NSW GOVERNMENT | Transport for NSW

New Intercity Fleet Maintenance Facility Project

Volume 1 – Review of Environmental Factors

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New Intercity Fleet - Maintenance Facility

REVIEW OF ENVIRONMENTAL FACTORS

Transport for NSW

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ABBREVIATIONS

AC	alternating current
ACHAR	Aboriginal Cultural Heritage Assessment Report
AEP	annual exceedence probability – the probability of a particular rainfall amount for a specified duration being equalled or exceeded in any one year period expressed as a percentage.
AHIMS	Aboriginal Heritage Information Management System
AHIP	Aboriginal Heritage Impact Permit
Ambient noise	The ambient noise level at a particular location is the overall environmental noise level caused by all noise sources in the area, both near and far.
ARI	average recurrence interval
Audible	Audible refers to a sound that can be heard. There are a range of audibility grades, varying from 'barely audible' and 'just audible' to 'clearly audible' and 'prominent'.
BCA	Building Code of Australia
BTEX	benzene, toluene, ethylbenzene, and xylenes
CAMBA	China-Australia Migratory Bird Agreement
CCTV	closed circuit television
CER	Chief Executive Requirements
Central Coast Council	Central Coast Council refers to the newly created Council consisting of the former Gosford and Wyong Shire Councils following commencement of the NSW council amalgamations on 12 May 2016. Any reference to the Wyong Shire LGA or Wyong Shire Council within this document should be considered to be a reference to the current Central Coast LGA or Central Coast Council.
CSR	combined services route
CTMP	Construction Traffic Management Plan
DBYD	Dial Before You Dig
DC	direct current
Down Main	The western most track on the Main North Line, allows movements away from Central Station in a northerly direction heading towards Newcastle
DDA	(Commonwealth) *Disability Discrimination Act*

DoE	(Commonwealth) Department of Environment
DSAPT	*Disability Standards for Accessible Public Transport Amendment 2010* (made under the *Disability Discrimination Act 1992*)
EEC	Endangered Ecological Community
EIS	Environmental Impact Statement
EMP	Environmental Management Plan
EPA	NSW Environment Protection Authority
EP&A Act	(NSW) *Environmental Planning and Assessment 1979*
EP&A Regulation	(NSW) *Environmental Planning and Regulation 2000*
EPBC Act	(Commonwealth) *Environment Protection and Biodiversity Conservation 1999*
EPL	Environment Protection Licence
ESCP	Erosion and Sediment Control Plan
ESD	Ecologically Sustainable Development
FM Act	(NSW) *Fisheries Management Act 1994*
GHG	Greenhouse gas
Heritage Act	(NSW) *Heritage Act 1977*
HV	High voltage
H-Sets	Otherwise known as OSCars (Outer Suburban Cars (a type of train)), H-sets run on the South Coast, Blue Mountains (to Springwood) and Central Coast/Newcastle Lines. These trains were first introduced in 2006.
Infrastructure SEPP	(NSW) *State Environmental Planning Policy (Infrastructure) 2007*
IPCC	Intergovernmental Panel on Climate Change
JAMBA	Japan-Australia Migratory Bird Agreement
kV	kilovolt
L_{Aeq}	equivalent continuous sound level
LALC	Local Aboriginal Land Council
LEP	local environmental plan
LGA	local government area

Level 1 maintenance	Minor repairs and daily checks, including cleaning and minor repairs
Level 2 maintenance	Routine 30 day and above general inspections, based on a time based predictive maintenance regime
Level 3 maintenance	Component change out replacement of major components, typically undertaken every six to eight years.
LoS	level of service
maintenance road	tracks for undertaking maintenance on the train sets
MCA	multi criteria analysis
Native Vegetation Act	(NSW) *Native Vegetation Act 2003*
NES	(Matters of) National Environmental Significance
New Intercity Fleet	The New Intercity Fleet is a new fleet of modern trains set to replace the existing intercity fleet and is intended to service the Central Coast and Newcastle, the Blue Mountains Line and the South Coast Line
NPW Act	*National Parks and Wildlife Act 1974*
NW Act	*Noxious Weeds Act 1993*
OCP	organochlorine pesticide
OEH	(NSW) Office of Environment and Heritage
OEMP	Operational Environmental Management Plan
OSCars	Outer Suburban Cars (refer to H-sets above)
PAD	potential archaeological deposit
PAH	polycyclic aromatic hydrocarbons
PCB	polychlorinated biphenyls
PEA	Preliminary Environmental Assessment
POEO Act	(NSW) *Protection of the Environment Operations Act 1997*
Project (the)	Construction and operation of the New Intercity Fleet Maintenance Facility in Kangy Angy (refer to Chapter 4 for a description of the Project).
REF	Review of Environmental Factors
Roads Act	(NSW) *Roads Act 1993*
Roads and Maritime	*Roads and Maritime Services*
RoKAMBA	Republic of Korea-Australia Migratory Bird Agreement

SCADA	supervisory control and data acquisition – a system for remote monitoring and control that operates with coded signals over communication channels
SHR	State Heritage Register
SEPP	State Environmental Planning Policy
Significant impact	Where the impact of an action cannot be mitigated such that the residual effect cannot be reversed or reasonably mitigated to an acceptable level.
SIS	Species Impact Statement
standing road	tracks for holding trains within the maintenance facility
T-Sets	Tangara passenger train fleet – the T-sets were introduced into service between 1988 and 1995.
TPH	total petroleum hydrocarbons
TSC Act	(NSW) *Threatened Species Conservation 1995*
TSP	Total suspended particles
Up Main	The eastern most track on the Main North Line, allows movements to Central Station in a southerly direction heading away from Newcastle
WM Act	(NSW) *Water Management Act 2000*
WSP	Water Sharing Plan

EXECUTIVE SUMMARY

The New Intercity Fleet Program

The *NSW Long Term Transport Master Plan* (NSW Government 2012a; 'Transport Master Plan') and its supporting document, *Sydney's Rail Future* (NSW Government 2012b), identifies the need to enhance rail passenger services, in particular for longer distance travel outside the metropolitan network.

In May 2014, the NSW Government announced its intention to invest in the procurement of the New Intercity Fleet, a fleet of trains that will carry Central Coast, Newcastle, the Blue Mountains and South Coast customers to and from Sydney. The introduction of the New Intercity Fleet will allow for the replacement of the older trains fleets used currently to provide intercity services.

In developing the New Intercity Fleet program, the new trains would provide for:

- A more consistent and improved level of customer service for intercity passengers
- The retirement of the two oldest electric train set types currently in operation
- A reduction in the costs of intercity operations
- Increasing capacity for intercity passengers.

Why is a New Intercity Fleet Maintenance Facility needed?

The need for investment in train maintenance facilities across NSW is ultimately linked to the current fleet size and its composition. The primary need for the proposed New Intercity Fleet Maintenance Facility is a direct result of the current procurement of the New Intercity Fleet trains and the requirement to adequately maintain these trains. However, an opportunity also exists to improve current train operations across the Sydney metropolitan network through the development of the New Intercity Fleet Maintenance Facility at a site in Kangy Angy on the NSW Central Coast.

Overall, the key factors driving the need for development of the New Intercity Fleet Maintenance Facility at Kangy Angy include the following:

- *Need for additional maintenance capacity* –driven by an overarching requirement for additional maintenance capacity to cater for the increase in the intercity fleet size and to mitigate the lack of spare capacity at the current maintenance facility sites to accommodate the new trains
- *The need for a dedicated New Intercity Fleet Maintenance Facility* –development of a New Intercity Fleet Maintenance Facility relates to the need for a dedicated maintenance capacity of the New Intercity Fleet, which is driven by:
  - the preference to consolidate maintenance capability for a given fleet in one location
  - constraints on the design and layout of existing maintenance facilities
- *A preference for an outer metropolitan facility* – it has been identified that the provision of such a facility would have a number of benefits including:
  - increasing fleet availability across the broader network
  - avoiding constraints associated with increasing metropolitan train movements and freeing maintenance capacity in Sydney for future growth in the suburban fleet.

Further discussion regarding the need and justification of the New Intercity Fleet Maintenance Facility Project is provided in Chapter 2 of this Review of Environmental Factors (REF).

Site selection and options development – why is Kangy Angy the preferred site?

In order to meet all of the operation requirements of the New Intercity Fleet, a comprehensive site selection and option development process was undertaken for the New Intercity Fleet Maintenance Facility which included consideration of a number of different site location options for the maintenance facility site.

The New Intercity Fleet will operate on three routes including: Sydney to the Central Coast/Newcastle (Main North Line and North Shore onto main North Line); Sydney to Blue Mountains (Western Line); and Sydney to Wollongong/Nowra (South Coast Line). The facility is therefore required to be located central to one of these core routes to minimise out-of-sector train movements solely for the purpose of maintenance. Based on this primary requirement Transport for NSW initially considered a total of 24 potential sites across the Main North, Western and South Coast lines as part of the initial site selection process.

In order to minimise empty train movements the preference for the new maintenance facility was to locate the maintenance facility closer to where trains commence and conclude their journeys, which is the Main North Line. In addition, the rationale for the Central Coast as the preferred location is based on the current New Intercity Fleet deployment strategy, which would provide for a larger proportion of New Intercity Fleet trains being deployed on the Central Coast and Newcastle Lines. As such, of the 24 initial sites identified, the seven sites located along the Main North Line were considered further as part of a strategic site options assessment. Following the strategic site options assessment, three of the seven sites were identified as being suitable for further detailed investigation.

The three short-listed sites were then considered against a more detailed series of environmental and engineering criteria including ecology; heritage; noise; contamination; flooding; planning approval processes; and construction access constraints. Based on the assessment process undertaken for the short-listed sites, a suitable site at Warnervale was identified. However, this site was subsequently identified as having a series of constraints including: impacts on areas of identified wetland identified under State Environmental Planning Policy No. 14; potential conflict with a proposed new link road between Warnervale and Wyong, a planned employment precinct for future development by the Central Coast Council and potentially challenging property acquisition constraints. These constraints resulted in this site being considered to be non-viable for the proposed New Intercity Fleet Maintenance Facility.

An additional eighth site (which was identified in the original 24), located at Kangy Angy, was consequently identified for consideration to address the identified constraints associated with the Warnervale site. Consideration of the site at Kangy Angy identified that it would result in a similar and/or more beneficial environmental and engineering outcomes to the previously identified Warnervale site. Therefore, the site at Kangy Angy was considered to be the preferred site option for the proposed New Intercity Fleet Maintenance Facility.

Further discussion regarding the options development and site selection process for the New Intercity Fleet Maintenance Facility Project is provided in Chapter 3 of this REF.

Description of the New Intercity Fleet Maintenance Facility

The proposed maintenance facility would include about six kilometres of electrified railway (in total), would be seven tracks wide at its widest point, would cover an area of approximately 500,000 square metres and would be bounded by a perimeter fence.

The key features of the proposed maintenance facility are shown in Figure ES.1 and would comprise:

- Maintenance facility elements:
  - fleet maintenance building
  - four enclosed maintenance roads (tracks for undertaking maintenance on the train sets) and three external standing roads (tracks for holding trains within the maintenance facility) to accommodate the new trains within the site

- auxiliary workshops
- electronic clean room
- material storage, including flammable liquid storage
- wheel lathe
- automatic train wash
- site access roads

→ Miscellaneous buildings:

- administration (including training rooms)
- facilities for presentation and train maintenance staff
- signalling building
- security
- train simulator
- substation building
- power supply (traction power, bulk power, signalling power supply and backup generators)

→ Other infrastructure including:

- new railway track infrastructure on the western side of the existing rail corridor to allow for trains to enter and exit the maintenance facility site from the Main North railway
- a new rail bridge (consisting of two separate structures) over Chittaway Creek and Turpentine Road
- a new access roadway and bridge to the maintenance facility site off Enterprise Drive
- a new flood access road between Orchard Road and the proposed new access roadway
- a series of drainage detention ponds
- staff car park
- relocation of the existing high voltage power transmission line and Combined Services Route.

Subject to determination and approval, early works associated with the Project are expected to commence in early 2017. Full construction of the New Intercity Maintenance Facility is expected to commence in mid-2017. Operation of the maintenance facility, including commissioning is scheduled to commence in 2019. Based on the current construction program and activities, the total construction program for the Project would be approximately 33 months.

Further detail regarding the design and different elements of the New Intercity Fleet Maintenance Facility Project is provided in Chapter 4 of this REF.

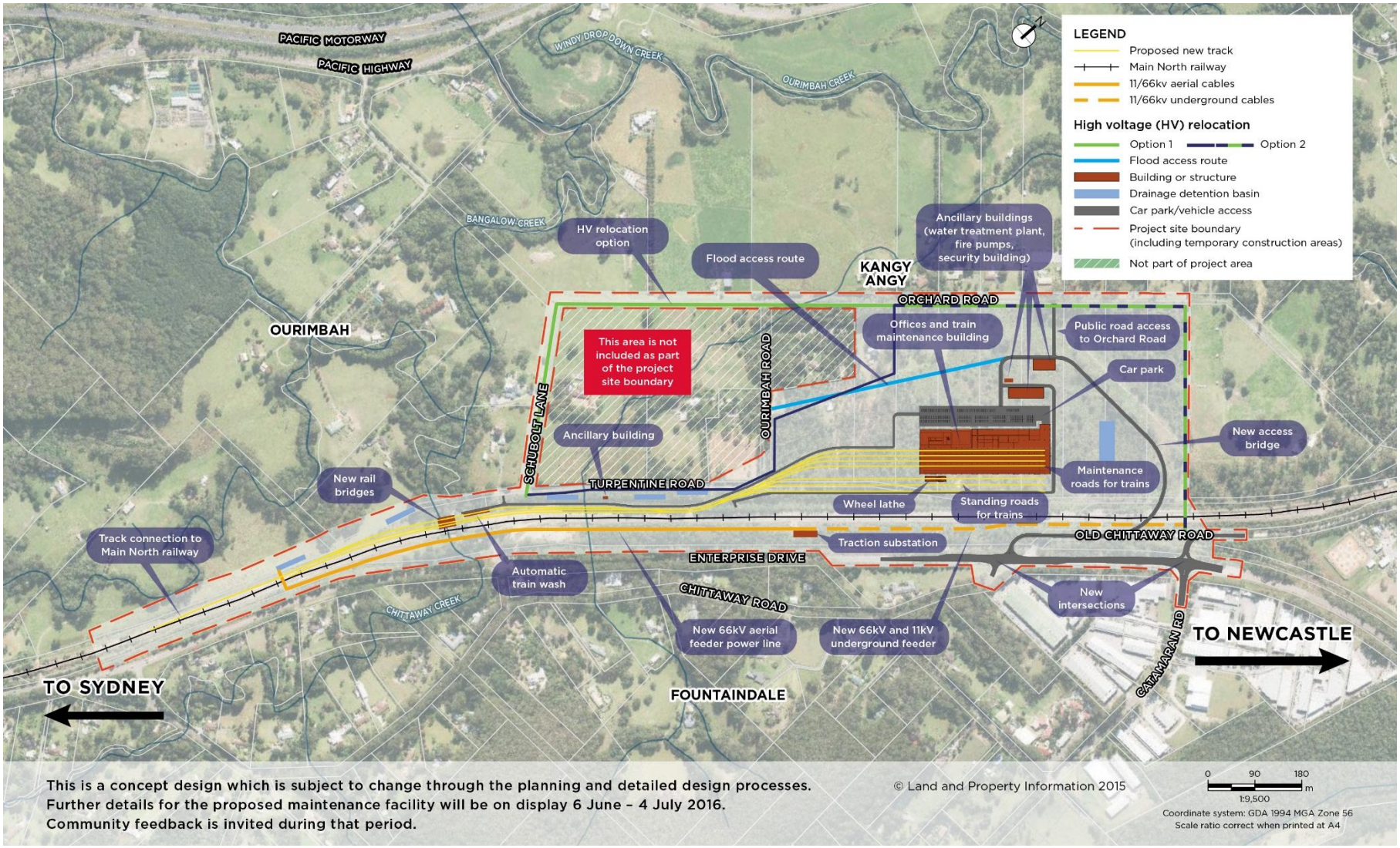


Figure ES.1 Indicative layout of the New Intercity Fleet Maintenance Facility

Statutory considerations

State Environmental Planning Policy (Infrastructure) 2007 (the Infrastructure SEPP) applies to the New Intercity Fleet Maintenance Facility Project. The Infrastructure SEPP aims to facilitate the effective delivery of infrastructure across the State. Clause 79 of Infrastructure SEPP permits development on any land for the purpose of a 'railway or rail infrastructure facilities' to be carried out by or on behalf of a public authority without consent. As the New Intercity Fleet Maintenance Facility comprises a 'rail infrastructure facility' and is to be carried out by a public authority (Transport for NSW), development consent from Central Coast Council (as the local authority) is not required. The New Intercity Fleet Maintenance Facility is therefore subject to Part 5 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

This REF has been prepared by WSP | Parsons Brinckerhoff on behalf of Transport for NSW to satisfy the environmental impact assessment requirements under Part 5 of the EP&A Act. For the purposes of these works, Transport for NSW is considered to be the proponent and a determining authority under Part 5 of the EP&A Act.

Having regard to the provisions of Sections 111 and 112 of the EP&A Act, a desktop analysis of existing vegetation mapping and field validation surveys identified that the vegetation within the Project site was comprised of four vegetation communities. Of these, only one threatened ecological community was identified within the project survey area; Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregion listed as Endangered under the (NSW) *Threatened Species Conservation Act 1995* (TSC Act). Based on the potential impacts, a Species Impact Statement (SIS) was also been prepared to assess the specific ecological impacts associated with the Project. Further detail regarding the SIS is provided in section 7.1 of this REF. For the purpose of the SIS, the NSW Office of Environment and Heritage (OEH) would be a concurrent determining authority for the Project (in addition to Transport for NSW).

Additionally, based on the Preliminary Biodiversity Assessment (EMM, 2015) an EPBC Act referral was made to the Department of Environment (DoE) in March 2016 to consider whether the Project would be considered to be a controlled action. This was due to the potential for significant impacts to the Biconvex Paperbark (*Melaleuca biconvexa*), listed as Vulnerable and protected under the EPBC Act.

Further detail regarding the statutory and other legislative considerations for the development of the New Intercity Fleet Maintenance Facility Project is provided in Chapter 5 of this REF.

Stakeholder communication

During the preparation of this REF, ongoing communication and involvement has been carried out with relevant state and local government stakeholders, including Central Coast Council. Consultation with government stakeholders was done via targeted meetings and direct correspondence. Community consultation and provision of information to the local community has also been carried out during the preparation of this REF through various ways including community newsletters, meetings and letters to property owners, Project website, door-knocking and direct phone calls.

The purpose of this consultation was to inform stakeholders and the community about the New Intercity Fleet Maintenance Facility and the environmental impact assessment process. Transport for NSW proactively engaged with the community to identify environmental and community issues for consideration during the design of the New Intercity Fleet Maintenance Facility Project and the planning approval process.

Consultation during REF public display

This REF is being placed on public display from 6 June 2016 to 4 July 2016, and during this time written submissions are invited from the community. Community consultation during the REF display period will include targeted consultation activities and two community information sessions. More information on stakeholder and community consultation is provided in Chapter 6.

The REF will be available to be viewed at the following locations:

- Central Coast Council, 16 Hely Street Wyong from 8:30 am to 5.00 pm, Monday to Friday
- Tuggerah Library and Council Services, 50 Wyong Road Tuggerah from 9.00 am to 5:30 pm, Monday to Friday and 9.00 am to 3.00 pm Saturday
- Department of Premier and Cabinet, Level 3, 131 Donnison Street, Gosford from 9.00 am to 5.00 pm, Monday to Friday
- Transport for NSW Level 5, Tower A, Zenith Centre 821 Pacific Highway, Chatswood from 8.30 am to 5.00 pm, Monday to Friday.
- The two community information sessions including:
  - Central Coast Steiner School, 45 Catamaran Road Fountaindale: Saturday 18 June 2016 from 10.00 am to 1.00 pm
  - Central Coast Steiner School, 45 Catamaran Road Fountaindale: Thursday 23 June 2016 from 4.00 pm to 7.00 pm.

Written submissions on the REF are encouraged throughout the public display period. All submissions should be emailed to Projects@transport.nsw.gov.au or sent to:

> ***Reference**: New Intercity Fleet Maintenance Facility Project*
> *Principal Manager Environmental Impact Assessment*
> *Transport for New South Wales*
> *Locked Bag 6501*
> *St Leonards NSW 2065*

At the close of the display period, Transport for NSW will consider the submissions received regarding the Project. A Submissions Report will be prepared to address and respond to any issues raised. The report, along with the REF and any other relevant information, will be used by Transport for NSW to assess and determine whether to approve the New Intercity Fleet Maintenance Project.

Should the New Intercity Fleet Maintenance Facility Project be determined to be approved, the local community would be notified of the determination via newspaper advertisements and newsletters. Correspondence would also be sent to those who make a submission. This information would include contact details for further information and an indication of the anticipated timing of construction work. Further detail regarding the stakeholder and community consultation which has been undertaken and which is proposed is provided in Chapter 6 of this REF.

Environmental impact assessment

Consideration of the potential impacts has been undertaken having regard to the factors provided in Clause 228 of the (NSW) Environmental Planning and Assessment Regulation 2000 (EP&A Regulation) and the matters of national environmental significance under the EPBC Act. The New Intercity Fleet Maintenance Facility Project is expected to have both positive and negative environmental and social impacts. A significant impact on a threatened species listed as Vulnerable under both the TSC Act and the EPBC Act (*Melaleuca biconvexa*) and one EEC (Swamp Mahogany – Cabbage Palm swamp forest) has been identified. As such, a SIS has been prepared as part of the assessment of the Project. With the implementation of suitable management and mitigation measures, the remaining impacts associated with the Project are not anticipated to be substantial, and therefore an EIS is not considered to be required for the Project.

Table ES.1 provides a summary of the key environmental and social issues identified for New Intercity Fleet Maintenance Project: biodiversity; noise and vibration; landscape and visual; traffic and transport; hydrology and flooding, groundwater; Aboriginal heritage; and socio-economic. It also identifies the key management commitments that would be implemented to minimise these impacts.

Table ES.1 Key issues and mitigation measures proposed

Key issues/impacts/benefits	Key mitigation measures
Biodiversity	
Potential impacts including: → Clearing of approximately 37.2 hectares of native vegetation including Endangered Ecological Community (EEC) and habitat for threatened species. → Direct removal of approximately 3,984 *Melaleuca biconvexa plants* (Vulnerable species under the (Commonwealth) *Environment Protection and Biodiversity Conservation 1999* and (NSW) *Threatened Species Conservation 1995.* → Potential impacts on approximately 33.3 hectares of groundwater dependent ecosystems due to changes in hydrology. → Potential increased dispersal of weed species during construction and operation.	Key mitigation measures to mitigate potential impacts would include (but not be limited to): → Opportunities to further reduce clearing of native vegetation would be investigated during detailed design. → Preparation of a vegetation management plan to address potential biodiversity impacts. The following general measures would be incorporated into the vegetation management plan to ensure ecological impacts are minimised (in particular during construction): ▪ Implementation of pre-clearing and clearing protocols by an experienced fauna ecologist. ▪ Prior to construction, site personnel should be adequately informed of environmental management procedures including, but not limited to, issues related to flora and fauna management, weed control, erosion and sediment control. ▪ Implementation of flora and fauna control measures. ▪ Clear demarcation on-site of the limits to clearing prior to construction to avoid unnecessary vegetation and habitat removal (e.g. through the installation of fencing around the Project site). ▪ Weed species within the study area would be managed in order to control them from further spread. In addition, a Species Impact Statement (SIS) has also been prepared to assess the specific ecological impacts associated with the Project. A more detailed set of mitigation measures including biodiversity offsets, revegetation and rehabilitation has been developed for specific species identified within the subject site in the SIS for the Project. The SIS will be placed on public exhibition under a separate process to the REF.
Noise and vibration	
Potential impacts including: → Predicted noise levels indicate a series of exceedances at the closest receivers on Ourimbah Road, Turpentine Road, Orchard Road, Enterprise Drive and Old Chittaway Road for some scenarios during the evening and night periods. → The trains standing, and arrival and departures movements, in addition to train washing were identified as the scenarios which would cause the highest exceedances of the relevant criteria.	Key mitigation measures to mitigate potential impacts would include (but not be limited to): → Further consideration of potential noise and vibration mitigation measures during detailed design with the aim of reducing potential noise and vibration impacts associated with the Project, including the adoption of alternative operational methods. → Preparation of a construction noise and vibration management plan prior to commencement of work which would include details of approved work and hours, noise generating activities and mitigation measures, community consultation protocols. → Standard construction mitigation measures contained within the Transport for NSW *Construction Noise Strategy* (CNS) would be included in the construction noise and vibration management plan.

Key issues/impacts/benefits	Key mitigation measures
→ Predicted noise levels also indicated that the testing of the country horn would have the highest noise impact and the majority of receivers considered in the assessment were predicted to experience noise level in excess of the sleep disturbance screening criteria. → Noise impacts were predicted for a number of receivers during construction works including both standard and out of hours periods. → The assessment of potential impacts from construction vibration indicated that there is not a substantial risk of building damage from the works as they generally take place at least 75 metres from sensitive receivers. → The predicted road noise levels indicated that the project would not cause a significant increase in noise level on Enterprise Drive during either the construction or operational phases of the project.	→ Where night works are proposed to be undertaken: ▪ Avoiding conducting noise intensive night works for more than two consecutive nights. ▪ Scheduling noise intensive activities to before 10.00 pm. ▪ Inform surrounding residents by mail of planned works prior to the works commencing. → An operational noise and vibration management plan would be developed and implemented for the site. → The maintenance shed doors would remain closed when activities are occurring inside the sheds, where reasonable.
Landscape and visual	
Potential impacts including: → Temporary visual impacts associated with construction elements such as barricades, machinery, earthworks and stockpiles. → Moderate visual impacts expected rural for properties close to the Project site who may have filtered views of the most prominent elements of the Project. → Moderate/high impact predicted on character of the woodland area landscape due to vegetation clearing. → Moderate/high impact predicted on rural residential landscape due to presence of large industrial element and clearance of vegetation contributing to change in character of the landscape.	Key mitigation measures to mitigate potential impacts would include (but not be limited to): → Restriction of vegetation clearing to those areas where it is necessary. Opportunities to minimise clearing would be identified as part of the ongoing development of the Project design. → Ensuring a vegetation buffer of existing planting is left between within or outside the Project site boundary to provide visual screening of the facility, where possible. → Rehabilitating vegetated areas where ground is disturbed as soon as practical. → Planting native trees and shrubs at varied heights to screen built form and reduce the scale of the infrastructure. → Reinforcing the local semi-rural landscape character through the use of appropriate native vegetation, including that from the identified endangered vegetation communities. → Considering during detailed design the potential for additional tree planting outside the identified Project site to assist in visually screening the facility.

Key issues/impacts/benefits	Key mitigation measures
Traffic and transport	
Potential impacts including: → Increase in light and heavy vehicle use on local roads including Enterprise Road during construction and operation, although much lower vehicle movements would be expected during operation. → Reduced performance at intersection of Enterprise Drive, Old Chittaway Road and new access road during peak periods during construction and operation if intersection is not upgraded (subject to detailed design).	Key mitigation measures to mitigate potential impacts would include (but not be limited to): → Ongoing consideration of the design for the new intersection of Enterprise Drive and the proposed access road to the new intercity maintenance facility as part of the detailed design in order to reduce potential performance impacts. → A construction traffic management plan would be prepared as part of the pre-construction planning. The plan would be developed to address construction traffic and transport management and would also be used to develop site-specific traffic management measures once the construction methods and haulage routes are finalised. → Heavy vehicles would be restricted to the routes specified. → Co-ordination of Project staging, vehicle movement and scheduling, equipment and resourcing would be undertaken throughout the construction period. → Construction communication would be provided to inform the community and local residents of vehicle movements and anticipated effects on the local road network relating to the site works, where required.
Hydrology and flooding	
Potential impacts including: → Improved flood free access for local residents through the provision of the new access road during flooding emergencies. → Flooding and drainage impacts associated with the 1 in 100 flood event level. → Water quality impacts from spills or sediment runoff from construction and operation activities. → Erosion and sedimentation impacts including potential changes to stream flow, impacts to fauna and water contamination due to land clearing during construction.	Key mitigation measures to mitigate potential impacts would include (but not be limited to): → A detailed Flood Impact Assessment of the site would be undertaken to provide greater certainty regarding the impact the Project on the regional flood and local drainage processes as part of the detailed design process. → All Project elements would be required to be designed above the 1 in 100 flood event (including consideration of climate change impacts). → A Hydrologic and Hydraulic assessment would be undertaken to confirm that additional structures within the Project area would not have substantial adverse effects upon existing drainage. → The existing track drainage system would remain operational throughout the construction of the main line siding and turnouts within the facility. → Water quality impacts would generally be managed in accordance with an Erosion and Sedimentation Control Plan for the Project. → Scour protection would be provided at both ends of culvert extensions to reduce erosion impacts.

Key issues/impacts/benefits	Key mitigation measures
Aboriginal heritage	
Potential impacts including: → Excavations which may uncover or harm previously undiscovered Aboriginal objects.	Key mitigation measures to mitigate potential impacts would include (but not be limited to): → An Aboriginal Cultural Heritage Assessment Report would be completed for the portion of the site which has been identified as having the potential for moderate or high potential archaeological significance, and would include Aboriginal community consultation and archaeological test excavation. → If the results of an Aboriginal cultural heritage assessment report confirm that Aboriginal objects are present and would be harmed by the proposed development, it would be necessary to apply for an Aboriginal Heritage Impact Permit prior to commencement of work.
Socio-economic	
Potential impacts including: → Potential noise impacts to surrounding sensitive receivers during both construction and operation. → Benefits to the regional economy through job creation during construction operational phases of the Project. → Improved flood free access for local residents through the provision of the new access road during times of flood.	Key mitigation measures to mitigate potential impacts would include (but not be limited to): → Undertaking consultation with sensitive receivers and adjacent residents about their concerns and suggestions for reducing the Project impact. → Development of a comprehensive strategy for consultation with community regarding timing and nature of all construction activities, particularly those that would be dusty, noisy or involve night work. → Develop an engagement plan for recording and responding to complaints from the community. → Where possible, Transport for NSW would ensure that employment opportunities for the local and regional population are maximised.

The following environmental issues were also considered during the REF including: non-Aboriginal heritage; land use and property; air quality; climate change; bushfire, waste and resources management; hazards and risks; and cumulative impacts. Impacts associated with these issues are considered relatively minor and able to be managed through the implementation of standard mitigation measures.

Further discussion of the potential environmental impacts and proposed management and mitigation measures for each of the environmental issues identified for the New Intercity Fleet Maintenance Facility Project is provided in Chapters 7 and 8 of this REF.

Conclusion

This REF has assessed the construction and operation of the proposed New Intercity Fleet Maintenance Facility at Kangy Angy. The New Intercity Fleet Maintenance Facility Project is expected to have both positive and negative environmental and social impacts. The New Intercity Fleet Maintenance Facility would provide a series of local and broader benefits including:

- deliver a maintenance facility which is dedicated to the maintenance of the New Intercity Fleet which realises the operational and maintenance benefits associated with replacing the existing older intercity fleet with a newer, modern fleet which would provide increased capacity for intercity customers
- delivering additional maintenance capacity in order to handle an increase in the intercity fleet size and a planned consolidation of intercity fleet maintenance activities
- provision of improved flood free access for local residents through the provision of the new access road during flooding (and other) emergencies
- provision of benefits to the regional economy through job creation during construction and operational phases of the Project.

