	Technical Report 10	Landscape and visual impact assessment
	Technical Report 11	Social impact assessment
	Technical Report 12	Climate change risk assessment

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Certification

Submission of environmental impact statement

Prepared under Division 5.2 of the Environmental Planning and Assessment Act 1979 (NSW)

Environmental impact statement prepared by:

Name	**Aryel Pyliotis**
Qualifications	Bachelor of Science (Honours)
Address	GHD Pty Ltd 133 Castlereagh Street, Sydney NSW 2000
Responsible person name and address (proponent)	Brian Green General Manager, Asset Management Interstate Division Australian Rail Track Corporation GPO Box 14 Sydney NSW 2001
The address of the land to which the statement relates	Land within the Fairfield and Liverpool local government areas as described within this environmental impact statement.
Description of the infrastructure to which this statement relates	Construction and operation of a 1.65 kilometre long section of new track adjacent to the existing Southern Sydney Freight Line track between the Hume Highway and Cabramatta Road East road overbridges in the suburbs of Warwick Farm and Cabramatta. The project also includes track realignment, bridge works and road works.
Environmental impact statement	An environmental impact statement is attached addressing all matters in accordance with Division 5.2 of the *Environmental Planning and Assessment Act 1979* (NSW) and Schedule 2 of the Environmental Planning and Assessment Regulation 2000 (NSW).
Declaration	I certify that I have prepared this environmental impact statement in accordance with the Secretary's Environmental Assessment Requirements dated 17 May 2018. The environmental impact statement contains all available information that is relevant to the environmental assessment of the infrastructure to which the statement relates. To the best of my knowledge, the information contained in the environmental impact statement is neither false nor misleading.
Signature	
Name	Aryel Pyliotis
Date	15 August 2019

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Abbreviations

Abbreviation	Definition
ABS	Australian Bureau of Statistics
ASS	acid sulfate soils
AEP	annual exceedance probability
AHD	Australian height datum
AHIMS	Aboriginal Heritage Information Management System
the Air NEPM	*National Environment Protection (Ambient Air Quality) Measure*
ANZECC	Australian and New Zealand Environment and Conservation Council
the Approved Methods	*Approved Methods for the Modelling and Assessment of Air Pollutants in NSW*
ARTC	Australian Rail Track Corporation
ARMCANZ	Agriculture and Resource Management Council of Australia and New Zealand
ASRIS	Australian Soil Resource Information System
Australian Government	Government of the Commonwealth of Australia
BAM	Biodiversity Assessment Method
BC Act	NSW *Biodiversity Conservation Act 2016*
BDAR	Biodiversity Development Assessment Report
the Blue Book	*Managing Urban Stormwater: Soils and Construction Volume 1*
the Code	Code of practice for archaeological investigation of Aboriginal objects in NSW 2010
the Cycleway	Parramatta to Liverpool Cycle Rail Trail
CEMP	Construction environmental management plan
CEEC	Critically endangered ecological community
CLM Act	NSW *Contaminated Land Management Act 1997*
CNVS	Construction Noise and Vibration Strategy
CO	Carbon monoxide
CPTED	Crime Prevention Through Environmental Design
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DECC	Department of Environment and Climate Change
DECCW	Department of Environment, Climate Change and Water
dB	Decibel is the logarithmic unit used for expressing the sound pressure level (SPL) or power level (SWL) in acoustics.
dBA	Frequency weighting filter used to measure 'A-weighted' sound pressure levels which confirms approximately to the human ear response, as our hearing is less sensitive at very low and very high frequencies.
DEE	Department of the Environment and Energy
DIRDC	Department of Infrastructure, Regional Development and Cities

Abbreviation	Definition
DPI	Department of Primary Industries
EEC	Endangered ecological community
EIS	Environmental impact statement
EIA-N04	*Environmental Impact Assessment Guidance Note - Guidelines for landscape character and visual impact assessment*
EPA	NSW Environment Protection Authority
EP&A Act	NSW *Environmental Planning and Assessment Act 1979*
EPBC Act	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*
EPL	Environment protection licence
ENM	Excavated natural material
FM Act	NSW *Fisheries Management Act 1994*
g/L	Gram per litre
GHG	Greenhouse gas
GRCCC	Georges River Combined Councils Committee
HC	Hydrocarbons
ICOMOS	Australia ICOMOS Charter for Places of Cultural Significance, The Burra Charter, 2013 (Burra Charter).
ICNG	Interim Construction Noise Guideline
IMEX	Import- Export
Infrastructure SEPP	State Environmental Planning Policy (Infrastructure) 2007
LALC	Local Aboriginal Land Council
LCZs	Landscape Character Zones
LEP	Local environmental plan
LGA	Local government area
LoS	Level of Service is the a performance rating for an intersection or road has which dependent on the magnitude of delays and spare capacity experienced.
LPG	Liquid petroleum generation
µg/m3	Micrograms (one-millionth of a gram) per cubic meter air
ug/L	Micrograms per Litre
uS/cm	Microsiemens per centimetre
MFN	Metropolitan Freight Network
MNES	Matters of National Environmental Significance
Mt CO2-e	Metric tons of carbon dioxide equivalent
NCA	Noise catchment area
NEPC	National Environmental Protection Council
NEPM	National Environmental Protection Measure

Abbreviation	Definition
'The Air' NEPM	National Environmental Protection(Ambient Air Quality) Measure
NGER	National Greenhouse Gas and Energy Regulations
NO	Nitrogen monoxide
NO_2	Nitrogen dioxide
NPI	National Pollutant Inventory
NPW Act	NSW *National Parks and Wildlife Act 1974*
NSW	New South Wales
NTU	Nephelometric Turbidity Units
O_3	Ozone
OEH	NSW Office of Environment and Heritage
PAD	Potential archaeological deposit
PCTs	Plant Community Types
$PM_{2.5}$	Particulate matter (airborne dust) with a size of 2.5 micrograms
PM_{10}	Particulate matter 10 micrometres or less in diameter
PMF	Probable maximum flood
POEO Act	NSW *Protection of the Environment Operations Act 1974*
the Regulation	Environmental Planning and Assessment Regulation 2000
RAP	Registered Aboriginal Party
RailCorp	Rail Corporation NSW
RING	*Rail Infrastructure Noise Guideline*
RNP	*Road Noise Policy*
Roads and Maritime	Roads and Maritime Services
SDSA	Southern Districts Softball Association
SEARs	Secretary's environmental assessment requirements (for the EIS)
SEED	Sharing and Enabling Environmental Data
SEPP	State Environmental Planning Policy
SO_2	Sulfur dioxide
SPRAT	Species profiles and threats database
SSFL	Southern Sydney Freight Line
TBEIA	Task Based Environmental Impact Assessment
t CO2-e	tonnes of carbon dioxide equivalent emissions
TfNSW	Transport for New South Whales
TEU	Twenty foot equivalent units (used to describe cargo capacity)
TOC	Train Operating Conditions

Abbreviation	Definition
VENM	Virgin excavated natural material
WARR Act	*Waste Avoidance and Resource Recovery Act 2001*
WRAP	*Western Regional Air Partnership Fugitive Dust Handbook*

Glossary

Term	Definition
Aboriginal object	Defined by the *National Parks and Wildlife Act 1974* as: 'any deposit, object or material evidence (not being a handicraft made for sale) relating to the Aboriginal habitation of the area that comprises New South Wales, being habitation before or concurrent with (or both) the occupation of that area by persons of non-Aboriginal extraction, and includes Aboriginal remains'.
Aboriginal site	A place where physical remains or modification of the natural environment indicate past and 'traditional' activities by Aboriginal people. Site types include artefact scatters, isolated artefacts, burials, shell middens, scarred trees, quarries and contact sites. Includes sites listed on the. Also known as Aboriginal objects.
Aboriginal places of heritage significance	Defined in the Standard Instrument - Principal Local Environmental Plan as an area of land, the general location of which is identified in an Aboriginal heritage study adopted by the Council, and that may be shown on the Heritage Map. The term may include (but is not limited to) places that are declared as Aboriginal places under section 84 of the *National Parks and Wildlife Act 1974*.
Absorptive capability	Absorptive capability relates to the ability of the landscape character zones to absorb the proposal within the existing landscape setting.
Annual exceedance probability	The chance of a flood if a nominated size occurring in a particular year. The chance of the flood occurring is expressed as a percentage and, for large floods, is the reciprocal of the ARI. For example, the 1 per cent AEP flood event is equivalent to the 100 year ARI flood event.
Approved methods	*Approved Methods for the Modelling and Assessment of Air Pollutants in NSW* (DEC, 2005)
Aquifer	A layer of soil or rock with sufficient porosity and permeability to enable usable quantities of water to be extracted from it.
Ausplume	A software implementation of the Gaussian plume dispersion model based on the Victorian Environment Protection Authority's *Plume Calculation Procedure* (EPAV 1985).
Average recurrence interval	The long term average number of years between the occurrence of a flood of a nominated size.
Ballast	Crushed rock, stone etc 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.
Biophysical environment	The physical environment (water, soil etc) as well as the biological activity within it (plants, animals etc).
Botany rail line	A dedicated freight rail line that forms part of the Sydney Freight Network. The line extends from near Marrickville Station to Port Botany.
CALMET	CALMET is a meteorological model which includes a diagnostic wind find generator containing objective analysis and parameterized treatments of slope flows, kinematic terrain effects, terrain blocking effects, and a divergence minimization procedure, and a micro-meteorological model for overland and overwater boundary layers.
CALPUFF	CALPUFF is a non-steady-state Lagrangian Gaussian puff model contain modules for complex terrain effects, overwater transport, coastal interaction effects, building downwash, wet and dry removal, and simple chemical transformation.
Classified road	A road that meets the definition of a classified road and is listed as such under the *Roads Act 1993* – includes main roads, highways, freeways etc.
Climate	The average weather experienced at a site or region over a period of many years, ranging from months to many thousands of years. The relevant measured quantities are most often surface variables such as temperature, rainfall and wind.

Term	Definition
Climate scenario	A plausible and often simplified representation of the future climate, based on an internally consistent set of climatological relationships that has been constructed for explicit use in investigating the potential consequences of anthropogenic climate change, often serving as input to impact models.
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.
Culvert	A structure that allows water to flow under a road, railway, track, or similar obstruction.
Dangerous goods	Dangerous goods are substances or articles that pose a risk to people, property or the environment, due to their chemical or physical properties. They are usually classified with reference to their immediate risk.
Embankment	A raised area of earth or other materials used to carry a rail line in certain areas.
Ecologically sustainable development	Development that uses, conserves and enhances the resources of the community so that ecological processes on which life depends are maintained, and the total quality of life, now and in the future, can be increased.
Emission	A substance discharged into the air.
Existing rail corridor	The corridor within which existing rail infrastructure, subject to works as part of the project, are located.
Formation	The earthworks/material on which the ballast, sleepers and tracks are laid.
Freight	Goods transported by truck, train, ship, or aircraft.
Haulage Routes	Routes for the movement of construction equipment and materials.
Heritage listed	An item, building or place included on statutory heritage lists maintained by local, State and/or the Australian Government.
$L_{A90(period)}$	The sound pressure level exceeded for 90 per cent of the measurement period.
$L_{Aeq(time)}$	Typically used to described ambient (background) noise levels.
$L_{Aeq(1\ hour)}$	The busiest 1-hour 'equivalent continuous noise level' – it represents the typical LAeq noise level from all the proposal noise events during the busiest 1-hour of the assessment period.
$L_{Aeq(9\ hour)}$	The night-time 'equivalent continuous noise level' - it represents the cumulative effects of all the proposal noise events occurring in the night-time period from 10.00 pm to 7.00 am.
$L_{Aeq(15\ hour)}$	The daytime 'equivalent continuous noise level' - it represents the cumulative effects of all the proposal noise events occurring in the daytime period from 7.00 am to 10.00 pm.
$L_{Aeq(24\ hour)}$	The 'equivalent continuous noise level', sometimes also described as the 'energy-averaged noise level' – it represents the cumulative effects of all the proposal noise events occurring in one day.
L_{Amax}	The maximum sound level recorded during the measurement period.
Landscape	All aspects of a tract of land, including landform, vegetation, buildings, villages, towns, cities and infrastructure.
Landscape character	The combined quality of built, natural and cultural aspects that make up an area and provide its unique sense of place.
Landscape character zone	An area of landscape with similar properties or strongly defined spatial qualities, distinct from areas immediately adjacent.
Landscape feature	A component, part or feature of the landscape that is prominent or eye-catching, eg hills, buildings, vegetation.

Term	Definition
Landscape quality	Largely subjective judgement based on particular characteristics that influence the way in which the environment is experienced, including special interests such as cultural associations or heritage interests, the presence and/or type of elements and condition.
Level of service	Defined by Austroads as a measure for ranking operating road and intersection conditions, based on factors such as speed, travel time, freedom to manoeuvre, interruptions, comfort and convenience.
Local road	Road used primarily to access properties located along the road.
Passing loop	A section of track off to the side of the main track/s that allows a train to move to the side.
Possession	A period of time during which a rail line is blocked to trains to permit work to be carried out on or near the line.
Project	The construction and operation of the Cabramatta Loop.
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.
Rail corridor	The corridor within which the rail tracks and associated infrastructure are located.
Rating background level	The underlying level of noise present in an area once transient and short-term noise events are filtered out.
Sensitivity	The sensitivity of a landscape character area or view and its capacity to absorb change. In the case of visual impact this also relates to the type of viewer and number of viewers.
Spoil	Material generated by construction.
Section 170 register	Under section 170 of the *Heritage Act 1977*, all state government agencies must keep and administer a database of heritage assets called a Section 170 Heritage and Conservation Register.
Sensitive receivers	Land uses which are sensitive to potential noise, air and visual impacts, such as residential dwellings, schools and hospitals.
Slewing	Track realignment.
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 (for example, by noise and vibration, visual or traffic impacts). The actual size and extent of the study area varies according the nature and requirements of each assessment.
Sydney Freight Network	A network of dedicated railway lines for freight in Sydney, linking NSW's rural and interstate rail network with Sydney's main freight yard at Enfield and Port Botany. Its main components are the Southern Sydney Freight Line and a line from Sefton to Enfield and Port Botany. The network is managed by ARTC.
Track	The structure consisting of the rails, fasteners, sleepers and ballast, which sits on the formation.
Visual amenity	The value of a particular area or view in terms of what is seen.
Visual catchment	Extent of potential visibility to or from a specific area, feature or proposal.
View	The visual experience from the viewer's perspective.
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.

Term	Definition
Waste management hierarchy	The waste management hierarchy is a set of priorities for the efficient use of resources, which underpins the objectives of the *Waste Avoidance and Resource Recovery Act 2001*. The waste management hierarchy progresses from avoidance (most preferred), to re-use/recycling, to disposal (least preferred).
Work area	Individual areas within the project site that are subject to construction at any one time.

Executive summary

Overview

Australia's freight task is set to experience significant growth over the coming decades. The existing freight infrastructure cannot support this projected growth, with increasing pressure on already congested roads and rail lines through Sydney, and increasing use of heavy trucks. 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, 2018d, Infrastructure Australia, 2018).

Over the next 20 years, the predicted increase in container rail freight volumes on Sydney's rail freight network will put more pressure on existing rail infrastructure, which includes the Southern Sydney Freight Line (SSFL).

Australian Rail Track Corporation's *Sydney Metropolitan Freight Strategy* (ARTC, 2015) considers existing rail freight capacity issues and identifies priority actions to respond to rail freight demands on Sydney's rail freight network, including the SSFL. This includes the Cabramatta Loop Project (this project).

The project is one of a number of initiatives proposed to increase the capacity of Sydney's rail freight network. In addition to the project, ARTC is also proposing to undertake the Botany Rail Duplication Project, which would involve duplicating a section of the Botany Line.

The Australian Government has recognised the need for the Cabramatta Loop and Botany Rail Duplication projects and announced a funding commitment of $400 million in the 2018 budget for both projects.

The project

The project would comprise the construction and operation of a passing loop on the SSFL to enable freight trains, up to 1,300 metres long and travelling in either direction, to pass each other. The project would be partly located within the existing rail corridor between the Hume Highway and Cabramatta Road East road overbridges in the suburbs of Warwick Farm and Cabramatta. In addition, the project includes works in Broomfield Street and Jacquie Osmond Reserve, adjacent to the rail corridor.

The project would involve:

- new rail track – providing a 1.65 kilometre long section of new track, adjacent to the existing track, with connections to the existing track at the northern and southern ends to form a loop
- track realignment – moving about 550 metres of existing track sideways (slewing) to make room for the new track
- bridge works – constructing two new bridge structures adjacent to the existing rail bridges over Sussex Street and Cabramatta Creek
- road works – reconfiguring Broomfield Street for a distance of about 680 metres between Sussex and Bridge streets.

Ancillary work would include communication, signalling and power upgrades, works to existing retaining and noise walls, drainage work and protecting/relocating utilities. In addition, minor works in the form of new signalling would be installed at a number of locations within the rail corridor.

The project is State significant infrastructure in accordance with Division 5.2 of the *Environmental Planning and Assessment Act 1979* by operation of State Environmental Planning Policy (State and Regional Development) 2011 and State Environment Planning Policy (Infrastructure) 2007. As State significant infrastructure the project is permissible without development consent and is subject to assessment and approval by the NSW Minister for Planning and Public Spaces.

Construction and operation of the project

Subject to approval of the project, detailed design is proposed to commence following approval and construction would likely commence in early 2021 and is expected to take about two years. Construction is expected to be completed in early 2023.

Construction of the project would broadly involve the following main work phases:

- enabling works (including site establishment and protection or relocation of utilities)
- main construction works (including the new track, track realignment, bridge works, road works at Broomfield Street and Sussex Street, and ancillary infrastructure and works such as the noise wall, retaining walls and embankment at Jacquie Osmond Reserve)
- testing and commissioning works.

In order to minimise the impact to Sydney's freight network, it is anticipated that the project would predominantly be constructed while the existing rail line continues to operate. Some features of the project would need to be constructed during programmed rail possession periods when rail services along the Southern Sydney Freight Line and, in some cases, adjacent commuter train lines, do not operate.

The project would operate as part of the SSFL and would continue to be managed by the ARTC. ARTC works with rail operators to provide access to rail for businesses and producers across Australia. Freight train services and rolling stock which utilise the ARTC network are currently, and would continue to be, owned and operated by a variety of operators.

It is estimated that once the project is operational, there may be an increase in freight train movements from 48 up to 72 per day. The passing loop and existing Southern Sydney Freight Line would continue to operate during the existing operational hours, which are 24 hours per day, 365 days per year. Operational activities would continue to be undertaken in accordance with ARTC's operating system which includes an Environmental Management System and ARTC's existing environmental protection license (EPL # 3142).

Project need and benefits

Efficient access to and from Port Botany is critical to the economic growth and prosperity of Sydney. Over the next 20 years, container freight, air freight, air travel and general traffic in and around the Port Botany area are expected to grow significantly. This will put more pressure on roads and other infrastructure and impact local communities. Without significant infrastructure investment, existing transport constraints and challenges will worsen.

The amount of container freight handled by Port Botany is predicted to significantly increase. The Australian and NSW Governments have identified clear objectives to increase the share of this freight that is moved by rail. Transporting more freight to and from Port Botany by rail will place additional demands on the existing rail line, with freight that cannot be accommodated on rail placing demands on the surrounding congested road network.

The SSFL is already operating close to capacity, limiting its ability to adequately service future demands for rail freight transport. The single track section of the SSFL between Cabramatta and Warwick Farm constrains the ability to increase the share of freight moved by rail on the line. Additional demand arising from the predicted growth in container freight has the potential to exacerbate this situation, impacting on reliability and restricting the efficient movement of freight across the broader Sydney rail network.

The primary objective of the project is to increase capacity to meet the forecast demand for container freight transport on the Southern Sydney Freight Line. Secondary objectives are to provide:

- increased reliability for freight customers
- increased operational efficiency and flexibility
- increased rail market share for containerised freight.

It is intended the project would:

- alleviate constraints on, 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.

The project is one of a number of initiatives proposed to increase the capacity of Sydney's rail freight network. In addition to the project, ARTC is also proposing to undertake the Botany Rail Duplication Project, which would involve duplicating the Botany Line.

Environmental impact assessment

This environmental impact statement (EIS) has been prepared to support ARTC's application for approval of the project. It has been prepared in accordance with the environmental assessment requirements of the Secretary of the Department of Planning, Industry, Environment (the SEARs) dated 17 May 2018 and the form and content requirements of schedule 2 of the Environmental Planning and Assessment Regulation 2000.

Key biophysical and social aspects have been examined throughout the design development process. ARTC has also, and would continue to implement a comprehensive community and stakeholder consultation program to engage proactively with local communities and key stakeholders about the project and identify key potential impacts at an early stage. This has resulted in a number of design refinements and changes to the construction method that have mitigated potentially significant impacts.

Where impacts cannot be avoided through design refinement, appropriate and well proven mitigation and management measures have been developed and are provided in Chapter 22.

The following sections provide a summary of the main impacts identified within the EIS. The potential impacts of construction and operation of the project were assessed. Given the nature and size of the project the EIS considers the potential for impacts to the project site as well as the broader study area, where relevant.

The EIS was informed by specialist technical assessments of the key environmental issues defined by the SEARs, in addition to other relevant environmental issues.

Traffic, transport and access

Construction would generate additional vehicle movements, including light and heavy vehicles. There would also be local traffic disruptions, minor delays and short-term access restrictions and detours for road users during road and bridge works, particularly during the Broomfield Street realignment works. Most intersections potentially affected by the project would continue to operate throughout the construction period at a level of service comparable to existing conditions.

Minor access diversions would be in place for pedestrians and cyclists during works on Cabramatta Creek bridge. There may be temporary disruptions to access for properties directly fronting Broomfield Street during enabling works.

Parking impacts are likely during construction and approximately up to 46 on-street parking spaces (consisting of both formalised angled parking and informal kerbside parallel parking) would be unavailable

during works on Broomfield Street. It is anticipated that construction worker parking would be kept to designated compounds and areas designated for construction workers only. An accessible temporary at-grade parking area is being investigated to provide about 40 parking spaces within 800 metres of Cabramatta Station during construction.

There are no changes expected to occur to the existing road network (including pedestrian and cyclist networks) or access arrangements to public transport as a result of the project.

The project would result in the loss of some parking spaces on the western side of Broomfield Street as a result of angled kerb parking converted to parallel parking. Up to 11 spaces are anticipated to be impacted, however, parking surveys indicate there is sufficient capacity within Broomfield Street to absorb this loss.

Noise and vibration

Given the nature and duration of works and close proximity of receivers, airborne noise during construction is expected to exceed noise management levels along the alignment. This would be consistent for works during and outside standard construction hours. The highest construction noise impacts are expected during road earthworks, noise wall construction and track installation.

Receivers located along Railway Parade, Broomfield Street, Station Street, Lawrence Hargrave Road, Todman Road and Sappho Road would be expected to experience the worst-case noise impacts as they are located directly adjacent to the construction works. In general, construction activities would move along the construction alignment. Impacted receivers would only experience the predicted worst case noise levels when construction works are located closest to the receiver.

Construction works would be required outside standard construction hours, due to the need to minimise impacts on the road network. During the night time period, airborne noise levels are expected to exceed the sleep disturbance criteria at some locations during certain activities.

Residential receivers within 140 metres of vibration intensive works have the potential to experience impacts on human comfort. However, this is considered conservative and the construction vibration would be intermittent. No residential or commercial sensitive receivers are predicted to be impacted by vibration during operation.

The existing noise wall would be replaced as part of the project. The predicted noise levels during operation would be exceeded for one sensitive receiver with the replacement noise wall in place. This receiver will be considered for mitigation.

Biodiversity

The project site does not contain native vegetation and clearing required for the project would result in 3.5 hectares of non-native vegetation. This vegetation has low biodiversity value given its context and habitat value for threatened species. The clearing would involve the removal of some individual native plants, including mature planted street trees and trees in parkland. The project would result in the removal of 43 planted trees with the majority of these located along Broomfield Street.

Construction of the project would remove a very small area of fauna habitat, as most of the project site is already cleared land. The vegetation that would be removed or modified would have little value for native fauna species given its structure, condition and proximity to the heavy rail corridor.

No endangered aquatic communities, aquatic fauna or marine vegetation occur in the project site and no significant impacts on riparian vegetation or habitats downstream of the project site are anticipated as a result of the project. There would be minor, if any impacts on Key Fish Habitat in Cabramatta Creek as a result of the project.

The wider study area contains some land with biodiversity value, including a threatened flora species, *Acacia pubescens,* and threatened ecological community, River-flat Eucalypt Forest. This species would not be

impacted by the project and the project site has been designed to avoid any vegetation removal of the threatened ecological community.

Hydrology, flooding and water quality

The project site, particularly near Cabramatta Creek, would be located in an area that is currently subject to flooding conditions. Any flood impacts during construction are expected to be localised and relatively minor and would be effectively managed through the implementation of mitigation measure. The locations of compounds, work sites and undertaking of activities within designated flood hazard areas would not result in flood affectation of other properties, assets and infrastructure

Construction activities could impact also water quality if soil or watercourses are disturbed, contamination is generated, or uncontrolled discharges of substances to watercourses occur.

Based on the flooding assessment undertaken the inclusion of structures as part of the project (with the exception of the proposed drainage works) would have a minimal impact on the flooding of Cabramatta Creek for the full range of flood events. Minimal increases (of less than 11 millimetres) in flood levels are expected in the majority of the study area for the one per cent annual exceedance probability (AEP) and the one per cent AEP plus climate change event. However, in the probable maximum flood event, an extremely rare event, these impacts are more pronounced at around 75 mm, but occur only in areas where the rail formation is already predicted to be flooded by several metres depth.

With regards to the proposed drainage changes along Broomfield Street the flooding assessment indicated that the project would have a minimal impact on the flooding of the majority of properties along Broomfield Street during the one per cent AEP flood event. Eight properties that currently experience flooding along Broomfield Street would experience flooding levels beyond the flooding criteria adopted for the assessment. However, for the majority of these eight properties the flooding impact due to the project would be confined to the front yard of and the flood level increase would be marginal (up to 8 millimetres greater than the proposed design criteria). Further refinements of the drainage design will be undertaken during detailed design to mitigate the flood impacts noted above. These design refinements could include changing the proposed level of Broomfield Street to match the existing grading.

Heritage

There are multiple heritage items within and adjacent to the project site. During construction, there is potential for vibration impacts to two locally listed bridges adjacent to the proposed bridges and the archaeological remains of a locally listed federation cottage.