The key potential impacts associated with the Project have been identified as comprising:

- biodiversity – including the loss of existing vegetation, some of which has been identified as threatened species and an EEC
- noise and vibration – including impacts during both construction and operation of the Project
- landscape and visual character impacts – including changes to the rural-residential nature of the existing environment
- traffic and transport – which would primarily occur during the construction of the Project
- hydrology, flooding and groundwater – including the potential to be impacted by the 1:100 year flood event, in addition to construction impacts associated with high groundwater levels
- Aboriginal heritage – including the potential to identify currently undiscovered Aboriginal artefacts within the site.

Chapter 7 of this REF provides a detailed assessment of the likely effect of the Project including the key impacts listed above. With the implementation of suitable management and mitigation measures, the remaining impacts associated with the Project are not anticipated to be significant, and therefore an EIS is not considered to be required for the Project.

1 INTRODUCTION

This chapter provides an overview of the New Intercity Fleet Maintenance Facility at a site in Kangy Angy, including its location and its key features. This chapter also outlines the purpose and structure of the Review of Environmental Factors (REF).

1.1 Background

1.1.1 New Intercity Fleet Program

The existing intercity train fleet currently operated by NSW Trains provides services on three main routes consisting of:

- Sydney to Central Coast/Newcastle (Main North Line)
- Sydney to Blue Mountains (Western Line)
- Sydney to Wollongong/Nowra (South Coast Line).

The *NSW Long Term Transport Master Plan* (NSW Government 2012a; 'Transport Master Plan') and its supporting document, *Sydney's Rail Future* (NSW Government 2012b), identifies the need to enhance rail passenger services, in particular for longer distance travel outside of the Sydney suburban network.

In May 2014, the NSW Government announced its intention to invest in the procurement of the New Intercity Fleet, a fleet of trains that will carry Central Coast, Newcastle, Blue Mountains and South Coast customers to and from Sydney. The introduction of the New Intercity Fleet will allow for the replacement of the older electric trains fleets used currently to provide intercity services. It would also facilitate the retirement of the two oldest electric train set types currently in operation.

In developing the New Intercity Fleet Program, the new train fleet would provide for:

- A more consistent and improved level of customer service for intercity passengers
- The retirement of the two oldest trains operating on the intercity network
- A reduction in the costs of intercity operations
- Increasing capacity for intercity passengers.

The New Intercity Fleet would comprise of approximately 520 cars and would come into service progressively, with the first trains expected to be delivered by 2019, with the remainder of the fleet being delivered through to 2024. The new fleet of trains would provide a safe, comfortable, accessible environment for customers during longer journeys.

Current intercity trains are maintained at Flemington Maintenance Centre with periodic major overhauls undertaken at Auburn. Intercity trains are currently stabled at a large number of locations, including Flemington, Eveleigh, Mount Victoria, Lithgow, Gosford, Broadmeadow, Newcastle, Port Kembla and Wollongong.

As part of the procurement of the New Intercity Fleet trains, the development of an enclosed maintenance facility (the 'Project') is proposed to provide a dedicated space for the New Intercity Fleet rolling stock to be maintained. Land adjacent to the Main Northern railway line at Kangy Angy was been identified by Transport for NSW as a preferred site due to its proximity to the railway line and alignment with train operational requirements (refer to Chapter 3 for details).

1.2 New Intercity Fleet Maintenance Facility Project overview

The proposed facility would include about six kilometres of electrified railway (in total), would be seven tracks wide at its widest point, would cover an area of approximately 500,000 square metres and would be bounded by a perimeter fence.

The key features of the proposed maintenance facility would comprise:

- Maintenance facility elements:
  - fleet maintenance building
  - four enclosed maintenance roads and three external standing roads to accommodate the new trains within the site
  - auxiliary workshops
  - electronic clean room
  - material storage, including flammable liquid storage
  - wheel lathe
  - automatic train wash
  - site access roads
- Miscellaneous buildings:
  - administration (including training rooms)
  - facilities for presentation and train maintenance staff
  - signalling building
  - security building
  - training simulator
  - substation building
  - power supply (traction power, bulk power, signalling power supply and backup generators)
- Other infrastructure including:
  - new railway track infrastructure on the western side of the existing rail corridor to allow for trains to enter and exit the maintenance facility site from the Main North railway
  - a new rail bridge (consisting of two separate structures) over Chittaway Creek and Turpentine Road
  - a new access roadway and bridge to the maintenance facility site off Enterprise Drive
  - a new flood access road between Orchard Road and the proposed new access roadway
  - a series of drainage detention ponds
  - staff car park
  - relocation of the existing high voltage power transmission line and Combined Services Route (CSR).

The location and indicative layout of the proposed New Intercity Fleet Maintenance Facility is shown in Figure 1.1.

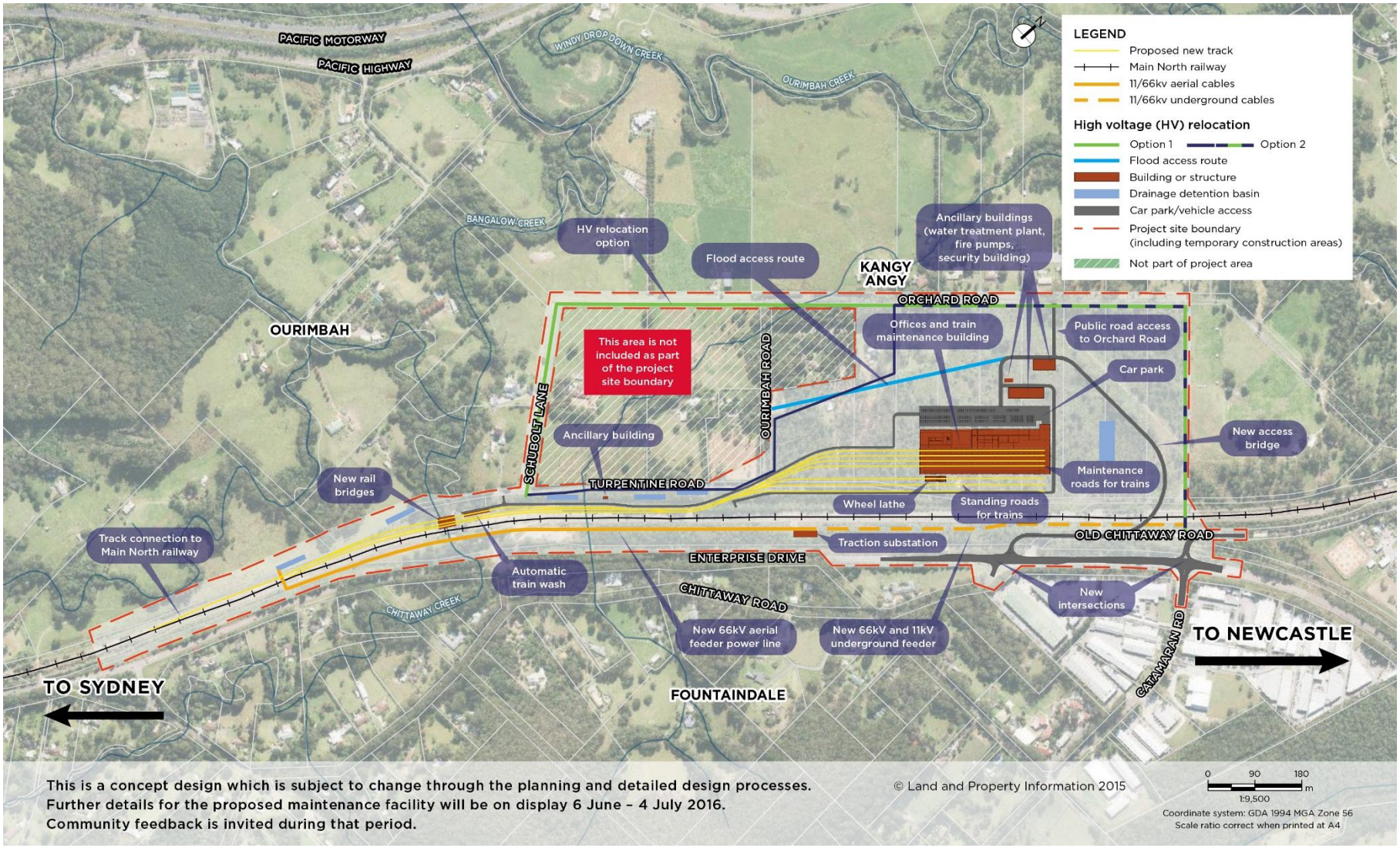


Figure 1.1 Indicative layout of the New Intercity Fleet Maintenance Facility

Subject to determination and approval, early works associated with the Project (including utilities diversions, the new access road, general roadworks, and other enabling works) are anticipated to commence in early 2017. Full construction of the new intercity maintenance facility is expected to commence in mid-2017. Operation of the maintenance facility is scheduled to commence in end of 2019.

A more detailed description of the Project is provided in Chapter 4.

1.3 Location

The proposed New Intercity Fleet Maintenance Facility is a purpose built maintenance facility located in Kangy Angy within the Central Coast Local Government Area (LGA) north of Sydney. It should be noted that prior to the NSW council amalgamations which commenced on 12 May 2016, the Project site was located within the Wyong Shire LGA portion of the current Central Coast LGA. Any reference to the Wyong Shire LGA or Wyong Shire Council within this document is also considered to be a reference to the current Central Coast LGA or Central Coast Council.

The site is located at on the down-track side (the line on which trains travel away from Sydney towards Newcastle) of the Main North Line, between Tuggerah and Ourimbah railway stations. The site is generally bordered by the Main North Rail Line rail corridor to the south, and Orchard Road to the north-west. Residential receivers on rural properties generally surround the site to the north, south and west, with industrial precincts to the south east and north-east (on the opposite side of the rail corridor to the site).

The M1 Pacific Motorway is located approximately 850 metres to the north-west, and Tuggerah Lake is approximately 3.5 kilometres to the east of the site. Chittaway Creek crosses the Project at the southern end and Ourimbah Creek is to the north of the site.

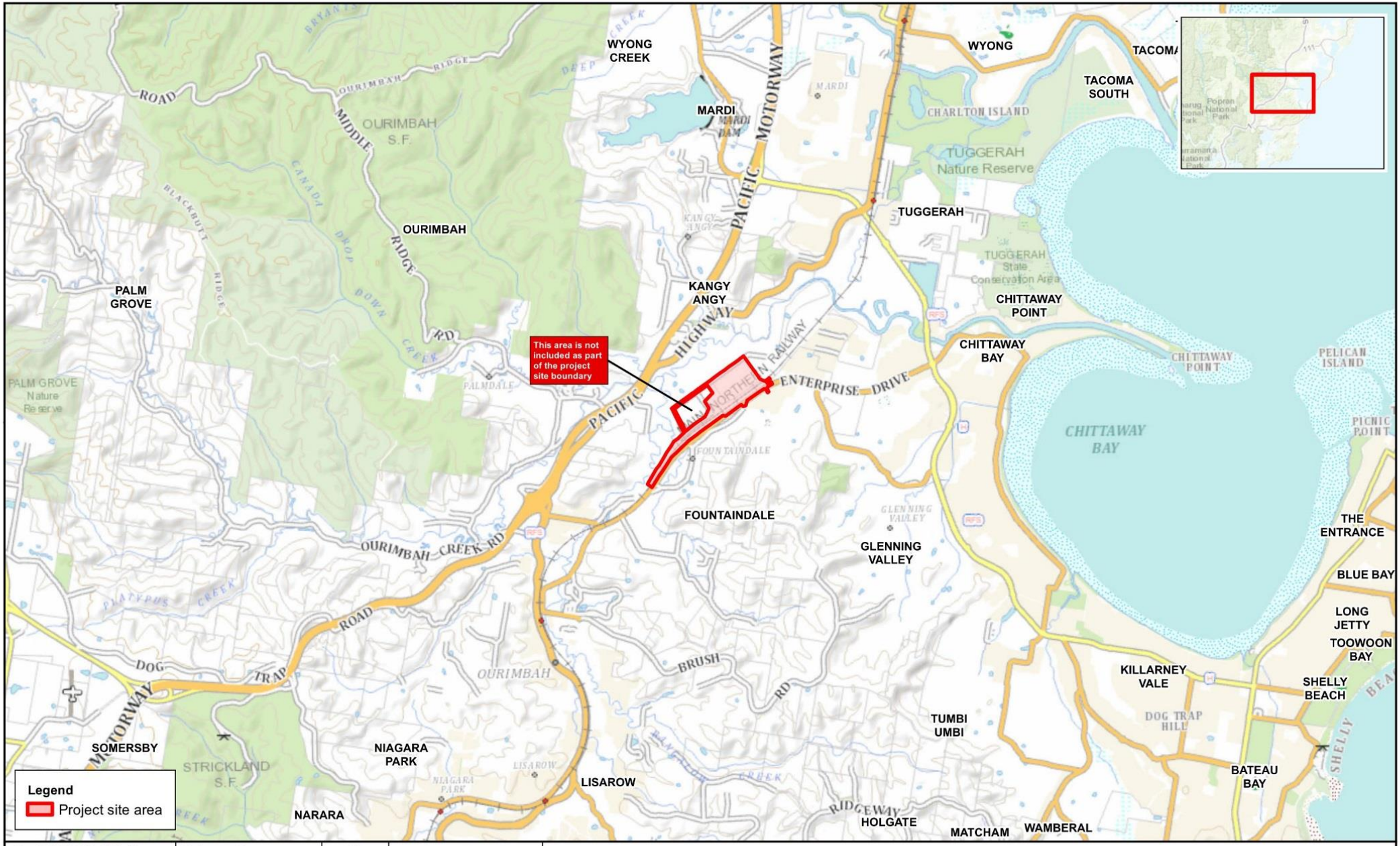
The existing nature of the maintenance facility site is typically densely planted with large areas of vegetation and contains one existing residential dwelling and associated structures (refer to section 7.1 for details). An existing 132 kilovolts Ausgrid transmission line and easement also traverse the western (adjacent to Orchard Road) and northern boundaries of the site.

Figure 1.2 and Figure 1.3 shows the location of the maintenance facility within a regional and local context respectively.

1.3.1 Maintenance Facility Project site

For the purposes of this assessment, the following definitions are used:

- The ‘Project’ refers to all physical works required as part of the New Intercity Fleet Maintenance Facility including required rail infrastructure, building, access and utilities works, and the operation of the maintenance facility
- The ‘maintenance facility site’ refers to the area that would be directly impacted by the Project. The location of the maintenance facility site is shown on Figure 1.3 and would encompass all of the works required for the New Intercity Fleet Maintenance Facility including required track and electrical work
- The ‘study area’ encompasses the maintenance facility site and the area that may be indirectly impacted by the Project. This area can vary in size depending on the environmental issue being discussed (e.g. biodiversity, heritage etc.) and the specific area for each issue is described in the relevant section of Chapter 7.



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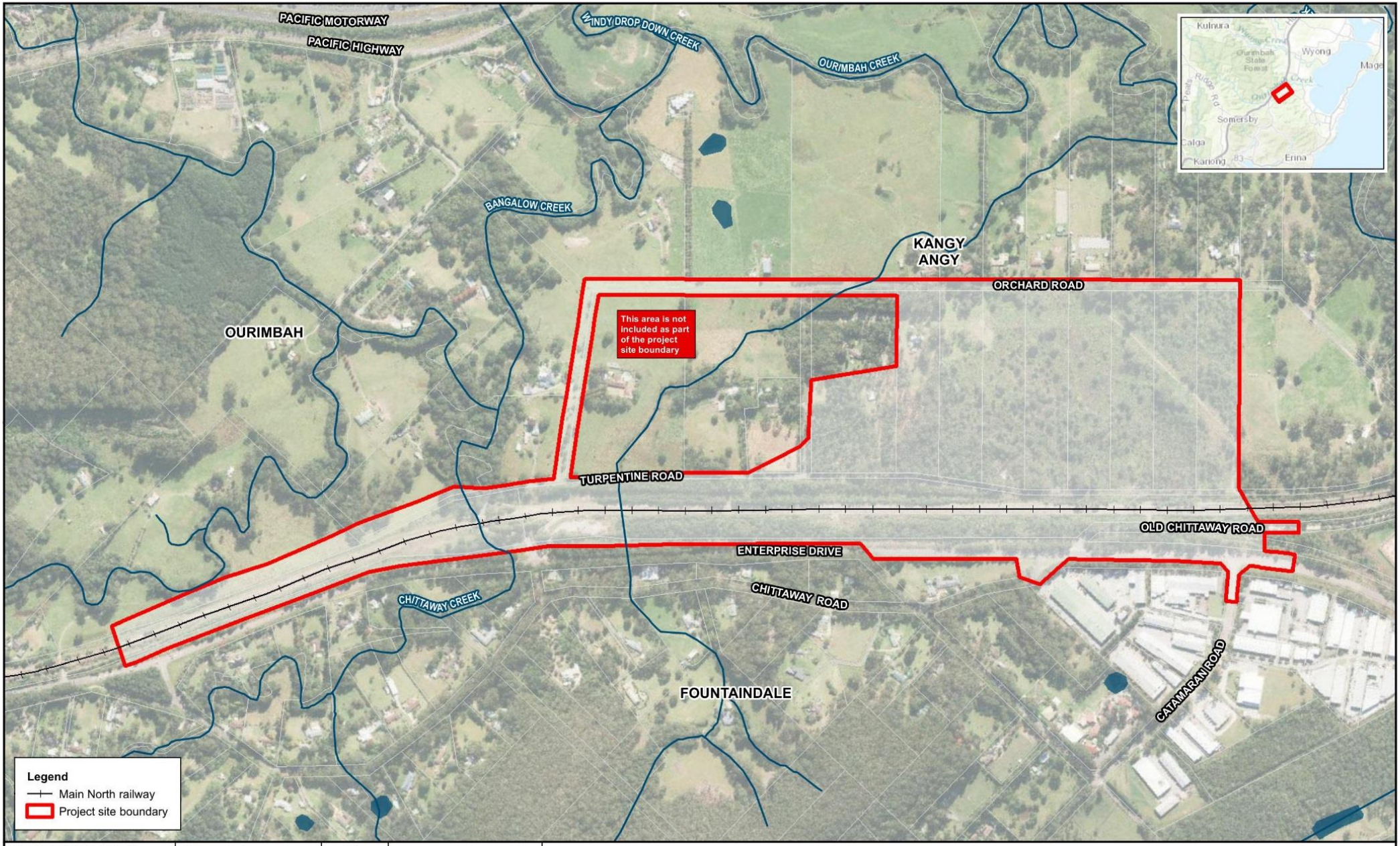
Note: Design is indicative only.
Subject to detailed design

New Intercity Fleet Maintenance Facility Project
Figure 1.2
Regional context



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Note: Design is indicative only.
Subject to detailed design

New Intercity Fleet Maintenance Facility Project
Figure 1.3
Site context

1.4 Project objectives

The objectives of the Project are to deliver a new maintenance facility that would:

- Cater for future intercity fleet capacity requirements
- Provide more cost effective maintenance operations than current NSW intercity facilities
- Supports commissioning of trains
- Support efficient operation of trains
- Support train condition monitoring and maintenance requirements.

1.5 Proponent and delivery

For the purposes of these works, Transport for NSW is the proponent and a determining authority under Part 5 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act).

The construction of the New Intercity Fleet Maintenance Facility would be undertaken by a contractor(s) engaged by Transport for NSW. At the award of the works package, the maintenance facility site would be occupied by the contractor, who will carry out all activities required for its work including site clearing, excavation, relocation of affected utility services, construction and fit-out of the new train maintenance facility, including associated work such as, track construction, high voltage cable relocations, signalling equipment relocations, testing and commissioning and all remaining work such as landscaping and site restoration. At the completion of the works package, the New Intercity Fleet Maintenance Facility would be handed over to the New Intercity Fleet train supplier/maintainer for operation.

1.6 Purpose of this Review of Environmental Factors

This REF has been prepared by WSP | Parsons Brinckerhoff on behalf of Transport for NSW. The purpose of the REF is to describe the proposed New Intercity Fleet Maintenance Facility and associated work, document the likely impacts of the Project on the environment, and to detail mitigation measures that would be implemented as part of the Project.

The description of the proposed works and associated environmental impacts has been undertaken in accordance with the requirements of Clause 228 of the *Environmental Planning and Assessment Regulation 2000* (EP&A Regulation) (refer to Chapter 9).

1.7 Structure and content of the Review of Environmental Factors

The structure and content of the REF is outlined in Table 1.1.

Table 1.1 Structure and content of the Review of Environmental Factors

Chapter	Description
Chapter 1 – *Introduction*	Outlines the background of the Project and need for the Project.
Chapter 2 – *Justification and need*	Outlines the overall need and justification for the Project.
Chapter 3 – *Options development and selection*	Provides an overview of the options that were considered during the selection of the site for the proposed intercity maintenance facility and the methodology that was used to select the site location. This chapter also identifies options considered for the layout of the maintenance facility on the preferred site.
Chapter 4 – *Description of the Project*	Provides a detailed description of the Project, including the elements of the Project, and construction, operation and maintenance of the proposed intercity maintenance facility.

Chapter	Description
Chapter 5 – *Statutory and planning considerations*	Outlines the relevant environmental planning instruments and policies and provides an assessment of their relevance to the Project.
Chapter 6 – *Stakeholder and community consultation*	Outlines how the community and stakeholders have been, and will continue to be, involved in the Project's development, assessment and construction phases. This chapter also summaries the issues raised by stakeholders during the preparation of the REF.
Chapter 7 – *Environmental impact assessment*	Provides an assessment of the potential impacts of the Project including assessment of issues such as traffic and transport, noise and vibration, Aboriginal heritage, non-Aboriginal heritage, air quality, biodiversity, soils, hydrology and water quality, sustainability, visual, resource use, utilities and waste management and cumulative impacts.
Chapter 8 – *Environmental management*	Outlines the proposed environmental management systems to be implemented and provides the management and mitigation measures during the construction, operation and maintenance of the proposed substation, to manage the impacts identified in the REF.
Chapter 9 – *Justification and conclusion*	Provides the justification for the Project and an outline of the key conclusions of this report.
Chapter 10 – *References*	Provides a list of key references used in preparing the REF.

The REF is supported by 10 specialist studies (refer to Volume 2 of this document), which provide detailed assessment of specific environmental issues associated with the Project. These specialist studies form appendices to the main REF and have been used to inform the REF as follows:

- Appendix A – Biodiversity Assessment Report (WSP | Parsons Brinckerhoff, 2016a)
- Appendix B – Noise and Vibration Impact Assessment (WSP | Parsons Brinckerhoff, 2016b)
- Appendix C – Landscape Character and Visual Impact Assessment (Clouston Associates, 2016)
- Appendix D – Non-Aboriginal Heritage Impact Assessment (Artefact Heritage, 2016a)
- Appendix E – Aboriginal Archaeological Survey Report (Artefact Heritage, 2016b)
- Appendix F – Traffic and Transport Impact Assessment (WSP | Parsons Brinckerhoff, 2016c)
- Appendix G – Social Impact Assessment (WSP | Parsons Brinckerhoff, 2016d)
- Appendix H – Surface Water Impact Assessment (WSP | Parsons Brinckerhoff, 2016e)
- Appendix I – Groundwater Assessment (WSP | Parsons Brinckerhoff, 2016f)
- Appendix J – Air Quality Construction Impact Assessment (Pacific Environment, 2016).

2 JUSTIFICATION AND NEED

This section provides a summary of the current train maintenance activities for the existing Sydney train fleet, in particular the intercity fleet, and outlines the need for a dedicated facility for the maintenance of the New Intercity Fleet trains.

2.1 Current fleet maintenance arrangements

2.1.1 Existing maintenance facilities

The whole of the existing electric train fleet, including the existing intercity fleet, is maintained at a number of locations across Sydney including:

- Auburn
- Flemington
- Hornsby
- Mortdale
- Eveleigh Presentation Centre.

The bulk of the current train maintenance operations is undertaken by the Sydney Trains Fleet Management Division with the exception of some fleet operations including maintenance of A-set trains (the Waratah fleet) and M-set trains (the Millennium fleet), whose maintenance is undertaken by external contracts.

The existing intercity train fleet is currently maintained at Flemington Maintenance Centre with periodic major overhauls undertaken at Auburn. These intercity trains are currently stabled at Flemington, Mount Victoria, Gosford and Wollongong.

2.1.2 Maintenance cycles

The existing Sydney train fleet is maintained routinely to ensure that it runs reliably and safely on the network. Trains are scheduled to enter maintenance periodically for routine maintenance, which involves a range of planned inspection activities aimed at preventing and correcting faults. To replace major parts and components, major periodic maintenance is generally scheduled at 6-year or 12-year intervals.

The existing maintenance strategy uses the following definitions:

- Level 1 maintenance – minor repairs and daily checks, normally undertaken at stabling locations
- Level 2 maintenance – routine 30 day and above general inspections, normally carried out at maintenance centres based on a time based predictive maintenance regime
- Level 3 maintenance – Component change out replacement and refurbishment of major components at the Auburn facility, typically undertaken every six years (or 12 years for heavy component replacements).

The current frequency at which trains are scheduled to enter planned maintenance varies by train but in general, older trains are brought in more frequently for service. For instance, the current suburban network fleet and current intercity fleet which were first introduced in the 1970s, are generally inspected every seven days. In comparison, the newer fleets such as the Tangara and OSCar fleets are inspected at increased intervals, typically between ever 30 and 90 days, depending on the level of maintenance required.

The procurement of the New Intercity Fleet trains would provide an opportunity to replace the current aging intercity fleet and reduce the maintenance burden associated with operating ageing trains whose maintenance requirements are higher due to their age and design.

2.2 Need for the New Intercity Fleet Maintenance Facility

The need for investment in train maintenance facilities across NSW is ultimately linked to the current fleet size and its composition. The primary need for the proposed maintenance facility is a direct result of the procurement of the New Intercity Fleet trains themselves and the requirement to maintain these trains. However, an opportunity also exists to improve current train operations across the Sydney metropolitan network through the development of the New Intercity Fleet Maintenance Facility at Kangy Angy.

Figure 2.1 illustrates the factors driving the need for development of the New Intercity Fleet Maintenance Facility at Kangy Angy.

To meet the needs identified in Figure 2.1, the New Intercity Fleet Maintenance Facility Project aims to:

- Deliver additional maintenance capacity in order to handle an increase in the intercity fleet size and a planned consolidation of intercity fleet maintenance activities
- Deliver a maintenance facility dedicated to the maintenance of the New Intercity Fleet to realise the operating and maintenance benefits associated with replacing an older fleet with a newer, modern fleet.
- Provide Sydney Trains with the ability to use other maintenance facilities more efficiently.

Each of the drivers identified that contribute to the need for the dedicated New Intercity Fleet Maintenance Facility is described in more detail in the following sub-sections.

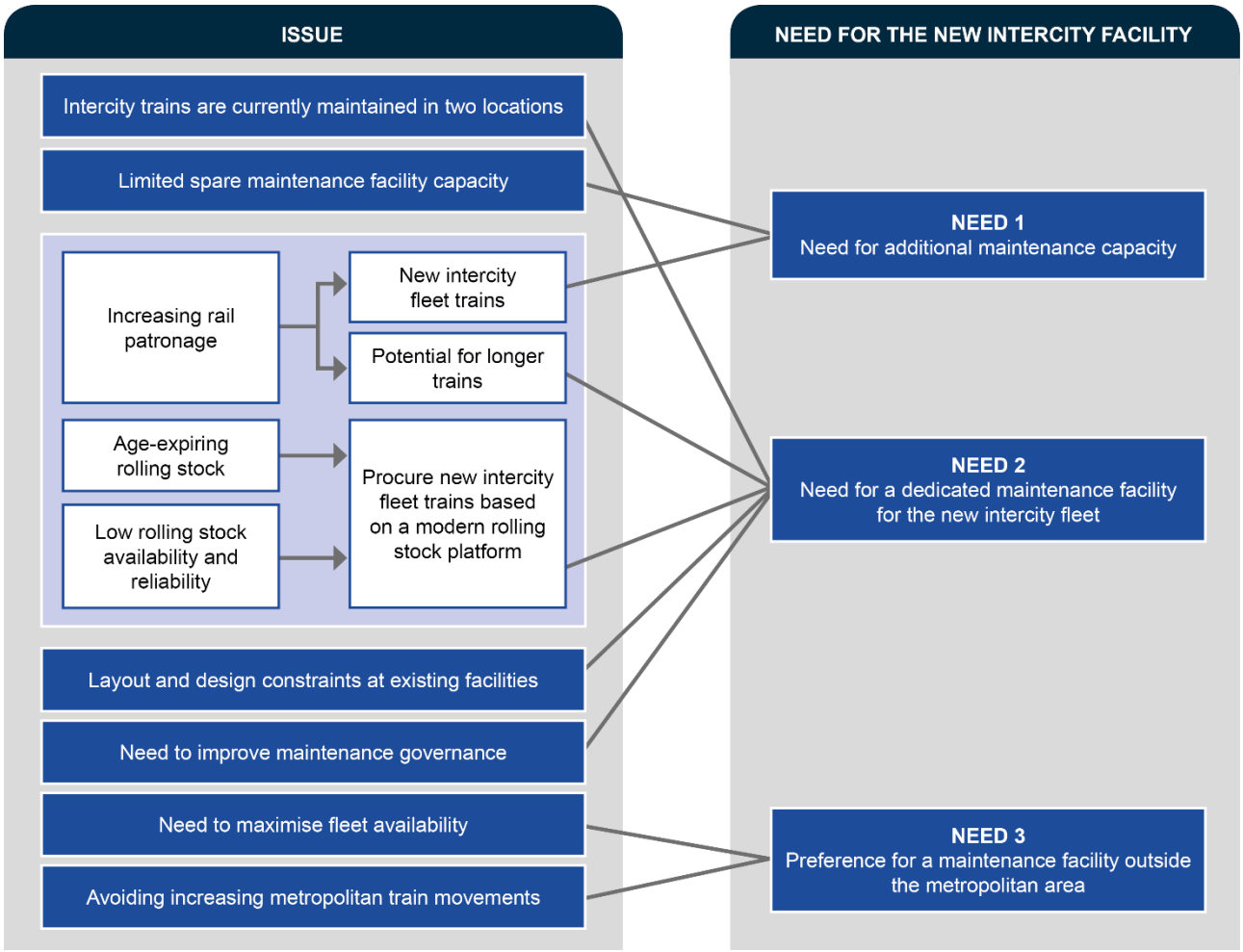


Figure 2.1 Identified needs for the New Intercity Fleet Maintenance Facility

2.2.1 Need 1: Need for additional maintenance capacity

The first need for the New Intercity Fleet Maintenance Facility is driven by an overarching need for additional maintenance capacity to cater for an increase in the intercity fleet size and to mitigate a lack of spare capacity at the existing maintenance facilities to house the entire fleet in one location.

Growth in the intercity fleet

To better manage increasing crowding levels on current intercity services, the Transport for NSW is considering increases to the capacity of the intercity fleet. The scope of any increase in fleet capacity is aimed at meeting the most immediate requirement to maintain approximately 520 cars. The proposed increase in the size of the intercity fleet following the introduction of the trains would require a dedicated facility capable of handling the consolidation of intercity train maintenance into one location.

Limited spare capacity at existing maintenance facilities

As a result of the projected increase in the intercity fleet size, a lack of capacity available to handle the maintenance of all New Intercity Fleet trains at any given existing facility would also be created.

A review of capacity at the existing maintenance facilities identified in section 2.1 above is provided in Table 2.1 below. This table highlights that none of the existing maintenance facilities have sufficient spare capacity or capability (including conducting of the all major overhauls and wheel turning i.e. Level 3 maintenance) to accommodate the required maintenance of the New Intercity Fleet trains.

Table 2.1 Electric fleet maintenance centre capacity

Location	Maintenance levels	No. cars maintained	Notional capacity	Spare capacity
Auburn	Level 1, 2 & 3	626	1000	**376**
Eveleigh	Level 1 & 2	360	360	**Full**
	Level 3	140	140	**Full**
Flemington	Level 1 & 2	558	550	**Full**
Hornsby	Level 1 & 2	236	500	**264**
Mortdale	Level 1 & 2	260	400	**140**

Note: Data refers to number of cars (carriages).

The existing fleet centre capacity identifies that there is some potential for existing facilities to be utilised to cater for the New Intercity Fleet trains. However, accommodating the New Intercity Fleet within the existing capacity would require extensive rearrangement of, and disruption to, current maintenance and stabling activities.

While it is acknowledged that the introduction of the New Intercity Fleet will allow for the retirement of the two oldest electric train set types currently in operation resulting in some increased spare capacity at the existing facilities, the layout and design constraints associated with these facilities (as described in section 2.2.2 below) would still not allow for the maintenance of the New Intercity Fleet to occur at the existing maintenance facilities where the increased capacity is generated.

2.2.2 Need 2: The need for a dedicated New Intercity Fleet Maintenance Facility

The second need for development of the New Intercity Fleet Maintenance Facility relates to the need for a dedicated maintenance capacity of the New Intercity Fleet, which is driven by:

- A preference to consolidate maintenance capability for a given fleet in one location
- Constraints on the design and layout of existing maintenance facilities.

Consolidation of fleet maintenance at dedicated locations

Recent experience has led to the preference for consolidating fleet types wherever possible in a single location. Previous initiatives to consolidate maintenance activities has been observed to deliver benefits. The consolidation of fleet maintenance, such as the provision of a dedicated maintenance facility for the New Intercity Fleet, would allow materials and equipment to be centralised and staff to develop a specialisation, focused on this single fleet type.

The consolidation of fleet maintenance would also aid in the dedication of specific train fleets (such as the New Intercity Fleet) to specific routes on the network as far as practical, and would assist in reducing the empty running of trains to the maintenance facility, as much as practically possible.

Layout and design constraints at existing facilities

Should capacity be able to be made available at existing maintenance facilities (refer to section 2.2.1 above), they are not currently designed in a manner which would enable the efficient and effective maintenance of the New Intercity Fleet. Typical features that would limit the efficiency of current facilities include:

- The design and current technologies of the existing maintenance facilities would limit the ability to undertake multiple tasks whilst a train is located on a given maintenance track (for instance, certain maintenance roads at the Flemington Maintenance Facility are used for brake inspections but cannot be used for brake repairs)
- Tracks and sidings within existing maintenance facilities may not be sufficiently long to cater for the New Intercity Fleet trains which may have an approximate length of 205 metres, exceeding the length of all current suburban trains and the current V-set intercity trains
- Complex track layouts that would complicate shunting arrangements (moving trains from one track to another) around existing maintenance yards, leading to potentially increased safety risks and overall inefficiency of maintenance operations
- Proximity to busy rail lines and junctions, which can serve to impede access to and from current maintenance facilities
- A need to upgrade to current standards and guidelines.

These limitations can increase the time required for trains to be maintained, decrease train availability and limit the capacity of the maintenance facility which impacts the overall operational performance of the network.

The development of the New Intercity Fleet Maintenance Facility at Kangy Angy would allow for the design and construction of a new, purpose built maintenance facility. This facility would be designed to accommodate all of the maintenance requirements for the new intercity train fleet and would allow the facility to be designed to maximise efficiency of maintenance activities, specific to this new fleet.

Additionally, the expectation for the maintenance of the New Intercity Fleet, is that the trains would require a minimum 30-day inspection regime (ideally 60 days). During these inspections, a broader and intensive range of maintenance activities would be undertaken, necessitating maintenance tracks that can be equipped to undertake these activities without unnecessarily moving trains between maintenance tracks. The proposed layout of the new intercity maintenance facility would allow for this to be achieved, which many of the existing maintenance facilities would not be able to accommodate.

2.2.3 Need 3: A preference for an outer metropolitan facility

The third need for development of the New Intercity Fleet Maintenance Facility relates to the preference for the New Intercity Fleet Maintenance Facility to be based outside the Sydney metropolitan area. It has been identified that the provision of such a facility would have a number of benefits including:

- Increasing fleet availability
- Avoiding the constraints associated with increasing metropolitan train movements and freeing maintenance capacity in Sydney for future growth in the suburban fleet.

Need to improve fleet availability

As a general principle, the location of maintenance facilities close to where trains start or end their journeys is preferable to reduce dead-running (running trains without passengers) and increase fleet availability. The existing approach has been to locate these facilities close to Central Station in Sydney, where most peak intercity services terminate. With a direct connection onto the main train line, the Flemington Maintenance Centre and Eveleigh are located close to Central Station and are able to accept intercity trains for maintenance once they have completed their morning peak runs for routine maintenance.

This arrangement is adequate for the current intercity fleet. In particular, the existing intercity trains have an intensive maintenance schedule requiring an inspection once for every week in service. This requires a maintenance facility to be located close to the city to allow these trains be available for an inspection before returning back to service for the evening peak.

It is anticipated that whilst the New Intercity Fleet trains would require fewer visits to a maintenance facility, the length of the visits is expected to be longer than the current maintenance activities in comparison to the current fleet. With the longer duration maintenance expectation, any new intercity trains brought in for service after morning peak services under the current maintenance arrangement would likely to struggle to re-enter service before the evening peak, potentially reducing fleet availability for the evening peak and resulting in a reduction in peak intercity services during the afternoon period.

In contrast, the provision of a New Intercity Fleet Maintenance Facility outside the Sydney metropolitan area would provide an opportunity to change this practice by scheduling maintenance after the conclusion of the evening peak. By accepting trains for maintenance after the evening peak, a longer maintenance window would be available to train maintainers. Additionally, by undertaking maintenance overnight, this would allow a greater proportion of the fleet to be available for service during both the morning and evening peak.

Avoiding increasing metropolitan rail movements

The number and density of train movements across the Sydney metropolitan network is expected to increase to cater for ongoing increases in current patronage levels. These increased movements are likely to result in not only higher levels of train movements during peak periods but also during shoulder and off-peak periods to cater for a spreading of the peaks and underlying patronage and freight growth. These general increases in train movements on the wider metropolitan train network will continue to increase pressure on passenger trains accessing a metropolitan based maintenance facility between the morning and evening peaks.

Based on the anticipated increase in congestion of the Sydney metropolitan network, there is a preference, where feasible, to locate new maintenance facilities closer to where trains commence and conclude their services. For intercity services, this would require a location outside the metropolitan area, preferably on the Central Coast. The rationale for the Central Coast as the preferred location is based on the current New Intercity Fleet deployment strategy, which would provide for a larger proportion of New Intercity Fleet trains being deployed on the Central Coast and Newcastle Lines.

3 OPTIONS DEVELOPMENT AND SELECTION

This chapter discusses the option development and selection process undertaken for the New Intercity Fleet Maintenance Facility including consideration of location options for the maintenance facility site and design options within the preferred site.

3.1 Site selection

3.1.1 Overview

As described in section 1.1 of this REF, the New Intercity Fleet will operate on three routes including: Sydney to the Central Coast/Newcastle (Main North Line); Sydney to Blue Mountains (Western Line); and Sydney to Wollongong/Nowra (South Coast Line). The facility is therefore required to be located central to one of these core routes to minimise out-of-sector train movements solely for the purpose of maintenance.

Services for the New Intercity Fleet would generally be consistent with the existing services operated by NSW Trains. Accordingly, the New Intercity Fleet Maintenance Facility is required to be alongside, or easily accessible to the Main North, Western or Southern railway lines. Transport for NSW initially considered a total of 24 potential sites across the Main North, Western and South Coast lines as part of the initial site selection process. The key criteria for this initial site selection included consideration of the following factors:

- The area must be larger than 10 hectares
- The area must be adjacent to one of the identified the railway lines (i.e. a site that would not require a long spur line to provide access)
- The area must be adjacent to a generally straight section of rail track.

To minimise empty train movements the preference for the new maintenance facility was to locate the maintenance facility closer to where trains commence and conclude their runs. The Main North railway is expected to receive a larger proportion of New Intercity Fleet and as a result, the Central Coast was considered to be the preferable region for the new maintenance facility (refer to section 2.2.3).

In considering the initial 24 sites, the sites located along the Main North railway were identified as best meeting the initial criteria identified above. This corridor was therefore chosen as the preferred region for further consideration as part of the strategic options assessment for the new maintenance facility site. Further discussion of this strategic options assessment, and identification of the preferred site, is provided in the following sections.

Do nothing option

As part of the options assessment process, Transport for NSW also considered a ‘do nothing’ option which would use existing train stabling and maintenance facilities which are currently used for other fleets types to maintain the New Intercity Fleet. However, it was identified that the utilisation of such facilities was not feasible due to existing stabling needs, functional constraints, and the extensive works that would be required to adapt existing infrastructure to stable the New Intercity Fleet trains. As such, the do nothing option was not considered any further as a feasible option.

3.1.2 Strategic site options

Identification of strategic site options

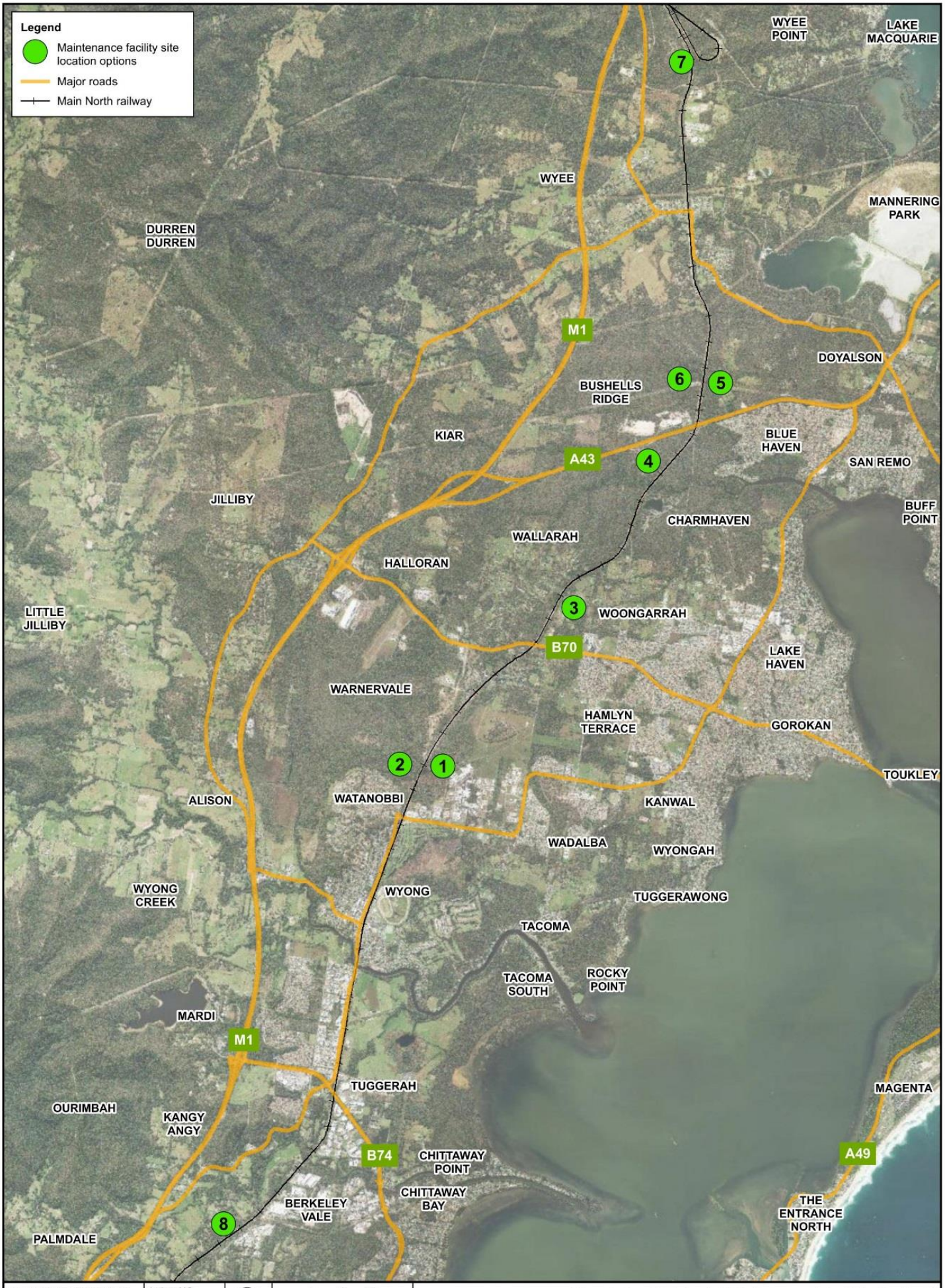
To assess the potential site locations along the Main North railway, Transport for NSW undertook a *Concept Options Development* study in November 2014 (GHD, 2014). This study focused on consideration of potential site options between Wyong and Vales Point Junction. The study comprised a two stage process to identify the preferred location of the new intercity maintenance facility:

- Strategic assessment of a long list of options to identify a short list
- Multi criteria assessment of the short list to identify the preferred location.

Seven potential sites were identified in the Wyong to Vales Point Junction corridor. The locations of the seven sites were chosen following overview of the corridor considering the availability of open land adjacent to, and the degree of curvature of, the existing railway. The seven sites were selected alongside both the Up Main tracks (southbound) and Down Main (northbound) the existing rail corridor generally between from Ourimbah and Vales Point Junction. The location of the seven identified sites are described in Table 3.1 and shown as Site 1 to Site 7 in Figure 3.1.

Table 3.1 Strategic site option locations along the Main North railway corridor

Option	Description
1	Up Main side of existing corridor between Pacific Highway and Warnervale Station
2	Down Main side of existing corridor between Pacific Highway and Warnervale Station
3	Up Main side of existing corridor between Sparkes Road and Doyalson Link Road
4	Down Main side of existing corridor between Sparkes Road and Doyalson Link Road
5	Up Main side of existing corridor between Doyalson Link Road and Wyee Station
6	Down Main side of existing corridor between Doyalson Link Road and Wyee Station
7	Up Main side of existing corridor between Wyee Station and Vales Point



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New Intercity Fleet Maintenance Facility Project
Figure 3.1
Preliminary maintenance facility site location options

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Assessment of strategic site options

A strategic assessment of these sites was undertaken by the Project team including representation from engineering, environmental, and planning disciplines. This stage in the options assessment process consisted of a strategic level review aimed at rapidly eliminating candidate sites to reduce the strategic 'long list' of options to a 'short list' of sites for more detailed assessment (described in section 3.1.3 below).

The assessment of these sites considered a set of high level criteria to provide an understanding of the various constraints and risks at each of the long-listed sites and to identify any critical elements which would make the sites unsuitable for further consideration. The criteria used for this strategic assessment included the following:

- Proximity to Wyong as a central location within the Central Coast
- A large open site adjacent to straight or near straight sections of the existing rail corridor
- Located along a section of the existing rail corridor/adjacent land with minimal existing infrastructure
- High level consideration of potential future land use of the nominated site
- Engineering constraints
- Environmental constraints.

Based upon the comparison of the sites against the identified criteria, three of the seven sites were identified for further, more detailed consideration. The main reasons for selection of these nominated sites, and for rejection of the other sites, is described in Table 3.2. Assessment of the options is provided in section 3.1.3.

Table 3.2 Summary of strategic site options assessment

Assessment	Site Option	Comment on site option assessment
Options considered for further investigation	2	→ Operationally preferred due to proximity to Wyong. → Large land size, single property owner. → Good location for track geometry. → Site is reasonably flat and level.
	4	→ Good access from the Link Road. → Favourable track geometry.
	5	→ Good access from the Link Road. → Favourable track geometry.
Options not considered for further investigation	1	→ Within floodplain and SEPP 14 wetlands. → Subject to potential future property developments.
	3	→ On the site of the future Warnervale town centre. → Terrain next to corridor would lead to increase in earthworks.
	6	→ On the site of the proposed Wallarah 2 coal rail loop
	7	→ Operationally constrained as the site would be more remote to Wyong. → Steep mainline track grade leading to network disruption. → Requires extensive earthworks (excavation of more than 2 million cubic metres of material).

3.1.3 Short-listed site options

Description of the short listed site options

As described in section 3.1.2 above, three sites were identified as part of the strategic options assessment as being suitable for further consideration. These sites were:

- Site 2 – Down side of existing corridor between Pacific Highway and Warnervale Station (also referred to as the 'Warnervale site')
- Site 4 – Down side of existing corridor between Sparkes Road and Doyalson Link Road (also referred to as the 'Bushells Ridge site')
- Site 5 – Up side of existing corridor between Doyalson Link Road and Wyee Station (also referred to as the 'Blue Haven site').

Assessment methodology for short listed site options

Following the strategic assessment, a multi-criteria assessment (MCA) was undertaken on the short listed sites to allow for a more detailed comparison and analysis of the three sites with the aim to identify a preferred site. This assessment was undertaken as a two-stage process:

- Stage 1 – assessment of each site against the defined criteria to rank the sites with respect to engineering and environmental constraints
- Stage 2 – secondary filtering of the sites with respect to potential property acquisition restrictions or advantages.

Assessment criteria

The assessment criteria for environmental and engineering impact measures are summarised in Table 3.3. The assessment did not allow for weighting of the individual criteria. While there is some subjective evaluation of the criteria required, the assessment was structured to focus the assessment upon objective measures of the impacts to allow a fair and robust comparison of the sites. The outcome of the evaluation and scoring for each of the sites is described in the following section.

Table 3.3 Short listed site options assessment criteria

Category	Elements of criteria considered
Ecology	→ Impact on mapped threatened species/endangered ecological communities (EECs). → Impact on mapped native vegetation.
Heritage (non-Aboriginal and Aboriginal)	→ Impact on listed European heritage. → Impacts on known Aboriginal sites. → Impacts on areas potentially containing Aboriginal items (highly sensitive i.e. creek lines).
Noise	→ Distance to nearest sensitive receivers (from stabling or maintenance shed).
Contamination	→ Potential for, or extent of known, contamination on site.
Flooding	→ Amount of land which is flood prone. → Buildings located on a creek Line.
Planning approvals	→ Ability to obtain approvals. → Timeframes in obtaining approvals.

Category	Elements of criteria considered
Construction access	→ Need for new access road. → Access through residential areas. → Additional vegetation clearance.
Enabling works	→ Earthworks (cut and fill requirements). → Existing infrastructure. → Impacts to major and minor culverts. → Diversion of utilities.

Property acquisition

In addition to the criteria identified in Table 3.3, property acquisition impacts were also considered as part of the assessment of each of the options. This enabled identification of a preferred site with respect to environmental and engineering constraints against which property ownership / acquisition risk could then be evaluated. The purpose of this approach was to ensure that a site could be identified that could be acquired within the Project timeframe.

Assessment of short listed site options

Stage 1 assessment – Consideration of assessment criteria

The MCA process considered each of the three sites that passed the strategic site options process. The assessment of the three short listed sites against the MCA criteria is provided in Table 3.4. For the purposes of the MCA, a simple scoring system was used to identify a preferred option where the option that accrued the highest score was considered to be the preferred site. The scoring system ranged from 1 to 5 with 1 representing a major impact and 5 representing little to no impacts.

As can be seen in Table 3.4, the outcome of the initial stage of the criteria assessment identified that the Bushells Ridge and Blue Haven sites would be the preferred from an environmental and engineering impact perspective. This is primarily because the sites have better access to the local road network than the Warnervale site and are further away from sensitive receivers with regard to potential environmental issues such as noise impacts.

Table 3.4 Assessment of short listed site options against environmental and engineering criteria

Criteria	Site 2 Warnervale	Site 4 Bushells Ridge	Site 5 Blue Haven
Ecology	1	2	2
Heritage (non-Aboriginal and Aboriginal)	2	3	3
Noise	1	4	3
Contamination	5	5	5
Flooding	3	2	3
Planning approvals process	1	3	3
Construction access	4	5	5
Enabling works	5	1	3
Total	**22**	**25**	**27**

Stage 2 assessment – Consideration of property ownership

As identified above, the second stage of the site selection assessment process considered property ownership as a separate test (i.e. a proposed site that scored well with regard to environmental and engineering constraints may ultimately fail the assessment if the site cannot be acquired within the given timeframes). For each of the short-listed sites, this comprised:

- The Warnervale site which is currently owned wholly by Central Coast Council
- The Bushells Ridge site which is currently owned by the Darkinjung Aboriginal Land Council
- The Blue Haven site which currently has dual ownership, shared between Darkinjung Aboriginal Land Council and a private property owner.

Discussion of short listed options

Ultimately, the identified property ownership and future development constraints at the three shortlisted sites site determined the outcome of the preferred location as part of the *Concept Options Development* study (GHD, 2014). The proposed construction of the new maintenance facility is required to be completed by the end of 2019 in order to meet the delivery of the New Intercity Fleet trains as described in section 1.1.1 of this REF. While the Bushells Ridge and Blue Haven sites (sites 4 and 5) scored well from an environmental perspective; their land ownership structure was complex when compared to the Warnervale site (Site 2).

A risk assessment undertaken by the Project team (as part of the *Concept Options Development* study) identified that the time associated with land acquisition for either of the Bushells Ridge and Blue Haven sites could potentially be twice as long as that for the Warnervale site. While the Warnervale site was considered to be least preferred from an environmental perspective, it was identified as the most preferable location because of the land ownership structure. It was considered unlikely that property acquisition for these sites could be negotiated within the required Project timeframe.

Although the Warnervale site was identified as the most preferable location for the proposed maintenance facility, it was identified as being constrained by environmental issues at either end of the site. At the southern end of the site SEPP14 wetlands were identified, while to the north of the proposed site, existing residential properties and a planned residential subdivision were also identified which would constrain the site. In addition, Roads and Maritime are currently investigating a proposed new link road between Warnervale and Wyong. The provision of this road was identified as potentially conflicting with the Warnervale site and would require the facility to be moved, further impacting on additional SEPP14 wetlands.

3.1.4 Additional site option – Kangy Angy

Following identification of the Warnervale site in November 2014 as the proposed location for the New Intercity Fleet Maintenance Facility, Central Coast Council (formerly Wyong Shire Council) identified an additional, alternative site at Kangy Angy which was considered by the Council to be a more preferable site to the one previously identified at Warnervale (refer to Site 8 as shown on Figure 3.1). The identified site is located on the Down Main (western) side of existing corridor between Tuggerah Station and Ourimbah Station.

While the site at Kangy Angy was outside of the original study area (Wyong to Vales Point Junction) Transport for NSW agreed to review the site in March 2015. Central Coast Council indicated that the alternative site was preferred on the basis that it did not clash with proposed plans currently being considered by Central Coast Council for the Warnervale area, including a proposed Wyong to Warnervale Link Road and a proposed business and education precinct.

To assess the additional site at Kangy Angy, Transport for NSW prepared a *Comparative Site Analysis* (GHD, 2015a) to compare the Warnervale site (as the currently preferred site) and the proposed Kangy Angy site. The objective of the study was to undertake the comparison of the two locations to identify the preferred site with regard to engineering and environmental impacts. The assessment was based on a like for like comparison of the existing concept design at the new site.

Multi criteria assessment of the Kangy Angy site

As part of the *Comparative Site Analysis* (GHD, 2015a), a MCA of the Kangy Angy site was done in line with the process used for the *Concept Options Assessment* (GHD, 2014). The assessment utilised the same staged MCA assessment that was undertaken for the initial options assessment. Table 3.5 provides a summary of the MCA comparison between the Warnervale and Kangy Angy sites.

Table 3.5 Comparison MCA between the Warnervale and Kangy Angy sites

Criteria	Site 2 Warnervale	Site 8 Kangy Angy
Ecology	1	1
Heritage (non-Aboriginal and Aboriginal)	2	3
Noise	1	1
Contamination	5	4
Flooding	3	3
Planning approvals process	1	3
Construction access	4	4
Total	**17**	**19**

Note: A higher score denotes a better overall outcome.

Discussion of the Kangy Angy site

Based on consideration of both the environmental and engineering criteria, in conjunction with the identified property ownership constraints, it was considered that the Kangy Angy site was identified as having a series of advantages over the Warnervale site. These are summarised in Table 3.6.

Table 3.6 Access road option assessment

Impact/item	Warnervale	Kangy Angy
SEPP 14 wetlands	→ The Warnervale site is mapped as being immediately adjacent to SEPP 14 wetland. While the Warnervale site would not propose to directly impact mapped SEPP 14 wetland, there would be an increased risk of impact to water quality in the adjacent wetland.	→ The Kangy Angy site is not mapped as containing SEPP 14 wetland.
Aboriginal heritage	→ The Warnervale site has Known Aboriginal heritage items located on site and which are likely to be impacted.	→ There are no known Aboriginal heritage impacts, however areas of potential items have been identified.
Non-Aboriginal heritage	→ The Warnervale site contains no items, however the entry/exit tracks would be located in the vicinity of a locally listed item.	→ There are no known listed non-Aboriginal heritage constraints.
Impact to vegetation	→ Potential impacts to endangered ecological community (EEC).	→ Potential impacts to EEC.
Impact to existing infrastructure	→ Significant infrastructure interface(s) and requirement for augmentation.	→ Potentially less requirement for augmentation of existing infrastructure in comparison to Warnervale.
Site access	→ Greater construction constraints including additional access structures and increased earthworks.	→ Less construction constraints including access structures and earthworks.
Cost	→ Greater overall cost.	→ Less overall cost.

3.1.5 Further consideration of the Bushells Ridge site

Further to consideration of the additional site option at Kangy Angy, Transport for NSW also undertook additional evaluation in April 2015 of the Bushells Ridge site. The Bushells Ridge was considered in further detail as part of the *Bushells Ridge Site Assessment* (GHD, 2015b). The key reason for undertaking the additional evaluation was to provide a greater understanding of some of the constraints and potential constructability issues that affect the Bushells Ridge site.

In part, this additional evaluation was also done in response to ongoing consultation with affected land owners including:

- Central Coast Council (as the land owner of the Warnervale site), who indicated that the Warnervale site would be subject to a compulsory acquisition process, therefore delaying the construction of the facility.
- Contact from the land owner of Bushells Ridge, Darkinjung Aboriginal Land Council, who requested further clarification as to the status of the proposed maintenance facility following initial consultation made during the early phases of development.

Following the additional evaluation of the Bushells Ridge site by Transport for NSW (GHD, 2015b), it was still considered that while the site would provide some environmental benefits in comparison to other identified sites, the Bushells Ridge site would also present considerable obstacles and potential for delay to the Project being able to obtain the use of the Bushells Ridge site on Darkinjung Land, which would make it an undesirable site overall.

These obstacles include:

- The Darkinjung Land, being subject to the *Aboriginal Land Rights Act 1989* (NSW), cannot be compulsorily acquired by Transport for NSW pursuant to the *Land Acquisition (Just Terms Compensation) Act l991* (NSW)
- Additionally, Transport for NSW understand that there are unresolved native title claims in respect of the Darkinjung Land and due to the provisions of the *Aboriginal Land Rights Act 1989* (NSW), this creates limitations on the Darkinjung Local Aboriginal Land Council's ability to sell or otherwise deal with the Bushells Ridge site; and
- Approval from the NSW Aboriginal Land Council, in addition to the Darkinjung Local Aboriginal Land Council, would also need to be obtained for the use of the site.

3.1.6 Preferred option

Based on the consideration of all identified site options against the assessment criteria and potential property acquisition constraints, the site at Kangy Angy was identified to be the preferred site option for the proposed New Intercity Fleet Maintenance Facility. Overall, the Kangy Angy site was considered to be the most favourable in relation to the assessment criteria described above and the most appropriate to meet the Project objectives outlined in section 1.4.

As previously described above, Central Coast Council has also indicated its intention to develop the Warnervale site as an education precinct and Roads and Maritime have indicated the need for a new link road between Warnervale and Wyong. Therefore, it was considered that, with respect to both property acquisition and potential environmental impacts (such as SEPP 14 wetlands), the Kangy Angy site would also present the least challenging option and present the least risk to delaying the Project.

A more detailed description of the preferred option is provided in Chapter 4.

3.2 Maintenance facility design options

Following identification of the preferred site, further options development for the design of the new maintenance facility was undertaken. The key elements considered as part of the design options development included the following:

- Maintenance facility access road
- High voltage line realignment
- Traction substation location
- Surface water management.

Descriptions of the options considered for these Project elements is provided in the following sections.