Once operational, there may be indirect impacts to the aesthetic significance and views of the two locally listed bridges and indirect impacts to the heritage values of the two station groups by changing the settings of the items.

A search of Aboriginal cultural heritage sites within proximity to the project site, identified the presence of archaeological sites and an Aboriginal Place. Two sites are located within 50 metres of the project site and would not be impacted as a result of the project. Impacts to the area of moderate archaeological potential within Jacquie Osmond Reserve cannot be avoided as utility works are required. Access would also be required from this location to build a retaining wall alongside the existing rail corridor.

Land use and property

Land uses within the project site include the existing rail and road corridor, open space recreational and commercial/industrial. Direct impacts on land use during construction would include temporary land take to locate some of the proposed compounds and work sites and to temporarily relocate utilities. It would also include the short term presence of construction equipment, plant, vehicles, compounds, and work sites within the project site.

Where the compound and work sites are proposed, the recreational use of Jacquie Osmond Reserve and Warwick Farm Recreation Reserve would be temporarily restricted during construction. Impacts to major utilities have been identified for the road works along Broomfield Street and for the construction of the passing loop in the southern extent of the project.

Some permanent acquisition is required to the east of the existing rail corridor to accommodate the passing loop. The project would not directly impact any local urban release areas identified for future residential or employment land. The project would enable the increase in economic productivity and economic growth by contributing to a freight and logistics network that is competitive and efficient.

Landscape and visual amenity

The existing landscape and visual environment consists of the rail and road corridor, residential areas either side of the rail corridor, commercial and industrial land uses near the rail corridor and passive (Cabramatta Creek) and active recreation (Jacquie Osmond Reserve and Warwick Farm Recreation Reserve). Sensitive visual receivers in the study area include residential properties along Broomfield and Sussex Street, users of Jacquie Osmond Reserve and pedestrians, road users and cyclists along Cabramatta Road.

Temporary visual impacts would be experienced during construction in the vicinity of construction compounds, and work sites. Visible elements would include machinery and equipment, site hoardings, partially complete structures, and other works. However, these impacts would be temporary and limited to the construction period.

The project would also result in the removal of the existing street trees and reconfiguration of Broomfield Street. Additionally trees would be removed in Jacquie Osmond Reserve and an embankment constructed parallel to the rail corridor.

A landscape concept was prepared as part of the reference design through an iterative design process that considered the urban landscape as well as the findings of a preliminary landscape and visual impact analysis. The resulting landscape and visual impact assessment took the landscape concept plan into consideration in the finalisation of the project impacts.

The assessment found that the visual impacts from the project range from moderate-to-low to high-to-moderate. The most significant impact is from the works along Broomfield Street due to the residential receiver type, their proximity to the project and the amount of visual change due to the project.

Mitigation measures have been developed to minimise the potential landscape and visual impacts of the project. These measures include the preparation of an urban design and landscape plan which would build on the existing landscape concept.

Other

In addition to the above, other environmental issues, including socio-economic, air quality, soils and contamination, health, safety and hazards, and waste management, were also considered to develop a comprehensive environmental management framework for the project.

Potential impacts resulting from the project are considered manageable through the implementation of the proposed mitigation measures.

The detailed design for the project would be developed with the objective of minimising potential impacts on the local and regional environment, and the local community. The design and construction methodology would continue to be developed with this overriding objective in mind, taking into account the input of stakeholders.

Next steps

The Department of Planning, Industry and Environment (formerly the Department of Planning and Environment) will place the EIS on exhibition for a minimum of 28 days. During the exhibition period, government agencies, project stakeholders and the community will be able to review the EIS and make a written submission to the Department of Planning, Industry and Environment for consideration in its assessment of the project.

Advertisements will be placed in newspapers to advise of the exhibition period, where the EIS can be viewed, and provide contact details.

Following the exhibition period, ARTC will consider the issues raised in submissions and will respond to community feedback in a submissions report. The report will also document the outcomes of any ongoing investigations and design work identified following the exhibition of the EIS.

Should changes to the project be proposed during the exhibition period, a preferred project report would be prepared to assess the impacts of any changes. The submissions report would be integrated into this report.

If the project is approved, it would be undertaken in accordance with the mitigation measures proposed in the EIS, the submissions/preferred infrastructure report, and the conditions of approval.

ARTC is implementing a comprehensive community and stakeholder consultation program to engage proactively with local communities and key stakeholders about the project. Consultation with stakeholders and the community would continue throughout the detailed design and construction phase.

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PART A

BACKGROUND AND PROJECT DESCRIPTION

CABRAMATTA
LOOP PROJECT

ENVIRONMENTAL
IMPACT STATEMENT

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1 Introduction

1.1 Background

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, 2018d; Infrastructure Australia, 2016).

Over the next 20 years, container rail freight volumes on Sydney's rail freight network are predicted to increase substantially. The major drivers of this increase will be population growth, economic growth (resulting in increases in freight movements over and above the rate of population growth) and growth in global community demand (Transport for NSW, 2018d). This will put more pressure on existing rail infrastructure, which includes the Southern Sydney Freight Line (SSFL).

The SSFL was commissioned in 2013 and is a 36 kilometre long single bi-directional track dedicated freight line located between Macarthur and Sefton, adjacent to the Main Southern Line in Sydney's south-western suburbs. The SSFL is managed and maintained by the Australian Rail Track Corporation (ARTC).

In 2015 ARTC prepared the Sydney Metropolitan Freight Strategy (ARTC, 2015) which considered existing rail freight capacity issues and identified priority actions to respond to rail freight demands on Sydney's rail freight network. This strategy recommended a number of infrastructure projects to enhance the capacity of the freight network, including a passing loop at Warwick Farm and the duplication of the Botany Rail line. Based on the outcomes of this strategy in 2015, the then Department of Infrastructure and Regional Development made a recommendation to develop a rail loop aligned with the existing rail corridor between Cabramatta and Warwick Farm stations.

In May 2018, the Australian Prime Minister announced the Federal government's commitment to the Botany Rail Duplication Project, including the Cabramatta Loop Project, to the value of $400 million. Consistent with this commitment ARTC proposes to construct and operate a passing loop for up to 1,300 metre length trains on the SSFL between Cabramatta and Warwick Farm stations (the Cabramatta Loop Project).

The Cabramatta Loop Project would allow freight trains to pass and provide additional rail freight capacity along the SSFL.

1.2 Project overview

To provide additional rail freight capacity along the SSFL, ARTC ('the proponent') is seeking approval to construct and operate the Cabramatta Loop Project ('the project').

The project would comprise the construction and operation of a passing loop on the SSFL to enable freight trains, up to 1,300 metres long and travelling in either direction, to pass each other. The project would be partly located within the existing rail corridor between the Hume Highway and Cabramatta Road East road overbridges in the suburbs of Warwick Farm and Cabramatta. In addition, the project includes works in Broomfield Street and Jacquie Osmond Reserve, adjacent to the rail corridor.

The location of the project is shown on Figure 1.1. Further information on the location and a description of the project site for the purposes of this environmental impact statement (EIS) is provided in Chapter 2 (Location and setting).

The project would operate as part of the SSFL and would continue to be managed by ARTC. ARTC manages and maintains the SSFL as part of its rail network across five states. ARTC works with rail operators to provide access to rail for businesses and producers across Australia. Freight train services and rolling stock which utilise the ARTC network are currently, and would continue to be, owned and operated by a variety of operators.

It is estimated that once the project is operational, there may be an increase in freight train movements from 48 up to 72 per day by 2033.

Further information on the project features, construction and operation is included in Chapter 6 (Project features and operation) and Chapter 7 (Construction).

The project is State significant infrastructure in accordance with Division 5.2 of the *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). As State significant infrastructure the project the project is permissible without development consent and is subject to assessment and approval by the NSW Minister for Planning and Public Spaces.

Further information on the approval requirements is provided in Chapter 3 (Approval and assessment requirements).

1.2.1 Key features

Key features of the project include:

- new rail track – providing a 1.65 kilometre long section of new track adjacent to the existing track, with connections to the existing track at the northern and southern ends
- track realignment – moving about 550 metres of existing track sideways (slewing) to make room for the new track
- bridge works – constructing two new bridge structures adjacent to the existing rail bridges over Sussex Street and Cabramatta Creek
- road works – reconfiguring Broomfield Street for a distance of about 680 metres between Sussex and Bridge streets.

Ancillary work would include communication, signalling and power upgrades, works to existing retaining and noise walls, drainage work and protecting/relocating utilities. In addition, minor works in the form of new signalling would be installed at a number of locations within the rail corridor.

The key features of the project are shown on Figure 1.2.

1.2.2 Delivery of the project

The project as described in this EIS is based on the outcomes of the reference design for the project. Subject to approval of the project, detailed design is proposed to commence following approval and construction would likely commence in early 2021 and is expected to take about two years. Construction is expected to be completed in early 2023.

In order to minimise the impact to Sydney's freight network, it is anticipated that the project would predominantly be constructed while the existing rail line continues to operate. Some features of the project would need to be constructed during programmed rail possession periods when rail services along the SSFL and, in some cases, adjacent commuter train lines, do not operate. Possession periods typically occur for 48 hours over a weekend, four times per year.

1.3 Project objectives

The primary objective of the project is to increase capacity to meet the forecast demand for container freight transport on the SSFL. Secondary objectives are to provide:

- increased reliability for freight customers
- increased operational efficiency and flexibility
- increased rail market share for containerised freight.

It is intended that the project would:

- alleviate constraints on, 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.

The project is one of a number of initiatives proposed to increase the capacity of Sydney's rail freight network. In addition to the project, ARTC is also proposing to undertake the Botany Rail Duplication Project, which would involve duplicating the Botany Line.

The Australian Government has recognised the need for the Cabramatta Loop and Botany Rail Duplication projects and announced a funding commitment of $400 million in the 2018 budget for both projects. The Botany Rail Duplication Project is subject to a separate assessment and approval process, which is currently underway.

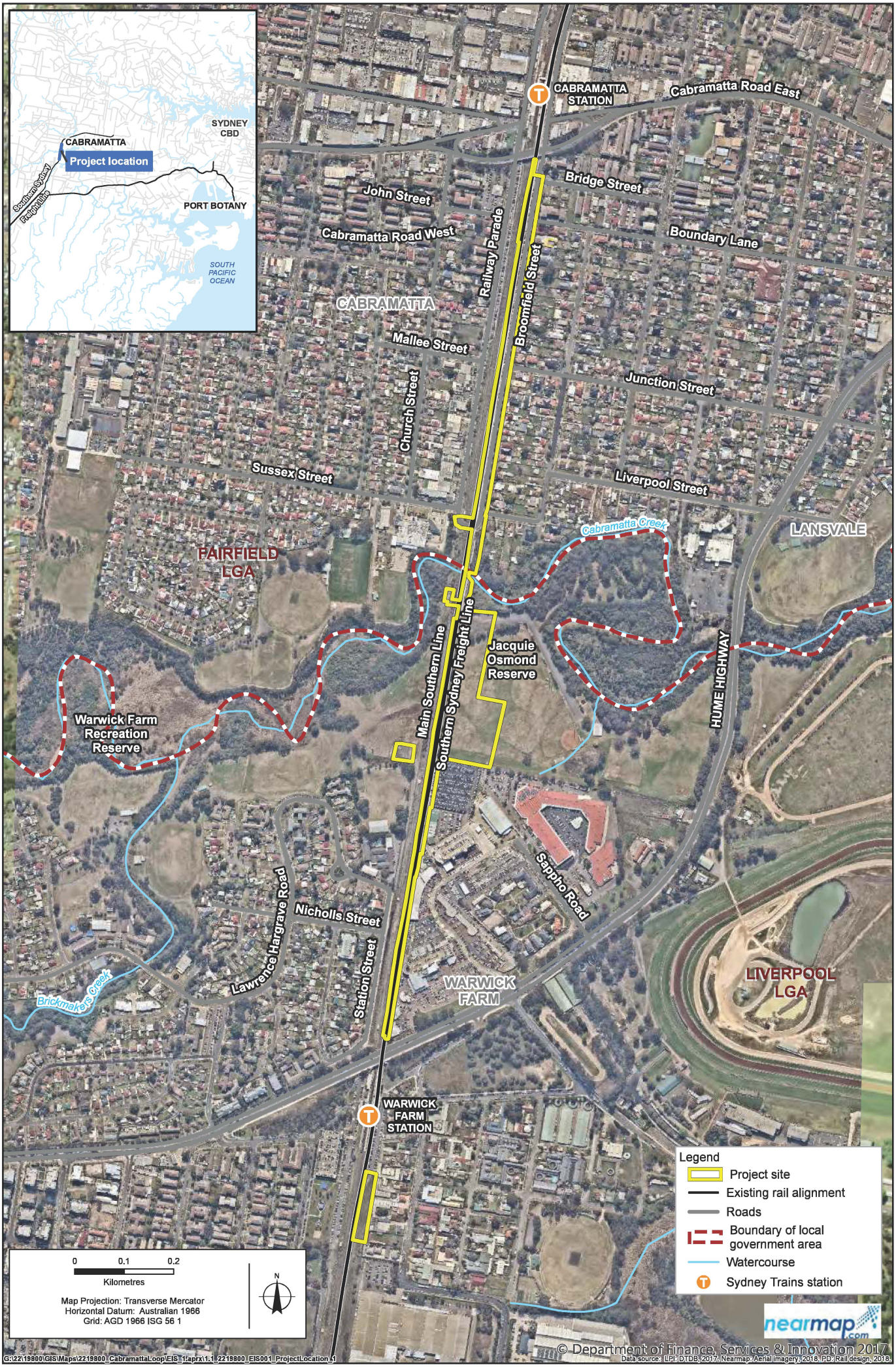

Figure 1.1 Location of the project

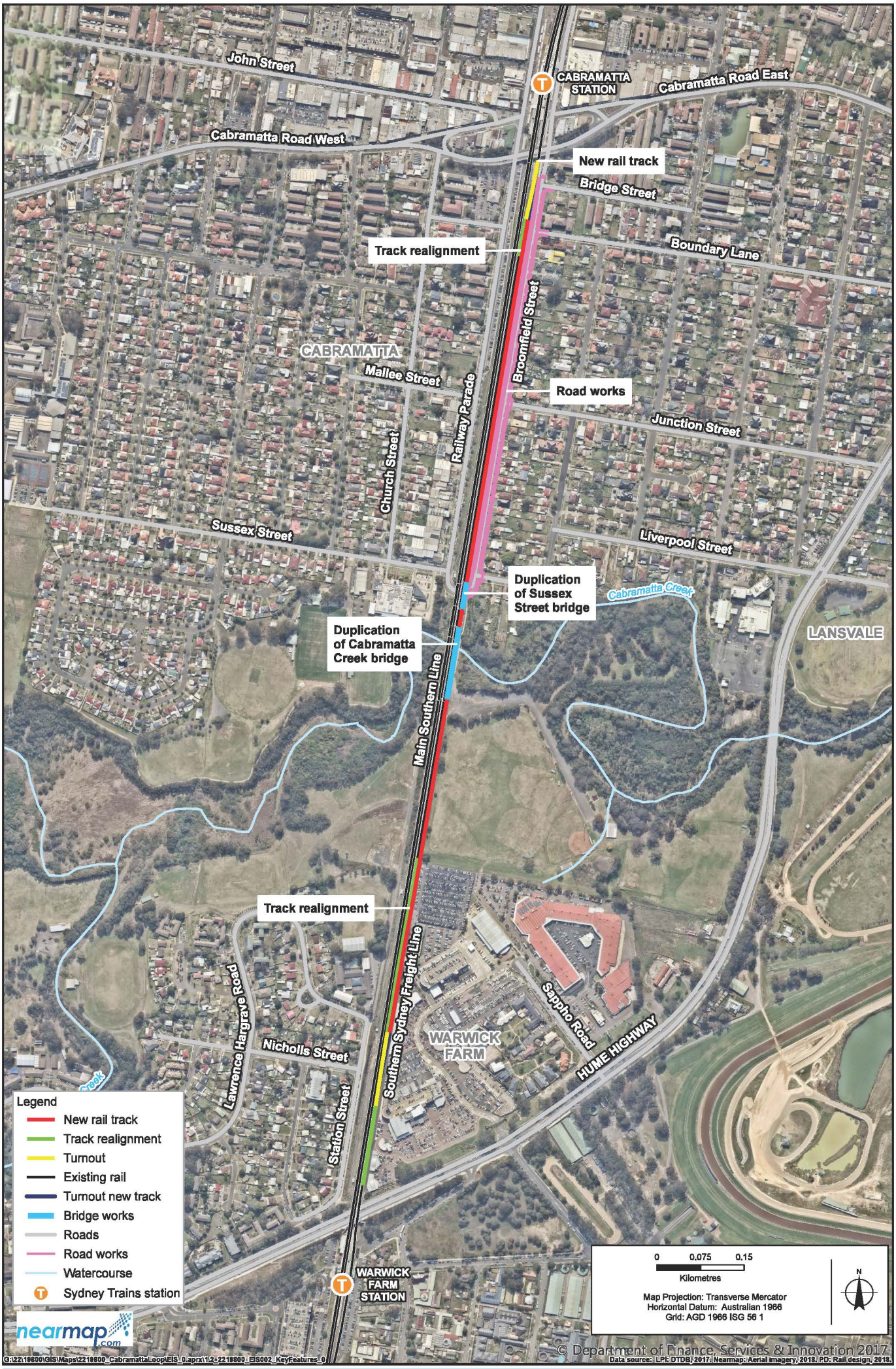

Figure 1.2 Key features of the project

1.4 The proponent

ARTC is the proponent of the project. ARTC is an Australian Government owned statutory corporation that manages more than 8,500 kilometres of rail track in NSW, Queensland, South Australia, Victoria and Western Australia. ARTC is responsible for:

- selling access to the rail network to train operators
- capital investment in the network
- managing train operations
- maintaining the network
- developing new business.

1.5 EIS purpose and structure

The EIS has been prepared to support the application for approval of the project as State significant infrastructure under Division 5.2 of the EP&A Act. It has been prepared in accordance with the environmental assessment requirements of the Secretary of the Department of Planning, Industry and Environment (the SEARs) dated 17 May 2018 and the form and content requirements of schedule 2 of the Environmental Planning and Assessment Regulation 2000 (the Regulation). The SEARs and requirements of the Regulation, as well as how they have been addressed in this EIS, are provided in Appendix A and Appendix B, respectively.

The EIS also documents the consultation undertaken by ARTC with the community and key stakeholders about the project and associated potential impacts. This is discussed in Chapter 4. The process, and the consideration of public submissions received as part of the EIS public exhibition, provides the basis for stakeholders to have their views on the project heard and considered, subsequently providing a mechanism for design refinements to further reduce potential impacts.

The EIS takes a local level approach to the assessment of potential environmental impacts due to the nature and size of the project.

The EIS is presented across a series of volumes. Volume 1 contains the EIS (this report) and its appendices. Volumes 2 to 5 provide the technical papers that inform the EIS. The EIS is structured as follows:

- Part A Background and project information:
    - an introduction to the EIS (Chapter 1)
    - a description of the project site and the general biophysical and socio-economic environment within which the project would be located (Chapter 2)
    - an overview of the statutory context and approval requirements for the project (Chapter 3)
    - a summary of the consultation that has occurred and is proposed for future project stages (Chapter 4)
    - a description of the background to the project, including the project need, alternatives to the project as a whole, how the design has developed, and the options considered as part of the design process (Chapter 5)
    - a description of the project features and operation (Chapter 6), including the design features and infrastructure proposed, operation, maintenance and other related information
    - a description of the indicative construction process and activities (Chapter 7).

- Part B Environmental assessment:
  - identifies potential environment impacts which may occur, including local traffic and access, heritage, visual, noise and vibration impacts (Chapters 8 to 21).
- Part C Synthesis and conclusion:
  - a consolidated summary of the key potential impacts, the proposed approach to environmental management and a compilation of the mitigation measures (Chapter 22)
  - conclusion and justification (Chapter 23)

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2 Location and setting

The EIS assesses the potential impacts of the project on the project site and, where relevant, the broader study area. This chapter describes the project site and study area for the purpose of the EIS, including a summary of its general biophysical and cultural (community, land use and socio-economic) environment.

Further information on the existing environment as it is relevant to each individual issue is provided in Chapters 8 to Chapter 21.

2.1 The project site

2.1.1 General description

The term 'project site' is used in this EIS to refer to the area that would likely be directly disturbed by construction of the project (for example, as a result of ground disturbance and the construction of foundations for structures). It includes the proposed location of construction activities, compounds and work sites, and the location of permanent operational infrastructure.

The project site is located about 35 kilometres west of the Sydney CBD in the City of Fairfield and City of Liverpool local government areas (LGAs). In the project site, the boundary of the LGAs runs along Cabramatta Creek. The northern extent of the project site is located in the vicinity of the intersection of Bridge and Broomfield streets, south of Cabramatta Station. The southern extent of the project site is located to the north of the Hume Highway and Warwick Farm Station (excluding construction compound C1 which is located to the south of Warwick Farm Station). The project site is shown on Figure 1.1.

The works associated with the project would be undertaken within and directly adjacent to the existing rail corridor (shown on Figure 1.1). The project site generally includes:

- the existing rail corridor for the SSFL (the existing rail corridor) between Cabramatta Station in Fairfield LGA and Warwick Farm train station in Liverpool LGA
- bridges crossing the rail corridor where works are proposed as part of the project (described in section 6.2.3)
- about 18,990 metres squared on Broomfield Street
- about 27,757 metres squared on Jacquie Osmond Reserve
- the proposed locations of work sites and construction compounds (described in section 7.4).

2.1.2 Land ownership

The majority of the project site (the existing rail corridor and shared path near Cabramatta Creek) is owned by the NSW Government (RailCorp). Small areas of land outside the corridor (a total of about 0.37 hectares) would be required to accommodate the passing loop and the associated widening of the rail corridor. The areas required would include:

- sections of the road corridor in Broomfield Street (owned by Fairfield City Council)
- a section of Jacquie Osmond Reserve owned by the Department of Planning, Industry and Environment (formerly the Department of Planning, Industry and Environment) but managed by Liverpool City Council
- a section of the rail corridor owned by Liverpool City Council
- a section of two privately owned commercial lots and one lot owned by Liverpool City Council in the southern part of the project site.

Additional agreements may be required for temporary use of land during construction. Further information on land requirements for the project is provided in section 6.5.

2.2 The study area

The term 'study area' is used to define the wider area, including and surrounding the project site, with the potential to be directly or indirectly affected by the project (for example, by noise and vibration, visual or traffic impacts). The actual size and extent of the study area varies according to the nature and requirements of each assessment and the relative potential for impacts. For example, the study area for the heritage assessment is generally restricted to the area with the potential for heritage impacts. In comparison, the study area for the noise and vibration assessment is based on noise catchment areas, and extends for a distance of about one kilometre on either side of the majority of the project site, and includes construction compounds.

2.2.1 General biophysical environment

A brief summary of the general biophysical characteristics of the study area is provided below.

2.2.1.1 Soils

The geology of the study area varies from Bringelly Shales in the north near Cabramatta Station, to Tertiary sediments and Quaternary alluvium in the south near the Warwick Farm end. The study area is located on the Blacktown soil landscape, which generally has low soil fertility and poor drainage.

The study area is located in an area of moderate salinity potential. Acid sulphate soils are located to the east of the project site, along Cabramatta Creek.

A contamination assessment undertaken to inform the EIS identified that there is a low risk of contamination within the project site.

Further information on geology and soils and soil contamination is provided in Chapter 12.

2.2.1.2 Water

The study area is located within the Cabramatta Creek catchment and the project site crosses Cabramatta Creek which flows eastwards to the Georges River. Within the project site water generally drains to Cabramatta Creek via stormwater drainage infrastructure.

Water quality within the catchment is generally poor because of the influence of run-off from urban areas.

The majority of the project site is subject to regular flooding from Cabramatta Creek and is located within a high flood risk precinct. Flooding issues generally result from the limited capacity of existing drainage infrastructure.

Further information on hydrology, flooding and water quality is provided in Chapter 13.

2.2.1.3 Biodiversity

The majority of the study area has been heavily modified by past and ongoing disturbances associated with urban development and the active rail and road corridor. Vegetation within the project site is dominated by planted native and exotic species. This includes vegetation in the form of street trees along Broomfield Street.

One listed ecological community, listed under *the Biodiversity Conservation Act 2016* (BC Act) occurs in the study area:

- River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions' (River-Flat Eucalypt Forest).

The Cabramatta Creek Grey-headed Flying-fox (Pteropus poliocephalus) roost camp is located around 350 metres to the east of the project site. The Grey-headed Flying Fox is listed as a vulnerable species under the Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) and the BC Act.

The rail corridor also contains one stem of the threatened plant Downy Wattle (*Acacia pubescens*), which is listed as a vulnerable species under the EPBC Act and the BC Act.

Further information on biodiversity is provided in Chapter 11.

2.2.2 General social and cultural environment

A brief summary of the general social and cultural characteristics of the study area is provided below.

2.2.2.1 Transport infrastructure

The transport infrastructure around the project site is typical of a Sydney suburb and includes a network of regional and local roads, active transport facilities, public transport (bus and passenger trains) and the SSFL. A brief overview of key existing infrastructure in the study area is provided below. Further information on the existing traffic and transport environment in the vicinity of the project site is provided in Chapter 8.

2.2.2.2 Rail

The project site includes the SSFL, and is located directly adjacent to the Main Southern Line. The SSFL (shown on Figure 2.1) is a 36 kilometre long single track dedicated freight line located between Macarthur and Sefton. The SSFL connects with the Metropolitan Freight Network (MFN) and provides access to Sydney's main intermodal terminals (Enfield, Chullora, Moorebank and Cooks River) and Port Botany.

The Main Southern Line, which is predominantly used by passenger trains, runs between Lidcombe in Sydney and Albury at the Victorian border. Within the study area, passenger services are provided by Sydney Trains along the T2 Inner West and Leppington Line, and the T5 Cumberland Line. Two Sydney Trains stations are located in close proximity to the project site – Cabramatta Station is located about 130 metres north of the project site, and Warwick Farm Station is located about 120 metres south of the project site.

2.2.2.3 Parking

There is generally a mix of both on street and off street parking available within walking distances to Cabramatta Station, Canley Vale Station and Warwick Farm Station.

Around Cabramatta Station there is designated on street parking provided on both sides of Broomfield Street. Off street parking within Cabramatta town centre (west of the station) is provided pre-dominantly for local business activity associated with the town centre. There is a multi-storey paid car park located to the east of the station accessible via Fisher Street and a smaller free car park accessible via Cumberland Street.