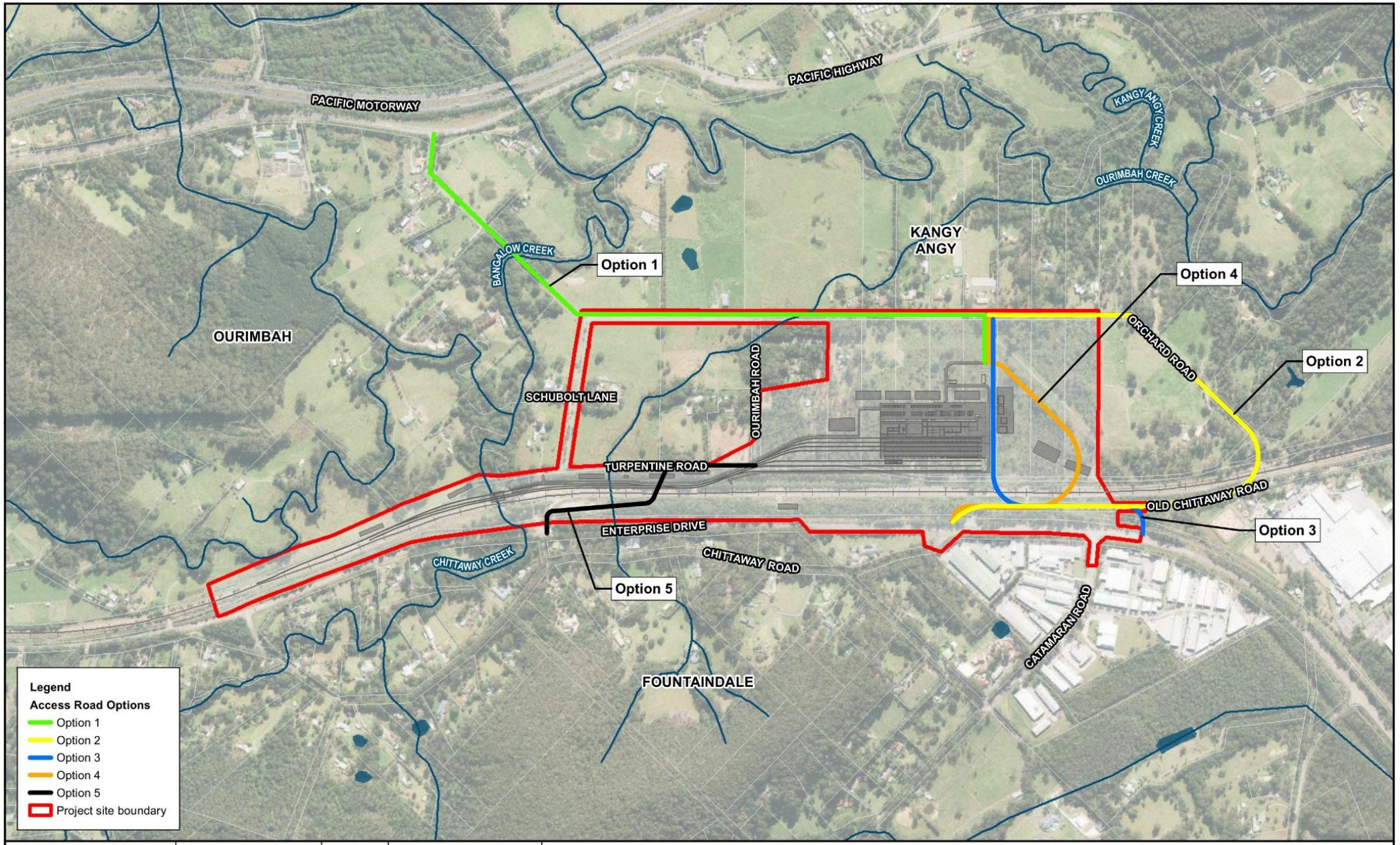
3.2.1 Maintenance facility access road

Description of options

The existing road access to the properties on the western side of the Main North railway corridor at Kangy Angy is via Turpentine Road. This crosses the rail corridor via a road under pass with a restricted height of approximately 3.3 metres clearance. This access road is also susceptible to flooding (refer to section 7.9). Due to the restricted access along Turpentine Road, and the anticipated increase in traffic flow for larger vehicles at the maintenance facility site (both during construction and operation) there is a need for a new access road to be constructed to the facility.

A number of access route options were considered as part of the preliminary design of the New Intercity Fleet Maintenance Facility. These options are summarised below and shown on Figure 3.2.

- *Access option 1*: An access road from Pacific Highway to the south-west, over Bangalow Creek and the identified flood plain
- *Access option 2*: An access road following Old Chittaway Road and crossing the Main North railway to the north of the site
- *Access option 3*: An access road from the west, following Enterprise Drive, crossing the Main North railway and entering the site immediately north of the maintenance facility
- *Access option 4*: A similar access to access Option 3, providing an alternative crossing option for the Main North railway further to the north of the maintenance facility
- *Access option 5*: An access road from the south of the maintenance facility site, leaving Enterprise Drive and crossing the Main North railway near Turpentine Road (replacing the current Turpentine Road rail underpass).



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New Intercity Fleet Maintenance Facility Project
Figure 3.2
Access road options

Assessment and selection of the preferred option

All of the options would provide the required access to the maintenance facility site. Advantages and disadvantages of each option are summarised in Table 3.7.

Table 3.7 Access road option assessment

Option	Advantages	Disadvantages
Access option 1	→ This option would be the only option which would not require a crossing of the Main North railway corridor. → The option would provide direct access to the Pacific Highway, potentially reducing the need for construction and operation traffic to travel along local streets.	→ This option would potentially require a substantial amount of additional land acquisition outside of the existing road reserve between Schubolt Lane and the Pacific Highway to accommodate the required earthworks. → A substantial portion of the access road would be impacted by the 1:100 flood levels. Mitigation of flood impact due to this access road would be expected to require additional bridge structures, and would make this option non-competitive from a cost and construction program perspective. → This option would require the second largest amount of earthworks (approximately 38,000 m^3) of all options. → This option would result in visual impacts to the largest potential catchment for all options and would result in a large amount of construction and operational traffic passing the greatest number of residential properties.
Access option 2	→ Minimal property acquisition would be required.	→ This option would be have minor impact from the 1:100 flooding levels, in particular to the north of the site. → This option would require the largest amount of earthworks (approximately 62,000 m^3). → This option would result in increased amenity impacts to a larger number of properties being affected by construction and operational traffic in compared to other options. → This option would result in difficulty designing the bridge curve to minimise property impacts (i.e. within the identified property boundaries).
Access option 3	→ No additional property acquisition required. → This option would not cross the 1:100 flood level and therefore would not be flood affected.	→ This option would require a larger amount earthworks (approximately 21,500 m^3) than options 4 and 5. → This option would be visually prominent to residential receivers to the north and west of the maintenance facility. → This option would have a substantial cost associated with the provision of a large viaduct structure/bridge immediately adjacent to the maintenance facility buildings. → This option was considered to be restrictive and wouldn't allow for any potential future expansions of the facility (if required).
Access option 4	→ No additional residential property acquisition would be required. → While this route would cross a part of the flood plain to the north of the maintenance facility, this section of the access road would be above ground level on the viaduct and hence would not be impacted by the 1:100 flood levels. → This option would require a comparatively lower earthworks than other options (approximately 16,000 m^3).	→ This option would be more visually prominent to residential receivers to the north and west of the of the maintenance facility site due to the height of the viaduct, however the number of overall receivers would be limited.

Option	Advantages	Disadvantages
Access option 5	→ This option would have limited flood impacts due to elevated nature at identified flooding locations. → This option would require a comparatively lower amount of earthwork requirements in comparison to other options.	→ This option would require additional property acquisition of private property. → This option would be visually prominent to a number of residential properties to the east and west of the Main North railway corridor. → This option would have a large additional cost associated with the requirement to provide a bridge over up to six tracks (including the access tracks and the existing Main North Railway)

While access Option 5 was identified as having some advantages, the overall adverse effect on private properties was not considered to be acceptable and this option was therefore not assessed further.

As outlined in Table 3.7, access Option 1 would, whilst being the only option which would not require a crossing of the Main North railway, would result in a number of other disadvantages, in particular with respect to environmental and constructability issues, in comparison to the other feasible options. As such this option was not considered to be the preferred option for providing access to the site.

With respect to the remaining options, the access options 3 and 4 were considered the most feasible, with access Option 4 resulting in additional benefits with respect to providing the greatest flexibility for future development of the Main North railway (quadruplication) or expansion of the maintenance facility (subject to separate environmental assessment and approval). Access Option 4 is also expected to have a lower construction cost in comparison to a majority of the other options considered.

The preferred access to the maintenance facility site was therefore determined to be access Option 4. Further discussion regarding the preferred option for the maintenance facility access road is provided in section 4.2.3.

3.2.2 High voltage line realignment

Description of options

The existing Ausgrid 33 kilovolt feeder line currently running through the maintenance facility site would require relocation as part of the new maintenance facility. In addition, some existing RailCorp 11 kilovolt and 66 kilovolt feeders which encroach the maintenance facility site would be required to be relocated as part of the Project (refer to section 4.2.4 of this REF).

Two main options for the realignment of the Ausgrid 33 kilovolt feeder lines were identified as part of the consideration of the design of the maintenance facility. These options include the following:

- *Option 1* – this alignment would commence at the intersection of Turpentine Road and Schubolt Lane. The alignment would follow Schubolt Lane to Orchard Road, and would then follow Orchard Road to the northern boundary of the maintenance facility site. From this point, the alignment would follow the northern boundary of the maintenance facility site to a new connection point near Old Chittaway Road.
- *Option 2* – this alignment would commence at the intersection of Turpentine Road and Schubolt Lane and would follow Turpentine Road north to the corner of Turpentine Road and Ourimbah Road. At this point, the alignment would generally be located within the western portion of the site towards Orchard Road. At Orchard Road, the alignment would be similar to that for Option 1, providing a new connection point along Old Chittaway Road.

These options have been arranged to eliminate as far as possible additional interfaces between any electrical enabling works required for the construction of the new intercity maintenance facility site and any future track work modifications of the Main North railway or within the maintenance facility (which would be subject to separate environmental assessment and approval).

The alignments of the two potential Ausgrid 33 kilovolt feeder line routes are shown on Figure 4.1 and Figure 4.2 in Chapter 4 of this report.

Assessment of options

Discussion with Ausgrid regarding the preferred alignment for the relocation of the 33 kilovolt power line is currently ongoing. The potential advantages associated with each of the identified options has however been considered. Each of the two options would generally result in a similar outcome. The advantages and disadvantages of each option are summarised in Table 3.8 below.

Table 3.8 Ausgrid 33 kilovolt High Voltage line relocation option assessment

Option	Advantages	Disadvantages
Ausgrid 33kV High Voltage line relocation Option 1	→ Reduced vegetation clearance requirements. → Separation of the power line from the operation of the maintenance facility. This may result in some advantages should any maintenance of the power lines be required which would potentially affect the use of the tracks within the maintenance facility site (in particular towards the current intersection of Turpentine Road and Ourimbah Road).	→ Some sections of the alignment would be within the 1:100 flood level. → Slightly longer overall length. → Alignment would be more visually prominent to a larger number of visual sensitive receivers to the south of Schubolt Road. → Would require some clearance of vegetation, including potential clearance of EEC).
Ausgrid 33 kV High Voltage line relocation Option 2	→ Slightly shorter overall length. → Somewhat reduced visual prominence of the power line as it would be closer to the proposed maintenance facility and would integrate with the new facility infrastructure. → Generally outside of the identified 1:100 flood impact level.	→ Would likely require additional vegetation clearance and maintenance requirements (including potential EEC).

At this stage, the final, preferred alignment for the Ausgrid 33 kilovolt power line has not been determined (refer to section 4.2.4) and will be determined during subsequent phases of the Projects' design in consultation with Ausgrid. The current environmental assessment presented in this REF has considered the potential impacts associated with each of these options.

3.2.3 Traction substation location

Description of options

Three possible locations of the new traction power substation were considered. The identified options take into account the proposed access road options (as described in section 3.2.1 above) as well as the required maintenance facility layout (including any potential for future expansion of the facility).

The three location options for the traction substation are show on Figure 3.3. All of the options would meet the operational power supply requirements of the new intercity maintenance facility. Advantages and disadvantages of the three options are summarised in Table 3.9.

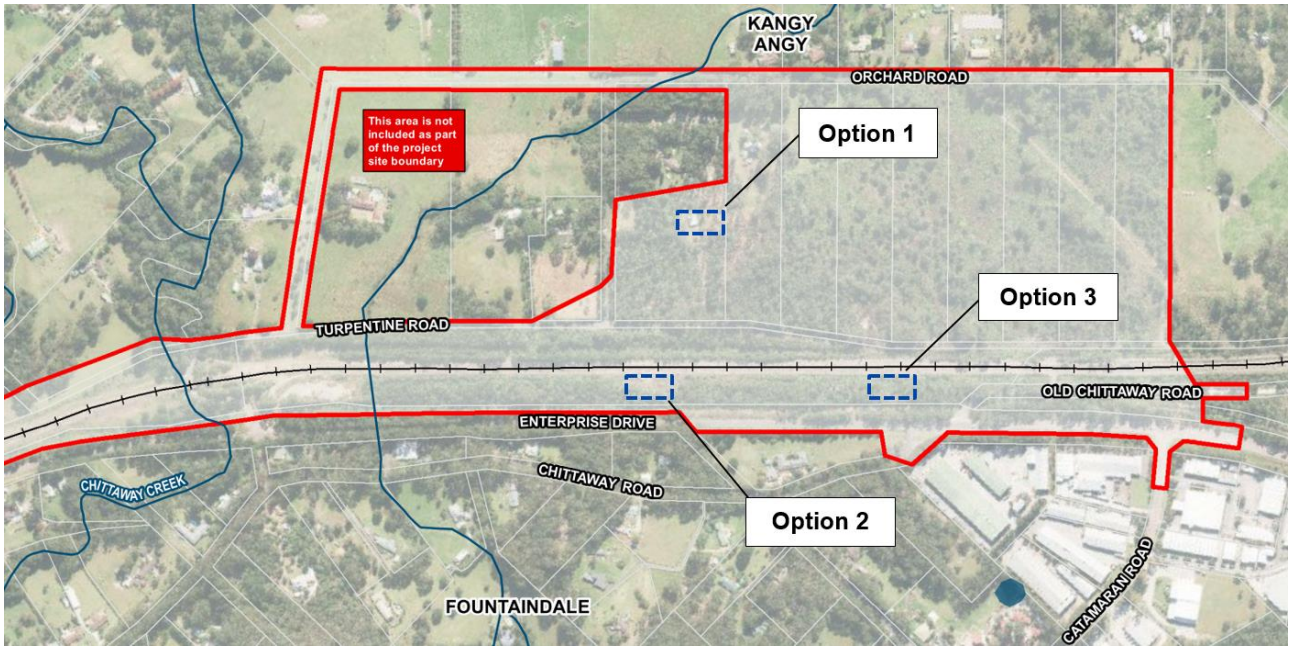


Figure 3.3 Potential traction substation location options (indicative)

Assessment and selection of the preferred option

Table 3.9 Traction substation option assessment

Option	Advantages	Disadvantages
Substation Option 1	→ Close to Ausgrid 33kV route and potential power feed options. → Substation would be located on the same side of the Main North Railway corridor to the new facility.	→ Additional investigation would be required to confirm potential impacts from nearby flood prone areas. → This option would be located closest to residential properties, in particular residential properties located along Ourimbah Road. → Access to the substation by Sydney Trains may result in the potential safety risks associated with entering a live maintenance facility site.
Substation Option 2	→ Close to preferred power feed locations. → Located away from the main construction works for the maintenance facility and could be constructed in isolation of the maintenance facility (e.g. as early works). → Location would not interfere with any potential future expansion of the maintenance facility site. → Located a reasonable distance away from potential residential receivers. → Access to the substation by Sydney Trains would be available without the potential safety risks associated with entering a live maintenance facility site.	→ Located on the opposite side of track, resulting in track under bore for cables. → Minor land acquisition from Central Coast Council would be required to provide an access track to the substation.

Option	Advantages	Disadvantages
Substation Option 3	→ Located away from the main construction works for the maintenance facility and could be constructed in isolation of the maintenance facility (e.g. as early works). → Location would not interfere with any potential future expansion of the maintenance facility site. → Located the furthest away from potential residential receivers. → Access to the substation by Sydney Trains would be available without the potential safety risks associated with entering a live maintenance facility site.	→ Further from preferred power feed locations. → Located on the opposite side of track, resulting in increased difficulty for staff access. → Minor land acquisition from Central Coast Council would be required to provide an access track to the substation.

As noted in Table 3.9, while substation Option 1 would be located the closest to the maintenance facility, the main disadvantages of this location would be have a greater potential for being flood affected and would be located closest to option to a residential dwelling of the three options.

With respect to substation options 2 and 3, although these options would require under bores below the existing Main North railway corridor, to connect with the new maintenance facility, construction of the new traction substation compound in either of these locations could be performed in isolation of the maintenance facility, providing a benefit during the overall construction program. In addition, the proposed location for Option 2 would be located within a generally cleared area, and resulting in less vegetation clearing requirements in comparison to substation Option 3.

Option 2 is therefore the preferred option for the siting of the traction substation. Further discussion regarding the preferred option for the traction substation is provided in section 4.2.4.

3.2.4 Surface water management

Description of options

Rainfall onto the maintenance facility site currently either percolates into the natural ground strata, or flows off to the north, west and south. Surface and stormwater then makes its way eventually to Ourimbah Creek to the west of the site, and its various tributaries including Bangalow Creek, Chittaway Creek, and an unnamed intermittent watercourse. Cross drainage passes under the Main North railway via the bridge at Chittaway Creek, as well as a number of smaller drainage pipes and culverts.

To manage the potential impacts associated with the new intercity maintenance facility surface and stormwater flows, a series of stormwater management strategies were considered for the maintenance facility site. These included the following options:

- *Option 1* – directing surface and stormwater away from the Main North railway towards the southwest, west and north. This would be achieved by capturing water between the new rail tracks and directing this water to a series of detention ponds. Water run-off from general and road areas would also be directed towards the detention ponds. The detention ponds would both decrease the flows leaving the site and improve the quality of the water (through measures such as filtering agents). The water would eventually make its way to water courses to the south-west and north-west of the maintenance facility site or seep into the ground as currently occurs
- *Option 2* – directing all surface and stormwater from the maintenance facility site towards Chittaway Creek to the south, and towards Ourimbah Creek to the north and north-west. This would require substantial drainage pipe installation which would run parallel to the rail lines
- *Option 3* – directing stormwater from the maintenance facility east under the Main North railway, towards the lower elevation areas along Enterprise Drive

- *Option 4* – construction of a permeable platform area within the maintenance facility site to allow continued absorption of most rainfall into the ground as currently occurs. Such measures could include permeable structural zones and capping layers (e.g. gravel layers), or introduction of extensive drainage cells.

Assessment and selection of the preferred option

While each of the identified options would allow for the management of surface and stormwater management for the new intercity maintenance facility options 2, 3 and 4 were not considered to be desirable options for the following reasons:

- Option 2 would involve excessive (greater than 600 metres) lengths of stormwater pipe, such that connection into the creeks at appropriate levels may not be possible
- Option 3 is not considered desirable, as it would involve additional drainage culverts under the Main North railway, then longitudinal pipe drainage along Enterprise Drive before dispersal into the same major creeks and watercourses as option 1
- Option 4 is not considered to be feasible due to both cost and poorer drainage performance in comparison to the other options.

Option 1 is therefore considered to be the preferred options for the Project. Further discussion regarding the preferred option for the surface and stormwater management for the maintenance facility site is provided in section 4.2.5.

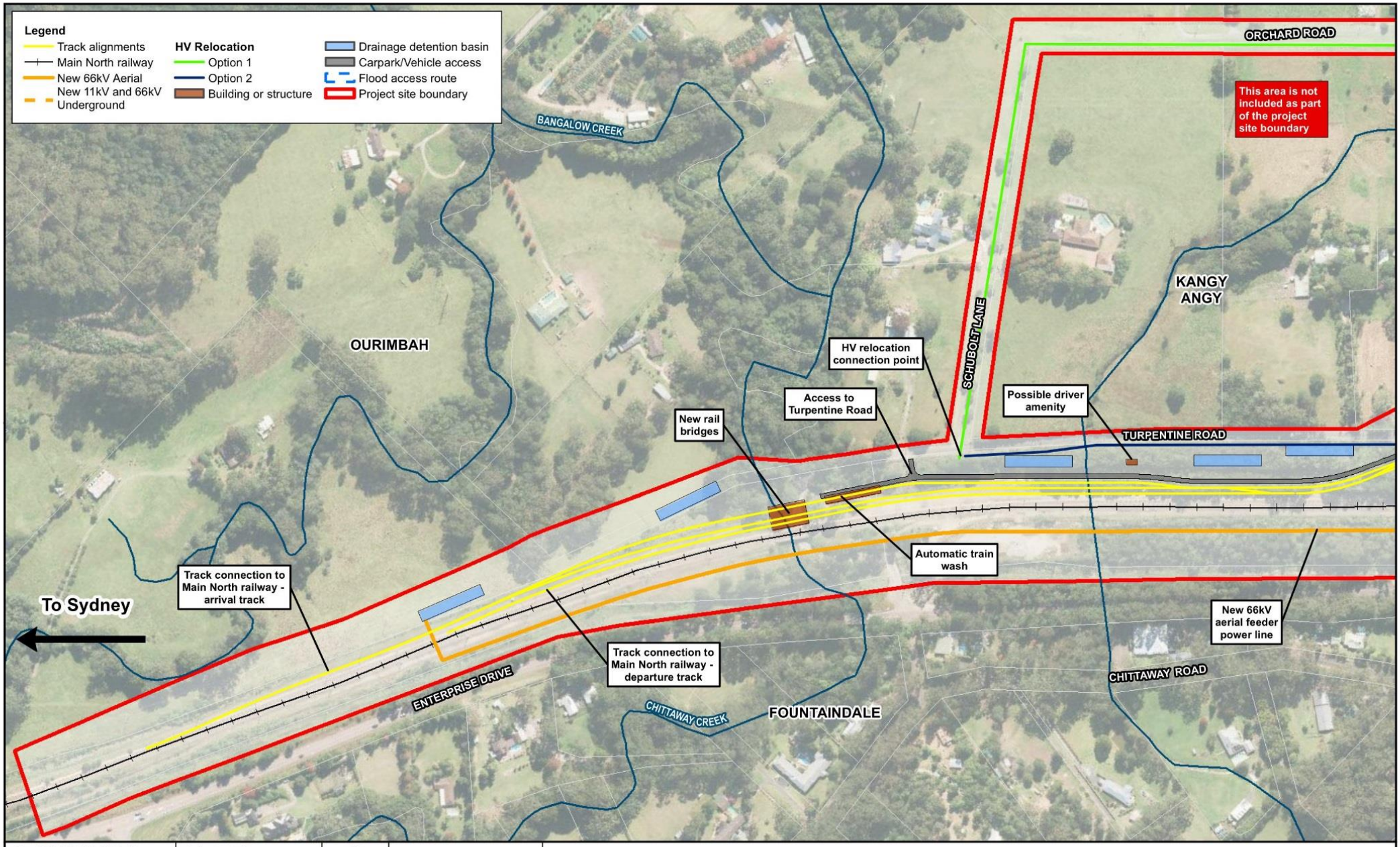
4 DESCRIPTION OF THE PROJECT

4.1 Overview of the proposed works

The proposed facility would include about six kilometres of electrified railway (in total), would be seven tracks wide at its widest point, would cover an area of approximately 500,000 square metres and would be bounded by a perimeter fence. The key features of the proposed maintenance facility are shown in Figure 4.1 and Figure 4.2 and would comprise the following:

- Maintenance facility elements:
  - fleet maintenance building
  - four enclosed maintenance roads and three external standing roads to accommodate the new trains within the site
  - auxiliary workshops
  - electronic clean room
  - material storage, including flammable liquid storage
  - wheel lathe
  - automatic train wash
  - site access roads
- Miscellaneous buildings:
  - administration (including training rooms)
  - facilities for presentation and train maintenance staff
  - signalling building
  - security building
  - training simulator
  - substation building
  - power supply (traction power, bulk power, signalling power supply and backup generators)
- Other infrastructure including:
  - new railway track infrastructure on the western side of the existing rail corridor to allow for trains to enter and exit the maintenance facility site from the Main North railway
  - a new rail bridge (consisting of two separate structures) over Chittaway Creek and Turpentine Road
  - a new access roadway and bridge to the maintenance facility site off Enterprise Drive
  - a new flood access road between Orchard Road and the proposed new access roadway
  - a series of drainage detention ponds
  - staff car park
  - relocation of the existing high voltage power transmission line and Combined Services Route.

A detailed description of the design components associated with the new intercity maintenance facility is provided in sections 4.2.



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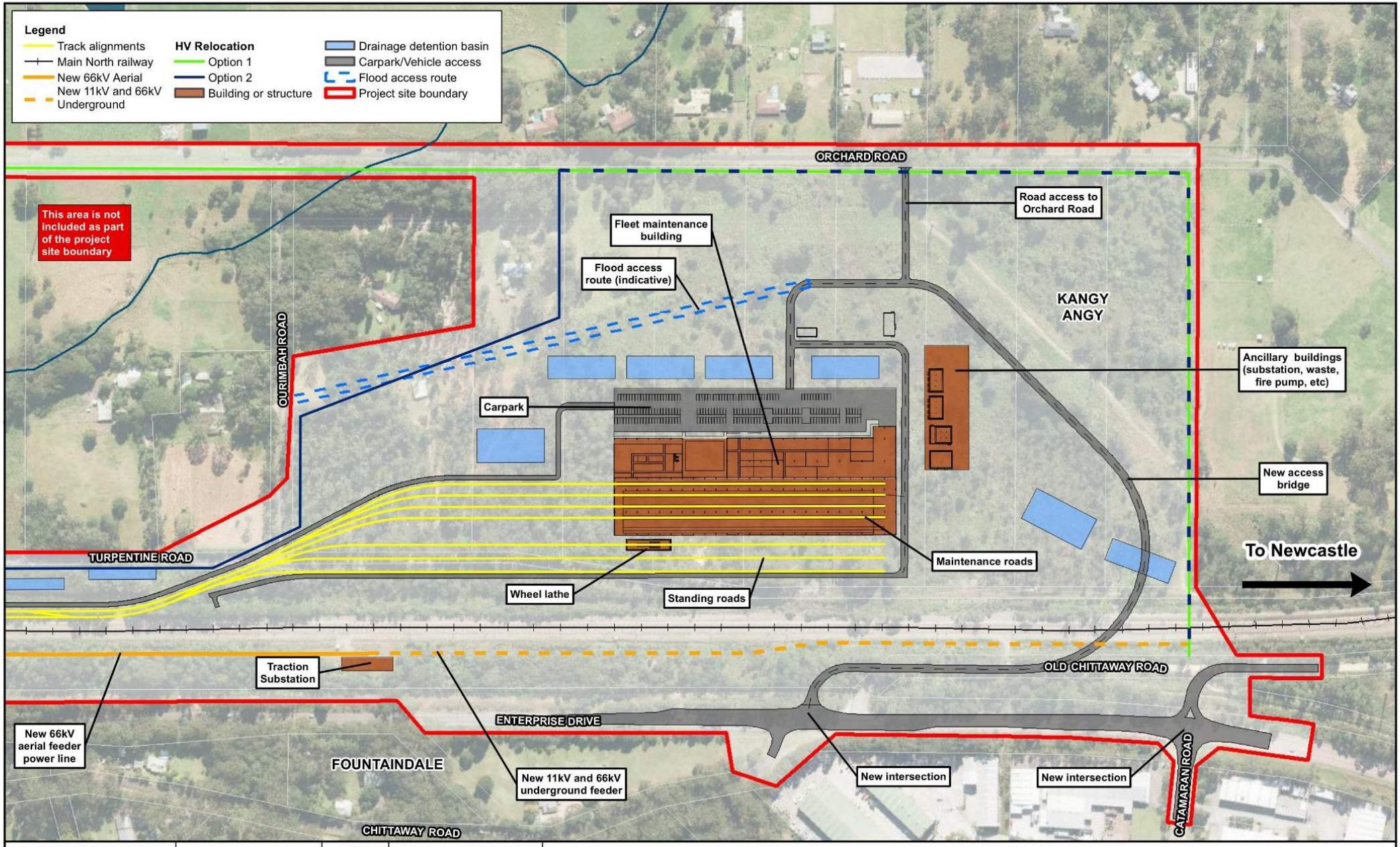
New Intercity Fleet Maintenance Facility Project
Figure 4.1
Indicative project layout (South)



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Coordinate system: GDA 1994 MGA Zone 56

Scale ratio correct when printed at A4

Note: Design is indicative only.
Subject to detailed design

New Intercity Fleet Maintenance Facility Project
Figure 4.2
Indicative project layout (North)

4.2 Components of the Project

4.2.1 Fleet maintenance building built form and layout

The design and layout of the new intercity maintenance facility establishes an order of functionality by establishing work zones and associated spaces which would be linked through clear and direct routes for pedestrians and vehicles. The maintenance building would consist of a single building comprised of the primary maintenance building, an administration building and storage/delivery areas within a single building envelope. The built form of the new intercity maintenance facility site would consist of a number of building elements including the following:

- Fleet maintenance building including:
  - fleet maintenance area
  - administration
  - storage and workshops
  - delivery and loading docks
- Wheel lathe building
- Security building
- Waste enclosure
- Fire pump room
- Substations/

An indicative layout of the proposed buildings for the new intercity maintenance facility is shown in Figure 4.1 and Figure 4.2 above. A description of the key maintenance facility buildings are provided in the following sections of this REF.

Fleet maintenance building

The fleet maintenance building would consist of a single building comprised of four fleet maintenance roads and administration and storage/delivery areas within a single building envelope. The size of the building would be approximately 250 metres by 85 metres. The proposed design for the fleet maintenance building would incorporate a zone between the fleet maintenance area and offices which would include meeting rooms and breakout spaces.

The maintenance and standing roads within the fleet maintenance building would be approximately 230 metres in length which would allow for a full train to be stood on each of the maintenance roads. Within the fleet maintenance building, adjacent stores and workshop areas, the rail tracks for the maintenance roads would be slightly elevated with depressed floors (approximately 0.8 metres below rail level) and a full length pit in each of the maintenance roads approximately 1.3 metres below the rail level (between the rails). Additionally, a range of access ways, platforms and gantries would be located throughout the main area of the fleet maintenance building to provide maximum accessibility for under floor, at floor and roof level inspections.

Each of the four maintenance roads within the fleet maintenance building would be approximately 10 metres apart (at the track centres) to provide space to operate various plant and machinery including work platforms, mobile bridge/gantry cranes, hoists and the movement of other plant such as fork lifts along the length of trains within the facility. It is anticipated that the western-most maintenance road within the fleet maintenance building would be utilised for heavy maintenance as it is located adjacent to the stores and delivery area, while the remaining three maintenance roads would be utilised for light maintenance.

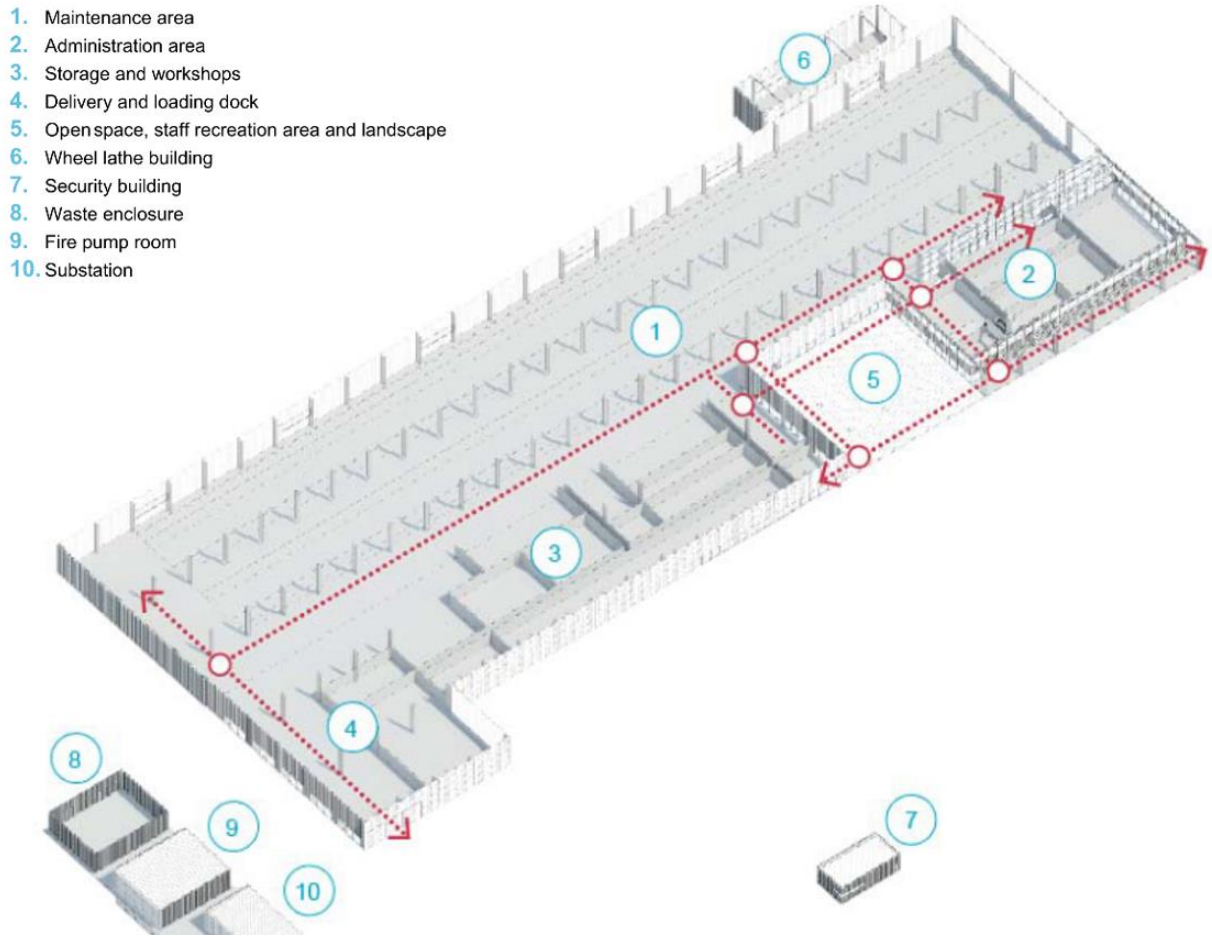
The main storage, delivery and loading dock areas of the facility would be located to the west of the maintenance roads. This area would be used for the storage of fleet maintenance equipment, including new

bogies and other larger replacement equipment. The administrative area would also be located to the west of the maintenance roads at the southern end of the fleet maintenance building.

An indicative perspective of the main fleet maintenance building is provided in Figure 4.3 and an indicative layout of the internal elements of this building is shown in Figure 4.4.

Source: AECOM 2016. Note: Design and layout of the facility is indicative only and subject to detailed design.

Figure 4.3 Fleet maintenance building perspective



Note: Design and layout of the facility is indicative only and subject to detailed design.

Figure 4.4 Indicative internal layout of the fleet maintenance building

Wheel lathe

The tread of train wheels becomes worn during operation. To keep the New Intercity Fleet train wheels in good condition, the train wheels would be periodically machined using either an underfloor wheel lathe or milling machine. The wheel lathe would allow for the train wheels to be maintained without the need to remove them from the vehicle for machining.

The wheel lathe would typically comprise a heavy duty machine mounted in a pit, over which the rail vehicles would pass on retractable rails. The wheel lathe would support the train wheels on powered rollers, lifting the wheels clear of the rail section, leaving the wheel tread exposed for machining and re-profiling/smoothing.

The wheel lathe would be located within an enclosed facility (to minimise noise impacts) adjacent to the fleet maintenance building to reduce distance travelled by maintainers and improve associated efficiencies. This location would also remove any necessity for personnel to cross external tracks when approaching the wheel lathe building. An example a typical wheel lathe facility is shown in Figure 4.5 below.

Source: AECOM 2016

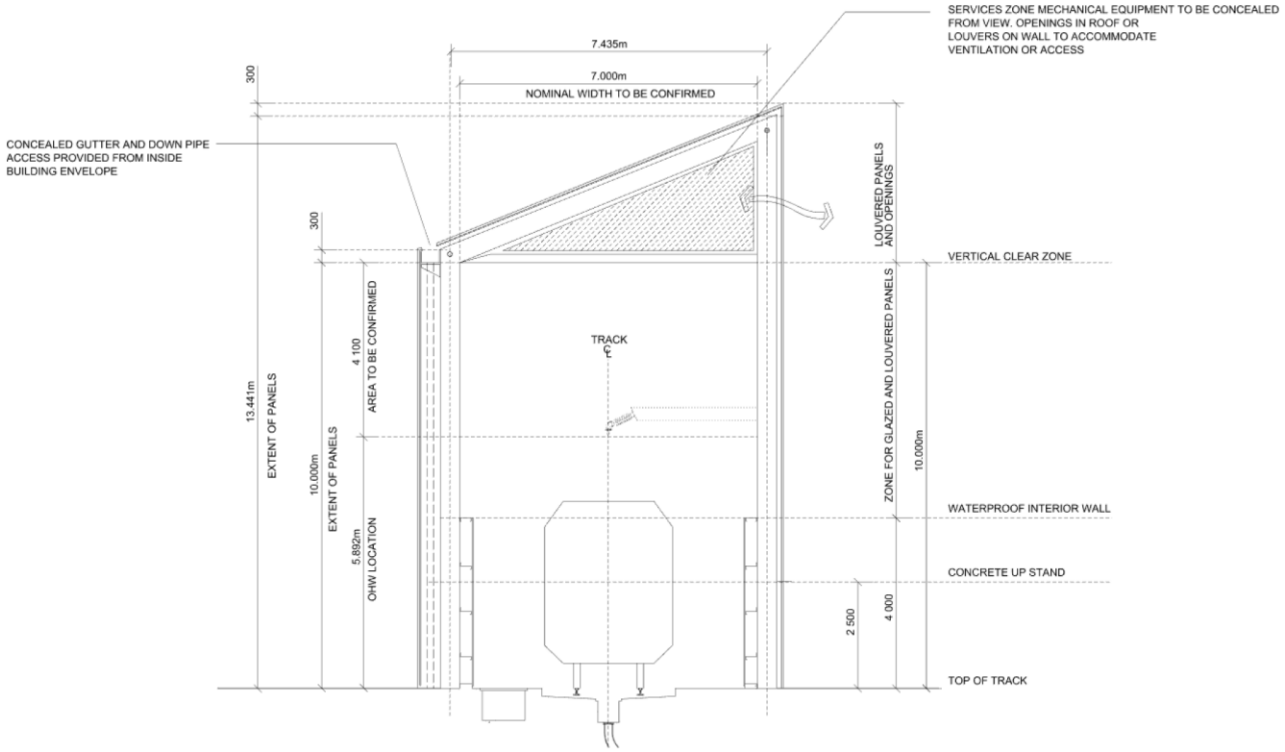
Figure 4.5 Typical wheel lathe building (Auburn Maintenance Centre, Sydney)

Automatic train wash

The new intercity maintenance facility would include an automated train wash building. The train wash would be located on the arrival track to enable all incoming trains to be transitioned through the wash. The location of the automatic train wash (refer to Figure 4.1) would enable a train arriving from the Main North railway to decelerate safely prior to entering the automatic train wash. It is expected that the New Intercity Fleet would be washed approximately every seven days. The trains would move through the automatic train wash under their own power.

During train washing, the train would pass through the train wash at walking pace over a period of approximately six minutes. It is expected that up to 95 per cent of the wash water used in the automated train wash would be recyclable water. The residual five per cent of the wash water would be discharged.

The train wash would be capable of cleaning all external surfaces (sides, skirts, ends) of the train fleet. An indicative section of the proposed automatic train wash building is provided in Figure 4.6.



Source: AECOM 2016. Note: Design and layout of the facility is indicative only and subject to detailed design.

Figure 4.6 Typical section of the automatic train wash building

An important component of the automatic train wash would include the control room and wastewater treatment plant to treat the recycled water from the train wash. This would be located adjacent to the main train wash building as shown in Figure 4.1.

Ancillary buildings

A series of additional buildings would also be located across the site to meet various operational requirements including:

- Security building
- Waste enclosure
- Fire pump room
- Substations.

The location of these buildings are shown on Figure 4.1 and Figure 4.2.

4.2.2 Rail infrastructure works

Track works

Southern connection to existing Main North railway

The connection to the existing Main North railway on the southern side of the maintenance facility site would provide two main connections, being an arrival track and a departure track. The connection to the existing Main North railway has been designed to allow for an exit speed of 70 kilometres per hour.

The turnout from the existing Main North railway to the arrival track would be located approximately 20 metres from the nearest mainline element on the existing down main of the Main North railway. There would then be an additional connection approximately 40 metres to the north to provide a connection to the departure track turnout. This arrangement would allow for simultaneous entry and exit to the maintenance facility site for two trains (if required).

A new vehicle access track would also be provided to the west of the new arrival and departure tracks.

The design of the Project at this location would provide for a narrow corridor which would accommodate the proposed tracks, access road, drainage (and other services) safely in order to minimise land acquisition.

Wash plant and bridge alignment

Once separated from the Main North railway, the tracks towards the main maintenance facility site would separate into three main tracks consisting of the arrival, departure and train wash tracks. Each of these tracks would run parallel to the Main North railway with the western-most track leading to the wash plant (refer to section 4.2.1 for details). The wash plant would be located on the dedicated wash track and would provide approximately 240 metres of track on either side to allow a train to stand clear of the arrival track and therefore not impact on its operation. Additionally, the wash plant has been located on the outermost (western) track in order to improve signal sighting and reduce the need for personnel to cross tracks for maintenance and provisioning.

As part of this section of the track alignment, two new bridges would be provided over Turpentine Road and Chittaway Creek consisting of two new trough girder bridges adjacent to the existing twin track rail over road bridge which caters for the Main North railway (refer to section 4.2.1 for details).

Main facility track layout

After passing the location of the wash plant, the tracks would separate into the individual maintenance roads (tracks) within the site. The configuration of the main portion of the maintenance facility would provide for the following:

- Four maintenance roads which terminate within the fleet maintenance building
- Three standing roads external to the fleet maintenance building consisting of the following:
  - a track containing the wheel lathe (‘wheel lathe road’)
  - two additional standing roads would be used for other maintenance facilities such as graffiti removal, bio-hazard washing (such as animal strikes etc.). These tracks would be bunded to so as to contain and collect and any liquids used in these processes including solvents and detergents used in the removal of graffiti.

Each of the maintenance and standing roads would be approximately 240 metres in length which would be sufficient to accommodate the proposed train configurations for the New Intercity Fleet.

The current design for the facility track layout has also considered requirements for potential future needs of the New Intercity Fleet. While not proposed as part of the current design for which approval is being sought, the current layout of the maintenance facility site has been designed so as not to preclude any future requirements for Transport for NSW to provide future infrastructure within the overall maintenance facility site. Any future expansion of the capacity of the maintenance facility would be subject to separate environmental assessment and approval.

Signalling

New and relocated signals on the Main North railway would be provided to protect and control movements for the connection of the maintenance facility site from the existing railway line.

Signalling for entry and exit of the maintenance facility site would be controlled by NSW Trains, with signal spacing designed for a 70 kilometre per hour entry/approach speed upon entry and a 75 kilometre per hour exit/departure speed. Once trains are no longer on the Main North railway, further movements within the maintenance facility site would be undertaken through signalling controlled by the operators of the maintenance facility.

Further details regarding the proposed signalling configuration for the operation of the maintenance facility would be finalised during detailed design.

4.2.3 Access road, bridges and other structures

Maintenance facility access road

Existing access to the maintenance facility site is via Turpentine Road, Ourimbah Road and Orchard Road. Due to the increased vehicles and size of some vehicles which would be required to access the site, a new access road is proposed to be constructed to allow access to the site and to provide a crossing of the Main North railway (refer to Figure 4.2).

The access road would be accessed from Enterprise Drive via a new intersection with Old Chittaway Road. From the intersection with Enterprise Drive, the access road would start to ramp up to a curved viaduct structure over the Main North railway. The access road would be designed in accordance with the requirements of Central Coast Council and, in addition to the proposed traffic lanes would include other elements such as a shared user path, anti-throw screes and appropriate lighting (meeting relevant Australian Standards).

After the access road has crossed the Main North railway, it would continue as elevated viaduct to allow for a potential future northern connection of the maintenance facility to the Main North railway. The access road would then return to ground level, follow the existing Ausgrid high voltage overhead wire easement before entering the maintenance facility site at the northern boundary.

Due to the existing height of the overhead wires for the Main North railway, at its highest point, the access road would be approximately 12 metres above the existing ground level. The access road would be constructed using a combination of reinforced soil walls (to limit encroachment into the existing rail corridor) and bridge support piers. The route for the new access road would be designed to be above the 1 in 100 year flood line (refer to section 7.9).

Due to the design of the access road, the current southern section of Old Chittaway Road would be removed. A diversion for Old Chittaway Road traffic would be built opposite Catamaran Drive to maintain access to Old Chittaway Road (refer to Figure 4.2).

During construction, the new access road between Orchard Road and Enterprise Drive would not be opened to the public and would only be used by staff for providing access to the maintenance facility. Transport for NSW would continue to liaise with Central Coast Council regarding dedicating the access road as a public road to allow for alternative access for residents along Orchard Road.

Internal access roads

The maintenance facility would include a series of paved roads allowing access for light vehicles across the site and within the rail corridor to areas such as the wash plant at the southern end of the maintenance facility site (refer to Figure 4.1 and Figure 4.2).

At the southern end of the site, access to the rail corridor would be through a gate from Turpentine Road and would consist of a maintenance road (potentially unsealed) running south alongside the new tracks. The access off Turpentine Road would be required to cross Chittaway Creek and would be provided as a low level crossing. Within the remainder of the maintenance facility site, a paved road network would be constructed around the exterior perimeter of the fleet maintenance building. The road would be suitable for light vehicles to travel around the site and for staff to attend to buildings maintenance requirements, as required.

The wheel lathe building would also be accessible by a paved road for collection of waste materials generated during wheel machining. A paved road would also be provided on the outside of the proposed railway tracks (closest to the Main North railway). This road would enable access to various equipment at the southern end of the facility for maintenance. It would also provide access to a signalling equipment room.

A paved road would also extend from the maintenance shed along the western side of the tracks to the wash plant. This access road would allow maintenance personnel to safely access the following facilities on route:

- Signalling equipment
- Railway track infrastructure and other fixed infrastructure south of the fleet maintenance building
- The wash plant.

A new flood access road would also be provided along the western edge of the maintenance facility site between Ourimbah Road and the new maintenance facility access road (described above) to provide an alternative access route for residents along Turpentine Road, Ourimbah Road and Orchard Road during flooding events (and other emergencies) which may restrict access to Enterprise Drive from the southern end of Turpentine Road. The indicative location of this flood access road is shown on Figure 4.2.

Staff car park

A new staff car park would be constructed adjacent to the fleet maintenance building. This car park and would have space for approximately 185 vehicles, including an adequate provision of *Disability Discrimination Act* (DDA) compliant parking spaces located as close as possible to the fleet maintenance building. The car park would be connected to the new maintenance facility access road (refer to section 4.2.3).

Rail bridges over Turpentine Road

To provide access to the maintenance facility from the southern end of the site, the new arrival and departure tracks which connect to the Main North railway would be required to cross Turpentine Road and Chittaway Creek. In order to accommodate this, two new bridge structures parallel to the existing overbridge structure for the Main North railway would be required including:

- One twin track bridge structure to accommodate the arrival and departure tracks
- One single track structure providing access to the train wash track.

The use of separate twin track and single track structures would allow for the westernmost bridge (proposed to be used for accessing the automatic train wash) to be raised slightly following the Turpentine Road profile to provide consistent clearance for vehicles travelling along Turpentine Road. The new structures would provide the same vertical clearance as the existing structure, which is posted as 3.3 metres.

Turpentine Road realignment

As a result of the design of the arrival tracks to the fleet maintenance building, a small portion of Turpentine Road (at its intersection with Ourimbah Road) would be required to be realigned to avoid impacting the maintenance facility.

4.2.4 Power supply and utility adjustments

Traction power supply

Traction power supply for operation of the New Intercity Fleet within the maintenance facility site would be provided by a new traction power substation located on the eastern side of the Main North railway between the up main tracks (southbound) and Enterprise Drive. This substation would provide power for the overhead wiring allowing for the movement of electric trains within the maintenance facility site.

The new traction substation building would be sized to contain indoor equipment only including direct current circuit breakers, rectifiers and supervisory control and data acquisition (SCADA) equipment. Other equipment such as the transformers, reactors, high voltage alternating current switchgear, and isolators would be suitable for outdoor applications adjacent to the substation building. The traction substation would be constructed from either precast concrete or reinforced blockwork walls, with a lightweight steel roof and have an area of approximately 700 square metres. Connection to the maintenance facility site would be via new under bores of the Main North railway which would be undertaken as part of the initial construction works (refer to section 4.4 of this REF).

Overhead wiring

The maintenance facility would be equipped with 1500 volt direct current overhead wiring to allow for the movement of the New Intercity Fleet trains within the maintenance facility site. This would apply to all tracks to and from the adjacent Main North railway, and all tracks within the maintenance facility site with the exception of the wheel lathe. Within the fleet maintenance building, electric traction would be provided on all tracks, and retractable overhead conductor rails would be used to allow for ease of maintenance access to the roof of trains.

High voltage line works

As described in section 3.2.2, the existing (33 kilovolt) feeder line that currently runs through the proposed maintenance site would require relocation as part of the new maintenance facility. Discussion with Ausgrid regarding the preferred alignment for the realignment of the 33 kilovolt power line is currently ongoing. At this stage, two options for the realignment of the power lines have been identified. These options include the following:

- *Option 1* – this alignment would commence at the intersection of Turpentine Road and Schubolt Lane. The alignment would follows Schubolt Lane to Orchard Road, and would then follow Orchard Road to the northern boundary of the maintenance facility site. From this point, the alignment would follow the northern boundary of the maintenance facility site to a new connection point new Old Chittaway Road.
- *Option 2* – this alignment would commence at the intersection of Turpentine Road and Schubolt Lane and would follow Turpentine Road north to the corner of Turpentine Road and Ourimbah Road. At this point, the alignment would generally be located to within the western portion of the site towards Orchard Road. At Orchard Road, the alignment would be similar to that for Option 1, providing a new connection point along Old Chittaway Road.

The alignments of the two potential routes are shown on Figure 4.1 and Figure 4.2. The final, preferred alignment for the 33 kilovolt power line would be determined during detailed design in consultation with Ausgrid.

In addition, some other existing electrical services which encroach the maintenance facility site would be required to be relocated as part of the Project. These services would include the following:

- Sydney Trains 66 kilovolt – the existing line (located on the western side of the railway tracks) would need to be relocated to the eastern side of the railway tracks (installed half as aerial and half as trenched). The proposed relocation for this electrical line is shown on Figure 4.1 and Figure 4.2.
- Sydney Trains 11 kilovolt – the existing line is located on the eastern side of the railway tracks. While this line is not proposed to be relocated, it would be required to be buried for some of its current alignment within the vicinity of the proposed traction substation.

Low voltage supply

Low voltage electricity supply for light and power for the amenities buildings within the maintenance facility site, car park and the general site would be provided from two new distribution substations to be located at the northern end of the facility (refer to Figure 4.2). These substations would also supply power to the new signalling system within the maintenance facility site.

Other utility adjustments

The construction of the new intercity maintenance facility would also result in some impacts to existing service utilities, including the need to provide permanent utility connections from the local utility supplier to the maintenance facility site for the following:

- Potable water supply
- Sewage
- Telecommunications.

The location and extent of impact on these services would be confirmed during detailed design, and in consultation with the utility service provider or Sydney Trains with adjustments being made to these services as required.

4.2.5 Landscaping

Landscaping for the new intercity maintenance facility would be minor in nature due to the intended use of the site. It is expected that some soft landscaping would be utilised at the site entrance and on exposed areas around the buildings within the maintenance facility site to enhance the appearances of the approaches to the facility, soften the appearance of the building features and used to filter light emissions including security lights, train headlights and warning lights on vehicles from the facility.

The design of the landscaping for the maintenance facility would incorporate appropriate local species of flora whilst meeting the bushfire requirements to enhance the local amenity of the facility. Progressive landscaping of the maintenance facility site would help to minimise erosion and therefore reduce the requirement to implement additional environmental controls on exposed areas of land.

4.2.6 Other components

Control and communication systems and security

The control, information and communications technology services required for the new maintenance facility would include telephones, hand-held radios, intercoms, local area network/wide area network and precise clock. To facilitate these services, the following would be provided:

- Backbone communications systems
- Radio systems
- Telephone systems
- Maintenance yard communications systems
- Control systems, including:
  - main control systems including supervisory control and data acquisition (SCADA) and building management systems
  - signalling and train control system
  - security management
- Condition monitoring systems.

The security services for the new maintenance facility would consist of an access control system, intrusion detection, closed circuit television (CCTV) system, intercom, perimeter fence around the entire site, physical measures (doors, glazing, fencing, gates and barriers) and security personnel.

To facilitate these services, the following provisions would be required in addition to those required for the control and communication systems discussed above:

- Mounting space and structures (for cameras, sensors and intercoms)
- Lighting poles/mounting structures.

The final design of the security for the maintenance facility would be determined during the detailed design of the Project in accordance with Sydney Trains standards. Access into the site would be via the new facility access road located off Enterprise Drive and access would be controlled via a security gate.

Train decanting and tanking facility

At the southern end of the maintenance facility site, an area would be allocated to allow for emptying of effluent tanks and refilling of water tanks on-board the New Intercity Fleet. The facilities which would be located on the site would include a pump to draw effluent out of the train tank system for storage an appropriately sized decant facility vacuum tank to allow for discharge to the sewer network.

Fire mains and bush fire protection systems

The fleet maintenance building would be protected by heat sensors and fire alarms linked to the sprinkler system in the both the administration area, store rooms and specific areas of the main hall to meet building code of Australia (BCA) requirements. A fire ring main would be installed around the buildings and administration area separate from the potable water supply to the building. Water for the ring main would be supplied separately by both Council potable water supply and the recycled non potable water from the storm water harvesting within the site. The drainage detention ponds would also provide water for managing any bush fire threats to the site (refer to section 7.15 of this REF).

Lighting

Outdoor lighting would be provided as part of the facility for both navigation and security purposes. Lighting across the site would include:

- General lighting of access roads and foot paths
- Lighting of access routes in the train stabling areas
- External lighting of buildings for both access and security
- Security lighting of access gates
- General lighting of car parking areas
- General lighting of the external areas to allow for traffic and maintenance and stabling activities during the night
- General security lighting suitable for use with CCTV cameras.

Car park, new bridge over the railway and road lighting would be designed to satisfy Australian Standards, while lights within the maintenance facility would be in accordance with Asset Standard Authority (ASA) Standards. Due to the 24 hour operation of the facility, lighting would be required to be on for all or most of the night and would be designed to minimise off site impacts to sensitive receivers. Potential lighting impacts associated with the Project have been considered and are discussed in section 7.3 of this REF.

Stormwater drainage

Rainfall onto the maintenance facility site currently either percolates into the natural ground strata, or flows off down the gentle slopes to the north, west and south. Stormwater eventually makes its way to Ourimbah Creek to the west of the site and its various tributaries including Bangalow Creek, Chittaway Creek, and an unnamed intermittent watercourse. Existing cross drainage currently passes under the Main North railway via the existing bridge at Chittaway Creek, as well as a number of smaller drainage pipes and culverts.

As part of the development of the Project, a concept plan for stormwater drainage dispersal has been developed which identifies the general areas that would be drained and where the water is proposed to be directed. The maintenance facility site is divided by 13 separate catchments that stretch across site sections. For each of these catchments, direct flows of stormwater would be directed toward a detention pond, generally by a piped drainage system. The areas between the new rail lines would be drained via surface drains and pipes. These would then pass to a pipe network that would connect to the detention ponds surrounding the site at closest possible locations.

Up to 14 detention ponds would also be constructed across the western side of the site to supplement the proposed drainage within the maintenance facility site (refer to Figure 4.1 and Figure 4.2). These ponds would be designed to help attenuate the flows discharging into the main drainage system during a 1 in 100 year flood event. The largest of these ponds would be located around the fleet maintenance building and car park. A series of smaller ponds would along be located along the arrival and departure section of the facility along the eastern side of Turpentine Road.

The drainage pipes would be connected to the base of the detention ponds due to the limits of the site topography. During storm events, the pipes would then fill up with water and the levels within the detention ponds balance between the pond and the pipe system. Drainage works for the site would be designed for the 1 in 100 year annual exceedence probability (AEP) flood event with an allowance of 10 percent made for potential future climate change impacts. The roads and car park area would also be designed for this flood event. The final site drainage would be refined during the subsequent phases of the detailed design for the maintenance facility.

Noise attenuation

Noise attenuation structures are currently being considered as part of the new intercity maintenance facility to minimise the potential noise impacts. This is further discussed in section 7.2 of this REF. A series of noise walls are currently proposed for additional consideration as part of the detailed design (refer to section 7.2.6 of this REF) at the following locations to minimise potential noise impacts:

- A barrier of approximately five metres in height above the track alongside the standing tracks east of the maintenance shed
- A barrier of approximately three metres in height above the track along the northern side of the access tracks up to the end of the five metre barrier
- A barrier of approximately five metres in height above the track along the southern side of the eastern standing tracks to where the standing track meets the access track.

The height, length and positioning of the noise attenuation barriers would be subject to further detailed design (including alternative noise mitigation methods) during the subsequent phases of the design of the new intercity maintenance facility. As described above, all of the key components of the maintenance facility operations, including the main fleet maintenance building, automatic train wash and wheel lathe would be enclosed within individual buildings to minimise potential noise impacts to surrounding sensitive receivers.

4.2.7 Sustainability

The current design for the new intercity maintenance facility has been undertaken in accordance with Transport for NSW's *Sustainable Design Guidelines for Rail* (Transport for NSW, 2014) which groups sustainability into seven themes:

- Energy and greenhouse gases
- Climate resilience
- Materials and waste
- Biodiversity and heritage
- Water
- Pollution control
- Community benefit.

A holistic approach to sustainability has been adopted to ensure exceptional environmental and design quality outcomes for the new intercity maintenance facility. A selection of the sustainable design initiatives proposed as part of the current design of the facility include:

- Modular design of the facility buildings
- A façade shading system designed to minimise heat gain and maximise reflected light
- Building orientations which maximises north and south facades
- Skylights incorporated above the atrium spaces to direct sunlight into internal building spaces, increasing the amount of ambient light and reducing energy consumption
- Design of internal spaces to maximise glazing panels to allow facilitation of daylight into work areas
- Use of recycled rainwater in cooling towers to reduce potable water usage
- Detention ponds which would be incorporated into the design to mitigate flooding, and the design capacity which allows for climate change, in addition to re-use for emergencies such as bushfires.
- Re-use of test drain water from sprinkler systems

- Connection points within central plant to facilitate a precinct-wide central energy plant
- Consideration of solar photovoltaic and hot water panels at roof level.

Additional sustainability initiatives to be further explored during future design stages include:

- Zoned lighting controls on movement and lighting sensors (absence detection)
- Daylight dimming in public areas
- Integration of LED and low energy lighting
- Additional passive ventilation methods
- High levels of insulation and air-tightness are proposed to reduce heat loads
- Light coloured finishes for pathways could be utilised
- Use of alternative fuel to be sourced by the nominated contractor during construction
- Opportunities for the nominated contractor to reuse construction materials in temporary works
- Potential to mulch some of vegetation to be cleared for re-use on site.

4.3 Land requirements

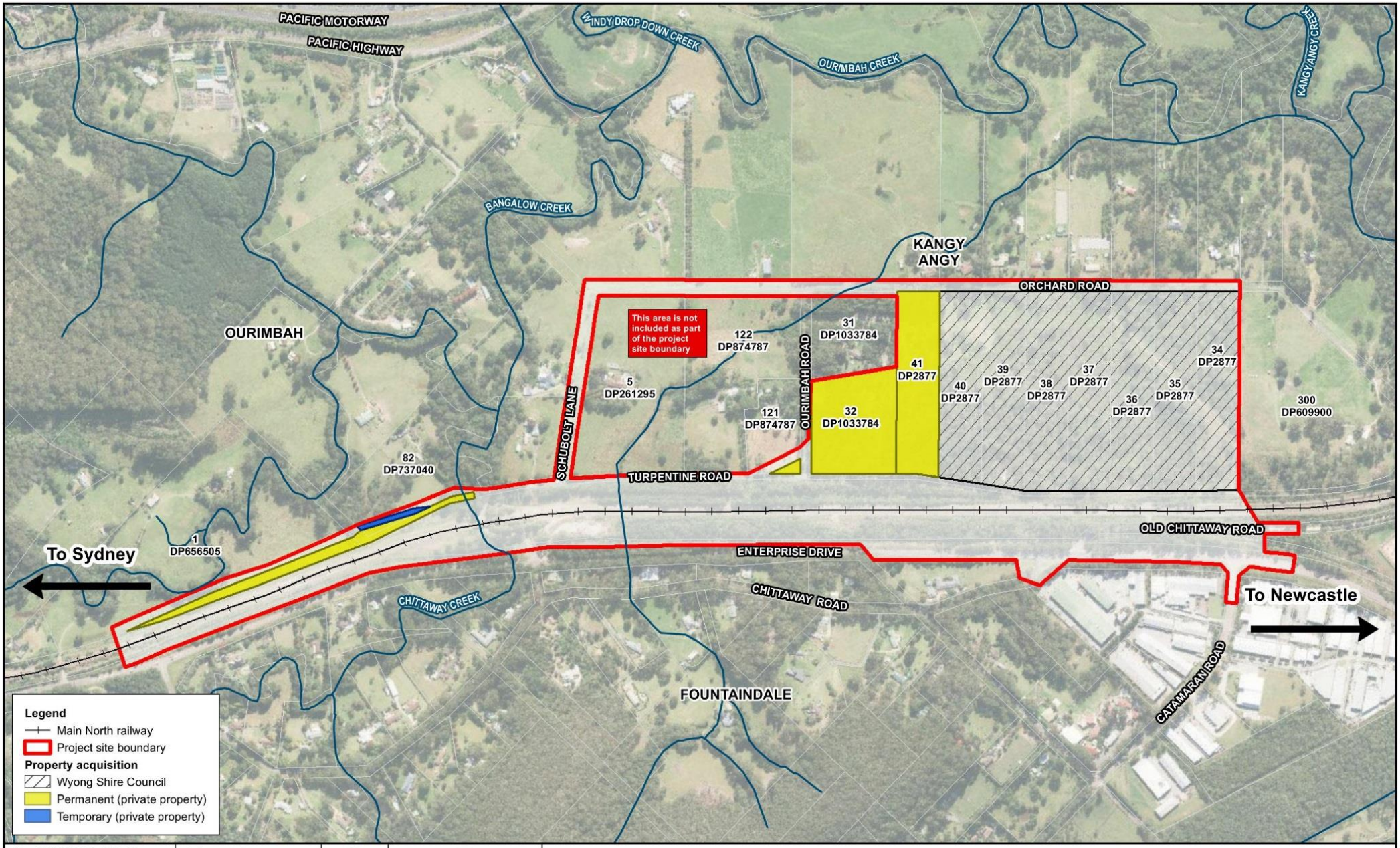
4.3.1 Land required for permanent works

As described in section 4.1, the new intercity maintenance facility would cover an area of approximately 500,000 square metres. To accommodate this area, a number of properties would be required for the permanent works associated with the facility. The land proposed for acquisition is required to accommodate all permanent works, including access roads, the fleet maintenance facility buildings, tracks, new rail bridges, rail embankment widening, road and utility deviations, environmental and drainage control measures (such as detention ponds).

Landowners which would be affected by the new intercity maintenance facility would include:

- Sydney Trains
- Central Coast Council
- Ausgrid
- Private residents along Turpentine Road, Ourimbah Road and Orchard Road.

Transport for NSW has already acquired, or commenced the process of acquisition for a number of properties for the construction and operation of the new intercity maintenance facility. A summary of the required property acquisition for the permanent works is outlined in Table 4.1 below and shown on Figure 4.7.