There are approximately 379 parking spaces available on Broomfield Street (north and south of Cabramatta Station). Untimed on-street parking is located on both sides of Broomfield Street. For the majority of street within the project site there is currently angled parking on the western side of the road and informal kerbside parallel parking on the eastern side. North of Broomfield Lane the parking consists of parallel parking on the western side only.

Warwick Farm Station is serviced by a multi-storey off street parking facility at the western side of the station. At grade parking facilities exist adjacent to the station to the east and the west. In addition, there is on street parking available on Hart Street, located to the west of the station.

2.2.2.4 Road network

Classified roads close and/or crossing the study area via road overbridges include Governor Macquarie Drive and Hume Highway in the south and Cabramatta Road (East and West) and Railway Parade in the north.

Hume Highway runs in an east –west direction in the southern part of the study area before heading north and running roughly parallel to the project site in the eastern part of the study area. Cabramatta Road East connects to Hume Highway to the northeast of the study area.

Orange Grove Road/Joseph Street, which is located about 1.5 kilometres to the west, also runs roughly parallel to the project site.

2.2.2.5 Buses

A number of bus routes cross the study area, serving Cabramatta Station and Warwick Farm Station in the north and south of the study area, respectively.

No bus routes are located within the project site. The nearest bus routes to the project site run along Broomfield Street and Cabramatta Road to the north of the project site, stopping at Cabramatta Station.

2.2.2.6 Taxis and kiss and ride facilities

On the western side of Broomfield Street adjacent to Cabramatta Station there is a taxi rank with capacity for two cars, Directly north of this taxi rank, there is a pickup and drop off area (commonly called “kiss and ride”) with two car spaces serving Cabramatta Station. There is also a kiss and ride facility with one car space serving Cabramatta Station on the southern side of Cabramatta Road East.

At the Warwick Farm Station Remembrance Avenue/Hart Street exit there is a designated taxi zone designed to accommodate a maxi taxi located adjacent to the station access. Warwick Farm Station also has a designated kiss and ride facility with ten spaces on Remembrance Avenue, just east of Hart Street.

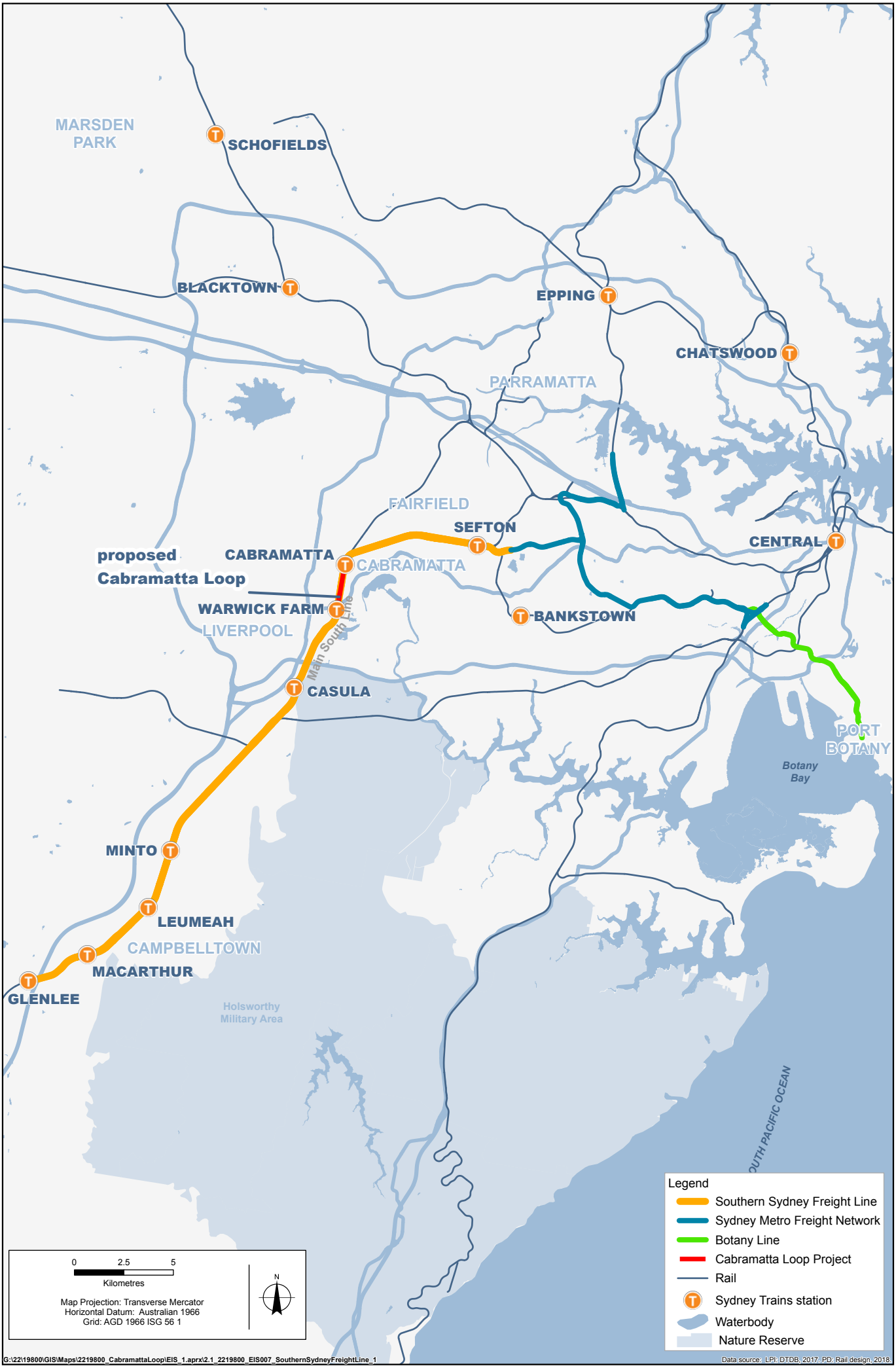

Figure 2.1 Location of the Southern Sydney Freight Line

2.2.2.7 Active transport

The study area includes active transport facilities typical of suburban streets with footpaths on both sides of local roads. The majority of local cycling connections are on-road mixed environments or pathways through recreation areas/parks with the exception of the Parramatta to Liverpool Cycle Rail Trail (the Cycleway). A formal path which forms part of the Cycleway, runs parallel to the eastern boundary of the rail corridor in the north of the study area. An informal path crosses under the rail corridor at Jacquie Osmond Reserve/Warwick Farm Recreation and runs parallel to the western boundary of the rail corridor to connect with the Cycleway south of the project site. The Cycleway runs beside the rail line between Liverpool and Parramatta train stations, providing access to railway stations, shops, schools, playing fields, parks, hospitals, industrial developments and Cabramatta's town centre and restaurant precinct.

2.2.2.8 Land use and property

The study area consists of a varied and relatively dense mix of land uses, including residential, commercial, recreation, transport infrastructure, community, health, education, and industrial.

The works are located within an active rail corridor used for transport (rail) purposes and within land directly adjacent to the rail corridor. This includes regional rail freight uses (the SSFL) and suburban rail uses (the Main Southern Line). Other land uses include a road corridor (Broomfield Street) and recreational areas (Jacquie Osmond Reserve and Warwick Farm Recreation Reserve).

Land uses surrounding the project site mainly include a mix of predominantly low density residential and recreational land uses, with other land uses scattered throughout the study area.

Commercial development is generally located in the north of the study area, near Cabramatta Station (Cabramatta CBD) and in the south of the study area near Peter Warren Automotive and Warwick Farm Station.

The vast majority of the project site is located on publicly owned land.

Further information on land use and property is provided in Chapter 16.

2.2.2.9 Socio-economic

The Fairfield and Liverpool LGAs have a combined population of 403,143 (ABS, 2016), with about 50 per cent living in each LGA. The study area is characterised by socially and culturally diverse communities.

The Fairfield LGA covers an area of 102 square kilometres and incorporates 27 suburbs. It is predominantly residential with some semi-rural areas to the west and large scale industrial parks at Wetherill Park, Fairfield East, Lansvale, Old Guildford, Yennora and Smithfield. There are also 560 recreational parks (60 of which are major parks) including one of the largest urban parks in the world, Western Sydney Parklands.

The Liverpool LGA covers an area of 306 square kilometres, with semi-rural areas to the west and mixed use and residential to the east. The population of the LGA is growing significantly due to urban land release for development and redevelopment of established areas. Within the LGA a number of major developments are proposed, including the Western Sydney Airport at Badgerys Creek.

The Liverpool LGA is one of the oldest urban settlements in Australia. After the urban sprawl in the 1950s it became an outer suburb of metropolitan Sydney with a strong working-class presence and manufacturing industries. The Liverpool CBD has become the major commercial centre of southwest Sydney and includes many shopping centres, high rise office developments and the Liverpool Hospital. The LGA also contains many open spaces and natural environment areas including Georges River, Chipping Norton lakes and other bushland area that are part of Western Sydney Parklands.

Further information on the socio-economic environment is provided in Chapter 18.

2.2.2.10 Heritage

Non-Aboriginal heritage

Urban development in the vicinity of the project site increased following the early 1850s to late 1880s with the construction of the railway line from Granville to Liverpool, which formed part of the Main South railway line to Goulburn.

In 1884, land contained within the northern part of the project site (part of a 300 acre grant), was acquired by John Bloomfield who subsequently subdivided the land, establishing the town ship of Cabramatta.

One item listed on the State Heritage Register (Liverpool Railway Station Group) is located in the south of the study area. A number of other local or items listed on the Section 170 heritage register are located adjacent to, or within 25 metres of the project site, including the rail bridges at Cabramatta Creek and Sussex Street which are located directly adjacent to the existing SSFL bridges.

Further information on non-Aboriginal heritage is provided in Chapter 14.

Aboriginal heritage

The project site is in the vicinity of three language groups:

- the Dharwal who covered the south side of Botany Bay, extending as far as Shoalhaven River
- the hinterland Darug who covered the area from Appin in the south to the Hawkesbury River in the north and west of the Georges River, Parramatta, the Lane Cover River and Berowra Creek
- the Gundungurra who covered the southern rim of the Cumberland Plain west of the Georges River, as well as the southern Blue Mountains (Attenbrow, 2002).

The project site would have provided an abundance of natural resources able to be utilised in various ways by Aboriginal people. Artefacts and potential archaeological deposits have been previously recorded within the region in the vicinity of permanent sources of water such as Cabramatta Creek.

There are no listed Aboriginal heritage sites located within the project site. The closest previously recorded Aboriginal heritage sites are a potential archaeological deposit and isolated item within Warwick Farm Recreation Reserve (about 50 metres from the project site). As a result the area to the west of the project site, within Warwick Farm Recreation Reserve, is considered to have high archaeological potential. The area to the east of the rail corridor, within Jacquie Osmond Reserve, has higher levels of disturbance so is therefore considered to have moderate archaeological significance. The rest of the project site is considered to have low archaeological significance due to the existing levels of disturbance in these areas.

Further information on Aboriginal heritage is provided in Chapter 15.

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3 Approval and assessment requirements

This chapter provides a summary of the project's approval requirements under relevant legislation, and the application and assessment process for the project. The chapter also considers the consistency of the project with other relevant statutory requirements.

3.1 Summary of requirements

The project is State significant infrastructure in accordance with Division 5.2 of the EP&A Act, by operation of the State and Regional Development SEPP and the Infrastructure SEPP. As State significant infrastructure the project is permissible without development consent and is subject to assessment and approval by the NSW Minister for Planning and Public Spaces.

The key steps in the planning approval process for the project are shown in Figure 3.1. The assessment and approval requirements under the EP&A Act are described in section 3.2. Other approvals and permits are also required, as described in section 3.3.

3.2 Approval and assessment requirements under the EP&A Act

The EP&A Act and the Regulation provide the framework for development assessment in NSW. The EP&A Act and the Regulation include provisions to ensure that the potential environmental impacts of a development are considered in the decision making process prior to proceeding to construction.

The key requirements of the EP&A Act in relation to the approval and assessment of the project are described below and shown in Figure 3.1. This is discussed further in Section 3.2.2.

Clause 79(1) of the Infrastructure SEPP 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 on any land. As the project is characterised as development for the purpose of a railway or rail infrastructure facilities and ARTC is identified as a public authority for development connected with 'rail corridors or railway infrastructure facilities' under clause 5 of the SEPP, development consent under Part 4 of the EP&A Act is not required for the project.

Part 5 of the EP&A Act defines the assessment process for infrastructure activities that do not need development consent. In accordance with section 5.1(1), ARTC is the proponent and determining authority for the project.

Section 5.12(2) of the EP&A Act provides that a State environmental planning policy may declare any development, or any class or description of development, to be State significant infrastructure. 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 is specified in the categories of development in Schedule 3 of the State and Regional Development SEPP.

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 about $120 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 and the preparation of an EIS is required (section 5.17(1) of the EP&A Act).

ARTC is seeking the project to be declared by the Minister for Planning and Public Spaces as critical State significant infrastructure under section 5.13 of the EP&A Act.

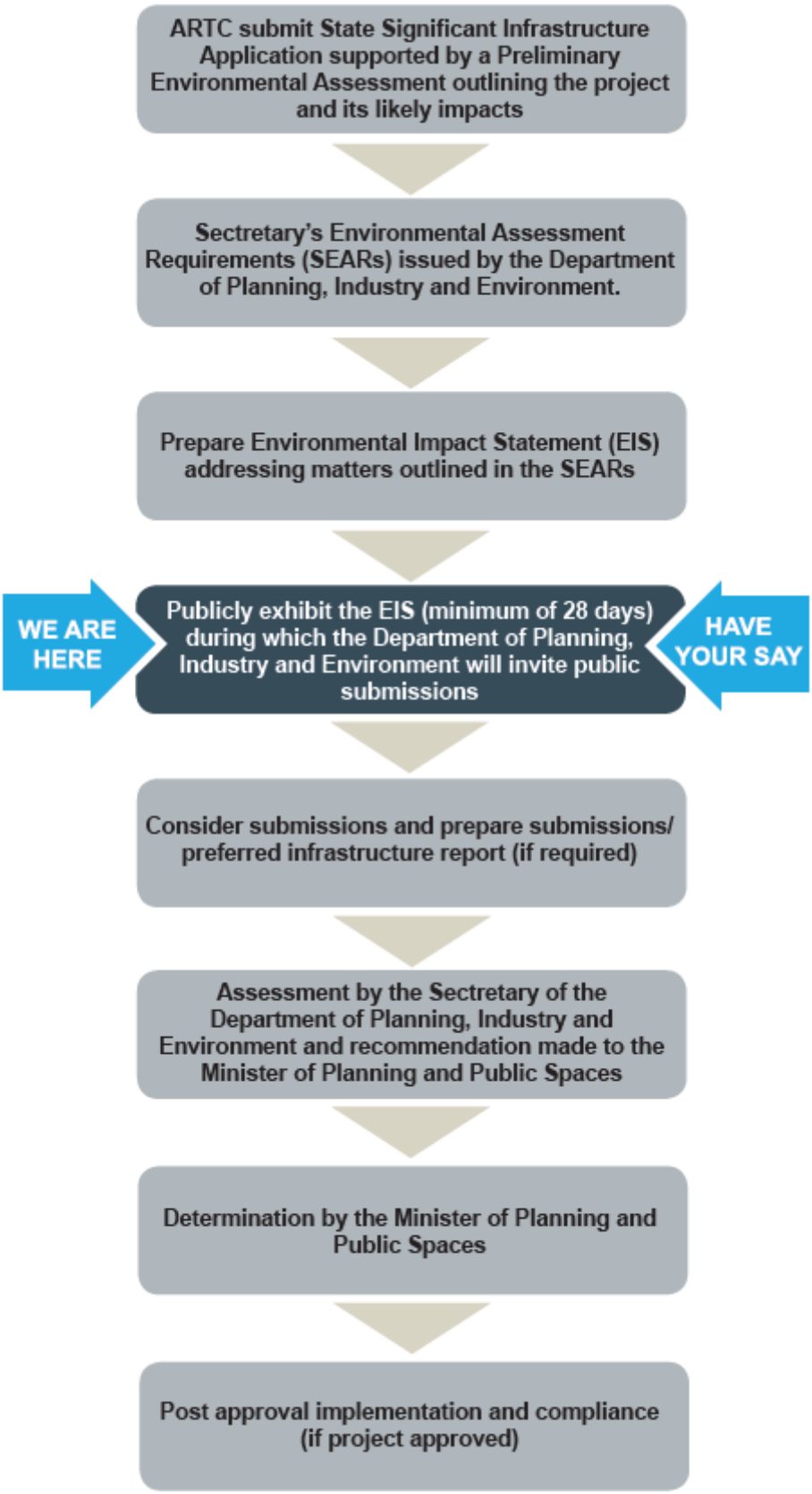

Figure 3.1 NSW planning approvals process for State significant infrastructure

3.2.1 Approval authority

Division 5.2 of the EP&A Act defines the approval requirements for State significant infrastructure. Under section 5.14, the approval of the Minister for Planning and Public Spaces is required for State significant infrastructure.

3.2.2 Approval process under Division 5.2 of the EP&A Act

3.2.2.1 Environmental assessment requirements

In accordance with section 5.15(2) of the EP&A Act, an application for State significant infrastructure needs to describe the infrastructure and contain any other matter required by the Planning Secretary. The SEARs for the project, issued on 17 May 2018, define the matters the Secretary requires the EIS to address (in accordance with section 5.17 of the EP&A Act). The requirements detailed in the SEARs, together with where they are addressed by this EIS, are provided in Appendix A.

The form and content requirements for the EIS are defined by Schedule 2 of the Regulation. These requirements, and how they are addressed by the EIS, are provided in Appendix B.

3.2.2.2 Public exhibition and submissions

The Department of Planning, Industry and Environment will place the EIS on public exhibition for a minimum of 28 days. During the exhibition period, interested parties can review the EIS and make a written submission to the Department of Planning, Industry and Environment for consideration during the assessment process.

At the completion of the public exhibition period, the Department of Planning, Industry and Environment will provide ARTC a copy of the submissions received. After reviewing the submissions, ARTC will prepare a submission report that responds to the relevant issues raised. If changes are required to the project to respond to the issues raised or to minimise environmental impacts, a preferred infrastructure report may also be required. The report will be made available to the public. Further information on the proposed approach to consultation during the exhibition period is provided in Chapter 4 (Consultation).

3.2.2.3 Assessment and approval

Following the exhibition period, the Department of Planning, Industry and Environment will prepare an assessment report, which is submitted to the Minister for Planning and Public Spaces for consideration.

Approval from the Minister for Planning and Public Spaces is required before ARTC can proceed with the project (pursuant to section 5.19 of the EP&A Act).

3.2.3 Land owner's consent/notification requirements

Clause 193 of the Regulation provides the owner's consent and notification requirements for State significant infrastructure. In accordance with clause 193(1), as the project is State significant infrastructure being undertaken by a public authority and is for linear transport infrastructure, the consent of individual land owners is not required to make an application.

However, notice of the application needs to be given in accordance with the requirements of clause 193(4).

3.2.4 Application of relevant environmental planning instruments

Section 5.22(2)(a) of the EP&A Act provides that environmental planning instruments (such as State environmental planning policies and local environmental plans) do not apply to or in respect of State significant infrastructure, except where *'they apply to the declaration of infrastructure as State significant infrastructure or as critical State significant infrastructure (and to the declaration of development that does not require consent)*'. The State environmental planning policies relevant to the declaration of the project as

State significant infrastructure and as development that does not require consent are considered in sections 3.2.1 and 3.2.2.

3.3 Other NSW legislative requirements

Sections 5.23 and 5.24 of the EP&A Act define the legislation that does not apply to State significant infrastructure, and the approvals that must be applied consistently. In accordance with these sections and relevant legislation, the other approvals that would be required are summarised in Table 3.1. Further information in relation to these requirements is provided in section 3.3.2.

Table 3.1 Other approval requirements under NSW legislation

Legislation	Requirement
Protection of the Environment Operations Act 1997 (POEO Act)	Operation of the project would be a scheduled activity for the purposes of the POEO Act and would require an environment protection licence (EPL). The need to modify ARTC's existing EPL (EPL #3142) to include the project would be confirmed in consultation with the EPA.
Water Act 1912	A licence would be sought under Part 5 of the *Water Act 1912* due to the need to undertake dewatering during piling and utility relocation works.

3.3.1 Legislation that does not apply or must be applied consistently

In accordance with section 5.23(1) of the EP&A Act, some legislation does not apply to State significant infrastructure or must be applied consistently. The relevant approvals not required, 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 (other than an aquifer interference approval) under section 91 of the *Water Management Act 2000.*

In addition, Division 8 of Part 6 of the *Heritage Act 1977* (relating to making heritage orders) does not apply to prevent or interfere with the carrying out of approved State significant infrastructure.

In accordance with section 5.24(1) of the EP&A Act, the following approvals that are potentially required cannot be refused:

- an environment protection licence under Chapter 3 of the POEO Act
- a consent under section 138 of the *Roads Act 1993*.

3.3.2 Consideration of requirements under relevant NSW Acts

NSW environmental planning related legislation relevant to the project is identified in Table 3.2.

Table 3.2 Consideration of requirements under relevant NSW legislation

Legislation	Requirement
Protection of the Environment Operations Act 1997 (POEO Act)	An EPL is required under Chapter 3 of the POEO Act to undertake a scheduled activity or scheduled development work (listed in Schedule 1). The project meets the definition of '33 Railway systems activities' in Schedule 1. Operation of the project would be a scheduled activity for the purposes of the POEO Act and would require an EPL. ARTC have an existing EPL (EPL #3142) that authorises rail system activities on the rail network. The need to modify ARTC's existing EPL to include the project would be confirmed in consultation with the EPA.
Roads Act 1993	Under section 138 of the *Roads Act 1993*, approval from the relevant roads authority is required to disturb, erect a structure, or carry out work in, on or over a public road. Clause 5(1) of Schedule 2 to the Roads Act exempts public authorities from this requirement, except in relation to works on or over classified and Crown roads. As discussed in section 3.2.1, ARTC is identified as a public authority for development connected with 'rail corridors or railway infrastructure facilities' under clause 5 of the Infrastructure SEPP. Additionally, the project does not include works to a classified public road. As such, approval is not required under the Roads Act 1993.
Water Management Act 2000 and Water Act 1912	The provisions of the *Water Management Act 2000* are being progressively implemented to replace the *Water Act 1912*. Since 1 July 2004 the new licensing and approvals system has generally been in effect in those areas of NSW covered by operational water sharing plans. The study area is covered by the Water Sharing Plan for the Greater Metropolitan Region Groundwater Sources 2011. Temporary dewatering and construction activities that interfere with aquifers are generally identified as aquifer interference activities in accordance with the *Water Management Act 1912* and the *NSW Aquifer Interference Policy (DPI 2012)*. However, the aquifer interference approval provisions of the *Water Management Act 2000* have not commenced, and licensing of these activities is carried out under Part 5 of the *Water Act 1912*. Construction of the project would involve piling works for construction of the bridges and retaining walls, which is likely to intercept groundwater. A licence would be sought under Part 5 of the *Water Act 1912* if extraction of groundwater in the form of dewatering is required.
Contaminated Land Management Act 1997	Section 60 of the *Contaminated Land Management Act 1997* outlines the circumstances in which notification of the EPA is required in relation to the contamination of land. The EPA would be notified in writing of contamination identified within the project area, in accordance with the requirements of section 60 of the Act.
Fisheries Management Act 1994	Section 199 of the *Fisheries Management Act 1994* requires a public authority to notify the Minister prior to carrying out dredging or reclamation (defined by section 198A). The project would require works near Cabramatta Creek, which may trigger the notification requirements of the Act. Further information on the works required is provided in Chapters 6 and 7 (Project description – operation and construction). The

Legislation	Requirement
	potential impacts on the creek are considered in Chapter 13 (Hydrology, flooding and water quality). The Minister for Primary Industries would be notified in writing if dredging or reclamation work is required, in accordance with the requirements of section 199.
Heritage Act 1977	Section 146 of the *Heritage Act 1997* requires that the Heritage Council be notified if a relic is uncovered, where it is reasonable to believe that the Heritage Council is unaware of the location of the relic. The Heritage Council would be notified in writing of relics uncovered during construction, in accordance with the requirements of section 146.
Land Acquisition (Just Terms Compensation) Act 1991	The *Land Acquisition (Just Terms Compensation) Act 1991* specifies the procedures and requirements for the acquisition of land for a public purpose. Chapter 16 (Land use and property) provides information on the acquisition of private property required for the project. Acquisition would be undertaken in accordance with this Act.
Biosecurity Act 2015	The *Biosecurity Act 2015* provides for the prevention, elimination, minimisation and management of biosecurity risks. Landowners have a responsibility to control invasive weeds on their land, including public authorities. The approach to managing weeds during construction is provided in Chapter 11 (Biodiversity).
Waste Avoidance and Resource Recovery Act 2001	The *Waste Avoidance and Resource Recovery Act 2001* encourages the most efficient use of resources to reduce environmental harm. As described in Chapter 19 (Waste), waste resulting from the project would be managed in accordance with the requirements of this Act.

3.4 Requirements under Commonwealth legislation

3.4.1 Environment Protection and Biodiversity Conservation Act 1999

Under Part 3 the EPBC Act, approval from the Australian Government Minister for the Environment would be required for an action that:

- has, will have, or is likely to have a significant impact on a matter of national environmental significance
- is undertaken on Commonwealth land and has, will have, or is likely to have a significant impact on the environment
- is undertaken outside Commonwealth land and has, will have or is likely to have a significant impact on the environment of Commonwealth land
- is undertaken by the Commonwealth and has, will have or is likely to have a significant impact on the environment.

Matters of national environmental significance comprise:

- world heritage properties
- national heritage places
- wetlands of international importance
- Commonwealth-listed threatened species and ecological communities

- Commonwealth-listed migratory species
- Commonwealth marine areas
- the Great Barrier Reef Marine Park
- nuclear actions (including uranium mines)
- a water resource, in relation to coal seam gas development and large coal mining development.

An EPBC Act protected matters search was undertaken on 20 September 2018 for an area within a 10 kilometre radius of the project site. No world, national or Commonwealth heritage items have been identified within or adjacent to the project area.

The potential for impacts on ecological matters of national environmental significance are considered in Chapter 11 (Biodiversity). No potential significant impacts were identified.

The project would not impact on Commonwealth marine areas or the Great Barrier Reef Marine Park, and it does not involve a nuclear action or coal seam gas/coal mining.