Map: 2202522A_GIS_F021_A3	Author: suansrir
Date: 13/05/2016	Approved by: -

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Coordinate system: GDA 1994 MGA Zone 56

Scale ratio correct when printed at A4

Data source: - © Land and Property Information 2015

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New Intercity Fleet Maintenance Facility Project
Figure 4.7
Land acquisition

Table 4.1 Property acquisition required

Lot(s)	Deposited Plan	Street address	Current property ownership	Acquisition required	Approximate area (m^2)
1	656505	137 Enterprise Drive	Private	Partial acquisition to accommodate the rail embankment widening at this location.	7,251
82	737040	16 Turpentine Road	Private	Partial acquisition to accommodate the rail embankment widening at this location.	816
121	874787	12 Ourimbah Road	Private	Partial acquisition to accommodate the adjustment to the alignment of Turpentine Road at its intersection with Ourimbah Road.	832
32	1033784	11 Ourimbah Road	Transport for NSW	This property has been acquired by Transport for NSW.	30,180
34-40	2877	55 Orchard Road	Central Coast Council	Full acquisition of these properties would be required to accommodate the Project.	207,780
41	2877	53 Orchard Road	Private	Full acquisition of this property would be required to accommodate the Project.	27,640

Transport for NSW is currently in the process of negotiating with existing private property owners and Central Coast Council for the acquisition of their respective land holdings in accordance with the (NSW) *Land Acquisition (Just Terms Compensation) Act 1991*.

In addition to the land identified in Table 4.1, the following land would also be required as part of the permanent land requirements for the new intercity maintenance facility to accommodate construction of the new maintenance facility access road, intersection upgrades along Enterprise Drive, new rail track and the traction substation (as shown within the Project site boundary on Figure 4.2):

- A portion of Old Chittaway Road
- A portion of Enterprise Drive
- A portion of the Main North line rail corridor.

Some partial acquisition of Turpentine, Ourimbah and Fountain roads (both made and unmade parts) would also be required.

Transport for NSW would consult with Central Coast Council and Sydney Trains as the respective owners of these areas as part of the ongoing design of the Project for the use of these areas of land.

Subdivision

As described above, the Project would involve the acquisition of private and public land. In some cases subdivision or boundary adjustments may be required at the completion of the project.

Where a part of any lot is identified as being surplus to operational requirements or requiring boundary adjustment following the completion of construction, detailed Deposited Plans of subdivision would be developed and lodged for the subdivision of the land.

Note: Transport for NSW is a subdivision authority under the provisions of Section 109D of the EP&A Act.

4.3.2 Land required for temporary works

In addition to the area land required for the permanent facility components, some areas of temporary land take would also be required to accommodate Project construction elements such as:

- Construction compounds
- Temporary access
- Drainage control works.

While a majority of the Project could be contained within the larger areas of the maintenance facility site, the anticipated temporary land take areas which would be required during construction include the following and are shown on Figure 4.7.

- Approximately 1,250 square metres of Lot 82, DP 73040 to accommodate temporary construction work.
- Additional portions of the Main North railway and Old Chittaway Road reserve to accommodate construction compounds for proposed early works (including the maintenance facility access road, Enterprise Drive intersection works, the two new rail bridges, and service under bores under Enterprise Drive and Main North Line).

Temporary land within the identified Project site boundary that is required for the construction period (i.e. the stockpile site) would be leased from the owners for the duration of the construction period. This land would then be returned to the owner after being rehabilitated to its original state or a state agreed upon through consultation with the landowner.

4.4 General construction approach

4.4.1 Construction program and staging

Subject to determination and approval, early works associated with the construction of the Project (including utilities diversions, the new access road, general roadworks, and other enabling works) are anticipated to commence in early 2017. Full construction of the new intercity maintenance facility is expected to commence in mid-2017. Operation of the maintenance facility is scheduled to commence in 2019.

An indicative construction program and outline of the key construction activities for each of the proposed stages of construction is provided in Table 4.2. Based on the current construction program and activities, the total construction program for the Project would be approximately 33 months.

The construction activities presented in Table 4.2 are based on the current concept design and will be subject to confirmation by the nominated construction contractor (not yet appointed). Any material changes to the construction methodology which could result in additional environmental impacts to those assessed in this REF would be the subject of additional environmental assessment.

Table 4.2 Indicative construction and commissioning program and activities

Stage	Construction activities	Target duration (approx.)
Project enabling works	→ Initial enabling works such as construction of services under bores along Enterprise Drive and the Main North railway. → Establishment of traffic management arrangements. → Relocation of overhead high voltage power lines on Old Chittaway Road.	3 months
	→ Construction of external access road and bridge into maintenance facility site.	10 to 12 months
	→ Relocation of high voltage overhead wire power lines on maintenance facility site.	6 months

Stage	Construction activities	Target duration (approx.)
	→ Relocation of existing combined services route on the down main (western) side of the Main North railway to the up main (eastern) side.	3 to 6 months
	→ Construction of the rail bridges at Turpentine Road/Chittaway Creek.	9 months
Preconstruction works, site establishment and early works	→ Property adjustments and land acquisition. → Installation of environmental protection and water quality works. → Establishment of construction compound sites. → Vegetation clearing. → Establishment of traffic management arrangements. → Isolating work areas from the live rail corridor.	2 months
Main construction works	→ Topsoil stripping and bulk earthworks from cut areas to fill areas along rail line. → Earthworks, including import of fill (as required). → Construction of drainage works (pipes, flow channels, swales etc.). → Main building construction. → Track work laying -ballast, sleepers, rail. → Signalling and overhead wiring systems. → Construction of high voltage substations. → Construct other facilities (train wash, decant, diver amenity, wheel lathe, water treatment plants). → Services connections and reticulation: potable water, fire water, recycled water, sewer, power, and communications. → Final maintenance facility site roads and car park, etc. → Urban design and landscaping works.	24 months
Post construction: testing and commissioning	→ Testing and commissioning of railway systems and signals.	2 months
Post construction demobilisation	→ Removal of temporary construction facilities. → Rehabilitation and landscaping of the work site and affected areas. → Removal of temporary environmental controls once landscaping has been established.	3 months

Note: Some of the construction and commissioning activities would overlap between the stages

4.4.2 Construction workforce

It is anticipated that up to approximately 200 construction staff (typical working day) and 300 construction staff (during peak times/rail close down periods) would typically be required on-site during construction.

4.4.3 Construction work hours

The majority of the proposed construction works would be carried out during standard construction hours:

- → 7.00 am to 6.00 pm – Monday to Friday
- → 8.00 am to 1.00 pm – Saturdays
- → No work on Sundays or public holidays, with the exception of works undertaken during rail close downs (refer to section 4.4.4).

Exemptions and approval for works outside of the above standard construction hours may be required during the following circumstances:

- Works required by utility service providers or where impacts to services cannot be reasonably managed
- Works requiring rail closedowns (as outlined in section 4.4.4)
- Oversized deliveries/unloading of machinery than can only travel between hours specified by the police or Roads and Maritime Services
- Where works can be undertaken so as to be inaudible at the nearest residential receivers
- As otherwise agreed with the NSW Environment Protection Authority (EPA) for works subject to an Environment Protection Licence (EPL), or otherwise Transport for NSW.

4.4.4 Rail closedowns

Rail closedowns (also known as possessions) are periods when part of the rail network is temporarily shut down in order to facilitate maintenance, construction or emergency works within the rail corridor in a safe manner when trains are not operating. During these periods rail services and access to train services would be suspended and replacement buses would operate.

Rail closedowns are normally conducted at weekends or holiday periods as scheduled by the rail operator. These periods are traditionally quieter periods with lower patronage demand and, therefore, it is expected that disruptions and impacts would be less.

The local community (including residents and businesses) would be notified in advance of any out-of-hours works that are likely to be audible at adjacent sensitive receivers, including mid-week, night time and weekend rail closedowns.

Construction activities that are likely to be undertaken during a rail closedown would include (but are not limited to):

- Any civil works within three metres of the live track, including earthworks, drainage, signalling and track work
- Installation of new mainline switch and crossings
- Installation of under bore crossings
- Alteration and installation to overhead wiring and structures within three metres of the
- Live track and installation of new overhead wire crossings
- Installation of new rail bridge superstructure over the live tracks for the new access road
- Signalling commissioning.

The number of temporary rail closedowns required for the Project would be determined by Sydney Trains in consultation with Transport for NSW and the nominated construction contractor during detailed design, however the overall number of temporary rail closedowns required are expected to be limited.

4.4.5 Construction plant and equipment

Table 4.3 provides an indicative list of construction equipment required during the construction program. The final construction equipment list would be confirmed by the nominated construction contractor during the detailed design and construction programming for the Project.

The construction scenarios outlined in Table 4.3 are as follows:

- A – Access Road
- B – Access and rail bridges
- C – Combined Services Route and high voltage relocation
- D – Under bores
- E – Bulk earthworks
- F – Drainage works
- G – Track work
- H – Main building work
- I – Plant and services

Table 4.3 Indicative construction equipment

Construction equipment	A	B	C	D	E	F	G	H	I
Piling rigs		✓						✓	
Sheet piling		✓		✓		✓			
Cranes		✓	✓	✓		✓	✓	✓	✓
Front end loader, skid steer	✓	✓	✓		✓	✓	✓	✓	
Trucks	✓				✓	✓	✓		
Concrete truck	✓	✓		✓	✓	✓		✓	✓
Pumps		✓		✓		✓		✓	✓
Dozers	✓				✓	✓	✓		
Excavators	✓	✓	✓	✓	✓	✓	✓	✓	✓
Compressors		✓	✓	✓		✓	✓	✓	✓
Shotcrete hoses		✓		✓	✓	✓		✓	
Graders	✓				✓				
Vibratory rollers, compactors	✓	✓	✓		✓	✓	✓	✓	✓
Scaffolding		✓						✓	✓
Drills, breakers				✓			✓	✓	
Hi rail dumpers							✓		
Tamper regulator							✓		
Rail grinder							✓		
Rail saw							✓		
Thermit welding							✓		
Semi-trailers	✓	✓	✓				✓	✓	✓
5-tonne dumpers							✓		

4.4.6 Earthworks

Given the relatively flat nature of the site, it is not anticipated that substantial earthwork volumes would be required to be moved as part of the Project. However, some levelling of the site and other earthworks would be required, in particular with respect to the construction of the new rail embankments and new access road off Enterprise Drive.

An outline of the estimated cut and fill requirements for the Project are provided in Table 4.4.

Table 4.4 Estimated cut and fill requirements

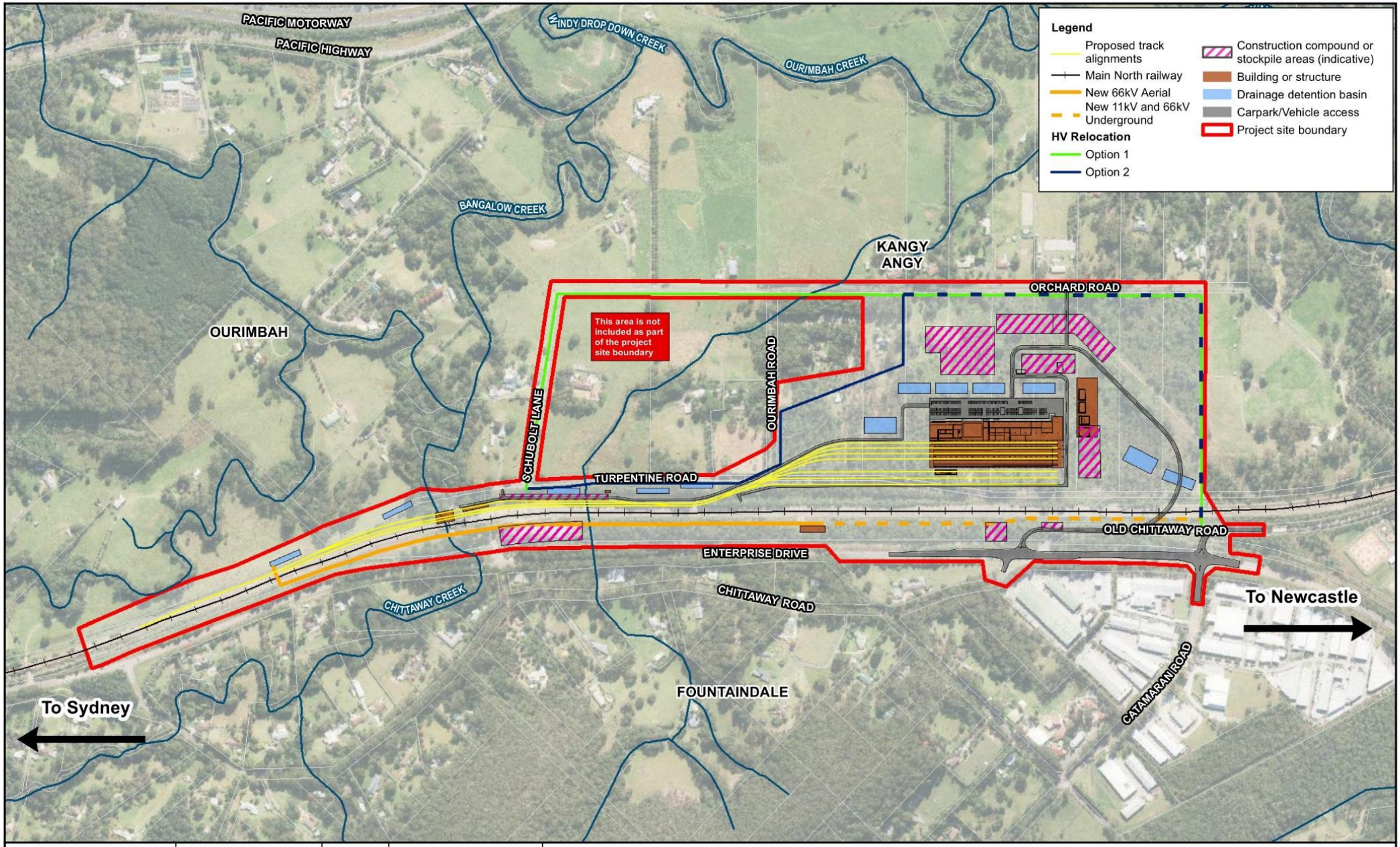
Activity	Approximate volume (cubic metres)
Rail embankment	
General fill	11,500 m^3
Imported fill (capping and structural zone)	30,000 m^3
Topsoil strip and stockpile	4,000 m^3
Maintenance facility site	
Net cut for rail embankment	Between 11,500 m^3 and 26,500 m^3 (depending on subgrade quality)
Expected topsoil strip and stockpile	11,500 m^3
Imported fill (capping and structural zone)	Between 49,000 m^3 and 98,000 m^3 (depending on subgrade quality)

4.4.7 Construction worksite, potential compounds and storage

Following site establishment, the whole site would be utilised for the construction of the maintenance facility. As part of the indicative construction of the Project, a series of construction compounds (for activities including stockpile sites and laydown areas) within the identified Project site boundary have been identified.

The indicative location of these compounds are shown on Figure 4.8 and would comprise the following:

- Along Enterprise Drive and Old Chittaway Road to allow for the proposed enabling works including:
  - the new access road and bridge located off Enterprise Drive to the main maintenance facility site over the Main North railway
  - combined services route and high voltage power line relocations
  - under bores of Enterprise Drive and the Main North railway to allow for new and/or relocated services
  - two new rail bridges over Chittaway Creek and Turpentine Road.
- Within the main construction area for the Project to allow for the construction of the maintenance facility and associated works.



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Scale ratio correct when printed at A4

Note: Design is indicative only.
Subject to detailed design

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New Intercity Fleet Maintenance Facility Project
Figure 4.8
Indicative construction compounds and storage areas

4.4.8 Construction traffic and construction access

Construction traffic would comprise vehicles transporting equipment, materials and spoil, as well as workers vehicles.

During construction it would be necessary to move various amounts of on-site excavated materials from cuttings to fill areas in order to provide a level site and to provide the required embankments for the new railway line.

Construction vehicle access during enabling works would be mainly on the up main (eastern) side to the construction compounds and enabling works areas. Limited access would be available to the down main (western) side, via Turpentine Road, as this road would be limited to smaller construction vehicles due to both the current road standard and the low clearance of the existing bridge.

Construction vehicle access during the main works contract would occur via the new access road (which would be constructed during as part of the enabling/early works) (refer to Figure 4.9). As a result, these vehicles would generally not be required to pass the existing residential properties or driveways located along Orchard Road, Ourimbah Road or Turpentine Road.

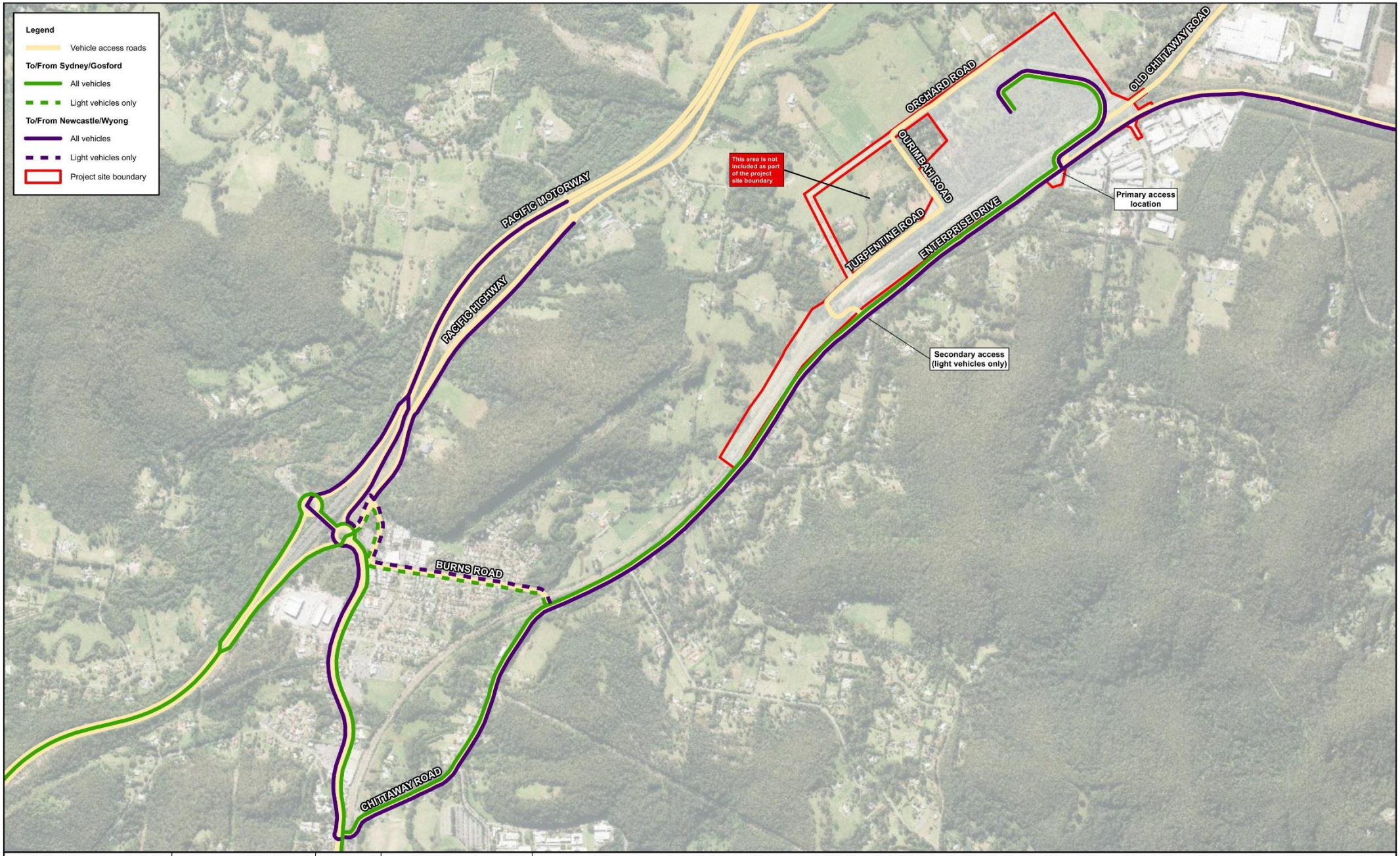
Within the site the movement of construction plant and equipment will be within the acquired land and rail corridor.

The number of light motor vehicles would typically be limited to the number of workers anticipated on the site. During a typical working day, it is assumed that a majority of the light vehicle movements would occur within approximately an hour period prior to 7.00 am (when employees arrive at work) and after 5.00 pm (when employees depart from work). During rail closedown periods, the arrival and departure of construction staff is anticipated to occur late at night/early in the morning.

It is further expected that up to approximately six heavy vehicles per hour on average could be arriving and departing from the site. These vehicles would be delivering construction materials and equipment.

Where feasible, the excavated material would be reworked (if necessary) and used to meet any on-site fill material needs. However, this may be impractical if the excavated material is unsuitable for the purposes of structural fill. In this case, fill material would need to be imported, and excavated material exported for reuse on other sites or for treatment or disposal.

The final earthwork quantities for the Project would be refined during the detailed design of the Project.



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Note: Design is indicative only.
Subject to detailed design

New Intercity Fleet Maintenance Facility Project
Figure 4.9
Access routes to and from the project site

4.5 Operation and maintenance

4.5.1 Commissioning

The commissioning phase of this Project would require specific activities to be undertaken to ensure that the operational requirements have been achieved to the required standards and that the facility meets the required asset life conditions. Inspections would be required for all infrastructure against the final design documentation and operational runs completed to ensure that all safety systems are fully functional and fail safe.

Items that would require inspection and specific commissioning plans prior to commencement of operation for the New Intercity Fleet would include the following:

- Main line connection and functionality
- All track and signalling systems
- Automatic train wash operation, maintenance and structures
- Wheel lathe operation, maintenance and structures
- Amenities
- Stores and relevant safety systems
- Overhead wire isolation within workshop
- All ancillary building, including sub stations, storage areas, cleaning pits
- Cranes and maintenance facility equipment, turn tables lifting jacks etc.
- Roads and designated walkways
- Full functionality test of all elements of the maintenance facility.

4.5.2 Operations

The main function of the facility is to provide a maintenance centre that supports the New Intercity Fleet of trains throughout their lifecycle. The maintenance facility would operate on a 24-hour, seven day a week basis. The primary functions of the facility are to:

- Satisfy the Level 1 maintenance requirements (trip servicing and provisioning) of the New Intercity Fleet enabling fast turn-around times and allowing for prompt return of trains into service
- Satisfy the Level 2 and 3 maintenance requirements (light and heavy maintenance) of the New Intercity Fleet enabling the maintenance contractor to achieve the performance requirements of the contract
- Implement a design which does not prohibit requirements pertaining to future development of the facility, which may comprise of the possible inclusion of additional maintenance and stabling bays for train facilities to compensate for fleet expansion in future.

The following sections provide a summary of the operational activities associated with the Project.

Maintenance facility activities

Operation of the maintenance facility would typically be undertaken in three shifts as follows:

- 6.00 am to 2.00 pm
- 2.00 pm to 10.00 pm
- 10.00 pm to 6.00 am.

The typical maintenance activities to be carried out at the new intercity maintenance facility site at Kangy Angy would be based on the three levels of maintenance activities undertaken for all train fleets across the Sydney Trains and NSW Trains networks. A summary of these activities is described below.

Level 1 maintenance

Typical maintenance at the new maintenance facility would consists of minor repairs (including the rectification of normal wear and tear on interior trim, panels, toilets, signage, window film etc.), interior cleaning of the train carriages, emptying of toilets, exterior washing and correction of vandalism and graffiti. These activities would be carried out on a 24-hour basis. Exterior washing of the New Intercity Fleet trains would also be undertaken on a typically weekly basis.

If issues requiring substantial work arises from the general maintenance and cannot be undertaken as a minor repair, the operators of the maintenance facility would source an alternative train in order to maintain passenger services.

Level 2 maintenance

This includes planned routine maintenance examinations or for maintenance of trains that are unfit for service due to graffiti and/or vandalism. Level 2 maintenance would also include other activities such as wheel lathe attention and replacement of defective major components such as bogies, compressors or train carriage couplers.

Level 3 maintenance

After a number of years, major components such as bogies, couplers, gangways and compressors would need to be replaced or overhauled due to normal wear and tear. It is expected that this level of maintenance would be required to be undertaken at approximately six and 12 year intervals.

Proposed staffing

The new intercity maintenance facility would have up to approximate 200 employees over a 24 hour period during the operation stage, with approximately 50 to 60 employees on duty at any one time. During the normal weekday day shift, this number could increase by a further 10 office staff.

Operating arrangements for fleet arrival and departure

A number of trains would enter and exit the maintenance facility site throughout each 24-hour period. The initial operating arrangement for arrivals and departures into the maintenance facility would include the following daily movements:

- *Morning departures*: at start of day (4.00 am to 7.00 am), approximately three trains would enter service from the maintenance facility
- *Inter-peak arrivals and departures*: between the morning and afternoon peaks, approximately five trains would arrive on site, be washed and cleaned, then depart the site into service approximately 30 minutes after arrival. This timing is based upon minor interior cleaning
- *Evening arrivals*: at end of day (7.00 pm to 2.00 am), approximately three trains would leave service for stabling and/or maintenance.

A summary of the total estimated number of trains arriving and departing the facility per day is shown in Table 4.5 below.

Table 4.5 Estimated number of trains arriving and departing the maintenance facility

Time	Direction	Train movements (Total)
Morning	Departures	3
Morning	Arrivals	5
Afternoon	Departures	5
Afternoon	Arrivals	3
Total Daily	**Departures**	**16**
	Arrivals	**16**

Source: Concept of Operations Report (Transport for NSW 2016)

Stabling of the New Intercity Fleet

At this time, stabling of the New Intercity Fleet would be routinely at Eveleigh between morning and evening peaks. Stabling the fleet at this location reflects the demand for the fleet which brings large volumes of customers into the city each morning and is used more lightly off-peak before carrying the demand back from the city to suburban and regional centres in the evening. Outside of this period, it is anticipated that the existing stabling arrangements at Flemington, Mount Victoria, Gosford and Wollongong would continue to provide overnight stabling of services.

5 STATUTORY AND PLANNING CONSIDERATIONS

This chapter outlines the statutory requirements and explains the environmental planning process and approvals process for the construction and operation of the Project. The environmental planning instruments relevant to the construction and operation of the Project are also outlined.

5.1 NSW Government legislation and regulations

The Project comprises an 'activity' for the purposes of Part 5 of the (NSW) *Environmental Planning and Assessment Act 1979* (EP&A Act) by reason of clause 79 of *State Environmental Planning Policy (Infrastructure)* 2007 (the Infrastructure SEPP). Specifically, Clause 79 of the Infrastructure SEPP outlines that development for the purpose of railways and railway infrastructure facilities, which include 'maintenance, repair and stabling facilities for rolling stock', are permissible without the need for development consent under Part 4 of the EP&A Act when undertaken by a public authority. Further details regarding the Infrastructure SEPP are provided in section 5.3.1 of this REF.

As the determining authority for the purposes of Part 5 of the Act, Transport for NSW must:

- Examine and take into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of that activity, in accordance with Section 111 of the EP&A Act
- Determine whether or not the activity is likely to significantly affect the environment or is likely to significantly affect threatened species, populations and ecological communities.

Chapter 7 of this REF assesses the likely effect of the Project on the environment and threatened species, populations and ecological communities. Having regard to the provisions of Sections 111 and 112 of the EP&A Act, a desktop analysis of existing vegetation mapping and field validation surveys identified that the vegetation within the Project site was comprised of four vegetation communities. Of these, only one threatened ecological community was identified within the project survey area; Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregion listed as Endangered under the (NSW) *Threatened Species Conservation Act 1995* (TSC Act). Based on the potential impacts, a Species Impact Statement (SIS) was considered to be required and has been prepared as part of the assessment of the Project. Further details regarding the SIS is provided in section 5.5.1 and section 7.1 of this REF.

The remaining impacts associated with the Project are not anticipated to be significant with the implementation of suitable management and mitigation measures, and therefore an Environmental Impact Statement (EIS) is not considered to be required for the Project.

5.1.1 Assessment and approval process under Part 5

Transport for NSW has prepared this REF, which includes appropriate mitigation measures to manage and minimise impacts on the environment (refer to Chapter 7). The REF document will be made publicly available from 6 June 2016 to 4 July 2016. During the display period, the community would be encouraged to make submissions to Transport for NSW on the Project and information contained in the REF. Following the display period, Transport for NSW will consider issues raised in submissions and respond to community feedback in a submissions report. If required, Transport for NSW may also propose changes to the Project and detail these in the submissions report. These documents will be available to the public via the Transport for NSW website (www.transport.nsw.gov.au/Projects).

Following the preparation of the submissions report, Transport for NSW will determine whether to proceed with the Project. If the Project proceeds, it would be designed, constructed and operated in accordance with the mitigation measures outlined in this REF, the submissions report and any additional conditions of approval.

The planning approvals process for the Project under Part 5 of the EP&A Act is outlined in Figure 5.1.

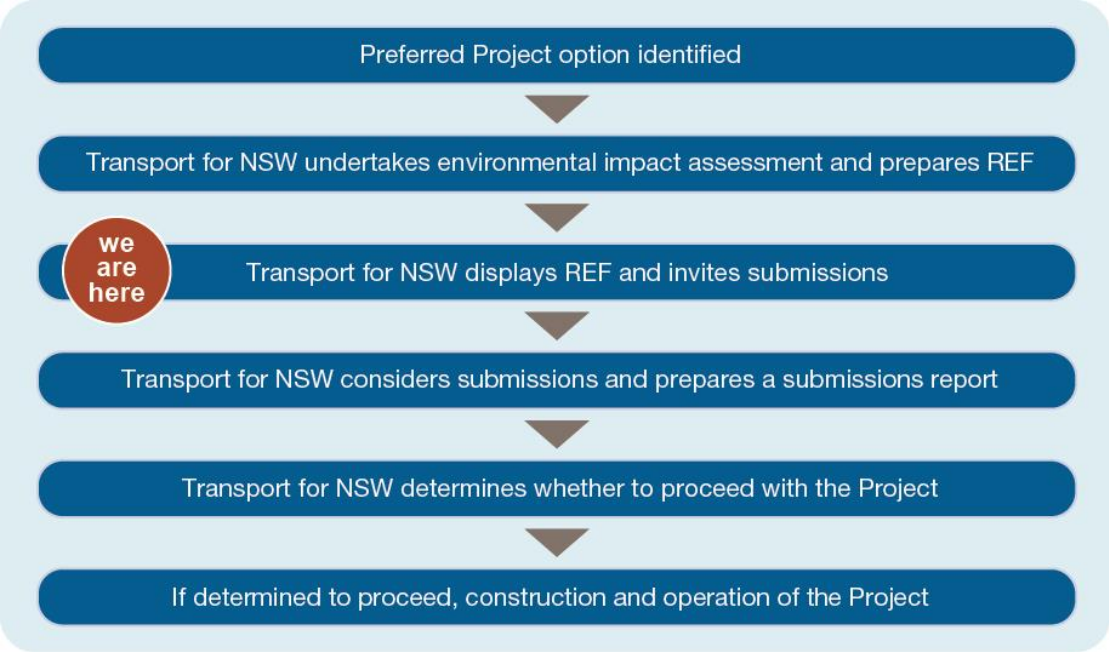


Figure 5.1 Planning approvals process for the Project

In addition, as described above, a SIS for the Project has been prepared under Section 112 of the EP&A Act in accordance with the Chief Executive Requirements (CER's) which were issued for the SIS by the Office of Environment and Heritage on 11 February 2016. For the purpose of the SIS, the OEH would be a concurrent determining authority for the Project (in addition to Transport for NSW) in accordance with Part 5 of the NSW EP&A Act. Commencement of the construction of the Project would not occur until approval determinations from both authorities have been obtained.