As no significant impacts on matters of national environmental significance or Commonwealth land are predicted, and the project is not being undertaken by a Commonwealth agency, approval under the EPBC Act is not required.

3.4.2 Native Title Act 1993

The main objective of the *Native Title Act 1993* is to recognise and protect native title. Section 8 states that the *Native Title Act 1993* is not intended to affect the operation of any law of a State or a Territory that is capable of operating concurrently with the Act. Searches of the register maintained by the National Native Title Tribunal indicated that there are no native title claims registered with respect to land within the project area. The project also would not directly affect Crown land that is currently the subject of a native title claim.

4 Consultation

This chapter describes the engagement and consultation undertaken for the project and the EIS to date, and proposed during EIS exhibition and construction. The key issues raised and relevant to the EIS are summarised below.

4.1 Consultation approach and strategy

4.1.1 Overall approach and objectives

ARTC is committed to active engagement with the community and key stakeholders in the projects it undertakes. ARTC's approach to consultation for this project aims to:

- build relationships with the community and key stakeholders
- ensure that the local community and key stakeholders are informed about the project and given the opportunity to provide feedback
- demonstrate an understanding of community concerns and values
- manage community and key stakeholder feedback and complaints in a timely, respectful way
- build community and stakeholder confidence in ARTC and the decisions it makes.

ARTC is implementing a comprehensive community and stakeholder consultation program to engage proactively with local communities and key stakeholders about the project. In addition to the local community, the key stakeholders for the project include:

- Fairfield and Liverpool councils
- local community groups
- representatives of community infrastructure and facilities in the vicinity of the project site
- rail commuters
- Aboriginal community groups
- elected representatives
- Transport for NSW
- Sydney Trains
- NSW Ports
- utility providers.

4.1.2 Consultation plan

Community and stakeholder engagement for the project commenced in early 2018. A Stakeholder Engagement Strategy was developed to identify and guide the objectives and expected outcomes of consultation during each stage of the consultation process, including:

- prior to and during preparation of the EIS
- during exhibition of the EIS
- prior to construction.

A community and stakeholder engagement plan would be prepared prior to main construction works to guide the construction phase of works and would aim to detail the approach to communication between ARTC and

its Construction Contractor(s), and the community and government authorities. This is discussed further in section 22.1.2.

4.2 Consultation undertaken prior to and during preparation of the EIS

4.2.1 Consultation activities

The purpose of this stage of consultation was to introduce the project to the community and key stakeholders, and to seek input (in terms of issues and concerns) to inform the EIS preparation and design process. A summary of the consultation activities and tools that were utilised during this stage is provided in Table 4.1.

Given the cultural diversity within the LGAs (refer to section 2.2.2) guidance on how to access translation and interpretative services were provided on all flyers, fact sheets and on the project website, in English, Vietnamese, Mandarin and Arabic.

Table 4.1 Consultation activities

Activity	Purpose/outcomes	Timing
Community contact mechanisms: • toll free community information line (1300 550 402) • project email (enviroline@artc.com.au)	• Obtain feedback, measure awareness and provide opportunities for input • To date one telephone enquiry has been received	Established in November 2018
Project website (https://www.artc.com.au/projects/cabramatta-loop-project/)	• Provide information and promote channels through which people can communicate their views, issues, and concerns	Website went live in February 2019
Printed information: • posters • notification letter • engagement strategy	• Raise awareness and understanding • Provide information on the community information session and contact mechanisms • Notification letters were sent to 2,770 addresses within the local area (within 250 metres of the project site Print and electronic copies sent to Liverpool City Council and Fairfield City Council • Electronic copies were sent to the Principals or key contacts at 3 local schools, 2 local hospitals, and 13 social/recreational clubs (eg Southern Districts Softball Association, CORE Community Service Fairfield) for distribution to parents/members • All key stakeholders and community groups identified in the Stakeholder Engagement Strategy were emailed electronic copies of the notification letter, as were 6 persons who requested to be kept informed via responding on the ARTC website. • The notification letter was posted on the ARTC website.	February to March 2019

Activity	Purpose/outcomes	Timing
	• Posters were displayed at Cabramatta and Warwick Farm stations sent to Fairfield City Council and Liverpool City Council • Printed Stakeholder Engagement Strategy was available at the drop-in session and provided to councils. Electronic copy was available on the ARTC website.	
Advertisements	• Raise awareness of the project • Provide information about the community information session • Advertisements were placed in local newspapers Fairfield City Champion and Liverpool City Champion	20 February 2019
Community information session	• The session was held at Cabravale Community Centre in Cabramatta • Five people attended • Issues raised included: - construction approach and impacts - impacts to parking - noise impacts from freight trains - environmental impacts, such as impacts on local wildlife.	13 March 2019
Stakeholder meetings and briefings	• A number of meetings have been held with Liverpool City Council and Fairfield City Council to describe and provide updates to the project as well as seek feedback on key issues and design development, refer below for further detail • Discussion with the South District Softball Association on 31 January 2019 to discuss potential impacts the project may have on Jacquie Osmond Reserve • Meeting with the principal of Lawrence Hargrave School on 19 March 2019 to provide a project briefing and discuss any concerns held by the school and its wider community • Transport for NSW's Transport Management Centre on 17 July 2019 to provide a project briefing and discuss any potential project concerns • A meeting was held on 24 May 2019 with private land owners who have the potential to be impacted by project, to provide a project briefing and to discuss site access for utility investigations, as well as property acquisition	January 2018 to July 2019

4.2.1.1 Consultation with councils

Consultation with Liverpool City Council and Fairfield City Council was undertaken to provide key information relating to the design of the project, the approach to construction and management of key impacts. Information regarding key design elements was provided to the councils, and review of this information has allowed an understanding of the council's operational needs and asset maintenance requirements to be considered in the project design. This included the following considerations:

- a key area of design input for Fairfield City Council related to the alignment of Broomfield Street including the specifications to adopt for footpaths, lane widths and parking lane widths
- a key area of design input for Liverpool City Council related to the proposed design of the hybrid embankment and retaining wall within and adjacent to Jacquie Osmond Reserve, which has been designed to consider future operations and maintenance of the reserve.

A number of key issues associated with the design and construction of the project have been discussed across a range of meetings including, but not limited to:

- property access
- parking
- consultation, considering residential and business impacts as well as social infrastructure
- construction staging
- compounds
- landscaping.

The following meetings have been held with Liverpool City Council and Fairfield City Council to describe and provide updates to the project as well as seek feedback on key issues and design development:

- Liverpool City Council in January 2018
- Liverpool City Council in October 2018
- Liverpool City Council in December 2018
- Liverpool City Council in January 2019
- Liverpool City Council in February 2019 (two meetings)
- Fairfield City Council in February 2018
- Fairfield City Council in November 2018
- Fairfield City Council in December 2018
- Fairfield City Council in February 2019 (two meetings)
- Fairfield City Council in March 2019
- Fairfield City Council in August 2019

4.2.1.2 Aboriginal Community

Consultation with the Aboriginal community was undertaken as part of the Aboriginal heritage impact assessment, in accordance with the *Aboriginal cultural heritage consultation requirements for proponents* (DECCW, 2010). This included initial notification of the project to the below stakeholders in November 2018 as part of a request for a list of Aboriginal stakeholders who should be contacted regarding the project:

- Fairfield City Council
- Gandangara Local Aboriginal Land Council
- Greater Sydney Local Land Services
- Liverpool City Council
- National Native Title Tribunal
- NSW Native Title Services Corporation Limited
- Office of Environment and Heritage (OEH)
- Office of the Registrar, Aboriginal Land Rights Act 1983 of Aboriginal Owners.

Further information regarding this consultation process, including the outcomes of this consultation, is provided in Chapter 15 (Aboriginal heritage).

4.2.2 Summary of issues raised

A summary of the key issues raised during consultation relevant to the project and EIS, including the potential impacts to be considered and the information to be provided by the EIS, is provided in Table 4.2.

Table 4.2 Summary of issues raised

Issue category	Issues raised	By whom	Where addressed in the EIS
Traffic and transport	Traffic disturbance and management strategies	Councils, Transport for NSW, local residents, Southern Districts Softball Association	Construction traffic impacts, including diversion and traffic management requirements during construction, are described in section 8.3.3. Mitigation measures to minimise these impacts are provided in section 8.5.2 This includes preparation of a construction traffic management plan which would will include measures to minimise the potential for impacts on the community and the operation of the surrounding road and transport environment, including those listed in this EIS. Further information is provided in Technical Report 1 – Traffic, transport and access impact assessment.
	Loss of parking and relocation of on-street parking for local residents and commuters	Councils, local residents, wider community (commuters)	An assessment of parking impacts due to loss of parking during construction and operation is provided in section 8.3.5 and section 8.4.2, respectively. Measures to mitigate impacts associated with loss of parking are provided in section 8.5.2 and includes the provision of temporary parking in the surrounding area to offset loss. The parking assessment concluded that that Broomfield Street has the capacity to absorb the loss of 11 parking spaces that would occur as a result of the project. Further information is provided in Technical Report 1 – Traffic, transport and parking impact assessment.

Issue category	Issues raised	By whom	Where addressed in the EIS
Noise and vibration	Noise impacts during night works	Councils, local residents	The construction noise impact assessment described in section 9.3 included an assessment of noise outside of standard hours, including the potential for sleep disturbance. As described in section 9.5.2 an out of hours protocol will be developed as part of the construction noise and vibration plan which will provide a process for the consideration of out of hours work and procedures to manage potential impacts. Further information is provided in Technical Report 2 – Noise and vibration impact assessment.
	Noise generated by operation of the project	Councils, local residents, Lawrence Hargrave School	An operational noise impact assessment was undertaken and is described in section 9.4. The assessment found that the predicted noise levels would be exceeded at one sensitive receiver. This receiver will be considered for potential noise mitigation as discussed in section 9.5.2. Further information is provided in Technical Report 2 – Noise and vibration impact assessment.
	Noise generated by an increase in rail freight traffic in the early mornings and evenings	Councils, local residents	An operational noise impact assessment was undertaken for the project and is discussed in section 9.4. This assessment considered the impacts associated with an increase in rail freight traffic at all times of the day. As noted above the predicted noise levels were only exceeded at one residence. Further information is provided in Technical Report 2 – Noise and vibration impact assessment.

Issue category	Issues raised	By whom	Where addressed in the EIS
Biodiversity	Potential impacts on the local flying fox population at Cabramatta Creek	Councils, local residents	A biodiversity assessment was undertaken for the project and considered potential impacts to the Cabramatta Creek Grey-headed Flying-fox roost camp. This assessment is provided in section 11.3.2. The assessment concluded that given the distance of the Cabramatta Creek Grey-headed Flying-fox roost camp from the project site and the minor magnitude of noise and other residual impacts arising from the project no particular measures to further minimise impacts to the roost camp are required. Further information is provided in Technical Report 4 – Biodiversity development assessment report.
Flooding	Exacerbation of flooding issues on Sussex Street	Fairfield City Council	A flooding impact assessment which considers operation of the project including the realignment of Broomfield Street, was undertaken and is described in section 13.4.1. The assessment found that the project would have a minimal impact on the flooding of the majority of properties along Broomfield Street during the one per cent AEP flood event, due to proposed drainage changes along Broomfield Street. As described in section 13.5, further assessment and design refinement would be undertaken during detailed design to minimise the potential for flooding impacts. Further information is provided in Technical Report 5 – Hydrology and flooding impact assessment.

Issue category	Issues raised	By whom	Where addressed in the EIS
Socio-economic (amenity) impacts	Proximity of Lawrence Hargrave School to the rail corridor, with the potential for impacts including noise and vibration, access impacts Management of potential impacts at Lawrence Hargrave School	Lawrence Hargrave School	The potential for access impacts to the school were assessed as part of the construction traffic impact assessment and are described in section 8.3.6. These impacts would be managed through implementation of a construction traffic management plan, described in section 8.5. Potential construction noise and vibration impacts to the school were considered as part of the noise and vibration assessment described in section 9.3. As described above, with the exception of one receiver, no operational noise impacts were predicted due to the project. However, consideration has been given to the school's needs and concerns (refer to Chapter 18 (Socio-economic impacts), and consultation will be undertaken with Lawrence Hargrave School as committed to through mitigation measure D7.4.
	Relocation of softball diamonds and associated costs	Liverpool City Council, Southern Districts Softball Association	Relocation of the softball diamonds from a land use perspective and community impact perspective is discussed in sections 16.3 and 16.4 (land use) and sections 18.3 and 18.4 (social). As committed to through mitigation measure D7.3 consultation will be undertaken with Liverpool City Council and the Southern Districts Softball Association as part of design development to minimise impacts on the softball fields. Note that consideration of costs is beyond the scope of the EIS.

Issue category	Issues raised	By whom	Where addressed in the EIS
Landscaping and visual amenity	Request to reinstate shade and foliage along the rail corridor to replace that lost during construction of the Southern Sydney Freight Line	Liverpool City Council, Southern Districts Softball Association, local residents	The landscape and visual impact assessment considered the loss of trees within Jacquie Osmond Reserve. However, as described in section 17.3.3, the provision of trees or other plantings on the embankment would potentially cause safety issues (branches in the rail corridor and hard distances near the softball field) and/or require additional maintenance. As described in section 17.6.2 an urban design and landscape plan would be developed during detailed design with the aim of reducing impacts due to the loss of vegetation. Further information is provided Technical Report 10 – Landscape and visual impact assessment.
	Potential for lighting impacts during night works	Councils, local residents	The potential for lighting impacts during construction has been considered as part of the landscape and visual impact assessment and is described in section 17.4.3. The potential for lighting impacts would be mitigated through the implementation of mitigation measure C10.2, which requires temporary lighting to be sited and designed to avoid light spill.

4.2.3 Consultation undertaken as an input to the SEARs

A summary of issues raised by government agencies consulted by the Department of Planning, Industry and Environment during preparation of the SEARs is provided in Table A.3 in Appendix A, together with a reference to where they are addressed in the EIS.

Engagement with these government agencies since SEARs has been limited to engagement with OEH. Engagement with OEH during Aboriginal community engagement, is discussed in section 4.2.1.

4.3 Consultation during exhibition of the EIS

The Department of Planning, Industry and Environment will place the EIS on exhibition for a minimum of 28 days. During that time, the consultation tools implemented during preparation of the EIS will continue to be used, where relevant. Consultation tools used during this period will include the following:

- advertisements will be placed in newspapers to advise of the exhibition period, how to view the EIS, and project team contact details to contact
- distribution of flyers and e-newsletters to the community
- community information session and briefings will be held during exhibition to enable community members and representatives to ask questions ahead of making a submission to the Department of Planning, Industry and Environment.

The EIS will be available for viewing at the following locations:

- Fairfield City Council Administration Centre, 86 Avoca Road, Wakeley
- Whitlam Library Cabramatta, 165 Railway Parade, Cabramatta
- Liverpool Council Administration Centre, 33 Moore Street, Liverpool.
- Liverpool Library, 170 George St, Liverpool.

The document can also be viewed at the Department's website (https://www.planningportal.nsw.gov.au/major-projects).

During the exhibition period, government agencies, project stakeholders and the community will be able to review the EIS and make a written submission to the Department of Planning, Industry and Environment for consideration in its assessment of the project.

A community information session will be held during the display to enable community members and representatives to ask questions and to provide feedback to ARTC project team members. In addition to the community information session a number of other activities will be undertaken to promote awareness of the EIS exhibition. These activities include:

- doorknocking of residents along Broomfield Street, residents along the haulage route around Station Street and commercial businesses located at the Warwick Farm Home Centre with an offer of face-to-face meetings with a translator as needed
- distribution of flyers at both Cabramatta and Warwick Farms stations, as well as a pop-up conversation booth at Cabramatta Station
- broadening the area for the letterbox distribution of flyers
- advertising the EIS exhibition in the local Vietnamese newspaper.

At the completion of the exhibition period the Department of Planning, Industry and Environment will provide ARTC with a copy of submissions received and a summary of issues raised. A submissions report will be prepared responding to the issues raised, and the report will be made available for viewing on the

Department of Planning, Industry and Environment's planning portal website. If changes to the project need to be made, a preferred project report will also be prepared.

4.4 Consultation during design and delivery of the project

4.4.1 Consultation activities

Consultation with the community and key stakeholders would continue in the lead up to and during construction. The aim of consultation during design and delivery of the project would be to ensure that:

- accurate and accessible information is available
- a timely response is given to issues and concerns raised by the community
- feedback from the community is encouraged
- opportunities for input are provided.

The community contact facilities would continue to be available during construction, together with a 24-hour complaints management mechanism (described in section 4.4.2). Targeted consultation methods, including notifications, signage and face-to-face communication, would continue to occur. ARTC's project website would also include updates on the progress of the project. These consultation methods would be detailed in a community and stakeholder engagement plan which would be prepared prior to the commencement of main construction works, and would detail the approach to communicate between ARTC and its Construction Contractor(s), and the community and government authorities. The community and stakeholder engagement plan is described further in section 22.2.3.

The consultation mechanisms that would be implemented during future stages of the project are summarised in Table 4.3.

Table 4.3 Consultation tools and activities to be implemented during design and delivery

		Timing	
Activity	**EIS exhibition**	**Design**	**Construction**
Project and EIS display	✓		
Community contact mechanisms (1300 telephone number and email)	✓	✓	✓
Meetings and discussions with key stakeholders, including project briefings	✓	✓	✓
Project website	✓	✓	✓
Social media	✓	✓	✓
Letters, notifications and project updates	✓	✓	✓
Face-to-face consultation	✓	✓	✓
Media engagement	✓		✓
Signage			✓

Activity	EIS exhibition	Timing	
		Design	Construction
Complaints management			✓

4.4.2 Complaints management

The construction contractor would be required to implement a complaints management and handling procedure during construction. This procedure would be defined by the construction environmental management plan, which the contractor would be required to prepare and have approved by ARTC and the Department of Planning, Industry and Environment prior to construction commencing.

The complaints management procedure would include the following at a minimum:

- contact details for a 24-hour project response line and email address
- management of complaints in accordance with ARTC's management protocols, specifically:
- details of all complaints received will be recorded
- verbal and written responses will be provided within time limits.

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5 Project background, needs and options

This chapter provides background information in relation to how the design of the project has developed. The strategic context to the project's development is described, including the key issues, demands and planning driving the need for the project. A summary of the need for the project is included.

The chapter also describes the alternatives to the project as a whole, the process of design development to date, and the options that were considered as part of the design process.

5.1 Strategic context

5.1.1 Existing situation and key issues

5.1.1.1 The importance of the Sydney Metropolitan Freight Network

Transporting freight by rail is a key priority for the Australian and NSW Governments, ARTC and its customers. In October 2015 ARTC published the *2015-2024 Sydney Metropolitan Freight Strategy* following investigation of Sydney rail freight movements and forecasts. This identified that rail freight on this network is to increase over the next 15 years. Further, the Transport for NSW *Freight and Ports Plan 2018-2023* sets objectives to boost capacity and efficiency of the rail freight network. The project is one of several listed under the goal of building capacity of the freight network.

5.1.1.2 Port Botany

Port Botany is one of Australia and NSW's most important infrastructure assets, as the second 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.

As described in Chapter 2 (Location and setting), the SSFL forms part of the MFN which transports freight to and from Port Botany. The role of the SSFL is to eliminate the transit time/availability impacts of Sydney Train's passenger peak prohibition on rail freight operations through southern Sydney's commuter rail network.

5.1.1.3 Existing rail line constraints

The SSFL is predicted to be at capacity by 2023, limiting its ability to adequately service future demands for rail freight transport (described in section 5.1.2). The single track section of the SSFL between Cabramatta and Warwick Farm constrains the ability to increase the share of freight moved by rail on the line.

5.1.2 Future demands

Over the next 20 years, container freight, air freight, air travel and general traffic in and around the Sydney 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.

5.1.2.1 Freight growth

By 2036, the amount of freight moved in NSW is projected to nearly double to 618 million tonnes (Transport for NSW, 2018d). The amount of container freight handled by Port Botany is predicted to significantly increase over the next 20 years – from 2.36 million twenty foot equivalent units (TEU) in 2016 to between 7.5 and 8.4 million TEU in 2045 (NSW Ports 2015, Infrastructure NSW 2018).

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 port infrastructure 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 the port.

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.

5.1.2.2 Increasing demands for rail freight transport

The Australian and NSW Governments have identified clear objectives to increase the share of freight moved by rail (Transport for NSW, 2018d, Infrastructure Australia 2016). 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).

NSW Ports has set a target of 40 per cent of total freight volumes to be transported by rail (NSW Ports, 2015). This represents a substantial increase compared with the current 14 per cent share of freight moved by rail.

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 a 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 instead of road.

ARTC was requested by the Department of Infrastructure, Regional Development and Cities (DIRDC) to identify capacity enhancements required on the MFN and the SSFL to meet predicted demand to 2030, known as the "Capacity Project" (ARTC, 2015). The scoping phase of the capacity project was completed between July 2014 and September 2016.

Freight traffic to and from Port Botany from outer metropolitan Sydney runs via the MFN (North/West) and the SSFL (South). The SSFL is expected to reach its peak of 24 trains per day (in each direction) by 2023, which considers the predicted demand from Moorebank Intermodal Terminal. Demand is predicted to steadily increase from 2023, with up to 33 trains per day (in each direction) by 2030. The project would provide increased capacity, for up to 36 trains per day (in each direction), improving reliability for freight operators and thus supporting the targets to increase modal share.

5.1.3 Strategic planning and policy context

The strategic context for the project is influenced by strategic planning for transport, land use and freight undertaken at the national, state and regional/local levels. The project is consistent with the strategies outlined in Table 5.1. Further detail on the documents listed below is provided in Appendix C.

Table 5.1 Strategic context of the project

Strategy /plan / policy	Key policies and strategies relevant to project need
National	
*Inquiry into National Freight and Supply Chain Priorities (*Commonwealth of Australia, 2018)	The inquiry recognises the continuing growth of the Australian freight sector, and recommends priorities to guide investment, reform and governance for improved productivity and efficiency. Key to this is improving the efficiency and reliability of the freight rail network and its linkages to key ports such as Port Botany.
Australian Infrastructure Plan and Infrastructure Priority List (Infrastructure Australia, 2018)	Improving the efficiency of freight movements through major ports is a priority listed in the plan, to increase Australia's productivity and competitiveness and remove constraints and pinch-points. The Port Botany Freight Line duplication is listed as a High Priority Initiative of the Australian Infrastructure Priority List and the construction Cabramatta Loop project is noted to increase the benefits of the duplication.
NSW	
Future Transport Strategy 2056 (Transport for NSW, 2018b)	The outcomes of this strategy related to the project include: • efficient and reliable freight journeys supported by 24/7 rail access between key freight precincts with convenient access to centres • safely, efficiently and reliably moving people and goods.
State Infrastructure Strategy 2018-2038 (Infrastructure NSW, 2018)	The Strategy provides the NSW Government with advice about infrastructure policy and investment priorities. Recommendations of the strategy include: • overcome local constraints on the regional road and rail networks that limit the use of high productivity freight vehicles and rail freight • further develop the Sydney rail network with new rail links and system-wide upgrades • develop and protect freight and service networks by improving road and rail access for goods and services to local, national and global markets, leverage the Commonwealth's Inland Rail investment and address existing inefficiencies and pinch points.
NSW Freight and Ports Plan 2018-2038 (Transport for NSW, 2018d)	The Plan includes over 70 initiatives to be delivered by 2023 – ranging from infrastructure investment to trials of new technologies. The initiatives are focused on achieving five key objectives with supporting actions. Three of the objectives with actions of relevance to the project include: • economic growth: productivity will be enhanced by investing in freight infrastructure and delivering and improving key freight programs and projects • efficiency, connectivity and access: the efficiency of the rail network and trade gateways will be boosted by facilitating new technology and improved coordination of Port Botany freight movements • capacity: capacity boosting investments in the rail freight network will be made by improving the capacity of east-west movements through targeted improvements to the NSW rail network.

Strategy /plan / policy	Key policies and strategies relevant to project need
Regional	
A Metropolis of Three Cities – the Greater Sydney Region (Greater Sydney Commission, 2018a)	The Greater Sydney Commission's plan is that Sydney will grow as three cites - Western Parkland City, the Central River City and the Eastern Harbour City. Port Botany is located in the Eastern Harbour City and connects with the Western Parkland City via the SSFL. The plan states that the freight rail network is fundamental to the future transport of these three cities and that a growing Greater Sydney requires an efficient and effective road and rail freight network integrated with ports and airports.
Western City District Plan – connecting communities (Greater Sydney Commission, 2018)	The Western City District Plan identifies the need to increase economic productivity and the critical role that new infrastructure plays in achieving this. It emphasises the importance of the trade gateways – such as Western Sydney Airport and Port Botany for the economic corridor of the Western region, as well as Greater Sydney and NSW. A key action for councils and government agencies is to support and facilitate internationally competitive freight and logistics sectors. Currently most of Greater Sydney's freight is moved on the road network. This dedicated freight rail connection from Port Botany in the Eastern Harbour City to the Western Parkland City will increase the proportion of freight moved by rail, and reduce the number of trucks on the roads This should result in a more efficient road network by reducing congestion and delays in freight and logistics movements. The project will enable increased freight rail capacity, this may increase the economic potential of the industrial precincts in the area and enhance connections to the Western Sydney Employment Area.
Greater Sydney Services and Infrastructure Plan (Transport for NSW, 2018c)	The Greater Sydney Services and Infrastructure Plan is the NSW Government's vision for transport in Greater Sydney for the next 40 years. Supporting the safe, efficient and reliable movement of goods around Greater Sydney will require a high capacity network for moving goods between trade gateways and freight precincts, and improved rail networks. By 2026, additional freight rail capacity is proposed to support growth in containerised movements. Additional investment is proposed between Port Botany connections, particularly between ports and warehouses.
Sydney Metropolitan Freight Strategy (ARTC, 2015)	The purpose of this Strategy is to document and discuss the challenges, opportunities and the most effective solutions to achieve rail freight growth in Sydney so as to help provide direction both within the ARTC business, and for the supply chain participants. As part of the staged upgrading program for the MFN and Port Botany rail link, a capacity study looking at potential future enhancements to the MFN, Port Botany line and SSFL to accommodate increased freight traffic to Port Botany to 2030 was completed as Stage 3 of the Port Botany Rail Link program. The project was identified as an option to provide capacity improvement.
North-South Corridor Strategy (ARTC 2005)	The construction of the SSFL was identified as a key project in this strategy to improve the performance of the Sydney-Brisbane rail link and to deliver substantial improvements in transit time, reliability, capacity and above and below rail yield.

5.2 Project need summary

The project is needed to address the issues identified in section 5.1.1 and respond to the demands listed in section 5.1.2.

Efficient access to and from Port Botany is critical to the economic growth and prosperity of Sydney. Over the next 20 years, container freight, air freight, air travel and general traffic in and around the Port Botany area are expected to grow significantly. This will put more pressure on roads and other infrastructure and

impact local communities. Without significant infrastructure investment, existing transport constraints and challenges will worsen.

The amount of container freight handled by Port Botany is predicted to significantly increase. The Australian and NSW Governments have identified clear objectives to increase the share of this freight that is moved by rail. Transporting more freight to and from Port Botany by rail will place additional demands on the existing rail line, with freight that cannot be accommodated on rail placing demands on the surrounding congested road network.

The SSFL is predicted to be at capacity by 2023, limiting its ability to adequately service future demands for rail freight transport. The single track section of the SSFL between Cabramatta and Warwick Farm constrains the ability to increase the share of freight moved by rail on the line. Additional demand arising from the predicted growth in container freight has the potential to exacerbate this situation, impacting on reliability and restricting the efficient movement of freight across the broader Sydney rail network.

5.3 Alternatives to the project as a whole

This section describes potential alternatives to the project that have the potential to achieve the same project objectives.

5.3.1 Alternative freight transport solutions

Currently the majority of freight in NSW is transported by road. This is likely to be due in part to the historical inequity in the funding of road and rail infrastructure, but is also related to the superior efficiency and flexibility offered by road transport. Road transport of freight offers the following benefits:

- shorter door-to-door transit times than rail
- high reliability (on time), and high flexibility and availability to meet customer's preferred dispatch and receive times.

The NSW Government is currently delivering, or has delivered a number of road projects across Sydney, including WestConnex, NorthConnex, Western Harbour Tunnel, Beaches Link, the F6 Extension and major road projects to support the future Western Sydney Airport, and across regional NSW through the Bridges for the Bush Program, Fixing Country Roads Program, the Regional Road Freight Corridor Fund and the Pacific, Newell and Great Western highways upgrades. However, while investment in road projects forms part of the solution to Sydney's and the state's freight network needs, these alternatives are, by themselves, insufficient to address the forecast growth in freight demand. Additionally, there are a number of economic, environmental and safety impacts associated with the road transport of freight (when compared to rail) including:

- higher cost
- increased road congestion
- increased potential for traffic accidents
- greater road traffic noise and greenhouse gas emissions, impacting amenity for sensitive receivers nearby.

To meet the forecast growth in freight demand while minimising the environmental and social impacts associated with the use of road for freight transport the NSW Government has highlighted the need to significantly increase the share of freight transported by rail. As a result, it is also necessary to invest in upgrades to the rail freight network.

5.3.2 Alternative freight network enhancement options

As described in section 2.2.2 access to Port Botany and Sydney's main intermodal terminals is via the SSFL which connects to the MFN. Therefore, to support transporting increased freight volumes to and from Port Botany and the main intermodal terminals enhancement options needed to focus on these two lines. In conjunction with the Federal Government, ARTC developed a program of works to meet growing demand for container transport by rail from southern Sydney to Port Botany. These are described as follows:

- **Stage 1 works** – Botany Yard Reconfiguration. Major reconfiguration and upgrade of the Port Botany Rail Yard, which is the interface between the rail network and the Stevedore port loading facilities.
- **Stage 2 works** – Re-signalling. New staging works at Enfield Yard and new signalling systems along with signal control separation from Sydney Trains for the MFN. This provided train control of the of the full Port Botany rail line route by ARTC's Network Control Centre at Junee.
- **Stage 3A works** – Track Upgrading. Upgrade the existing condition of the Port Botany rail line between Botany and Sefton.
- **Stage 3B works** – Capacity Project. Analysis and design of enhancement options to the SSFL and MFN (includes this project).

ARTC considered a number of enhancement options as part of Stage 3B of ARTC's Port Botany Capacity Project. Options were developed to fulfil the following planning principles:

- Connectivity: located in areas providing effective capacity benefit and considerate of operational requirements and external impacts.
- Efficiency: efficient use of the existing network could release capacity and improve service levels.
- Flexibility: infrastructure and operations should be responsive to customer needs and predicted demand.
- Staging: staging and timing of construction is a significant consideration to meet predicted demand.
- Environment: reduce impacts to the environment and community, where possible.
- Property: reduce impacts to property or land requirements, where possible.

The modelling and desktop analysis identified the following potential locations and solutions available for enhancement:

- 1,300 metre loop at Cabramatta (SSFL)
- 1,300 metre loop at Minto South (SSFL)
- 350 metre Leightonfield loop extension (SSFL)
- 1,850 metre loop at Cabramatta (SSFL)
- 1,300 metre loop at Minto North (SSFL)
- 1,300 metre loop at Casula (SSFL)
- 900 metre track extension at Botany (MFN)
- Botany Yard modifications (MFN)
- 800 metre track extension at Mascot (MFN)
- track duplication Botany to Mascot (MFN).

Key criteria used to model a number of alternative options were as follows:

- maximum normal operating speeds for the SSFL and MFN based on track parameters, gradient and train operator requirements
- where loops were considered, the simultaneous entry loop standard was used to reduce track infrastructure requirements, increase operational performance and satisfy commercial rigour
- provision of bi-directional signalling to increase capacity, flexibility and reliability to the network and customers
- consultation with nearby Intermodal Terminal operators to identify the parameters for connection to the SSFL.

A range of assumptions for each of the options was based on their physical location, key constraints and risks. The modelling identified which options provided the greatest capacity benefit and when they would be required, based on predicted demand. The desktop analysis identified four preferred infrastructure enhancement options as requiring further concept design work:

- a simultaneous entry loop on the SSFL at Cabramatta (this project)
- 900 metre track extension at Botany on the MFN
- 800 metre track extension at Mascot on the MFN
- duplication of the single line track between Botany and Mascot on the MFN.

This EIS addresses the proposed capacity improvements on the SSFL at Cabramatta only. The duplication of the Port Botany line (the Botany Rail Duplication Project) is subject to a separate assessment and approval process, which is currently underway while concept assessment has been undertaken of the remaining two enhancement options.

5.3.3 Alternative passing loop locations

As described in section 5.3.2, a number of alternative passing loop locations were identified for the SSFL.

Further modelling of demand forecasts was undertaken considering these locations, to determine infrastructure requirements. The modelling considered a number of characteristics, including:

- current volumes
- types of freight using the network
- train lengths
- signal clearance points
- track speeds
- breaking distances
- operational movements
- future predicted volumes
- transaction times
- twenty-foot equivalent units per day
- utilisation occupancy
- headways
- saleable paths.

ARTC modelling indicated that a loop would be required on the SSFL by 2022 to meet capacity targets, and that a 1,300 metre loop at Cabramatta, being the mid-point between existing loops at Glenfield and Leightonfield, would provide the best solution to increase capacity requirements to 2030. A loop in this location could increase capacity by up to 12 services per day.

5.3.4 The 'do-nothing' alternative

The 'do-nothing' alternative would involve operating the existing rail line in its existing configuration. Under this alternative, the section of the SSFL would continue to operate as a single track.

ARTC's North-South Corridor Strategy (ARTC, 2006) was developed as an integrated investment strategy with the SSFL as a key element of that strategy. The primary consequence of excluding this upgrade to the SSFL would be to compromise the ability to achieve the freight efficiency and reliability objectives of the strategy.

The 'do-nothing' option would result in worsening delays (ie reliability due to the single track and increased freight demands) for freight access to and through Sydney, leading to a lower rate of rail freight growth than would otherwise be the case on the north-south corridor. This may result in road freight traffic volumes growing at a higher rate than rail freight, with attendant impacts on other road users and the environment.

5.4 Project design development

The design process has involved the following general phases:

- Phase 1 – concept design. As part of the concept design three additional preferred infrastructure enhancement options were considered and are discussed in section 5.3.2.
- Phase 2 – feasibility design. The feasibility design addressed some of the unresolved issues and risks from the concept design phase and incorporated additional information (eg site survey, services, contamination and geotechnical information).
- Phase 3 – reference design. The project as described in this EIS is based on the outcomes of the reference design for the project.
- Phase 4 – detailed design (not commenced). The detailed design would take into account the outcomes of the reference design phase, the findings of this EIS, including the mitigation measures detailed in Chapters 8 to 21 (and summarised in Chapter 22) and any conditions of approval (if the project is approved).

The design has, and will continue to, evolve over these phases as a result of engineering, traffic, financial, economic and environmental considerations.

5.5 Options considered

This section describes the options that were considered as part of the design development process for the project.

5.5.1 Approach to the option development and design process

Option development has been an integral part of the overall design process for the project. An iterative process of option selection, design development and evaluation has been undertaken to define the project to date.

Option assessments have been undertaken for the following features of the project:

- track alignment
- bridges
- retaining walls and noise wall
- road formations.

In general, the assessments involved the following tasks:

- confirm requirements
- identify options to be assessed
- review potential constraints (including environmental and social constraints), risks and opportunities associated with each option
- identify the preferred option
- reporting.

A summary of the outcomes of the options assessments is provided below.

5.5.1.1 Track alignment

A number of alignment options were considered for the passing loop. This included consideration of alternative locations closer to Cabramatta Station, shorter alignment lengths, reducing the width to the east of the passing loop (available for maintenance) and moving the locations of the turnouts. In total three different options were assessed:

- Option 1 was for the base case alignment of the loop adjacent to the SSFL on the eastern side of the rail corridor. This option included seven sub-options were the location of the alignment, alignment length and width adjacent to the passing loop varied.
- Option 2 involved changing the turnout at the northern end of the loop such that the SSFL was running on the turnout main line and the loop was running on the turnout diverge.
- Option 3 involved changing the turnout at the southern end of the loop such that the loop was between the SSFL and the existing Sydney Trains line.

A number of the sub-options to Option 1 which were closer to Cabramatta Station were discounted as they would require major works to the Cabramatta overbridge, the station and bus laybys and would also cause community impacts to users of Cabramatta Station, the Cabramatta town centre. The shorter loop sub-options were also discounted as the intent of having a shorter loop was to minimise the impacts and potential land take associated with private properties at the southern end of the project site. However, it was considered that there would be impacts to these commercial properties regardless and a shorter loop would not achieve the objectives of the project.

Option 2 was discounted as it would result in a reduced standing room for trains compared to the base-case (Option 1) and would also result in additional encroachment into Broomfield Street.

Option 3 was discounted as it would result in increased maintenance requirements and an increased in the amount of private land to be acquired at the southern end of the project site.

The existing passing loop alignment and length (Option 1 base-case with minor modifications to location and length) was determined to be the preferred option as it minimised the amount of land acquisition, did not result in major impacts to the Cabramatta town centre community and users of Cabramatta Station, and balanced the potential impacts to the existing rail corridor with potential land take and building impacts to the

residential and the commercial. It also met or exceeded ARTC's operational requirements and primary design objectives.

5.5.1.2 Sussex Street and Cabramatta Creek bridges

Three options were considered for each of the bridges as follows:

- Option 1 involved using the existing bridge design as a basis for a new structure crossing. This would mean that the new passing loop bridge would be attached to the existing bridge and there would be 4.5 metres clearance between the two track centre lines, which is the desirable clearance.
- Option 2 involved building a new bridge structure adjacent to the existing bridge structure with 5.5 metres clearance between the two track centre lines.
- Option 3 involved further refinement of the design associated with Option 2 such that the track clearance between the two centre lines was reduced to 4.5 metres due to an alternative bridge configuration.

Option 3 was considered the preferred option as providing a new bridge structure adjacent to the existing bridge would mean that the SSFL could continue to operate during construction of the new bridge. A reduced clearance of 4.5 metres between the track centre lines (compared to the 5.5 metres associated with Option 2) would also minimise land take requirements to the east of the rail corridor.

5.5.1.3 Road formation/alignment

A number of options were considered for realignment of Broomfield Street, to ensure there was sufficient space within the road corridor to fit the shared path, road profile and car parking. These included options associated with the offset of road corridor boundary from the centre of the new rail centreline, reducing the width of the retaining wall and shared path, reducing road lane width and revising the cross fall of the road surface.

The current road alignment, determined in consultation with Fairfield City Council, was considered the preferred option as it allowed sufficient clearance from the rail centre line for the retaining wall while ensuring the shared path was maintained and loss of car parking spaces was minimised. To enable the maximum amount of car parks to be retained, and ARTC and Council design requirements to be met, it was determined there would unlikely be the space to provide a similar level of landscaping to that which currently existing on both the eastern and western verge of Broomfield Street.

However, consultation with Council indicated that the loss of mature trees along Broomfield Street was a key concern as it would impact urban tree canopy and contribute to a heat island effect. Therefore, a landscape concept has been developed for the project that balances the need to retain street parking and ensure the road and rail corridor is design in accordance with relevant standards and design requirement (refer to section 6.2) with the need to maintain the landscape and visual amenity along Broomfield Street. This is discussed further in Chapter 17 (Landscape and visual amenity).

6 Project features and operation

This chapter provides a description of the project's features and operation for the purposes of the EIS. It includes a description of the infrastructure proposed as part of the project and how the project would operate. The proposed approach to construction of the project is described in Chapter 7.

6.1 Overview

6.1.1 Design development

The design of the project commenced in May 2015. To date, developing the design has involved:

- preliminary evaluation and review of options – evaluation of key issues, potential options and the feasibility of the project
- scoping design – options evaluation and systems definition, constraints analysis and mapping
- definition design – option selection and preferred option development (concept and feasibility design)
- reference design – augmentation of the definition design to provide a considered basis for the project, with designs produced to support contract documentation.

The design of the project has evolved over these stages, with an increasing level of detail and incorporating a range of considerations and options at each stage.

The reference design is the current design for which approval is being sought and it forms the basis of the EIS. The reference design has evolved over a period of about 18 months, and has involved many iterations and regular refining, particularly in relation to the design of the bridges and works to Broomfield Street. The development of the design has been informed by the consideration of stakeholder and community feedback, as well as the findings of environmental studies.

6.1.2 Approach to avoiding or minimising impacts

The approach to design development has included a focus on avoiding and/ or minimising the potential for impacts during all key phases of the process. As described in Chapter 5 (Project background, needs and options), the multi-criteria assessments undertaken during the option selection and design process for key pieces of infrastructure included consideration of environmental and social impacts. Various options assessments have been undertaken, and the preferred option chosen based on the outcome of the assessments. The options assessment process also included assessment of opportunities and risks.

The key constraints that have influenced the design of the project as described in this chapter are summarised in Table 6.1 together with how the project has developed to date to avoid/minimise potential impacts.

Table 6.1 Key constraints and how the design has avoided/minimised environmental impacts to date

Key constraint	Approach to avoiding/minimising impacts
Operation of the surrounding road network	Existing functionality of Broomfield Street has been maintained by minimising widening of rail corridor to install new track.
Operation of Broomfield Street	The retaining walls proposed are as narrow as possible to minimise operational impacts on Broomfield Street.
Parking in Broomfield Street	Options assessment was undertaken to identify a parking configuration that would minimise the loss of car parking capacity in Broomfield Street.

Key constraint	Approach to avoiding/minimising impacts
Cabramatta Creek – including hydrology, flooding, biodiversity and water quality	The design of the new bridge over Cabramatta Creek (adjacent to the existing bridge) would match the pier arrangement of the existing bridge and not introduce any instream structure, to minimise hydraulic impacts on flow within the creek, and associated potential for flooding, biodiversity and water quality impacts. Existing stream widths would be maintained. The proposed bridge design aims to minimise the footprint of the project in this area.
Sensitive receivers, including residences, located close to the project site	A new noise wall is proposed in the same locations the existing noise wall parallel to the rail corridor (but five metres east of the existing to minimise the potential for changes to the existing noise environment.
Presence of Sydney Trains infrastructure, including the rail line and stations	The project has been located to avoid impacts to Sydney Trains stations at Cabramatta and Warwick Farm, and the Hume Highway overbridge. The design has been refined to minimise the need for track realignment ('slewing') and potential impacts on Sydney Trains infrastructure. This has been undertaken in areas where a safety clearance risk exists such that realignment is required to meet operational requirements.
Land use	Project infrastructure such as the turnouts, slewing of the line, signalling, is proposed to be located within the existing rail corridor as far as practicable to minimise the potential for permanent impacts to land use and private property.
Use of Jacquie Osmond Reserve	The design of the project at Jacquie Osmond Reserve has been refined and the project footprint reduced to the extent practicable to minimise the potential impacts to use of Jacquie Osmond Reserve and the softball diamonds.

6.2 Design features

As noted in section 1.2.2, the project consists of the following key features:

- new rail track – providing a 1.65 kilometre long section of new track with connections to the existing track at the northern and southern ends
- track realignment – moving sections of existing track sideways (slewing) to make room for the new track
- bridge works – constructing two new bridge structures adjacent to the existing rail bridges over Sussex Street and Cabramatta Creek
- road works – reconfiguring Broomfield Street between Sussex and Bridge streets.

These features are described in more detail in sections 6.2.1 to 6.2.4.

Ancillary infrastructure to support the above features and operation of the project would include drainage, retaining and noise walls and other track and rail system works. These features are described in section 6.3. The project's features are shown on Figure 6.1.

It is noted that the project scope described in this chapter is based on the level of design developed to date. Detailed design would include further engineering and construction planning, and would be subject to further input from key stakeholders and the community. Any design modifications that occur as a result of matters arising during the exhibition of this EIS would be identified in a submissions report or a preferred infrastructure report.

Table 6.2 summarises some of the key criteria used to develop the design of the project which has been adopted in consultation with stakeholders including Sydney Trains and Fairfield City Council, in accordance with relevant design standards and Council specifications.

Table 6.2 Key design criteria

Key feature	Description	Approximate Dimension	Reason for inclusion
New track	Centreline of new loop track to SSFL or any other structures	4.5 m	Standard track centres to allow trains to pass safely.
	Length of new loop track	1,650 m	Allows a 1,300 m long train to stand within the loop plus turnouts (connection into existing track).
Sussex Street Bridge works	Length of bridge spans	6.9 m to 8.4 m	Maintains existing traffic flow.
	Height clearance (road level to the base of the bridge girders)	2 m	Maintain traffic access for height of vehicles as per the existing bridges.
Cabramatta Creek bridge works	Distance of bridge abutments from top of bank of the waterway	17 m	Matches existing SSFL bridge to maintain existing flow width.
	Minimum distance between underside of bridge and top of bank	4 m	To allow for access and future maintenance.
	Vertical clearance above the 1:100 year ARI of the underside of bridge	Min 500/ 600 mm	Bottom of girder depth matches existing SSFL bridge to maintain existing flow.
Road works	Minimum distance between the shared path and retaining wall	0.5 m	To allow sufficient clearance between the wall and shared path to minimise the chance of collision with the wall.
	Width of shared path	2.5 m	Minimum width required to provide a safe shared path width in accordance with relevant standards and to attain the minimum road reserve width of 16.5 m.
	Minimum parallel parking length	2.1 m	Adopted standard length to replace angle parking.
	Minimum width of traffic lane	2.3 m	Council guided minimum width to create a safe space for passengers to open car doors and t alight from vehicles/
	Minimum road verge	2.7 m (consisting of 1.2 m footpath and 0.6 m boundary offset	To attain a minimum road reserve width of 16.5 m.

Figure 6.1a The project

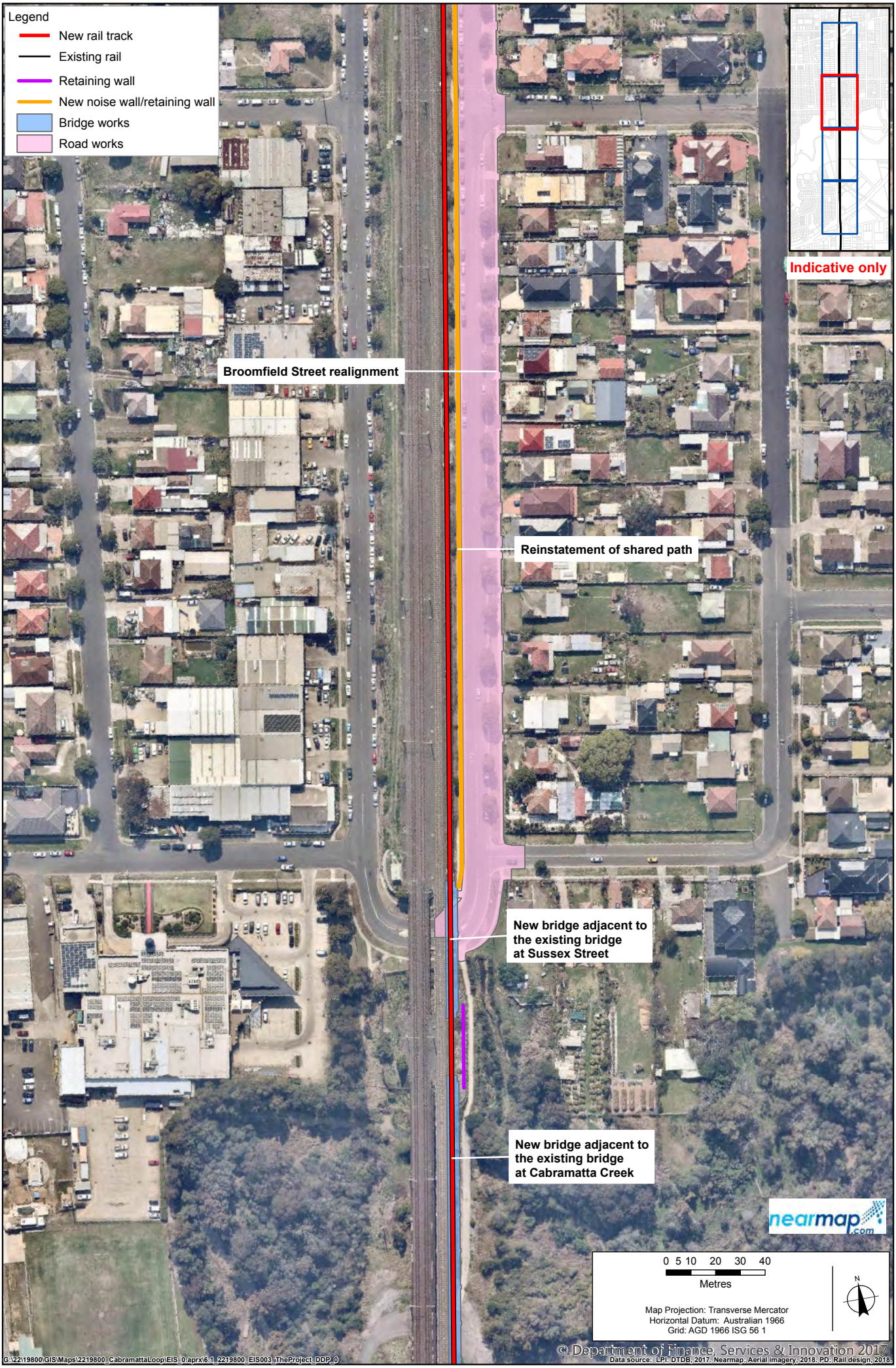

Figure 6.1b The project

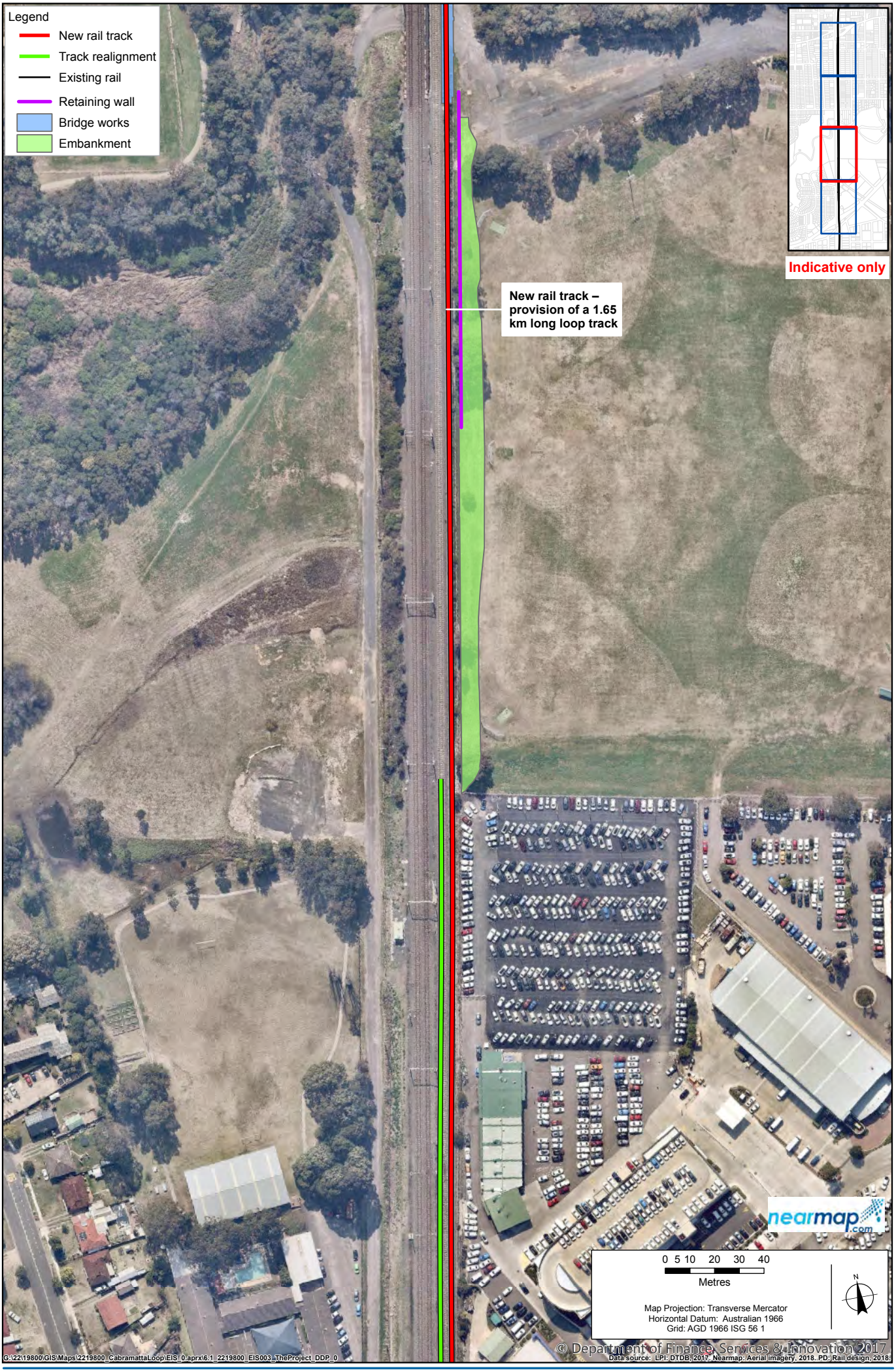

Figure 6.1c The project

Figure 6.1d The project

6.2.1 New track

6.2.1.1 Passing loop

The project involves providing a new section of track adjacent to the existing track to function as a passing loop, which would allow one train to pass another. The proposed passing loop would provide standing room for a 1.3 kilometre long train. It would consist of about 1.65 kilometres of new track for the passing loop itself, which would connect to the existing track via the proposed turn outs (described below). An indicative layout for the passing loop is shown in Figure 6.2.