5.1.2 Sustainability requirements under the EP&A Act

Schedule 2 of the (NSW) *Environmental Planning and Assessment Regulation 2000* (EP&A Regulation), and Section 6(2) of the (NSW) *Protection of the Environment Administration Act 1991* outline the four principles of ecologically sustainable development (ESD). Transport for NSW is committed to ensuring that its Projects are implemented in a manner that is consistent with the principles of ESD, which are:

- *The precautionary principle*: If there are threats of serious or irreversible damage, a lack of full scientific uncertainty should not be used as a reason for postponing measures to prevent environmental degradation.
- *Intergenerational equity*: The present generation should ensure that the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations.
- *Conservation of biological diversity and ecological integrity*: The diversity of genes, species, populations and their communities, as well as the ecosystems and habitats they belong to, should be maintained or improved to ensure their survival.
- *Improved valuation, pricing and incentive mechanisms*: Environmental factors should be included in the valuation of assets and services.

Transport for NSW has considered these principles and broader sustainability themes in the development of the Project. A discussion of how the Project has considered the principles of ESD, including sustainability initiatives incorporated into the Project, is provided in section 4.2.7 and Chapter 9 of this REF.

5.2 NSW Government policies, strategies and State priorities

5.2.1 State Priorities – *NSW: Making It Happen*

In September 2015, the NSW Government announced a series of State Priorities as part of *NSW: Making It Happen* (NSW Government, 2015). The State Priorities are intended to guide the ongoing actions of the NSW Government across the State and guide resource allocation and investment in conjunction with the NSW Budget. *NSW: Making it Happen* focuses on 12 key 'priorities' to achieve the NSW Government's commitments. These priorities range across a number of issues including infrastructure, the environment, education, health, wellbeing and safety in addition to Government services.

One of the 12 priorities identified as part of *NSW: Making It Happen* relates to investment in building infrastructure. The ongoing development and investment in the New Intercity Fleet is identified as one of the series of projects for delivery on as part of the wider building infrastructure priority.

The development of the proposed New Intercity Fleet Maintenance Facility would therefore meet the identified building infrastructure priority by providing a dedicated facility to maintain and service the proposed new fleet of intercity trains which are designed to replace the current, ageing trains which operate of the intercity network. The new fleet of trains would provide an enhanced customer experience for customers travelling from the Central Coast, Newcastle, the Blue Mountains and South Coast and the dedicated maintenance facility would assist in maintaining the reliability of these long distance train services.

5.2.2 NSW Long Term Transport Master Plan and Sydney's Rail Future

The *NSW Long Term Transport Master Plan* (NSW Government 2012a; 'Transport Master Plan') is a 20-year plan to improve the NSW transport system. It provides the basis upon which further detailed transport planning, including the Project, can be undertaken. The Transport Master Plan considers the future population growth and employment precincts within the State (including Sydney) and outlines the capabilities and limitations of the transport network for all transport modes (including buses, heavy rail, light rail, ferry and private vehicles) to provide clear direction for future transport investigations.

A key element of the Transport Master Plan and in particular Sydney's Rail Future, is the need to create a more reliable intercity service as well as providing new intercity trains which focus specifically on the needs of longer distance customers. As a result, the procurement of a new fleet of intercity trains was identified to support the needs of these longer distance rail customers.

As part of the delivery of the New Intercity Fleet, it was identified that a new maintenance facility was required to support the ongoing maintenance of these new trains. The proposed New Intercity Fleet Maintenance Facility is therefore an important component in achieving one of the aims of the Transport Master Plan.

5.2.3 State Infrastructure Strategy

The NSW Government's *State Infrastructure Strategy 2012–2032* (Infrastructure NSW 2012; 'State Infrastructure Strategy') sets out and commits to the State's infrastructure delivery and reform priorities over the next five years. The strategy is designed to complement the Transport Master Plan. A core element of the State Infrastructure Strategy is the development of a pipeline of Projects that prioritises investment, and delivery and operation of these Projects. The strategy seeks to prioritise Projects that maximise economic benefits for the State, while also considering the capacity of the Government to fund new Projects.

The State Infrastructure Strategy supports the ongoing aim to provide reliable, frequent and fast passenger trains as an essential part of the economic success of NSW and of the amenity of life, particularly in Global Sydney. The investment in the New Intercity Fleet which will carry Central Coast, Newcastle, the Blue Mountains and South Coast customers to and from Sydney, would assist in improving and maintaining access to the Global Sydney region for those residents who live outside of Sydney. To support the new fleet, the construction of the proposed new intercity maintenance facility at Kangy Angy is required, and therefore is also considered to support the overall aims of the State Infrastructure Strategy.

5.3 Environmental planning instruments

5.3.1 State Environmental Planning Policy (Infrastructure) 2007

As discussed in section 5.1, the Infrastructure SEPP outlines the permissibility and development controls for infrastructure works and facilities. Specifically, clause 79 of the Infrastructure SEPP outlines what railway facilities are permissible without the need for development consent under Part 4 of the EP&A Act. Rail infrastructure facilities are defined in Clause 78 of the SEPP, which includes 'maintenance, repair and stabling facilities for rolling stock' (part (g) of the definition of 'rail infrastructure facilities').

The proposed new train maintenance facility is considered consistent with the definition of development for the purpose of a "railway or rail infrastructure facility' under the Infrastructure SEPP and therefore does not require development consent under Part 4 of the EP&A Act.

5.3.2 State Environmental Planning Policy (State and Regional Development) 2011

The proposed facility is not listed in the State Environmental Planning Policy (State and Regional Development) 2011 (SRD SEPP) and has not been declared State Significant Infrastructure.

5.3.3 State Environmental Planning Policy No.44 — Koala Habitat

State Environmental Planning Policy No. 44 – Koala Habitat Protection (SEPP 44) aims to encourage the proper conservation and management of natural vegetation areas that provide habitat for koalas to ensure that permanent, free living areas are maintained over their present range. The policy applies to a number of LGA's across NSW, including the Central Coast LGA.

As outlined in section 5.1.1 the Project is being assessed under Part 5 of the EP&A Act and as such is not part of a development application to be assessed by Central Coast Council, therefore SEPP 44 does not apply to the Project.

The intent of SEPP 44 was however considered during the preparation of this REF, as outlined in the *Biodiversity Assessment Report* (WSP | Parsons Brinckerhoff) attached as Appendix A. This assessment identified that the Project site was found to contain two Koala feed tree species as listed in Schedule 2 of SEPP 44, being *Eucalyptus robusta* and *E. tereticornis*. *Eucalyptus robusta* was identified to occur within the Project site at a density of greater than 15 per cent of the canopy layer and was therefore assessed as containing potential Koala habitat under the conditions contained in SEPP 44. Opportunistic surveys over the study area found no evidence of Koala habitation with the study area.

5.3.4 State Environmental Planning Policy No. 55 — Remediation of Land

State Environmental Planning Policy No.55 — Remediation of Land (SEPP 55) provides for a consistent state-wide planning approach to the remediation of contaminated land. The policy states that land must not be developed if it is unsuitable for a proposed use because it is contaminated. If the land is unsuitable, remediation must take place before the land is developed.

As the Project is permissible without consent, the provisions of SEPP 55 do not apply. However, section 7.10 of this REF contains an assessment of the potential contamination impacts of the Project. As described, it is unlikely that any large-scale remediation (Category 1) work would be required as part of the Project. Should it be determined during future phases of the Projects design that remediation works are required for the maintenance facility site, these would be would be undertaken in accordance with this SEPP and a suitable remediation plan.

5.3.5 State Environmental Planning Policy No. 71 – Coastal Protection

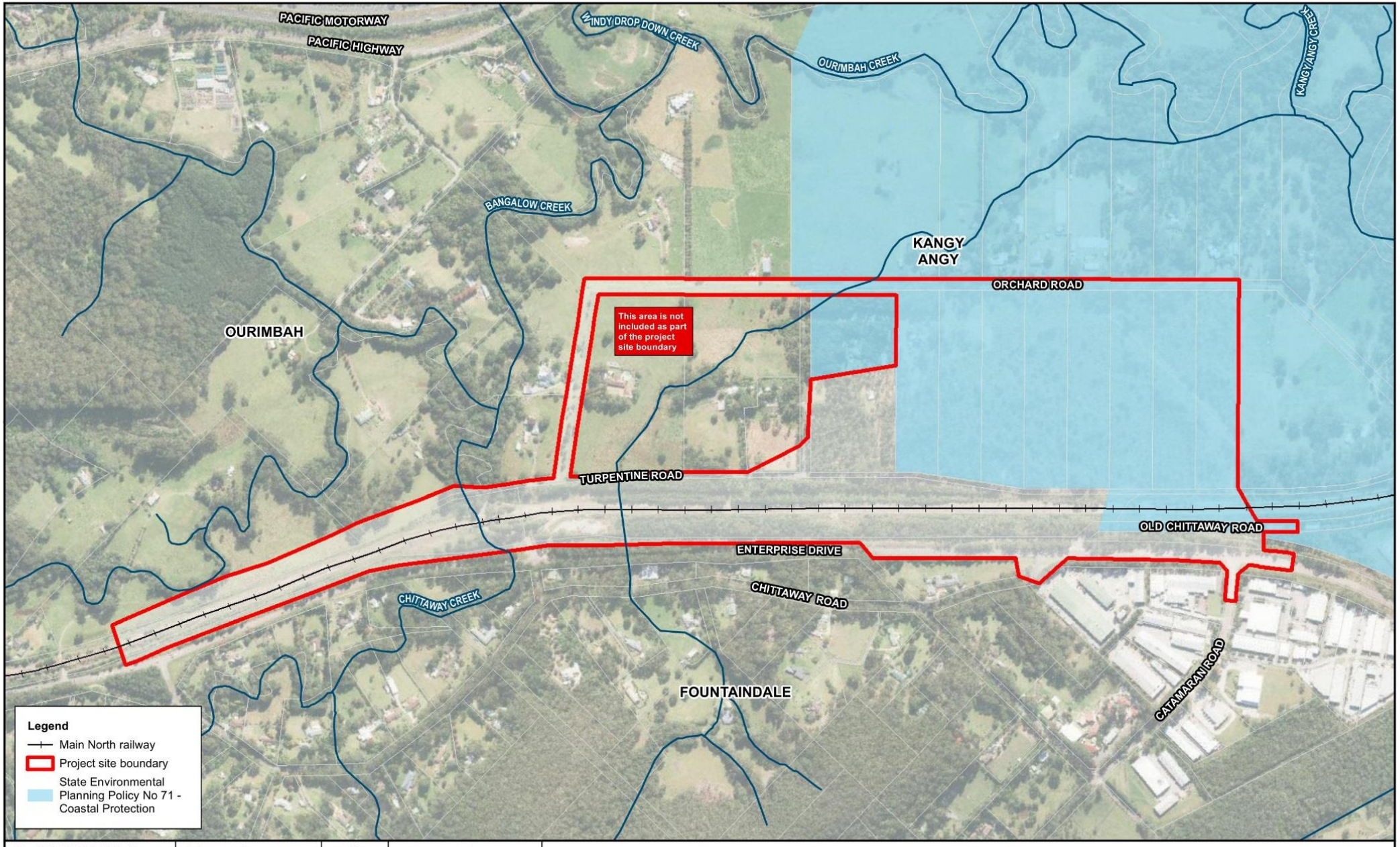
State Environmental Planning Policy 71 – Coastal Protection (SEPP 71) commenced on 1 November 2002. The Policy has been made under the EP&A Act to ensure:

- Development in the NSW Coastal Zone is appropriate and suitably located
- There is a consistent and strategic approach to coastal planning and management
- There is a clear development assessment framework for the Coastal Zone.

The site has been partly identified as being within the SEPP 71 'Coastal Zone' (as shown in Figure 5.2) and as such, the SEPP has been considered as part of the Project. Clause 8 of SEPP 71 identifies the matters for consideration for development located in the coastal zone. These include:

- Maintaining existing public access to and along the coastal foreshore and consideration of opportunities to improve or provide new access
- Consideration of the suitability of development given its type, location and design and its relationship with the surrounding area
- Consideration of any detrimental impact that development may have on the amenity of the coastal foreshore, including any:
  - substantial overshadowing of the coastal foreshore and any substantial loss of views from a public place to the coastal foreshore
  - impacts to the scenic qualities of the New South Wales coast
  - impacts to coastal processes and coastal hazards on development and any likely impacts of development on coastal processes and coastal hazards
  - impacts of development on the water quality of coastal waterbodies
- Consideration of existing wildlife corridors and the impact of development on these corridors
- Likely impacts of development on the water quality of coastal waterbodies
- The conservation and preservation of items of heritage, archaeological or historic significance.

As the maintenance facility site is located some distance from the coastal foreshore, the Project is not expected to have a detrimental impact on the amenity, environmental qualities or water quality of the coastal foreshore or coastal waterbodies. As such, it is not expected that the Project would impact on any of the relevant matters for consideration under the SEPP 71. Additional discussion regarding the potential impacts of the Project on ecology and heritage (in order to address the relevant matters for consideration) are is provided in section 7.1 and section 7.4 of this REF respectively.



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Date: 5/05/2016	Approved by: -

Data source: - © Land and Property Information 2015

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Coordinate system: GDA 1994 MGA Zone 56

Scale ratio correct when printed at A4

Note: Design is indicative only.
Subject to detailed design

New Intercity Fleet Maintenance Facility Project
Figure 5.2
SEPP 71 coastal protection zone

5.3.6 Wyong Local Environmental Plan 2013

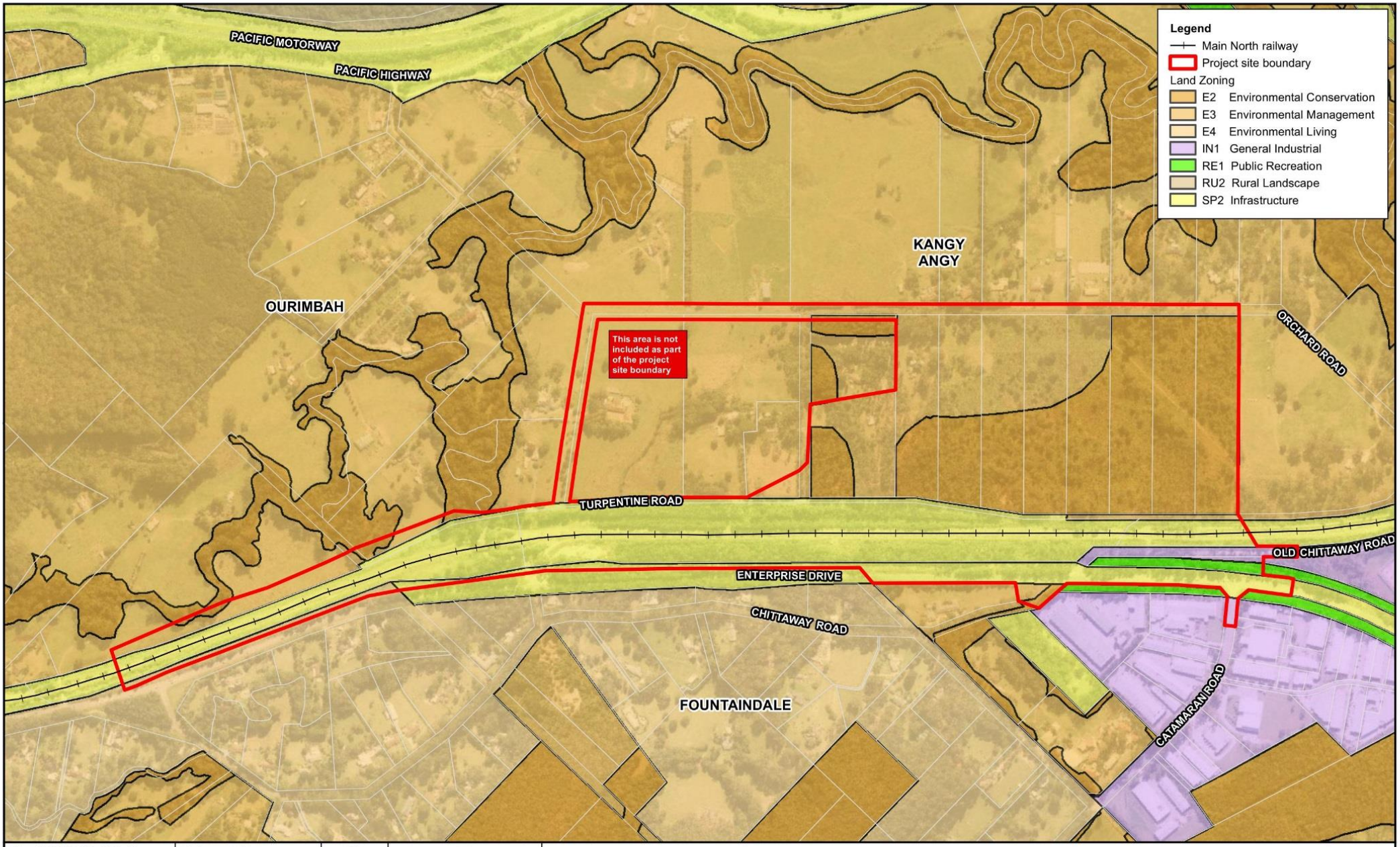
The New Intercity Fleet Maintenance Facility Project is situated within the Central Coast LGA. The operation of the Infrastructure SEPP means that local environmental plans (LEP's) would not apply to the extent that they impose controls which are inconsistent with the Infrastructure SEPP. However, during the preparation of the REF, the aims and objectives of the Wyong LEP 2013 (as the current LEP affecting the site), and the relevant land use zonings, were still considered. The proposed maintenance facility would be located across a range of zones as described in Table 5.1 and shown on Figure 5.3.

Table 5.1 Relevant land use zones and zone objectives

Zone	Zone objectives
IN1 General Industrial	→ To provide a wide range of industrial and warehouse land uses. → To encourage employment opportunities. → To minimise any adverse effect of industry on other land uses. → To support and protect industrial land for industrial uses. → To enable other land uses that provide facilities or services to meet the day-to-day needs of workers in the area.
SP2 Infrastructure	→ To provide for infrastructure and related uses. → To prevent development that is not compatible with or that may detract from the provision of infrastructure. → To recognise existing railway land and to enable future development for railway and associated purposes. → To recognise major roads and to enable future development and expansion of major road networks and associated purposes. → To recognise existing land and to enable future development for utility undertakings and associated purposes.
E2 Environmental Conservation	→ To protect, manage and restore areas of high ecological, scientific, cultural or aesthetic values. → To prevent development that could destroy, damage or otherwise have an adverse effect on those values. → To protect endangered ecological communities, coastal wetlands and littoral rainforests. → To enable development of public works and environmental facilities if such development would not have a detrimental impact on ecological, scientific, cultural or aesthetic values.
E3 Environmental Management	→ To protect, manage and restore areas with special ecological, scientific, cultural or aesthetic values. → To provide for a limited range of development that does not have an adverse effect on those values.

As noted in Table 5.1 above, the New Intercity Fleet Maintenance Facility Project would be consistent with the objectives of both the IN1 General Industrial and SP2 Infrastructure zones through including the provision of industrial land uses, encouraging increased employment opportunities, providing rail infrastructure related uses and recognising existing railway land and to enable future development for railway and associated purposes.

While it is acknowledged that the Project would result in a change to the overall environment and the identified intentions of the E2 Environmental Conservation and E3 Environmental Management zone objectives, the ongoing design of the Project has included consideration of these objectives in order to minimise potential impacts. In particular, throughout the ongoing design of the maintenance facility, the need to maintain and conserve as much of the existing vegetation on the site has been considered, including the retention of as much vegetation as possible, in particular along the boundaries of the site (refer to section 7.1 of this REF). Irrespective of the provisions of the Wyong LEP, the Project is permissible without consent under the provisions of the Infrastructure SEPP.



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Date: 5/05/2016	Approved by: -

Data source: - © Land and Property Information 2015

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Coordinate system: GDA 1994 MGA Zone 56

Scale ratio correct when printed at A4

Note: Design is indicative only.
Subject to detailed design

New Intercity Fleet Maintenance Facility Project
Figure 5.3
Zoning map

5.4 Approvals under other legislation

5.4.1 Threatened Species Conservation Act 1995

The TSC Act lists threatened species, populations or ecological communities to be considered in deciding whether there is likely to be a significant impact on threatened biota, or their habitats. If any of these are to be impacted by the Project, an assessment that addresses the requirements of section 5A of the EP&A Act must be completed to determine the significance of the impact.

A *Biodiversity Assessment Report* (WSP | Parsons Brinckerhoff, 2016a) (Appendix A) has been prepared to assess the impacts of the construction of the New Intercity Fleet Maintenance Facility. Significance assessments were carried out for threatened species, populations or communities listed under the TSC Act that were known or predicted to occur in the proposal locality (within a 10 kilometre radius of the study area) that had a moderate to high likelihood of occurring within the study area, based on suitable habitat and that were likely to be impacted upon by construction of the New Intercity Fleet Maintenance Facility.

A summary of the significance assessments undertaken for threatened biodiversity are provided in the *Biodiversity Assessment Report* (WSP | Parsons Brinckerhoff, 2016a) attached as Appendix A and summarised in section 7.1 of this REF. As the Project would result in clearing of native vegetation, including impact to a threatened species listed as Vulnerable under both the TSC Act and EPBC Act (*Melaleuca biconvexa*), it would be necessary to develop offset strategies to fulfil the requirements of 'maintain and improve' requirements of the Chief Executive's and OEH's requirements, in addition to Transport for NSW's *Vegetation Offset Guide* (Transport for NSW, 2013a). Further discussion regarding the offsets proposed for the Project are provided in the SIS which has been prepared for the Project.

The SIS has been prepared under Section 112 of the EP&A Act in accordance with the CER's which have been provided by the Office of Environment and Heritage under section 111 of the TSC Act. The CER's have been used to inform the preparation of the SIS and include specific requirements for the biodiversity impact assessment to address the potential ecological impacts of the New Intercity Fleet Maintenance Facility Project. For the purpose of the SIS, the OEH would be a concurrent determining authority for the Project (in addition to Transport for NSW). The SIS will also be available on the Transport for NSW website as part of the public display of the Project (www.transport.nsw.gov.au/Projects).

5.4.2 National Parks and Wildlife Act 1974

The *National Parks and Wildlife Act 1974* (NPW Act) provides for the control and management of all national parks, historic sites, nature reserves, wetlands and other state reserves. The Project is not within the boundary of a National Park. The NPW Act also provides for the protection of 'Aboriginal objects' and 'Aboriginal places'. Under the NPW Act, a person must not harm an Aboriginal object or place unless in accordance with an Aboriginal heritage impact permit (AHIP) issued under Section 90 of the NPW Act.

No registered Aboriginal sites within or in close proximity to the study area. However, outside of the existing railway corridor, the maintenance facility site is considered to have moderate or high archaeological potential. An Aboriginal archaeological survey report has been completed as part of this REF (refer to section 7.5 and Appendix E) which provides greater detail regarding the potential Aboriginal heritage impacts associated with the Project.

5.4.3 Native Vegetation Act 2003

The *Native Vegetation Act 2003* (Native Vegetation Act) manages the clearing of native vegetation in NSW. Section 25(g) of the Native Vegetation Act provides that any clearing that is part of an activity that is permissible without consent does not require approval under the Native Vegetation Act.

Clearing of native vegetation would be required for the construction of the Project (refer to section 7.1). While an approval to clear this vegetation is not required under the Native Vegetation Act, a comprehensive assessment of the extent and potential impact of the clearing has been completed as part of this REF (refer to section 6.1 and Appendix A). No further consideration of the Native Vegetation Act is considered to be required.

5.4.4 Noxious Weeds Act 1993

The *Noxious Weeds Act 1993* (NW Act) provides for the declaration of noxious weeds by the Minister for the Environment. Noxious weeds may be considered noxious on a national, state, regional or local scale. All private landowners, occupiers, public authorities and Councils are required to control noxious weeds on their land under Part 3 Division 1 of the NW Act. As such, if present, noxious weeds on the site should be assessed and controlled.

Three noxious weeds were recorded in the maintenance facility site, all of which would require control (refer to section 7.1.3). Mitigation measures to manage potential noxious weeds are provided in section 7.1.7.

5.4.5 Heritage Act 1977

The NSW *Heritage Act 1977* (Heritage Act) provides protection for items of 'environmental heritage' in NSW. 'Environmental heritage' includes places, buildings, works, relics, movable objects or precincts considered significant based on historical, scientific, cultural, social, archaeological, architectural, natural or aesthetic values. Items considered to be significant to the State are listed on the State Heritage Register (SHR) and cannot be demolished, altered, moved or damaged, or their significance altered without approval from the Heritage Council of NSW.

State Heritage Register

The SHR is a list of places and objects of particular importance to the people of NSW, including archaeological sites. To be listed, an item must be deemed to be of heritage significance for the whole of NSW. The SHR does not include any items within or in close proximity to the study area.

Section 170 registers

Under the Heritage Act all Government agencies are required to identify, conserve and manage heritage items in their ownership or control. Section 170 requires all government agencies to maintain a Heritage and Conservation Register that lists all heritage assets and an assessment of the significance of each asset. A search of available Section 170 Registers did not identify any items within or in close proximity to the study area.

Relics

The Heritage Act also provides protection for 'relics', which includes archaeological material or deposits. Sections 139 to 145 of the Heritage Act also prevent the excavation or disturbance of land known or likely to contain relics, unless under an excavation permit. Excavation permits are issued by the Heritage Council of NSW, or its Delegate, under Section 140 of the Heritage Act for relics not listed on the SHR, or under Section 60 for relics included within an SHR curtilage. No historical archaeological relics have been identified that would be impacted by the Project.

A *Non-Aboriginal Heritage Impact Assessment* (Artefact, 2016a) has also been completed as part of this REF (refer to section 7.4 and Appendix D) which provides greater detail regarding the potential non-Aboriginal heritage impacts associated with the Project.

5.4.6 Contaminated Land Management Act 1997

Part 3 of the NSW *Contaminated Land Management Act 1997* empowers the NSW Environment Protection Authority (EPA) to regulate contaminated sites that pose a substantial risk of harm to human health and/or the environment.

A preliminary contamination assessment was undertaken for the Project in January 2016 (Coffey, 2016a and Coffey, 2016b). This assessment identified a series of areas of environmental concern which would be unlikely to present an unacceptable human health or ecological risk for the Project. These generally included soil stockpiles and potential contamination issues associated with the existing Main North railway. A summary of this assessment is provided in section 7.10.

5.4.7 Protection of the Environment Operations Act 1997

The (NSW) *Protection of the Environment Operations Act 1997* (POEO Act) requires that environmental protection licences (EPL's) be sought from the NSW EPA for specific activities relating to air, water and noise pollution and waste management.

Development activities that require an EPL under the POEO Act are listed in Schedule 1 of the Act. The construction of the Project may potentially fall within the definition of 'railway system activities' and therefore may require an EPL prior to construction commencing. The operation of the maintenance facility is not currently considered to be a 'railway system activity' and therefore, at this time, an EPL is not expected to be required for this component of the Projects' operation. The applicability of an EPL for the construction and/or operation of the maintenance facility will be confirmed following consultation with the NSW EPA.

Under the current licensing regime, the operation of the New Intercity Fleet trains will be covered under EPL 12208 when operating on the area covered by Sydney Trains' network.

5.4.8 Roads Act 1993

Section 138 of the *Roads Act 1993* (Roads Act) requires consent from the relevant roads authority for the erection of a structure, or the carrying out of a work in, on or over a public road, or the digging up or disturbance of the surface of a public road. Clause 5(1) of Schedule 2 of the Roads Act states that a public authority, such as Transport for NSW, is not required to obtain a road authority's consent in accordance with Section 138 of the Act for works in, on or over an unclassified road. However, consent from Roads and Maritime Services is still required for works in, on or over a classified road.

As discussed in Chapter 4, some works would be required along Enterprise Drive to connect the new access road to the maintenance facility. Approval from Roads and Maritime would be required prior to the commencement of any road works on State roads. In addition, there are a number of local roads surrounding the site which will be used as haulage routes during construction. During construction and operation, the increase in traffic has been identified as negligible.

5.4.9 Water Management Act 2000

The NSW *Water Management Act 2000* (WM Act) controls the extraction and use of water, the construction of works such as dams and the carrying out of activities in or near water sources in NSW. 'Water sources' are defined very broadly and include any river, lake, estuary, place where water occurs naturally on or below the surface of the ground and NSW coastal waters. The main tool of the WM Act are water sharing plans (WSP's), that contain rules for the sharing of water between water users and the environment and rules for the trading of water.

Approval under the WM Act is required for certain types of developments and activities that are carried out in or near a river, lake or estuary. Under section 91E of the WM Act, it is an offence to carry out a controlled activity in, on or under waterfront land unless a controlled activity approval has been issued.

Under section 38 of the *Water Management (General) Regulation 2011*, a public authorities are exempt from Section 91E of the WM Act in relation to all controlled activities that it carries out in, on or under waterfront land. As a public authority, Transport for NSW is exempt from 'controlled activity' approval under the WM Act and as such, a controlled activity approval would not be required. Notwithstanding this, the NSW Office of Water has published guidelines for in-stream works (NSW Office of Water 2010). The aims and objectives of these guidelines would be considered during the detailed design and construction of the Project, in particular for works such as those to construct the new rail bridge over Chittaway Creek at Turpentine Road.

Groundwater impacts

The Project site is located within the WSP's for the Central Coast unregulated and alluvial water sources and the Ourimbah Creek water source. The waters in the Ourimbah Creek water source exclude all water contained within underlying aquifers, with the governing WSP being the Central Coast unregulated and alluvial water sources. The NSW Aquifer Interference Policy clarifies the requirements for obtaining water licences for aquifer interference activities and describes the assessment process for aquifer interference activities.

An aquifer interference activity includes the penetration of an aquifer, the obstruction of groundwater flow in an aquifer, and the taking of water from an aquifer. At this time, it is not proposed to utilise groundwater for the construction or operation of the Project. However, available groundwater information has identified that in the lower lying part of the site, existing groundwater levels may be within a few metres of the surface and may therefore need to be dewatered or extracted during construction. Any groundwater take during construction and during operation would need to be accounted for. Small amounts of water take (up to three mega litres per year), typically do not require a licence, provided that the amount of water taken can be demonstrated.

The NSW Aquifer Interference Policy applies to activities authorised under both the *Water Act 1912* and the WM Act, although Section 91(3) of the WM Act that provides for aquifer interference approval for an activity has not yet commenced. Consequently, if, during the ongoing design of the facility, groundwater extraction is identified as being required to deliver the Project, dewatering groundwater would be required to be authorised by a licence under Part 5 of the *Water Act 1912*. Ongoing consultation with DPI | Water regarding their requirements, including the potential need for a license would be required during detailed design.