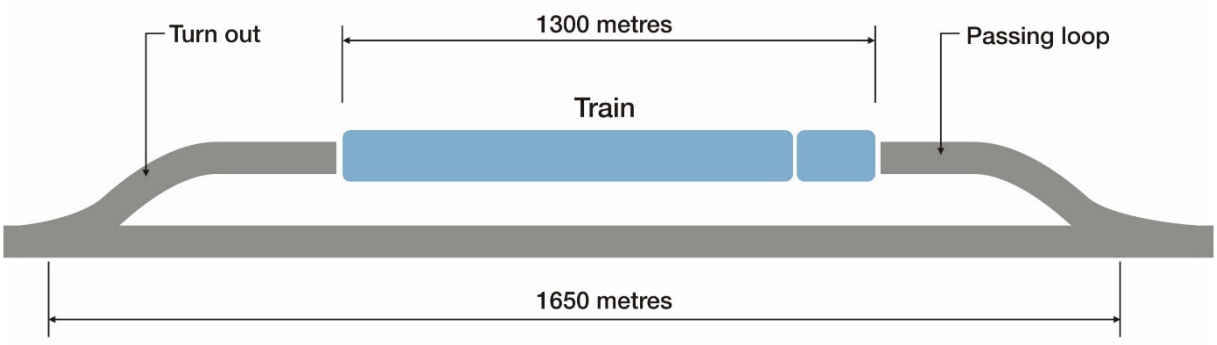

Figure 6.2 Aerial view of proposed passing loop layout (indicative)

The existing rail corridor would be widened by about five metres to the east to accommodate the passing loop. The proposed widening is limited to the minimum acceptable width required to install and operate the passing loop. This would require Broomfield Street to be reconfigured as described in section 6.2.4.

The new track would consist of concrete sleepers laid on ballast. The ballast would overlay the formation, which would comprise capping and structural layers consisting of different grade quarry material. The track and formation for the passing loop would be designed consistent with ARTC's standards. An indicative design for the new track is shown in Figure 6.3.

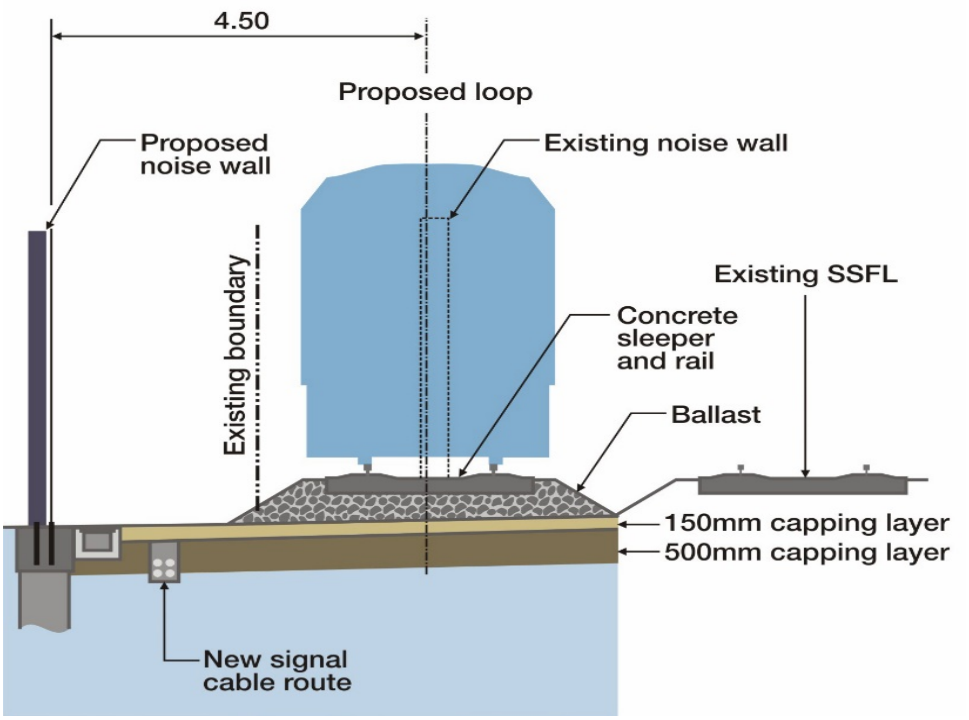

Figure 6.3 Side view of proposed passing loop layout (indicative)

6.2.1.2 Turnouts

Turnouts allow the train to be guided from one track to another.

The project includes providing turnouts at both ends of the passing loop. The turnouts would consist of about 100 to 150 metres of new track and formation each.
The proposed locations of the turnouts are shown on Figure 6.1.

6.2.2 Track realignment

At the southern end of the project site the existing SSFL track would be realigned (slewed) to the west, to provide room for the passing loop and minimise impact on adjoining land uses (on the Peter Warren Automotive site). This would involve realigning about 550 metres of the existing SSFL track and formation about two metres to the west within the rail corridor. In some locations the existing ballast may need to be replaced with new or reconditioned ballast.
The location of the proposed track realignment works is shown in Figure 6.1.

6.2.3 New bridges

To accommodate the passing loop, two new rail bridges are proposed directly adjacent to the existing rail bridges over Sussex Street and Cabramatta Creek.

The new bridges would consist of a bridge foundation with reinforced concrete headstock walls placed on bored concrete piles. Bridge planks would be placed on the headstocks. Ballast walls would be connected on each side of the structure. These would function to hold the ballast and track in place.

The new bridges would be structurally independent from, and would not be connected to, the existing bridges.

To minimise the potential impacts of the new bridges, the form, abutment and pier locations of both bridges would match the existing SSFL bridges. Key design criteria for the bridges are provided in Table 6.2. The bridges are described below and their locations are shown in Figure 6.4 and Figure 6.5.

6.2.3.1 Sussex Street bridge

The Sussex Street bridge would consist of a single ballasted track above a six span bridge structure. The bridge would be about 45 metres long and about 4.5 metres wide. It would have a height of about five metres from Sussex Street to the top of rail. Track and ballast would be laid on top of the bridge.

6.2.3.2 Cabramatta Creek bridge

The Cabramatta Creek bridge would consist of a single ballasted track above an eight span bridge structure. The bridge would be about 125 metres long and about 4.5 metres wide. It would have a height of about seven metres from Cabramatta Creek to the top of rail. Track and ballast would be laid on top of the bridge.

No piers are proposed to be located within the creek bed.

Similar to the current arrangement, new rock armouring would be installed at the base of bridge piers and existing rock armouring would be reinstated where disrupted by the works.

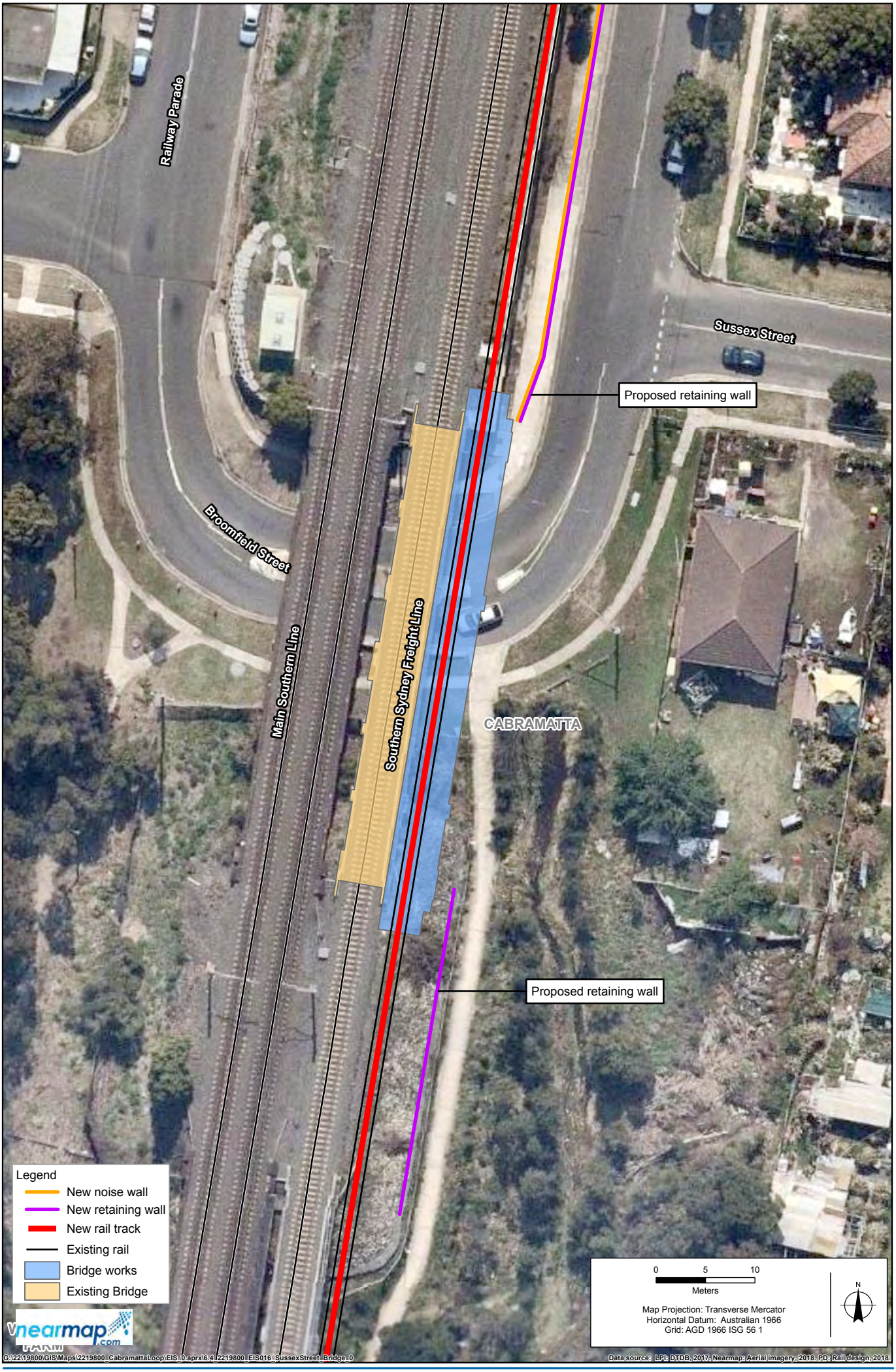

Figure 6.4 Sussex Street Bridge

Figure 6.5 Cabramatta Creek Bridge

6.2.4 Road works

6.2.4.1 Reconfiguration of Broomfield Street

The alignment of Broomfield Street would be reconfigured between Bridge Street and the Sussex Street bridge (a distance of about 680 metres). This is required to allow the rail corridor to be widened by about five metres to accommodate the proposed passing loop (described in section 6.2.1).

The proposed reconfiguration would involve reconfiguring road and pedestrian infrastructure to accommodate the change in the rail corridor boundary. The existing road configuration and an indicative design for the reconfiguration of Broomfield Street are shown in Figure 6.6.

The following infrastructure/facilities along Broomfield Street, between Bridge Street and Sussex Street, would be reconfigured.

Roadway

The current road configuration allows for two traffic lanes, one in each direction of travel. As part of the realignment works the centre line of the road corridor (consisting of traffic lanes and on-street parking) would be relocated generally about seven metres to the east. The resultant realignment would allow sufficient room for both traffic lanes to be retained, at widths in accordance with relevant Fairfield City Council requirements and specifications (refer to Table 6.2).

Changes to on-street parking

Untimed on-street parking, is located on both sides of Broomfield Street. For the majority of Broomfield Street within the project site, there is currently angled parking on the western side of the road, and kerbside parallel parking on the eastern side. Kerbside parallel parking on the eastern side of the road is not a formal parking lane as it does not meet current standards. North of Broomfield Lane, the parking consists of parallel parking on the western side only.

The project will reinstate kerbside parallel parking on the western side of the road. Kerbside parallel parking on the eastern side of the road would remain as per the current arrangement, however the parking lane will be widened to meet current standards as a result of consultation with Fairfield City Council. The potential impacts of this change on the availability of on-street parking is considered in Chapter 8 (Traffic, transport and access).

Shared path and western road verge

A shared path (shared pedestrian walkway and cycleway) that forms part of the Parramatta to Liverpool Cycle Rail Trail (the Cycleway) is located on the western side of Broomfield Street, between the rail corridor and angled parking. The shared path would be reinstated as per the current arrangement, however the overall width would be slightly reduced by about 20 centimetres.

Adjacent to the Cabramatta Creek and Sussex Street bridges, the shared path would be reinstated as per the current arrangement.

Footpath and eastern road verge

A footpath and grassed verge is located on the eastern side of Broomfield Street. The footpath and grassed verge would be reinstated as per the current arrangement and the existing width of the footpath would be maintained in accordance with relevant requirements (refer to Table 6.2). However the width of the grassed verge would be reduced by up to three metres to accommodate the realignment. This would result in the permanent removal of street trees along the eastern side of Broomfield Street (within the project site). The potential impacts of this change is considered in Chapter 17 (Landscape and visual amenity).

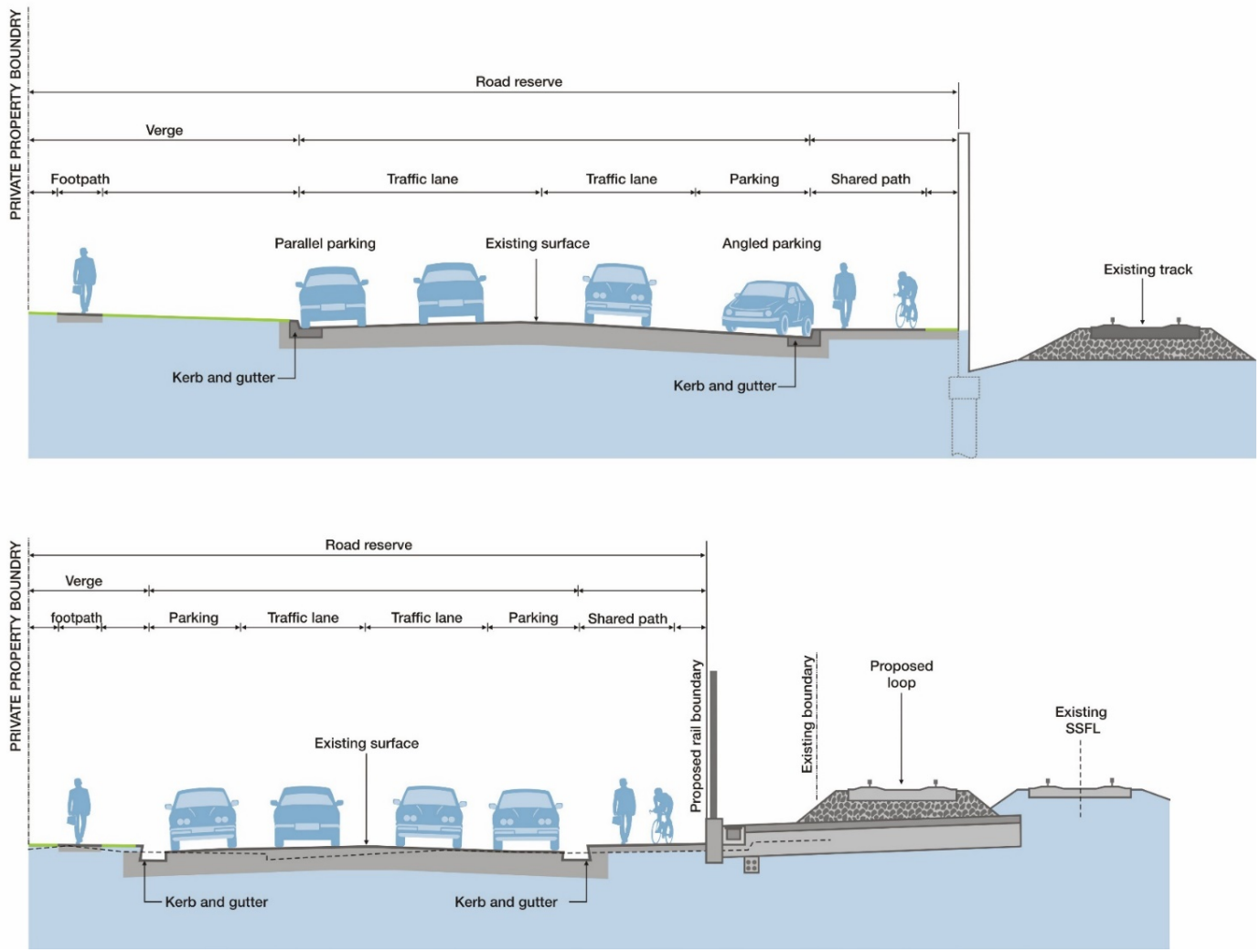

Figure 6.6 Existing configuration (top) and indicative proposed revised reconfiguration of Broomfield Street (bottom) (facing south)

Changes in Sussex Street

The existing level of Sussex Street would be reconfigured to allow for the new bridge at Sussex Street. The existing road pavement and adjacent shared path would be regraded to match the proposed approach to the eastern side of the bridges. No works are proposed to the shared path where it crosses Cabramatta Creek.

6.3 Ancillary works and infrastructure

6.3.1 Track drainage

The project would involve retaining the existing track drainage. Minor alignment changes would be made at some locations to accommodate the new track.

6.3.2 Road drainage

Existing road drainage would be relocated in conjunction with the road works described in section 6.2.4. The existing flow regime, hydraulics and flood immunities would be matched as closely as possible. To accommodate the realignment of Broomfield Street, the project would involve relocating the existing stormwater inlet pits to the new kerbs. This would include

- reconstructing about seven existing stormwater kerb inlet pits
- installing a new 700 metre long, 1200 millimetre diameter wide stormwater pipeline
- installing 21 new stormwater kerb inlet pits, on the eastern and western side of Broomfield Street
- installing five cross drainage structures between the road corridor and the rail corridor
- installing new kerb and gutter on the eastern and western side of Broomfield Street.

6.3.3 Noise wall

The existing noise wall would be realigned to be placed on the eastern side of the new track.

The new noise wall would be constructed of a similar concrete material as the existing wall. Panels from the existing wall would be reused where practicable. The height of the new noise wall would range from about 4.2 metres to 7.5 metres above Broomfield Street ground level, and would generally match the height of the existing noise wall.

6.3.4 Retaining walls and embankment

Due to the difference in ground level between the rail corridor and land to the east, the existing retaining walls would be relocated to the eastern side of the new track. One new retaining wall would be required at the southern extent of the project.

The height of the relocated retaining walls would generally match the heights of the existing walls.

The walls are proposed to minimise the project footprint and impacts to Broomfield Street, Cabramatta Creek and the southern extent of the site.

The location and details of the proposed retaining walls are summarised in Table 6.3.

Table 6.3 Proposed retaining wall structure

No.	Location	Approximate length (metres)	Approximate height (metres)	Wall type
1	Bridge Street to Sussex Street Bridge	710	0 to 3	Reinforced concrete pile cap and wall
2	Sussex Street bridge to Cabramatta Creek bridge	40	3	Reinforced concrete pile cap and wall. Exposed concrete finish with handrail on top
3	Jacquie Osmond Reserve	130	1 to 2	Reinforced concrete pile cap and wall. Exposed concrete finish with handrail on top
4	Southern extent of the site	90	1	Concrete block

An embankment would be constructed along the length of Jacquie Osmond Reserve. The length of the embankment would be about 260 metres. In consultation with Liverpool Council, it was identified that a hybrid of an embankment supported by a retaining wall at the northern extent of Jacquie Osmond Reserve would be required. The embankment allows for improved visual connectivity from the reserve to the rail line. As requested by Council, to support current maintenance practices in the Reserve the embankment would have a maximum height of 1.5 metres above ground surface, a width of about nine metres and a slope of one in six.

6.3.5 Other works

The following works would also be undertaken to accommodate the passing loop:

- provision of new and/or upgraded signalling, power and communications consisting of both under and above ground services and the in-situ decommissioning of the existing signalling, power and communications
- utility and rail system protection and relocation works within the construction footprint
- utility protection and relocation works potentially outside the construction footprint.

With the exception of the utility protection and relocation works, described in section 7.2.1, these works would be undertaken generally within the rail corridor.

6.4 Urban design

6.4.1 Project design principles and objectives

The urban landscape of the project site consists of the rail and road corridor, residential areas either side of the rail corridor, commercial and industrial land uses near the rail corridor and passive (Cabramatta Creek) and active recreation (Jacquie Osmond Reserve and Warwick Farm Recreation Reserve). These areas are described further in Chapter 17 (Landscape and visual amenity).

Urban design principals and objectives have been developed to retain the existing urban quality of the project site, and are as follows:

- improve the physical, aesthetic and visual amenity of the project site for residents and the local community by:
    - using robust, high quality and durable materials that minimise opportunities for vandalism
    - providing simple finishes that remain subtle within the landscape
    - maximising opportunities for tree planting in areas that have had existing trees removed
    - reducing visual clutter to ensure heritage and landmark features are legible
- revegetating the project site where possible to improve the visual quality of adjacent residential and open space. enhance natural and urban character areas by:
    - protecting creeks and creek banks by maximising tree retention and planting at creek crossings and aligning shared pedestrian/ cycle paths in close proximity to the carriageway
- apply the use of Crime Prevention Through Environmental Design (CPTED) principles through the design process by:
    - maximising the visibility of footpaths and shared paths from adjoining areas for good surveillance, sight lines and ease of orientation
    - ensuring adequate lighting of public places and footpaths for safe night-time travel
    - ensuring the landscaping makes places attractive, but does not provide unsafe environments for entrapment.

6.5 Land requirements

6.5.1 Permanent land requirements

The project would require land to the east of the rail corridor to accommodate the passing loop and the associated widening of the rail corridor. Table 6.4 summarises the land requirements for the operational features of the project. These requirements are shown in Figure 6.7.

The acquisition of land to meet these required would be managed in consultation with landowners and in accordance with the *Land Acquisition (Just Terms Compensation) Act 1991*. Where partial acquisitions are required, associated property adjustments, such as the realignment of property fencing, would be undertaken.

Table 6.4 Operational land requirements for the project

Lot/DP	Approximate amount of land required (m^2)	Part/all of lot?	Owner	Existing use	Existing land zoning
Lot 10 DP 776165	550	Full	Liverpool City Council	Car parking	IN1 General Industrial
	0.1				RE1 Public Recreation
Lot 3 DP 1013680	120	Partial	Peter Warren	Car sales	IN1 General Industrial
Lot 12 DP 578199	100	Partial	Peter Warren	Car sales	IN1 General Industrial
Lot 2 DP 250138	0.1	Partial	Department of Planning, Industry and Environment (managed by Liverpool City Council)	Jacquie Osmond Reserve	IN1 General Industrial
	630				RE1 Public Recreation
	120				SP2 Infrastructure
Road Corridor	940	Partial	Fairfield City Council	Broomfield Street	R2 Low Density Residential
	1,150				R3 Medium Density Residential
	25				SP2 Infrastructure
	25				E2 Environmental Conservation
	120			Shared path between Sussex Street and Cabramatta Creek	R2- Low Density Residential E2- Environmental Conservation
Road Corridor	125	Partial	Liverpool City Council	Rail corridor	SP2- Infrastructure RE1-Public Recreation

Further information regarding property impacts is provided in Chapter 16 (Land use and property).

Figure 6.7a Proposed land requirements

Figure 6.7b Proposed land requirements

6.6 Operation of the project

6.6.1 Operational train movements

6.6.1.1 Changes in operations from existing situation

The existing SSFL allows one freight train to run along the line in one direction at a time. The project would allow freight trains running in different directions to pass each other between Warwick Farm and Cabramatta stations. The project would include bi-directional signalling for the tracks within the project site to provide flexibility for operations.

This would increase the existing capacity of the freight line, allowing an increase in train volumes from 48 trains per day (24 in each direction) to 72 trains per day (36 in each direction).

6.6.1.2 Train numbers

The existing SSFL and forecast (project at year of opening and 10 years after opening) freight operations are provided in Table 6.5 to Table 6.7.

The existing freight operation figures are based on a typical day in 2019, which are the number of timetabled trains sourced from the April 2019 Master Train Plan. These numbers do not capture the expected increase in services from the Moorebank Intermodal Terminal that is scheduled to open later in 2019.

It should be noted that there are often differences between the number of timetabled trains and the number of trains that actually operate. This is because some timetabled trains don't operate. There are also ad-hoc services that do not appear in the timetable. Table 6.5 captures this and shows an average of the timetabled services across the days of the week.

Table 6.6 and Table 6.7 are modelled train numbers. Given the difficulty of predicting likely future train timetables, it is assumed that the number of trains operating during the different time periods is equal to the proportion that those hours account for over a 24 hour period (ie 'Night', or 9 hours, is 37.5 per cent of a 24 hour day).

Table 6.5 Existing SSFL freight operations – typical day 2019

Travel time		Down direction (from Sydney)	Up direction (to Sydney)
Day	7.00 am – 10.00 pm	7.5	7.5
Night	10.00 pm – 7.00 am	4.5	4.5
Total		**12**	**12**

Table 6.6 Forecast freight operations – typical day, year of opening (2023)

Travel time		Down direction (from Sydney)	Up direction (to Sydney)
Day	7.00 am – 10.00 pm	15	15
Night	10.00 pm – 7.00 am	9	9
Total		**24**	**24**

Table 6.7 Forecast freight operations – typical day, 2033

Travel time		Down direction (from Sydney)	Up direction (to Sydney)
Day	7.00 am – 10.00 pm	22.5	22.5
Night	10.00 pm – 7.00 am	13.5	13.5
Total		**36**	**36**

6.6.1.3 Train types and operating speeds

The design of the project (including signalling) allows for the operation of trains up to 1,300 metres in length or two trains of up to 650 metres in length, operating at speeds of up to 80 kilometres per hour.

The trains that would use the passing loop once the project is operational would be similar to those that currently use the existing SSFL.

6.6.1.4 Hours of operation

The passing loop and existing SSFL would continue to operate during the existing operational hours, which are 24 hours per day, 365 days per year.

6.6.1.5 Integration with the Metropolitan Freight Network

With the commissioning of the project there would be no change to the way in which the existing SSFL integrates with the MFN and Sydney's freight network as a whole.

6.6.2 Operational management and coordination

Operations along the line would continue to be controlled from ARTC's Network Control Centre South which is located in Junee. This represents no change to the operation of the ARTC network.

Operational activities would continue to be undertaken in accordance with ARTC's operating system which includes an Environmental Management System and ARTC's existing EPL (EPL # 3142).

6.6.3 Maintenance

Standard ARTC maintenance activities would be undertaken during operations. Typically, these activities include minor maintenance works, such as bridge and culvert inspections, rail grinding and track tamping, through to major maintenance, such as replacement and repair of existing bridge components, culvert repairs and cleaning, reconditioning of track and topping up of ballast as required.

Maintenance activities would continue to be undertaken in accordance with ARTC's operating system which includes ARTC's Environmental Management System and ARTC's existing EPL (EPL # 3142).

7 Construction

This chapter provides a description of the indicative construction methodology for the project. This includes an outline of the construction process and likely activities, the estimated construction resources that would be required, and an indicative construction program.

The construction methodology presented in this chapter is indicative and would continue to be modified and refined as the design process continues. A final construction methodology and program would be developed by the construction contractor based on the conditions of approval for the project (if approved) and the mitigation and management measures provided in Part B of this EIS.

7.1 Overview

Construction of the project would broadly involve the following main work phases:

- enabling works
- main construction works
- testing and commissioning works.

The indicative construction methodology during these work phases is described in section 7.2. Some overlap between these work phases may occur to ensure construction is completed as quickly as possible.

Construction is anticipated to start in early 2021 and take around two years. Further information on the construction program and timing is provided in section 7.3.

Key construction areas, including compounds and work sites, are shown in Figure 7.2, and described in section 7.4.

Information on construction requirements, including resources and transport arrangements, is provided in sections 7.5 and 7.6.

7.1.1 Approach to avoiding or minimising impacts

The approach to avoiding or minimising/managing impacts is based on two key steps; understanding the key constraints and issues in the study area and attempting to avoid these up-front by incorporating appropriate design and planning approaches, and then developing mitigation and management approaches based on the assessment of the potential impacts of the project as proposed. These approaches are described below.

7.1.1.1 Construction planning to date

The approach to design development (shown in Figure 7.1) and construction planning has included a focus on avoiding and/or minimising the potential for impacts during all key stages. The study area has a number of constraints and characteristics that have influenced development of the construction methodology to date.

The indicative construction methodology described in this chapter has been developed with consideration given to the constraints associated with the study area (including key environmental features and land uses) and other issues identified during the early stages of the design and environmental assessment process.

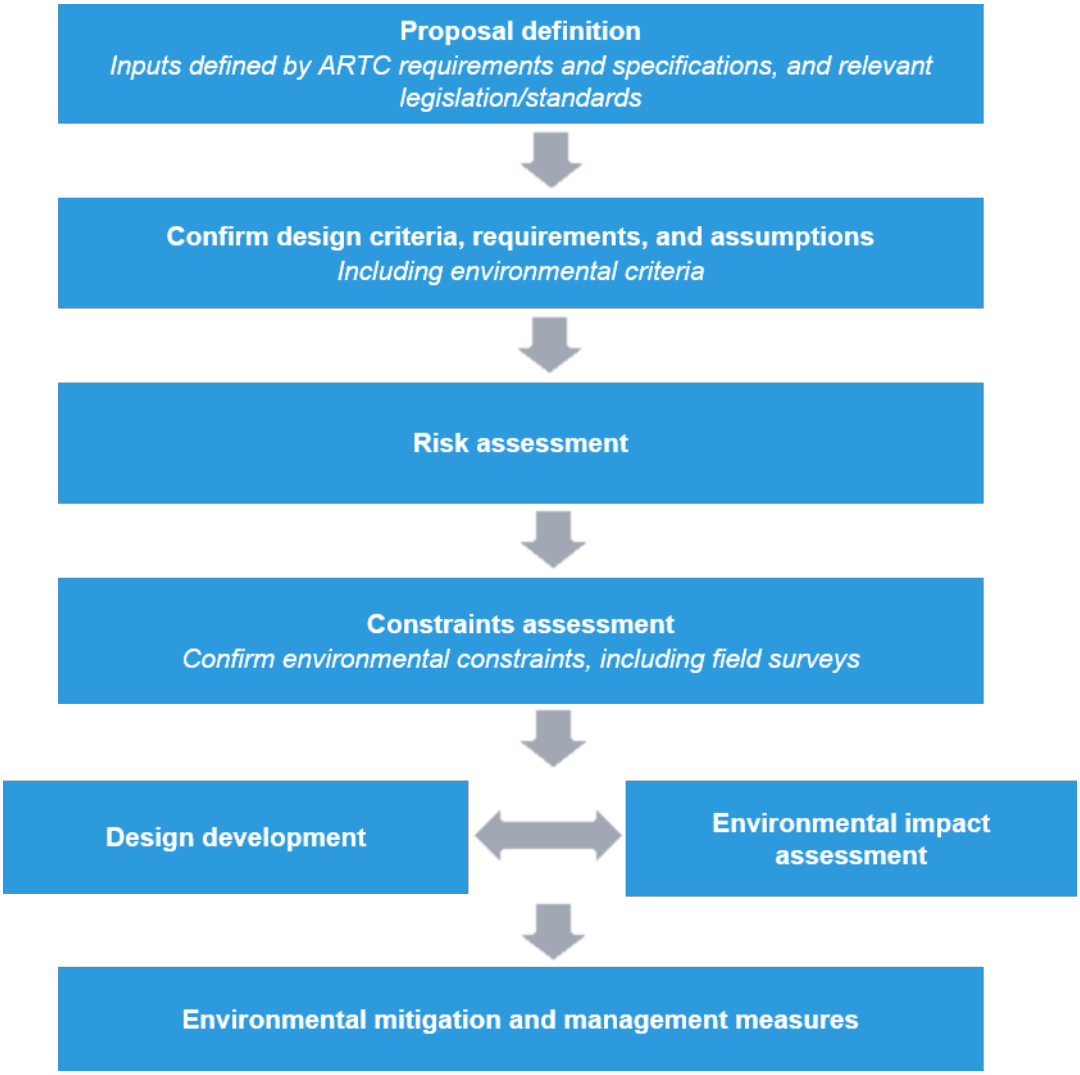

Figure 7.1 Approach to avoiding and minimising impacts during the design process

The key constraints that have influenced construction planning are summarised in Table 7.1 together with how the how the project has developed to date to avoid/minimise potential impacts.

Table 7.1 Key constraints and how construction planning has avoided/minimised environmental impacts to date

Key constraint	Approach to avoiding/minimising impacts
Access along Broomfield Street	The proposed approach to construction incorporates staging of the works in Broomfield Street so that access along the street is retained throughout the works.
Availability of on-street parking for construction workers	To minimise the need for construction workers to park in surrounding streets and local town or shopping centres (such as Hometown Warwick Farm), with the potential to impact on availability of parking for commuters and customers, parking for construction worker vehicles would be provided in construction compounds.
Water quality and flow	The use of large cranes is proposed such that bridges can be constructed without undertaking works within the creek bed of Cabramatta Creek.

Key constraint	Approach to avoiding/minimising impacts
Land use, Aboriginal heritage, biodiversity, community facilities	Compounds have been sited to utilise the sites used for similar activities during construction of the SSFL as far as practicable, to minimise impacts on land use, Aboriginal heritage and endangered ecological communities. The footprint of compound C3 (in Jacquie Osmond Reserve) has been configured to minimise potential impacts on the sports fields and use of the reserve.
Existing noise mitigation provided by the noise wall	The existing noise wall would be demolished and constructed in stages to minimise the length of time that the noise wall would not be effective and as such, the time sensitive receivers would be exposed to potential noise impacts from existing train operations.
Pedestrian/cyclist access between Broomfield Street and Jacquie Osmond Reserve	A temporary shared path diversion will be constructed during the enabling works to allow continued pedestrian/cyclist access while construction of the bridges is being undertaken. This temporary shared path diversion has been located to ensure that the disturbance footprint associated with construction of the temporary path was limited to either cleared land or non-native vegetation.

7.1.1.2 Construction environmental mitigation and management

Mitigation and management measures applicable to the pre-construction (enabling works) and construction stages would be implemented to minimise and manage the potential impacts described in chapters 8 to 21. Mitigation measures are provided in each chapter in Part B, and are summarised in Chapter 22 (Approach to environmental management and mitigation). The approach to environmental management includes preparing and implementing Site environmental management plans (EMP(s)) for enabling works and a construction environmental management plan (CEMP) including detailed sub-plans, for construction activities post enabling works.

The Site EMP(s) and CEMP would be prepared for the construction phase of the project by the responsible construction contractor. These documents would provide a centralised strategy through which all potential environmental impacts would be managed during construction, and would include detailed management measures to avoid or minimise potential impacts. The requirements for the Site EMP(s) and CEMP are described in Chapter 22 (Approach to environmental management and mitigation).

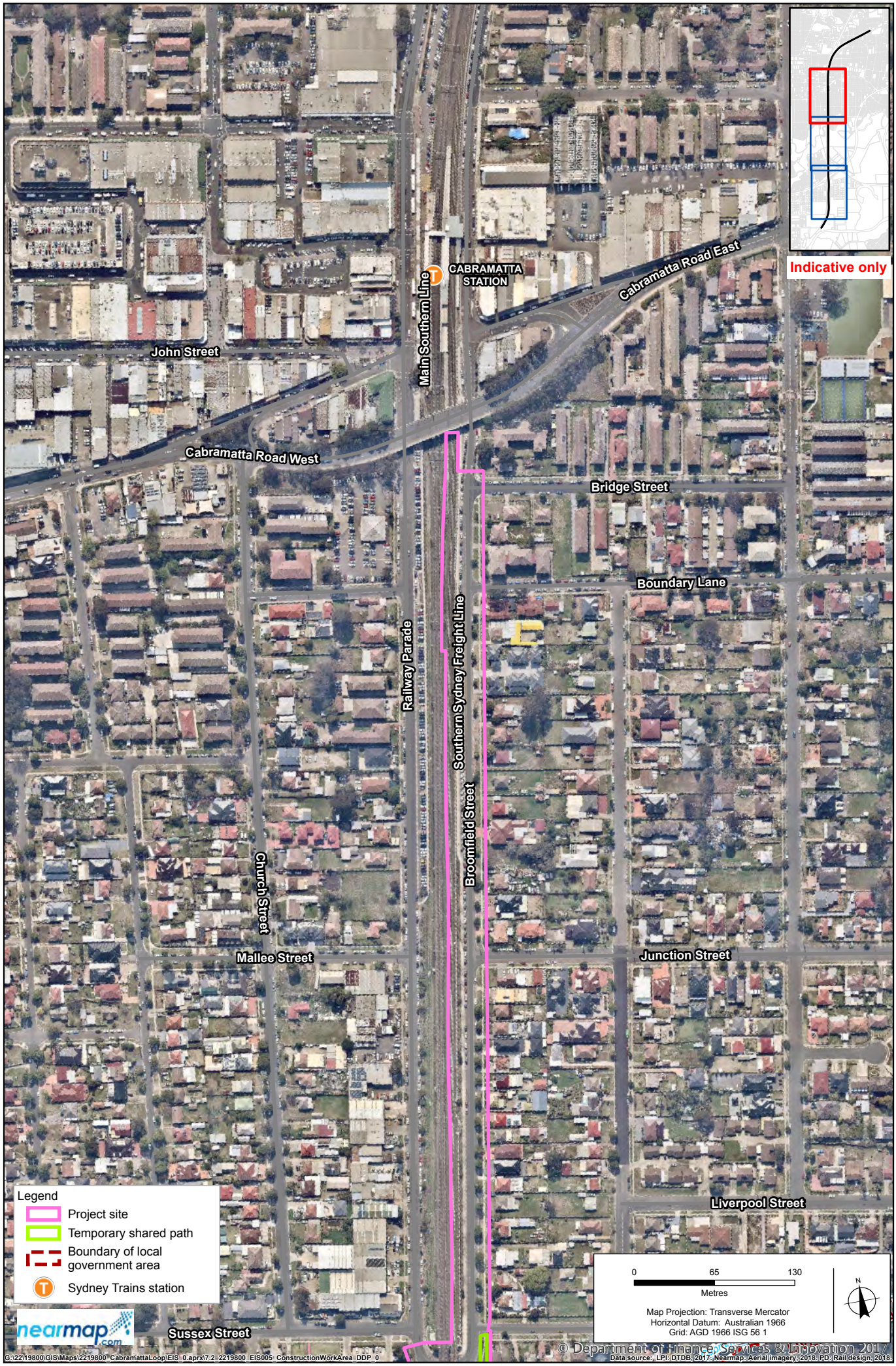

Figure 7.2a Construction work areas

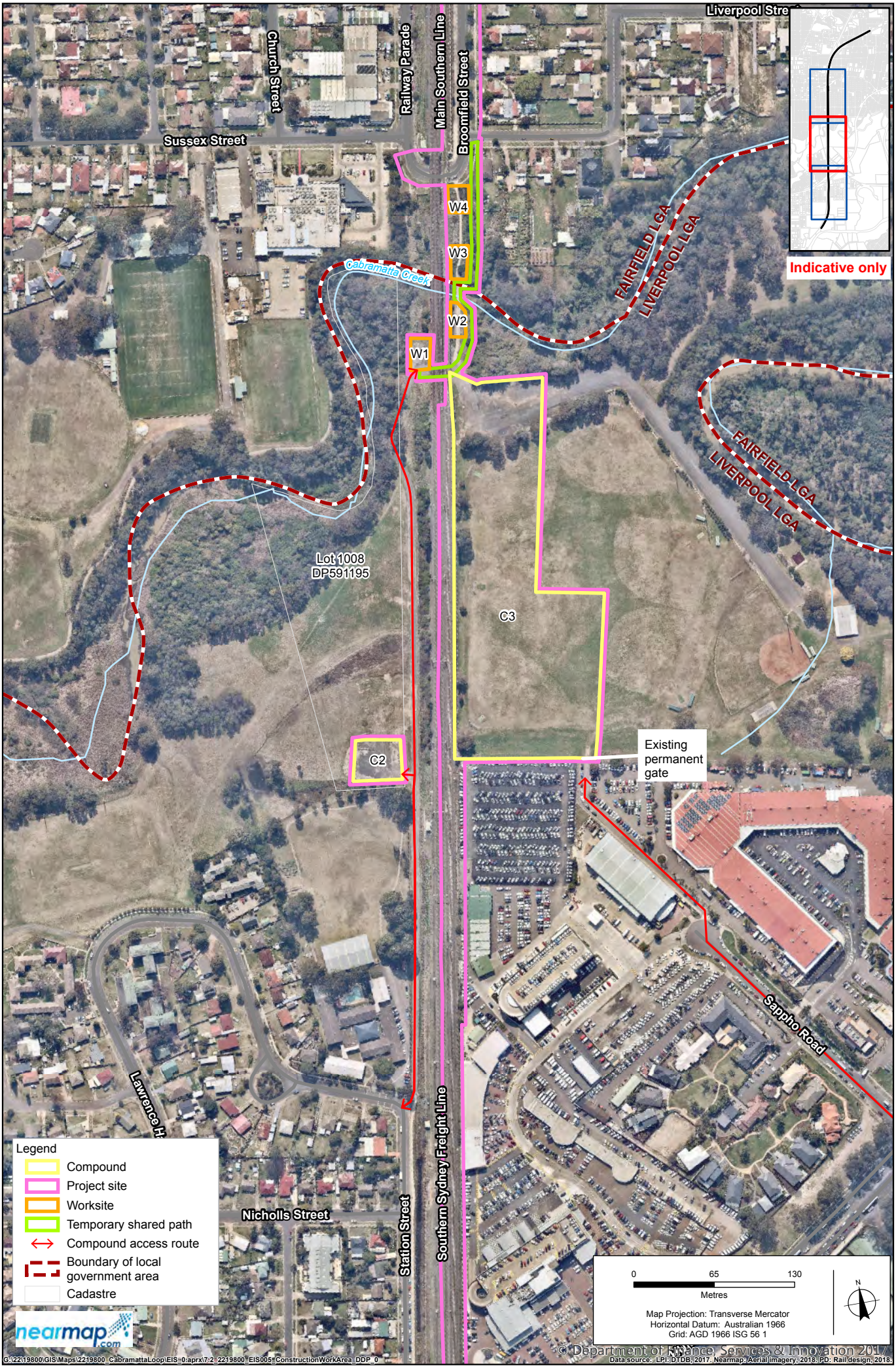

Figure 7.2b Construction work areas

Figure 7.2c Construction work areas

7.2 Indicative construction methodology

7.2.1 Enabling works

Enabling works for major infrastructure (also known as early works) are typically carried out before the start of substantial construction to establish key construction sites and provide protection to the public and environment as required.

All enabling works would be carried out in accordance with the relevant mitigation and management measures provided in this EIS, the Site EMP(s) and the conditions of approval for the project (if approved).

7.2.1.1 Site establishment

Site establishment is expected to include:

- carrying out heritage investigations, protection and archival recordings, if required
- installing site environment management and traffic controls (including pedestrian and cyclist management)
- establishing construction compounds and work sites including stockpiles and storage areas, regrading surfaces where required, delivery of plant and equipment, and installing fencing and hoarding where required in public areas (the proposed compounds and work sites are described in section 7.4)
- establishing access to work areas where required, including regrading of surfaces where required
- establishment of a temporary shared path to be used by pedestrians/cyclists during construction of Cabramatta Creek bridge
- suppling power, water and other utilities to construction compounds and other areas within the project site (whether temporary or permanent supplies)
- vegetation clearance and tree removal (further information is provided in Chapter 11 (Biodiversity)).

7.2.1.2 Protection or relocation of utilities

There are a number of utilities and services located within the project site, including power, water, wastewater and telecommunications. Those with the potential to be impacted by construction would be protected or relocated/adjusted prior to the commencement of the main construction works. It is expected that the following utilities would need to be relocated:

- stormwater drainage pipes on the eastern and western sides of Broomfield Street
- sewer rising main and gravity main located parallel to the rail corridor in Jacquie Osmond Reserve and Peter Warren Automotive
- power poles and power lines on the eastern side of Broomfield Street.

The general methodology to undertake these works is outlined below.

Relocation of sub-surface utilities

The general methodology to relocate sub-surface utilities, including stormwater drainage pipes and wastewater mains is as follows:

- trenching along the pipe alignment
- installing pipe bedding material
- installing pipes and access pits
- installing rock aprons at outlets (drainage pipes)
- tie in works with existing utilities

- backfilling material
- decommissioning existing pipes and rehabilitation.

Relocation of the Sydney Water gravity main will involve underboring at a depth of about four metres below ground surface. The type of underboring technique used would be confirmed during the detailed design phase of the project. Two underboring techniques which could be used are dry case-boring or wet-boring. Generally underboring will involve:

- drilling of a small diameter pilot hole along a directional path from one surface point to the next
- enlargement of the pilot hole using a back reamer
- pulling the pipeline through the enlarged hole behind the reamer using the drill stem.

Power pole relocation

Undertaking the proposed road works in Broomfield Street (described in section 6.2.4) would require relocation of power poles to the location of the proposed new footpath on eastern side of Broomfield Street. This would generally involve the following:

- isolating power source to existing power poles
- removing wires and poles
- excavating to about three metres below ground surface for power pole footing installation
- installing new poles and wires
- commissioning and testing of new asset.

Further information regarding utility adjustments is provided in Chapter 16 (Land use and property).

7.2.2 Main construction works

An outline of the proposed methodology (ie the works proposed) to construct the project's key features and main ancillary infrastructure is provided below. A description of how these works would be staged in relation to each other is provided in section 7.3.

All works would be carried out in accordance with the mitigation and management measures provided in this EIS, the CEMP and the conditions of approval for the project (if approved).

7.2.2.1 New track

The fencing and wall (noise and retaining wall, discussed further below) marking the existing eastern boundary of the rail corridor would be removed and new fencing and walls would be installed an average of t five metres east to mark the new boundary of the rail corridor. The new track for the passing loop would be installed within the new wider rail corridor area and would generally involve:

- placing and compacting the formation layer
- installing track drainage and connecting it to existing drainage outlets
- placing ballast, sleepers and rail tracks on top of the new formation
- tamping track to final height and alignment
- installing new signalling equipment and associated equipment.

Constructing the turnouts would generally involve:

- excavating the landform to the required design levels
- backfilling and compacting the formation layer
- placing ballast, sleepers and rail on top of the new formation
- tamping track to final height and alignment
- installing control infrastructure (points motor, power supply etc).

The above methodology is based on the retaining walls being in place prior to construction of new track.

7.2.2.2 Track realignment

Track realignment (slewing) is typically undertaken as part of standard ARTC rail maintenance works. Realignment of operational track, required as part of the project, would be undertaken during possession period(s) (refer to section 7.3.2).

The typical construction methodology for realigning the existing SSFL track would generally involve:

- removing the existing track infrastructure including rail, sleepers and fastenings for reuse in the new arrangement
- constructing new track as described above
- welding and adjusting the track to interface back into the existing track alignment.

7.2.2.3 Bridge works

Construction of the new bridges over Sussex Street and Cabramatta Creek would generally involve:

- diverting the shared pathway around perimeter of works to the temporary shared path (located to the east of the existing shared path)
- constructing access ramps to the bridge work areas for the piling rigs and cranes
- constructing crane pads and boring new piles (maximum depth of about 20 metres):
    - for the Sussex Street bridge a crane pad would be constructed at the southwestern corner of the proposed bridge location (Work site W4)
    - for the Cabramatta Creek bridge crane pads would be constructed at the northwestern and southwestern corners of the proposed bridge location (Work sites W3 and W2) - no works would be undertaken within the creek bed
- constructing pile caps to join between the piles
- erecting pre-cast piers
- installing the headstock and bearings
- installing girders by crane during possession periods – traffic control would be required on Sussex Street during bridge girder delivery
- adding barriers
- installing shock matt
- placing ballast, sleepers and rail on top of the new bridge
- tamping and profiling the ballast under and around the sleepers and welding tracks
- installing any required furnishings or infrastructure, such as handrails and walkways
- reinstating the shared pathway.

7.2.2.4 Road works

Broomfield Street

The reconfiguration of Broomfield Street would be undertaken in stages, as described in section 7.3.1. In summary, works would commence on the eastern side of Bromfield Street, and traffic would be diverted to the western side of Broomfield Street. Prior to works on the eastern side, fencing would be placed along the centreline of Broomfield Street to delineate the works area from the adjacent trafficked area. Once works on the eastern side of Broomfield Street are complete, fencing would be installed about five metres east of the previous rail corridor fencing. Traffic and parking would be diverted to the eastern side of Broomfield Street, between the new rail corridor fencing and the fencing installed along the Broomfield Street centreline.

The works would generally involve:

- earthworks to remove surface layers, including identifying and stripping of suitable top soil and stockpiling on site for future use
- importing embankment, foundation and select materials and fill to the road formation levels
- classifying and disposing of unsuitable and/or surplus material from the proposal footprint
- installing new culverts and subsoil drains
- installing new kerbs and gutters
- constructing the pavements, including placing and compacting select fill, the base course, and the asphalt wearing surface
- constructing tie-ins to existing roads
- installing new street lights
- resurfacing driveways on the western side of Broomfield Street to tie into the reconfigured road
- line-marking and installing signage
- removing fencing along previous centreline.

Sussex Street

The works at Sussex Street would generally involve:

- earthworks to remove surface layers, including identifying and stripping of suitable top soil and stockpiling on site for future use.
- importing embankment, foundation and select materials and fill to the road formation levels
- classifying and disposing of unsuitable and/or surplus material from the proposal footprint
- installing new kerbs and gutters
- constructing the pavements, including placing and compacting select fill, the base course, and the asphalt wearing surface
- constructing tie-ins to existing roads
- line-marking and installing signage.

7.2.2.5 Ancillary infrastructure and works

Noise wall

The noise wall would be installed on top of a cast-in-situ retaining wall.

The existing noise wall would be demolished first and then the new wall would be constructed. The new noise wall cannot be constructed until the existing noise wall is removed for the following reasons:

- Along some sections of the wall the new noise wall panels would not be able to be placed until the area behind the wall is filled to provide a counterweight. This cannot be undertaken if the retaining wall associated with the existing wall still needs to be demolished.
- Along some sections of the wall the new noise wall footings could be constructed without demolishing the existing wall. However, there would be insufficient space between the two walls to fit plant and equipment if the existing wall was demolished after construction of the noise wall, and the alternative would be to undertake works within the danger zone of the rail corridor. This could only be done during possessions, which as there are only four weekend possessions where this can occur, this is insufficient time to undertake the works.

Therefore, removing the existing noise wall and constructing the new noise wall would be undertaken in stages to minimise exposure of sensitive receivers to noise sources. It would involve the following general methodology:

- removing existing panels for storage, re-painting and later reuse, where practicable
- dismantling the existing retaining wall
- constructing the new retaining walls (as described below)
- installing the structural posts for the noise wall by bolting these to the top of the retaining wall (may require additional steel around the posts within the retaining wall structure)
- inserting reused panels from the old noise wall between poles using a mobile crane
- adding any urban design treatments and furnishings such as handrails as required.

Retaining walls

The required retaining wall structure would vary along the rail corridor requiring slightly different construction techniques. Construction of the retaining walls would involve:

- partial bored pile and partial cantilever retaining wall (Bridge Street to Sussex Street bridge):
  - excavating in the proposed location of the new noise walls
  - constructing bore piers to a maximum depth of 10 metres
  - building pile cap/footings and structural wall (either reusing concrete blocks or exposed concrete finish)
  - backfilling to the underside of formation behind the wall and installing sub-surface and surface water drainage.
- cantilever reinforced concrete wall (Sussex Street bridge to Cabramatta Creek bridge):
  - removal of the existing retaining wall
  - partially excavating between the two embankments

- constructing bore piers to a maximum depth of 10 metres
- constructing new footings involving excavation, placing formwork and steel, and pouring concrete backfilling to the underside of formation behind the wall and installing sub-surface and surface water drainage.

- reinforced concrete footing and wall (Jacquie Osmond Reserve):
  - minor excavation for the new wall
  - pouring concrete footing
  - installing structural wall (exposed concrete finish with handrail on top)
  - backfilling and installing sub-surface and surface water drainage
  - partially demolishing the old wall with the base to be retained underneath the new track.
- reinforced concrete footing and block wall (adjacent to the Peter Warren Automotive site)
  - potential shoring of existing building footings
  - assembly of steel reinforcement and formwork
  - pouring concrete into formwork for footing and wall
  - backfilling to the underside of formation behind the wall and installing sub-surface and surface water drainage.

Embankment at Jacquie Osmond Reserve

Construction of the embankment would involve:

- striping top soil
- placing reused spoil and compacting
- reinstating top soil and revegetating.

Other track and rail system works

Existing SSFL signals would need to be temporarily relocated during construction. This would involve:

- running a signal cable from the existing cable location to the western boundary of the rail corridor (through Sydney Trains track ballast)
- running a temporary signal cable within the existing rail corridor above ground (attached to star pickets)
- connecting back to the existing signal cable location at the extent of the project site.

Installing the proposed new combined services route and associated signalling would involve:

- excavating a trench for the new route directly to the east of the proposed passing loop track
- installing bedding material at the base of the trench
- installing conduit within the trench
- installing cable within the conduit by pulling it through the conduit
- excavating and installing pits between new and existing infrastructure
- installing signalling equipment and associated infrastructure
- backfilling trenches and pits with spoil

- compacting of backfilled material.

In addition, minor works in the form of new signalling would be installed at a number of locations within the rail corridor. Indicative locations for the signalling works are shown in Figure 7.3 however the exact locations would be determined during detailed design.

Signalling works at these locations would generally involve:

- installing a new slab and location case
- installing a local signal cable run and power supply, involving:
- excavating signal cable run or placing the cable run above ground (attached to wall)
- placing new signal / power cable in a polyvinyl chloride (PVC) conduit
- backfilling of existing excavated material into trench
- installing new signal and axle counter.

7.2.2.6 Finishing and rehabilitation

At the end of the main construction works phase, the contractor would remove all construction equipment from the project site. Areas that were occupied temporarily and do not form part of the operational footprint of the project would be rehabilitated and revegetated (where required and agreed with the relevant landowner). Construction work areas, compounds and access routes would be returned to the same or better condition than prior to construction commencement as required. Site reinstatement and rehabilitation would be undertaken progressively, and would include the following activities:

- demobilising construction compounds and work areas
- removing materials, waste and redundant structures from the work areas
- decommissioning temporary work area signs
- removing temporary fencing
- establishing permanent fencing, where not established during works
- decommissioning site access roads that are no longer required
- restoring disturbed areas as required, including revegetation.

Site rehabilitation would be undertaken in accordance with the landscape plan for the project (described in Chapter 17 (Landscape and visual amenity)) and the CEMP (described in Chapter 22 (Approach to environmental management).

7.2.3 Testing and commissioning

Testing and commissioning (checking) of the rail line and communication/signalling systems would be undertaken to ensure that all systems and infrastructure are designed, installed, and operating according to ARTC's operational requirements.

Figure 7.3a Indicative signalling locations

Figure 7.3b Indicative signalling locations

Figure 7.3c Indicative signalling locations

Figure 7.3d Indicative signalling locations

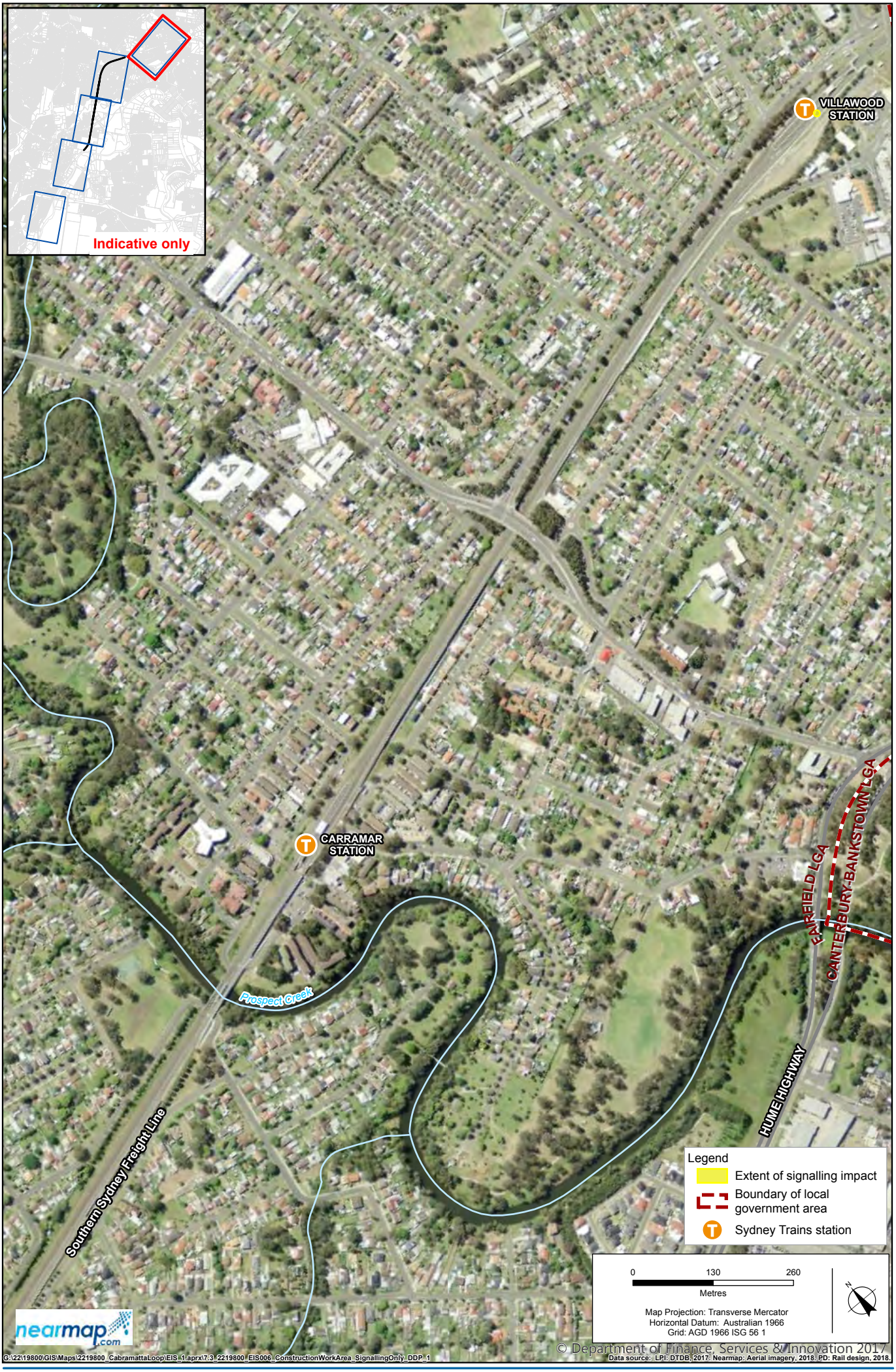

Figure 7.3e Indicative signalling locations

7.3 Construction program, timing and staging

7.3.1 Program and staging

Construction would commence once all necessary approvals are obtained (anticipated to be in early 2021) and take about two years to complete.

The main construction works would broadly be undertaken in six stages, some of which would overlap as shown in the indicative program shown in Figure 7.4 which also shows when enabling works would be undertaken. Testing and commissioning would likely be undertaken over one weekend possession in late 2022 (or potentially early 2023, if an additional possession is required).

A summary of the proposed staging for the main construction works is provided in Table 7.2. This would be subject to refinement and would be confirmed following engagement of the construction contractor.

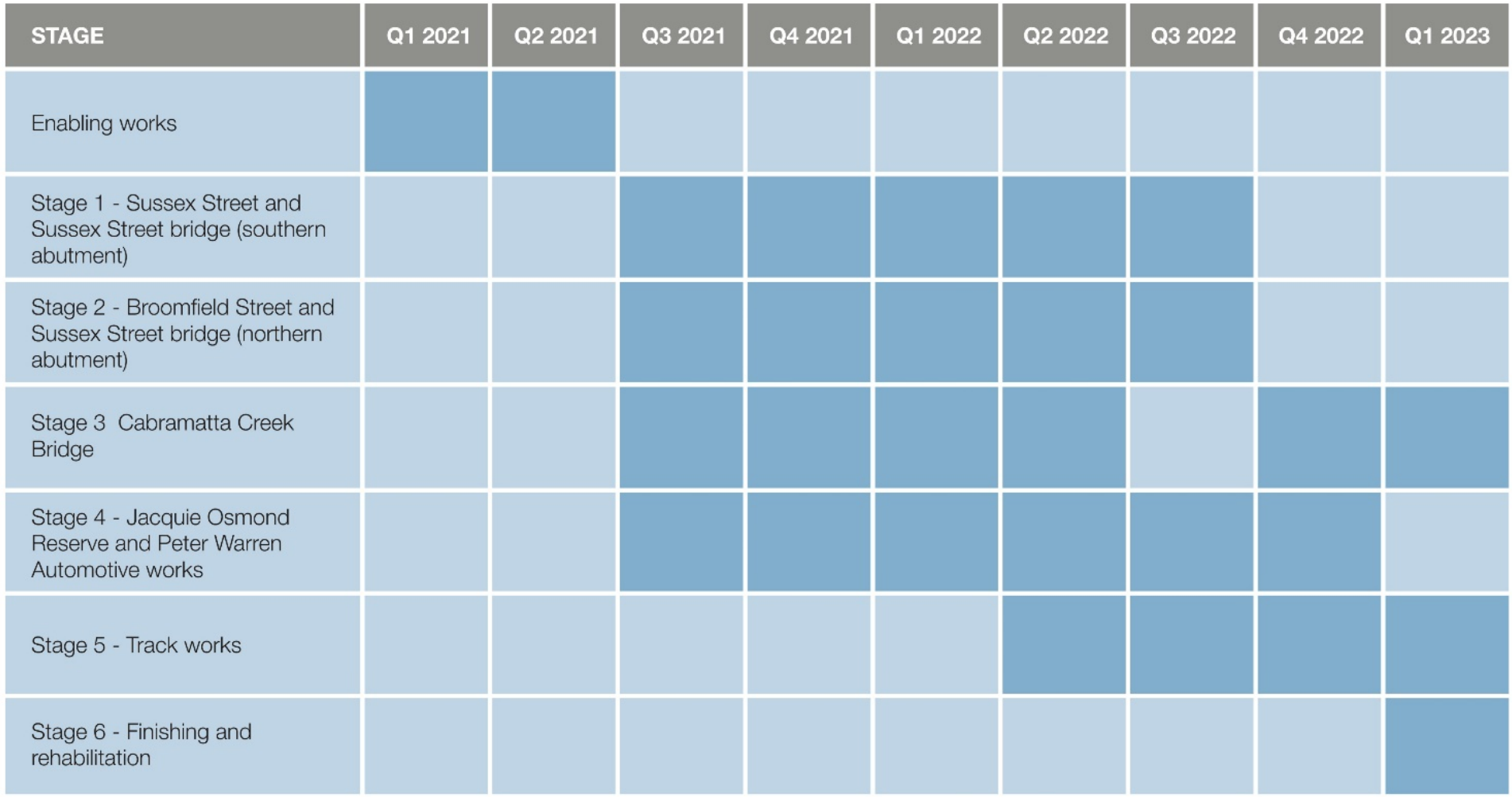

Figure 7.4 Indicative construction program

Table 7.2 Indicative staging

Stage	Feature constructed during stage	Main activities
Stage 1 – Sussex Street and southern abutment of Sussex Street bridge	• Road works (changes in Sussex Street and reconfiguration of Broomfield Street) • Sussex Street bridge	• Close the southern side of Sussex Street and direct traffic along the northern side of the road • Construct southern bridge abutment for the new bridge • Widen the road to the east of Broomfield Street, using the existing road (southbound lane) as a construction area while maintaining traffic flow on the west of Broomfield Street (northbound lane) – the Broomfield Street realignment would be completed as a rolling closure, from Sussex Street northwards to Bridge Street, in 200 metre sections
Stage 2 – Broomfield Street and northern abutment of Sussex Street bridge	• Road works (reconfiguration of Broomfield Street) • Retaining walls • Noise wall • Sussex Street bridge	• Redirect traffic through the southern side of Sussex Street Bridge and onto the east of Broomfield Street • Temporarily close the western part of Broomfield Street (northbound lane and parking) to use as a construction area • Construct northern abutment of the Sussex Street bridge • Remove existing retaining wall and noise wall and construct new retaining wall • Construct noise wall • Reinstate Broomfield Street with new alignment • Close Sussex Street over a weekend to construct the bridge
Stage 3 – Cabramatta Creek bridge	• Cabramatta Creek bridge	• Constructing the bridge (described in section 7.2.2) • Reinstating shared path
Stage 4 – Works at Jacquie Osmond Reserve and Peter Warren Automotive	• Retaining walls	• Clearance and site setup • Partial demolition of existing wall • Install footing for retaining structure • Build up sub-base and cap layer • Construct embankment (Jacquie Osmond Reserve only) • Reinstate fence
Stage 5 – Track works	• Track works • Signalling	• Construct track turnout and undertake realignment works at the northern end during the first available possession (described in section 7.3.2) • Construct track turnout and undertaken realignment at the southern end during the second available possession • New track would be constructed progressively along the corridor in a linear sequence, with multiple teams operating concurrently

Stage	Feature constructed during stage	Main activities
		• Install signals • Commission track during the last available possession
Stage 6 – Finishing and rehabilitation	N/A	• Demobilisation, rehabilitation and finishing works

7.3.2 Timing/work hours

7.3.2.1 Standard construction working hours

The majority of works (with the exception of during possession periods as described below in 'construction working hours for possession periods') would be undertaken during recommended standard construction working hours as defined by the Interim Construction Noise Guideline (DECC, 2009), which are:

- Monday to Friday: 7.00 am to 6.00 pm
- Saturday: 8.00 am to 1.00 pm
- Sundays and public holidays: no work.

During these periods, there may be a need to undertake some limited activities outside recommended standard working hours. These could include:

- electrical connections and installation
- delivery and/or removal of oversized equipment
- works on key roads such as delivering cranes, to minimise impacts to traffic flow and access
- setting up traffic conditions for partial road closures
- works required by utility service providers or where impacts to services cannot be reasonably managed during standard working hours.

Out of hours work would be undertaken in accordance with the out of hours work protocol described in Chapter 9 (Noise and vibration).

7.3.2.2 Construction working hours for possession periods

To ensure that works are carried out as efficiently as possible and that worker safety is maintained, some construction works would need to be undertaken during the scheduled rail maintenance possession periods, during which trains do not operate along the SSFL. ARTC currently schedules routine maintenance possessions on four weekends each calendar year.

Subject to detailed construction planning, these scheduled maintenance possessions would be used to complete certain construction works. Works that would need to be undertaken during possession periods include (but are not limited to):

- site establishment activities such as erection of barrier fencing within the rail corridor
- installing new track that affects operational line
- realigning the existing track
- moving large components (such as bridge girders) into place above the rail line
- bridge tie-in works
- signalling works

- installing undertrack crossings such as drainage and signal routes
- testing and commissioning of rail systems.

During possession periods, works may be undertaken 24 hours per day, and would involve working during and outside the recommended standard hours. However, the use of highly noise intensive equipment (such as hydraulic breakers and ballast tampers) would generally be limited to daytime and evening periods (between 7.00 am and 10.00 pm) unless technical constraints exist.

Work outside standard hours during possession periods would be undertaken in accordance with the out of hours work protocol.

7.4 Construction compounds and work sites

7.4.1 Compound

Construction compounds are areas used as the base for construction activities, such as for the storage of plant, equipment and materials, and/or construction site offices and worker facilities. Site compounds, which would be generally located outside the rail corridor, are shown in Figure 7.2 and are listed in Table 7.3. Compounds would be used for the duration of construction works and would include:

- site offices
- toilets, showers and change rooms
- meal rooms and first aid facilities
- areas for plant, equipment and material storage
- fencing and security facilities
- worker parking for between 60 to 80 cars.

Table 7.3 Construction compounds

Compound ID	Location	Existing land use
C1	Within rail corridor	Temporary storage
C2	Warwick Farm Recreation Reserve	Public recreation
C3	Jacquie Osmond Reserve	Public recreation

7.4.2 Work sites

In addition to the compounds and general construction activities within the rail corridor, there are also a number of other sites where construction activities would be undertaken, or where support would be provided for other construction areas. These sites, which would generally be located outside the rail corridor, are shown in Figure 7.2 and are listed in Table 7.4. The majority of these sites are unlikely be required for the duration of works.

Table 7.4 Work sites

Work site ID	Location	Existing use	Proposed use	Duration of use
W1	Access to compound site C3	Unnamed road/shared path	Truck turning circle	Long term
W2	Southern side of Cabramatta Creek bridge	Shared path	Crane pads	Short term
W3	Northern side of Cabramatta Creek bridge	Shared path	Crane pads	Short term

Work site ID	Location	Existing use	Proposed use	Duration of use
W4	Sussex Street bridge	Shared path	Crane pads	Short term

7.5 Construction resources

7.5.1 Workforce requirements

During non-possession periods, it is estimated that a peak workforce of about 80 people would be required. During possession periods, it is estimated that a peak workforce of about 220 people would be required, comprising 110 people per 12 her shift (with two 12 hours shifts per day). This increase in workforce numbers during possession periods is a result of the need to ensure that works can be completed during the possession period, which are limited to four 48 hours periods during the year.

7.5.2 Plant and equipment

An indicative list of the plant and equipment expected to be used during construction is provided in Table 7.5. The actual plant and equipment used at each work area within the project site would be refined during the detailed design stage and upon appointment of the construction contractor.

Table 7.5 Indicative construction plant and equipment

Feature/main works	Indicative plant and equipment	
Enabling works	• Grinder / mulcher • 20 tonne (T) excavator including rock-breaker • Vibratory roller • Directional drilling machine • Concrete truck and pumps	• Water cart Compactor Light vehicles • Delivery truck • 60 T crane • Welding truck
New track/track realignment	• Ballast train (side dump) • Rail train • Front end loader (modified to pick up sleepers)	• Rail tamper (vibration) • Rail regulator • 10 T franna
Road works	• Asphalting machines • Rollers (standard pneumatic and vibratory) • 4 x 20 T excavators including two rock-breakers • Several backhoes • Trucks for spoil • Articulated trucks for delivery • 100 T crane • Delivery truck / semi-trailers for material movement • Concrete trucks • Concrete vibration	• Water tanks • Water truck • Milling machine • Light vehicles • Piling rig • Concrete pump • Steel delivery • Panel delivery • Cherry picker • Grader
New bridges	• 200 - 300 T crane or 2 x 100 T cranes for girders	• Excavator • Concrete pump

Feature/main works	Indicative plant and equipment	
	• 60 T crane • Piling rigs for encased piles • Semi-trailer for delivery of girders • Concrete trucks • Concrete tester • Compressors • Front end loaders	• Concrete vibrators • Excavators (15 T and 20 T) including rock breakers • Truck and dog • Roller / compactor (plate compactor) • Pneumatic tools • Light vehicles
Retaining walls, embankment and noise walls	• 20 T excavator including rock breakers • Trailers • Truck and dog • Graders • Water cart • Concrete delivery	• Semi-trailers • Light vehicles • Vibratory roller • Jack hammers • Grinders / concrete cutters • 10 T Franna
Signalling	• Light vehicles • Trucks • Earthmoving equipment	
Finishing and rehabilitation	• Light vehicles • Trucks • Earthmoving equipment	
Testing and commissioning	• Light vehicles	

7.5.3 Materials

A variety of materials would be required to construct the project. The project would require about 8,500 cubic metres of fill material for the purpose of embankment widening and fill behind retaining walls.

The main materials are outlined in Table 7.6.

Table 7.6 Indicative material requirements

Feature	Indicative materials	
New track/track realignment	• Electrical conduit • Wiring • Pre-cast pits • Signal posts • Aluminium case cabinet • Concrete, general fill material	• Fine crushed rock (engineered materials) • Ballast • Rail • Sleepers • Steel handrail / walkway
Road works	• Asphalt • Concrete • Sand	• Road base (fine crushed rock) • Binding layer • Pre-cast concrete

Feature	Indicative materials	
	• Services pipes • Electrical wiring / telegraph poles	• Grates • Traffic barricades
New bridges	• Pre-cast girders • Concrete reinforcement • Piles • Scaffolding • Temporary barriers	• Lighting • Fencing • Engineered fill • Steel handrail / walkway • Concrete
Noise and retaining walls	• Hebel panels • Structural steel	• Piling casing • Recycled elements of the existing noise wall
Other	• Signage • Landscaping (plants and associated planting material)	• Paint • Signalling equipment (eg cables, star pickets, signal poles)

7.5.4 Earthworks and spoil generation

Earthworks would be required to construct the new passing loop, retaining walls and embankment at Jacquie Osmond Reserve and bridges at Cabramatta Creek and Sussex Street and to undertake the road works along Broomfield Street and Sussex Street.

Minor earthworks would also be required to construct infrastructure such as signalling and drainage, and undertake the ancillary works associated with the project, such as utilities relocation and temporary path relocations.

Excavated spoil would be reused within the project site where practicable to construct the rail formation. It is estimated about 8,100 cubic metres excess spoil would be generated. The approach to managing excess spoil and other construction wastes is considered in Chapter 19 (waste management).

7.5.5 Temporary land requirements

Some areas of land located outside the rail corridor would need to be temporarily leased or occupied for the proposed construction compounds and work sites (described in section 7.4). These areas are located within road reserves or other public land.

Additionally some land is proposed to be temporarily occupied on land privately owned south of Jacquie Osmond Reserve. This is required to facilitate the temporary relocation of the Sydney Water sewer rising main and gravity main located parallel to the rail corridor (as discussed in section 7.2.1). The land to accommodate the temporary relocation of this easement would likely be obtained via a temporary access license for a period of around six months. Temporary land acquisition requirements to facilitate relocation of the Sydney Water sewer rising main are summarised in Table 7.7.

Table 7.7 Temporary land requirements for the relocation of Sydney Water assets

Lot/DP	Approximate amount of land required (m2)	Part/all of lot?		Existing use	Existing land zoning
Lot 101 DP 876817	800	Partial	Private commercial owner	Car sales	IN1 General Industrial

Lot/DP	Approximate amount of land required (m2)	Part/all of lot?		Existing use	Existing land zoning
Lot 3 DP 1013680	110	Partial	Private commercial owner	Car sales	IN1 General Industrial
Lot 12 DP 578199	110	Partial	Private commercial owner	Car sales	IN1 General Industrial

ARTC is currently consulting with the relevant landowners to arrange leasing of the required land.

7.5.6 Site servicing requirements

Construction (mainly the use of compounds) would require connections to surrounding utilities, such as potable water, power, wastewater and telecommunications. Generally, these utilities are located close to the project site and supply is considered 'business as usual' for utility companies.

7.6 Transport, access and haulage

7.6.1 Routes for the movement of construction equipment and materials (haulage routes)

Preliminary identification of haulage routes has been undertaken with consideration given surrounding land uses. Potential routes have been proposed to minimise impacts on local roads as far as possible, while providing the most direct route to the arterial road network. It is proposed that the Hume Highway would provide the key access to and from the locality, with Cabramatta Road East and Mannix Parade comprising the two major access routes to and from the Hume Highway.

Liverpool and Junction streets may be used in one direction (westward) to access Broomfield Street, while Sappho Road may be used in special circumstances to access the Jackie Osmond Reserve. The preliminary haulage and access routes are shown on Figure 7.5.

These preliminary routes would be reviewed during detailed design and confirmed following appointment of the construction contractor. In general, vehicle movements would be scheduled to be undertaken outside peak periods. However, there may be a need for some vehicle movements during peak periods.

7.6.2 Access to work areas

With the exception of compounds and work sites access to the project site would be from either Broomfield Street, Sussex Street, Jacquie Osmond Reserve (via Railway Parade), Sappho Road, or Warwick Street near Warwick Farm Station.

Compounds and work sites would be accessed via the haulage and access roads described in section 7.6.1 and as shown in Figure 7.5.

7.6.3 Construction traffic numbers

Construction traffic would include heavy and light vehicles associated with waste removal, material deliveries, and the arrival and departure of construction workers. The indicative construction traffic volumes are based on the following vehicle types:

- light vehicles – up to 4.5 tonnes
- heavy vehicles – 12.5 metres long, greater than 4.5 tonnes.

It is estimated that an average of about 60 light vehicles and 40 heavy vehicles would access the project site on a typical working day. This number would increase to about 160 light vehicles and 96 heavy vehicles during possession periods.

Table 7.8 provides the estimated peak vehicle numbers per hour. Volumes have been shown for both during a possession period and outside of possession periods.

Traffic movements would be managed in accordance with the CEMP. Further information on the approach to managing construction traffic is provided in Chapter 8 (Traffic, transport and access).

Figure 7.5 Potential haulage and access routes

Table 7.8 Peak number of construction vehicles per hour

Road/Street	Possession (24 hours)		Outside possessions (day time working hours)	
	Heavy vehicle	Light vehicle	Heavy vehicle	Light vehicle
Hume Highway	4	60	4	30
Cabramatta Road East	2	20	2	15
Junction Street	2	20	2	15
Liverpool Street / Sussex Street	2	20	2	15
Broomfield Street	2	20	2	15
Mannix Parade / Lawrence Hargrave Road / Nicholls Street / Station Street / Railway Parade	3	60	2	30
Sappho Road	2	20	2	15
Warwick Street	4	60	4	30

7.6.4 Construction workforce parking

Parking would be provided for construction workers within the construction compounds and/or work sites. Approximately 60 to 80 worker's vehicles could be accommodated within the site compounds. Therefore there should be minimal impact to on street parking from construction workers. Parking locations would be detailed in the CEMP.

As the project site is located in close proximity to Cabramatta and Warwick Farm stations and a number of bus routes, there is also an opportunity for construction workers to use public transport, reducing the need for parking.

7.6.5 Diversions and temporary transport arrangements

To support construction, a number of changes to the surrounding road network would be required. These changes to the road network are required to:

- facilitate construction of the Sussex Street bridge
- facilitate the reconfiguration of Broomfield Street and changes in Sussex Street
- facilitate the movement of construction vehicles in and out of compounds and work areas
- ensure safe movement of pedestrians and cyclists around the project
- optimise the availability of on- and off-street parking.

The proposed changes and how these would be managed is considered in Chapter 8 (Traffic, transport and access).