Further discussion regarding the potential impacts on groundwater is provided in section 7.9.

5.4.10 Fisheries Management Act 1994

The NSW *Fisheries Management Act 1994* (FM Act) requires the Minister of Primary Industries to be consulted about any dredging or reclamation works and a permit may be required under Section 219 of the FM Act for any works undertaken by a public authority that could result in the temporary or permanent blockage of fish passage.

The Project would require the construction of an additional rail bridge over the alignment of Chittaway Creek. The crossing would be designed to meet the NSW Fisheries (part of NSW Department of Primary Industries) guidelines for water crossings. This would be undertaken in consultation with NSW Fisheries to ensure minimal impact on aquatic habitats and species protected under the FM Act. Transport for NSW would also consult with NSW Fisheries to discuss the proposal and its constraints, and to assist in refining the waterway crossing during the detailed design phase of the proposal to prevent the blockage of fish passage.

5.5 Commonwealth legislation

5.5.1 Environment Protection and Biodiversity Conservation Act 1999

The EPBC Act requires the approval of the Commonwealth Minister for the Environment for actions that may have a significant effect on matters of national environmental significance (NES) or a Project which is located on or will affect Commonwealth land and the environment.

Based on the Preliminary Biodiversity Assessment prepared by EMM in 2015, an EPBC Act referral was made to the Commonwealth Department of Environment (DoE) in March 2016 to consider whether the Project would be considered to be a controlled action. This was due to the potential for significant impacts to the Biconvex Paperbark (*Melaleuca biconvexa*), listed as Vulnerable and protected under the EPBC Act.

As part of the *Biodiversity Assessment Report* (WSP | Parsons Brinckerhoff, 2016a), a search of the EPBC Act Protected Matters Search Tool was undertaken for the proposed Kangy Angy site, with a five kilometre buffer, on 25 January 2016. This search identified that the following matters of NES may occur within this area: one endangered ecological community (EEC); 60 threatened species and 62 migratory species.

The *Biodiversity Assessment Report* has concluded that the New Intercity Fleet Maintenance Facility would not have a significant impact on any of the EPBC listed species, including the Biconvex Paperbark (*Melaleuca biconvexa*), listed as Vulnerable and protected under the EPBC Act. Accordingly, Transport for NSW provided further information to the DoE to revise the referral to recommend that the project not constitute a controlled action. The DoE is yet to make a decision on the matter.

New South Wales Bilateral Agreement

There is a bilateral agreement in place between the NSW and Commonwealth governments which provides for a 'one stop' shop for environmental assessments, including those under Part 5 and Part 5.1 of the EP&A Act. Section 4.1 of the bilateral agreement states that 'an action does not require assessment under Part 8 of the EPBC Act if the action is in the class of actions specified in Schedule 1 to this agreement'. Specifically, Section 2(a) (ix) of Schedule 1 of the bilateral agreement states:

> *Actions that are assessed under Part 5 (other than Division 5 Part 5 or where an EIS is required) of the Environmental Planning and Assessment Act 1979 (NSW) where the assessment has been undertaken in accordance with the requirements of Item 3 of this Schedule 1.*

Item 3 of Schedule 1 sets out the requirements for assessments, such as relevant guidelines to follow, direction for public display of documentation (14 days for Projects under Part 5 of the EP&A Act), and preparation of an assessment report by the determining authority.

Should the Project be determined to require assessment under the EPBC Act following consideration of the current referral and new information, Transport for NSW has requested approval to utilise the provisions of the bilateral assessment process (whereby the NSW assessment process is undertaken on behalf of EPBC process) for the assessment of the Project.

6 STAKEHOLDER AND COMMUNITY CONSULTATION

This chapter summarises the community consultation carried out to date for the Project. It includes a summary of the planned stakeholder and community consultation activities to be undertaken to support the REF display and construction phases. The REF display will include targeted consultation activities including the provision of community information sessions to provide an opportunity for stakeholders and the wider community to meet with the Project team and provide feedback on the Project.

6.1 Consultation objectives

Transport for NSW has developed a communications and consultation strategy for the New Intercity Fleet Maintenance Facility which includes details on key activities that will be carried out as part of informing and engaging with the local community and key stakeholders.

In summary, the consultation approach by Transport for NSW for the Project is to:

- Provide accurate, easy to understand, relevant and timely information through a variety of channels, including face to face contact
- Establish and maintain clear lines of communication and encourage community participation
- Consult early and often to ensure there were 'no surprises' to key stakeholders and the community
- Identify opportunities for community engagement at each stage of the Project's lifecycle
- Be transparent and accountable, and report back to the community on engagement activities
- Provide a mechanism for prompt issues resolution
- Identify and consider a diverse range of views and interests presented by the community.

Transport for NSW will ensure that community and stakeholders are engaged throughout the life of the Project including:

- Public display of the REF
- Post determination of the Project
- Throughout construction and operation of the facility.

6.2 Consultation undertaken prior to and during the preparation of the REF

As part of the development of the Project design and environmental assessment, the following key consultation activities have been carried out and are proposed to continue:

- Project notifications and Project updates for nearby residents, businesses and stakeholders
- Meetings with property owners about full or partial property acquisition
- Permission for consultation regarding property access for environmental assessment surveys
- Door-knocking nearby residents and businesses
- Meetings and briefings for key stakeholders, businesses and residents, including Central Coast Council
- Letters, emails and target correspondence
- Project updates on the Transport for NSW website.

In addition, initial consultation with local Aboriginal representatives has also been done. A summary of this consultation is provided in section 6.2.3 of this REF.

6.2.1 Community issues raised to date

Initial consultation with the community regarding the Project commenced in September 2015 to discuss various aspects of the overall concept design for the New Intercity Fleet Maintenance Facility. Feedback from the community has been collected as part of the development of the Project and, where feasible, considered as part of the ongoing development of the Project.

Table 6.1 provides a summary of the key community issues raised during the initial stages of the Project and where these concerns have been considered as part of this environmental assessment.

Table 6.1 Summary of issues raised by community and other stakeholders

Issue	Specific issues raised	Section where addressed in REF
Environmental		
Flora and fauna	→ Impacts to endangered species. → Impacts to yabbies in the creek and similar ecology across the site. → Identified the need to minimise the extent of vegetation clearing on the site.	Refer to section 7.1 and Appendix A.
Noise and vibration	→ Concern about overall noise and vibration impacts. → Concern about 24 hour operational impacts. → Identified the need to introduce a buffer between the maintenance facility in order to minimise noise to neighbouring properties.	Refer to section 7.2 and Appendix B.
Visual impacts and amenity	→ Concern about the disruption to the rural neighbourhood. → Visual impacts to adjacent properties and residents. → Disturbance at night from lighting at the facility.	Refer to section 7.3 and Appendix C.
Traffic and access	→ Suggested alternative access from Turpentine Road through to Enterprise Drive to eliminate the proposed bridge. → Concern for the increase in traffic during construction and operational stages, including increases in heavy vehicle movements on local roads. → Identified the need to maintain access to Orchard, Turpentine Street and Ourimbah roads. → Concern regarding the safety of children from increased heavy vehicles.	Refer to Chapter 3, section 7.6 and Appendix F.
Flooding and watercourse	→ Identification of existing flooding impacts. → Concern that the Project may affect flooding to adjacent properties. → Concern that the Project will affect the local watercourses. → Impact on removing the access used during times of flood. → Note that the area has flooded twice since 2015.	Refer to section 7.9 and Appendix H.
Ground and surface water	→ Concern for pollutants such as oil, grease, chemicals seeping into the ground. → Security of air borne pollutants affecting water supply from water collected from roofs into water tank systems.	Refer to section 7.10 and Appendix I.
Consultation	→ Perceived lack of community consultation about the site selection process and Project.	Refer to Chapter 3 and Chapter 6.
Amount of land required, acquisition and property valuation	→ Concern about the size of footprint required and associated road work impacts. → Noted that just terms and fair compensation should be provided. → Concern that the proposal will devalue properties.	Refer to section 4.3, section 7.7 and Appendix G.

Issue	Specific issues raised	Section where addressed in REF
Project design		
Site location /rezone	→ Concern that the NSW Government will rezone existing environment/conservation land to industrial. → Suggested alternative sites in a location where private properties not impacted. → Identified that the facility will be located a short distance from a child care centre and a school. → Questioned why the Darkinjung land at Bushells Ridge was not suitable for the site.	Refer to Chapter 3 and section 7.6 and section 7.8.
Bridge design	→ Concern that the proposed bridge to the highway will create flooding. → Concern regarding impacts from possible new rail bridge to span across the rail tracks to get access to facility.	Refer to Chapter 4 and section 7.9.
Livestock impacts	→ Concern regarding the impact of the Project on neighbouring properties which have livestock such as horses and cattle.	Refer to section 7.8.

6.2.2 Consultation with government agencies

Consultation with government authorities and agencies was conducted to help identify key environmental issues and opportunities as part of the concept design. During the REF preparation process, meetings were held with Wyong Shire Council (now Central Coast Council), Ausgrid, Office of Environment and Heritage and Rural Fire Services.

A summary of the issues raised during these discussions is provided in Table 6.2.

Table 6.2 Summary of issues raised by government agencies

Government agency	Issues raised	Section addressed in REF
Ausgrid (3 February 2016)	→ Impacts to existing services.	Refer to section 4.2.4 and section 7.16.
Office of Environment and Heritage (26 February 2016)	→ Ecological assessment process.	Refer to section 7.1 and Appendix A.
Sydney Trains (21 March 2016)	→ Initial stakeholder meeting with Sydney Trains.	Not applicable.
Wyong Shire Council (12 April 2016)	→ Property acquisition.	Refer to section 4.3 and section 7.8.
	→ Flooding and drainage.	Refer to section 7.9 and Appendix H.
	→ Ecology and offsets.	Refer to section 7.1 and Appendix A.
	→ Traffic management.	Refer to section 7.6 and Appendix F.
Rural Fire Services (18 April 2016)	→ Design requirements. → Fire access and mitigation strategies. → Bushfire mitigation.	Refer to section 7.15.

6.2.3 Aboriginal community involvement

The Project is within the boundary of the Darkinjung Local Aboriginal Land Council (LALC). As part of development of the Project, consultation with representatives from the Darkinjung LALC was carried out. This included a survey of the maintenance facility site with one representative from the Darkinjung LALC, one from the Guringai LALC and Project team members from Artefact Heritage on 19 February 2016. As part of the consultation process, Darkinjung LALC also provided comments on the previous reports completed for the maintenance facility site including those done by Biosis (2015) and RPS (2015a and 2015b).

A summary of the comments provided by the Darkinjung LALC representatives regarding the Project included the following:

- No further archaeological investigation of the railway corridor is required
- Further archaeological investigation of the remainder of the study area is required, as ground visibility during survey was very low
- Any earthworks within areas of Aboriginal archaeological sensitivity should be managed in consultation with the local Aboriginal community
- The ecological values of the study area should also be considered to have importance to the Aboriginal community.

Further discussion regarding the potential Aboriginal impacts associated with the Project is provided in section 7.5 of this REF.

6.2.4 Infrastructure SEPP consultation

Part 2, Division 1 of the Infrastructure SEPP contains provisions for public authorities to consult with local councils and other public authorities prior to the commencement of certain types of development. Clauses 13, 14, 15 and 16 of the Infrastructure SEPP require that public authorities consult with councils and other agencies, when proposing to carry out development without consent.

Table 6.3 lists the clauses to be considered, a summary of whether these are relevant to the Project and identification of any requirements for the Infrastructure SEPP consultation.

Table 6.3 Summary of consultation under the Infrastructure SEPP

Clause	Response
Clause 13	
1(a) Substantial impact on stormwater management services provided by a council.	No formal stormwater system is currently available within the immediate vicinity of the Project, and therefore this would not be impacted by the development of the site. Formal consultation with Central Coast Council is therefore not required to be undertaken in accordance with this clause.
1(b) Likely to generate traffic to an extent that would strain the capacity of the road system in a local government area.	The Project would temporarily result in increased traffic during construction largely relating to the construction of the New Intercity Fleet Maintenance Facility. This impact would have the potential to temporarily impact the existing operation of local roads including Enterprise Drive and Chittaway Road. However, in the long-term, the Project is not expected to result in a substantial impact to current and future traffic volumes, therefore not resulting in a strain to the existing capacity of the road system in the LGA. Formal consultation with Central Coast Council is not required under this clause.

Clause	Response
1(c) Involves connection to, and a substantial impact on the capacity of, any part of a sewerage system owned by a council.	The Project is not anticipated to substantially impact on the capacity of a sewerage system provided by Central Coast Council or the connection into such a system. Formal consultation with Central Coast Council is not required under this clause.
1(d) Involves connection to, and use of a substantial volume of water from, any part of a water supply system owned by a council.	Water would be required during construction for the management of dust. The source of this water would be determined during the detailed design phase of the Project. Formal consultation with Central Coast Council is not required on this item at this stage.
1(e) Involves the installation of a temporary structure on, or the enclosing of, a public place that is under a council's management or control that is likely to cause a disruption to pedestrian or vehicular traffic that is not minor or inconsequential.	The Project would not involve the installation of a temporary structure on, or the enclosing of, a public place that is under a council's management or control that is likely to cause a disruption to pedestrian or vehicular traffic. However, as part of the construction of the Project, some temporary closure of local roads may be required, (such as for construction works associated with the rail bridges over Turpentine Road or realignment of the intersection of Turpentine and Orchard roads. Formal consultation with Central Coast Council has been undertaken in accordance with this clause.
1(f) Involves excavation that is not minor or inconsequential of the surface of, or a footpath adjacent to, a road for which a council is the roads authority under the *Roads Act 1993* (if the public authority that is carrying out the development, or on whose behalf it is being carried out, is not responsible for the maintenance of the road or footpath).	The Project would involve impacts to an existing road managed by Central Coast Council. Formal consultation with Central Coast Council has been undertaken in accordance with this clause.
Clause 14	
Is likely to have an impact that is not minor or inconsequential on a local heritage item (other than a local heritage item that is also a State heritage item) or a heritage conservation area.	The Project would not involve any substantial impact to a local heritage item of heritage conservation area. Formal consultation with Central Coast Council is not required under this clause.
Clause 15	
Development that is to be carried out on flood liable land that may be carried out without consent and that would change flood patterns other than to a minor extent.	The Project would involve development in an area that is considered to constitute flood liable land. Formal consultation with Central Coast Council has been undertaken in accordance with this clause.
Clause 16	
Clause 16 of the Infrastructure SEPP states that a consent authority must not carry out any of the following development without giving written notice to the specified authority and taken their responses into consideration:	
(a) development adjacent to land reserved under the National Parks and Wildlife Act 1974 (Office of Environment and Heritage)	The maintenance facility site is not located adjacent to land reserved under the *National Parks and Wildlife Act 1974*.
(b) development adjacent to a marine park declared under the Marine Parks Act 1997 (Marine Parks Authority)	The maintenance facility site is not located adjacent to a marine park declared under the *Marine Parks Act 1997.*

Clause	Response
(c) development adjacent to an aquatic reserve declared under the Fisheries Management Act 1994 (Office of Environment and Heritage)	The maintenance facility site is not located adjacent to an aquatic reserve declared under the *Fisheries Management Act 1994.*
(d) development in the foreshore area within the meaning of the Sydney Harbour Foreshore Authority Act 1998 (Sydney Harbour Foreshore Authority)	The maintenance facility site is not located foreshore area within the meaning of the *Sydney Harbour Foreshore Authority Act 1998.*
(e) development comprising a fixed or floating structure in or over navigable waters (Maritime Authority of NSW)	The Project is not development that would comprise a fixed or floating structure in or over navigable waters.
(f) development for the purposes of an educational establishment, health services facility, correctional centre or group home, or for residential purposes, in an area that is bush fire prone land (as defined by the Act) (NSW Rural Fire Service)	The Project is not development for the purposes of an educational establishment, health services facility, correctional centre or group home, or for residential purposes, in an area that is bush fire prone land.

Consultation with Central Coast Council (formerly Wyong Shire Council) has been carried out under the requirements of the Infrastructure SEPP, with respect to clauses identified in Table 6.3 above. Ongoing discussions with Council have also been held in 2015 and 2016 to outline the site selection, flood modelling and preferred access options to the proposed maintenance facility. On 23 March 2016, Transport for NSW met with Council to present the preferred option and design as part of the REF.

In addition to the consultation currently carried out, REF documentation will be provided during the public display period. An invitation will be provided to Central Coast Council to provide feedback/submissions on the Project and during this period.

6.3 Consultation during REF display

This REF will be placed on public display from 6 June 2016 to 4 July 2016, when written submissions will be invited on the Project. The following tools and activities will be used to provide the community and stakeholders with a range of methods to find out more about the Project and also to comment on the Project.

6.3.1 Project information newsletters

A Project overview newsletter will be prepared and issued to the community and stakeholders, to include about 2,100 properties in the area surrounding the proposed facility. This Project overview would be distributed to government stakeholders, affected and adjacent property owners in Kangy Angy, local residents in Ourimbah, local community organisations, the local school and businesses.

The newsletter due for distribution as part of the display of the REF will:

- Detail the New Intercity Fleet Maintenance Facility Project and provide an overview of the REF assessment
- Include a map showing the location and key features of the Project
- Provide details about the proposed community information sessions and locations for accessing this REF documents
- Provide an overview about the main Project impacts on the community during construction and operation and highlight opportunities for community input
- Include contact details for further information.

6.3.2 Public display locations

Hard copies of the REF will be made available during the display at the following locations:

- Central Coast Council, 16 Hely Street Wyong from 8:30 am to 5.00 pm, Monday to Friday
- Tuggerah Library and Council Services, 50 Wyong Road Tuggerah from 9.00 am to 5:30 pm, Monday to Friday and 9.00 am to 3.00 pm Saturday
- Department of Premier and Cabinet, Level 3, 131 Donnison Street, Gosford from 9.00 am to 5.00 pm, Monday to Friday
- Transport for NSW Level 5, Tower A, Zenith Centre 821 Pacific Highway, Chatswood from 8.30 am to 5.00 pm, Monday to Friday.

6.3.3 Advertisements

Advertisements will be placed in the Central Coast Express Advocate and the Newcastle Herald newspaper to notify the community of the public display of the REF, the display duration, upcoming community information sessions and how to obtain further information about the Project.

6.3.4 Community information sessions

Community information sessions will be held during the public display of REF to explain to potentially affected residents and interested community members what the likely impacts of the Project are and any planned mitigation measures. Two community information sessions are proposed to be held in June 2016 at the following locations:

- ***Saturday 18 June 2016***
  Central Coast Steiner School, 45 Catamaran Road, Fountaindale from 10.00 am to 1.00 pm
- ***Thursday 23 June 2016***
  Central Coast Steiner School, 45 Catamaran Road, Fountaindale from 4.00 pm to 7.00 pm.

The information sessions will allow the public the opportunity to meet members of the Transport for NSW Project team to discuss the New Intercity Fleet Maintenance Facility Project. Attendees will have the opportunity to review the material on display, learn about the Project, understand the mitigation measures that have been included in the Project, and comment on any issues they would like addressed prior to construction.

6.3.5 Project information telephone line

The existing Project information telephone line 1800 684 490 is available for enquiries on the New Intercity Fleet Maintenance Facility Project. (The public will be able to continue to make enquiries during the public display, for those interested in further information and/or provide feedback on any issues related to the Project. In addition, a 24-hour construction response line (1800 775 465) would be available during construction of the Project which is subject to Project approval.

6.3.6 Website and email address

All New Intercity Fleet Maintenance Facility Project information, including ongoing updates will be made available through the Transport for NSW website www.transport.nsw.gov.au/Projects.

Submissions can also be made to the Transport for NSW email address at: Projects@transport.nsw.gov.au and at the NSW Government website www.haveyoursay.nsw.gov.au.

6.3.7 Government and stakeholder consultation

Transport for NSW will continue to meet and discuss the Project with key Government agencies and stakeholders throughout the display period (and through to the end of the construction period).

6.3.8 Written submissions

Written submissions on the REF are encouraged throughout the display period. All submissions should be emailed to Projects@transport.nsw.gov.au or sent to:

> ***Reference**: New Intercity Fleet Maintenance Facility Project*
>
> *Principal Manager Environmental Impact Assessments*
> *Transport for New South Wales*
> *Locked Bag 6501*
> *St Leonards NSW 2065*

Submissions can also be received through the Have Your Say website at www.haveyoursay.nsw.gov.au.

Submissions will be accepted no later than 4 July 2016. All submissions received during the display period (6 June 2016 to 4 July 2016) will be considered as formal submissions and will be responded to in the submissions report. All written submissions received during the display period will be acknowledged by return letter or email (depending on what contact information is provided).

All information in submissions may be published in subsequent assessment documents. If the stakeholder indicates at the time of supply of information that it should be kept confidential, Transport for NSW will attempt to keep it confidential however there may be legislative or legal justification for release of the information, for example under the *Government Information (Public Access) Act 2009* or under subpoena or statutory instrument.

6.4 Response to submissions

At the close of the display period, Transport for NSW will consider the submissions received regarding the Project. A Submissions Report will be prepared to address and respond to any issues raised. The report, along with the REF and any other relevant information, will be used by Transport for NSW to assess and determine whether to approve the New Intercity Fleet maintenance Project. The submissions report will:

- List any issues raised in submissions
- Consider and respond to the issues raised, including detailing appropriate mitigations measures
- Provide any new information concerning the Project
- Identify any changes to the Project as a consequence of feedback received during public display and the potential impact of the changes.

The submissions report would be published on the Transport for NSW website (www.transport.nsw.gov.au/Projects).

6.5 Post-determination consultation activities

Should Transport for NSW determine to proceed with the Project, consultation activities would continue, including updates to residents; businesses and other community members in the lead up to and during construction.

The consultation activities would ensure that:

- The community and stakeholders have a high level of awareness of all processes and activities associated with the New Intercity Fleet Maintenance Facility Project
- Accurate and accessible information is made available
- A timely response is given to issues and concerns raised by the community
- Feedback from the community is encouraged
- Opportunities for input to the New Intercity Fleet Maintenance Facility Project are provided.

Methods used for engaging and providing Project information to the community and stakeholders should the Project be determined would include:

- Project updates on the Transport for NSW website: www.transport.nsw.gov.au/Projects
- A 24 hour construction response line: 1800 775 465
- Project infoline: 1800 684 490
- An enquiry email address: Projects@transport.nsw.gov.au
- Delivering works notifications to nearby residents, businesses and stakeholders
- Doorknocking directly impacted residents and businesses
- Meetings and briefing for stakeholders, businesses and residents as required
- Site signage.

7 ENVIRONMENTAL IMPACT ASSESSMENT

This chapter summarises the key and non-key environmental impacts which have been considered for the construction and operation of the New Intercity Fleet Maintenance Facility. The assessment described in this chapter is supported by 10 specialist studies as described in section 1.7 of this REF. These provide detailed information on background data, assessment methodologies and the results of specialist assessments.

Where inconsistencies between this REF and the specialist studies exist, the main REF is considered to take precedence.

7.1 Biodiversity

A *Biodiversity Assessment Report* which details the methods, biodiversity field survey results and potential ecological impacts associated with the new intercity maintenance facility has been prepared by WSP | Parsons Brinckerhoff (WSP | Parsons Brinckerhoff, 2016a). This assessment is attached as Appendix A of this REF.

A summary of this assessment is provided in the following sections.

7.1.1 Background and previous reports

As part of the site selection process (refer to Chapter 3 of this REF), previous ecological surveys were undertaken by GHD to identify potential ecological constraints. In addition, a preliminary ecological assessment was completed by EMM (2015) to determine the likelihood of significant impacts likely to occur as a result of the Project, in accordance with the EP&A Act. The preliminary ecological assessment identified the presence of two threatened ecological communities and one threatened flora species as occurring within the Project site (Swamp Sclerophyll Forest, Lowland Rainforest and Biconvex Melaleuca (*Melaleuca biconvexa*)) as well as potential habitat for a number of other threatened species.

In light of the results of the preliminary ecological assessment, it was recommended that additional targeted surveys be completed to inform the environment impact assessment process moving forward for species considered likely to occur within the study area. Specifically, it was noted that the potential impacts would be such that it would trigger the requirement to prepare a Species Impact Assessment (SIS) under Part 5 of the EP&A Act. Subsequently a request to the OEH for the Chief Executive Requirements (CER's) was made by Transport for NSW on 15 January 2016 to inform the preparation of an SIS for the Project. The CER's were issued by the OEH on 11 February 2016.

The *Biodiversity Assessment Report* (WSP | Parsons Brinckerhoff, 2016a) which has been prepared to support this REF (and provided as Appendix A) is intended to provide an assessment of the potential ecological impacts of the Project in addition to informing the preparation of the SIS in accordance with the OEH CER's. The SIS for the Project will provide additional information regarding the potential impacts as a result of the Project on specific ecological communities, including *Melaleuca biconvexa*.

A more detailed set of mitigation measures would also be developed for specific species identified for the Project (measures including a biodiversity offset framework and opportunities for revegetation and rehabilitation) and these would be provided within the SIS for the Project.

It should be noted that the OEH would be a concurrent determining authority for the Project with respect to the SIS (in addition to Transport for NSW) in accordance with Part 5 of the NSW EP&A Act and that commencement of the construction of the Project would not occur until both determinations have been made.

7.1.2 Methodology

Definitions

For the purposes of the assessment of biodiversity, the following definitions have been used:

- *Project site* defined as the area which is proposed for development
- *Study area* is defined as the Project site and adjacent areas of habitat which may be subject to direct or indirect impacts as a result of the proposed development
- *Locality* is defined as an approximate five kilometres radius around the Project area
- *Region* is a bioregion defined in a national system of bioregionalisation. The Project is located within the Sydney Basin Bioregion as defined in the Interim Biogeographic Regionalisation for Australia (Thackway & Cresswell 1995).

Database search and literature review

A desktop review of relevant background reports and government databases pertaining to the biodiversity of the bioregion was undertaken comprising a 10 kilometre radius surrounding the study area. Table 7.1 provides a summary of the literature and data sources that were used as part of the biodiversity assessment.

Table 7.1 Database searches

Database	Search date	Area searched	References
BioNet Atlas of NSW Wildlife	25 January 2016	10 km x 10 km area centred on the Project site	(Office of Environment and Heritage 2016b)
OEH Threatened Species CMA search	18 March 2016	Wyong sub-region of the Hunter/Central Rivers Catchment Management Authority	(Office of Environment and Heritage 2016e)
EPBC Protected Matters Search Tool	21 January 2016	5 km buffer around the Project site	(Department of the Environment 2016b)
PlantNet	25 January 2016	5 km radius of Kangy Angy	(Royal Botanic Gardens 2016)
NSW Department of Primary Industries (Fishing and Aquaculture) threatened Aquatic Fauna Database	18 March 2016	(former) Wyong Local Government Area	(Department of Primary Industries 2016)

In addition to the above database searches other relevant resources were reviewed including:

- Research papers, books and other published data
- Aerial photography
- Broad scale mapping of the region; *The natural vegetation of the Wyong Local Government Areas, Central Coast, New South Wales* (Bell 2002)
- Previous ecological assessment of the Project site; *Preliminary Ecological Assessment: New Intercity Maintenance Facility* (EMM 2015).

Field surveys

Field surveys were conducted to identify the biodiversity values of the study area. Quantitative and qualitative data on the flora and fauna of the site and the distribution of the vegetation and habitat communities was collected as part of the field surveys. The study area was inspected during daylight and nocturnal hours between 22 February 2016 and 25 March 2016 by a team of qualified ecologists.

Flora survey

The floristic diversity and possible presence of threatened species was assessed using a combination of random meander, plot-based (quadrat/transect) and rapid data point surveys generally in accordance with the resources outlined below.

- Desktop mapping of vegetation communities was undertaken from existing mapping and aerial photograph interpretation. Vegetation within the Project site and locality has been previously mapped at the regional scale in *'The natural vegetation of the Wyong Local Government Area, Central Coast, New South Wales' (Bell 2002)*. Additionally the Project site was previously mapped in a site-specific ecological report '*Preliminary Ecological Assessment: New Intercity Maintenance Facility'* prepared by EMM (2015).
- Fourteen quantitative (quadrat/transect) site surveys were completed as outlined in the procedure contained in the BioBanking Assessment Methodology (Office of Environment and Heritage 2014).
- Random meander surveys are a transect type survey whereby the recorder walks in a random meander throughout the site recording all species observed, boundaries between vegetation communities and vegetation condition.

Vegetation condition

The condition of vegetation was assessed firstly against the BioBanking Assessment Methodology definitions of 'low' and 'moderate to good' broad conditions and secondly against the BioBanking condition benchmark data for the relevant vegetation type and other parameters such as intactness, diversity, history of disturbance, weed invasion and health.

Under BioBanking Assessment Methodology, vegetation in 'low' broad condition is:

> *a) woody native vegetation with native over-storey per cent foliage cover less than 25% of the lower value of the over-storey per cent foliage cover benchmark for that vegetation type, and where either: – less than 50% of ground cover vegetation is indigenous species, or greater than 90% of ground cover vegetation is cleared*
>
> OR
>
> *b) native grassland, wetland or herbfield where either: – less than 50% of ground cover vegetation is indigenous species, or more than 90% of ground cover vegetation is cleared.*

'Moderate to good' broad condition is native vegetation that is not in 'low' broad condition.

Three condition sub-categories within the 'moderate to good' broad BioBanking Assessment Methodology condition class were used to further define the condition of the vegetation. The sub-categories were defined as:

- *Condition sub-category 'High quality' condition* – Vegetation that still retains the species complement and structural characteristics of the vegetation community. The vegetation displays resilience to weed invasion due to intact groundcover, shrub and canopy layers (greater than 25 per cent of the lower benchmark). Native species diversity is relatively high. Weeds may exist in this vegetation type but exhibit less than 10 per cent foliage cover.
- *Condition sub-category 'Medium quality' condition* –Vegetation generally retains most of the species complement and structural characteristics however may no longer contain one or more of the strata layers due to land use disturbances. This vegetation generally displays resilience to weed invasion and has regeneration potential. Weeds may exist in this vegetation type but exhibit 10 to 60 per cent foliage cover.
- *Condition sub-category 'Low quality' condition* –Vegetation generally no longer contains a native canopy but the understorey and groundcover layers are generally dominated or co-dominated by exotic species that exhibit between 61 to 70 per cent foliage cover. Native species diversity is generally relatively low and the mid and low stratums have been structurally modified due to weed incursions.

Fauna survey and habitat assessment

Terrestrial vertebrate surveys completed within the study area were carried out considering the methodology detailed in the *NSW Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities (Working Draft)* (Department of Environment and Conservation 2004), the *Survey Guidelines for Australia's Threatened Birds* (Department of Environment Water Heritage and the Arts 2010), the *Threatened Species survey and assessment guidelines: field survey and methods for fauna-Amphibians* (NSW Department of Environment 2009) and the *Survey guidelines for Australia's threatened frogs* (Department of the Environment Water Heritage and the Arts 2010).

The fauna survey methodology involved surveys at 'standard fauna survey sites' and supplementary sites in accordance with the above guidelines. Three standard trapping sites were established to survey broad habitat types within the study area and consisted of standard fauna survey sites (described as sites S1, S2 and S3).

At each standard fauna survey site the following methodologies were used:

- Terrestrial mammal trapping
- Arboreal mammal trapping
- Arboreal hair-tubes
- Diurnal bird survey
- Ultrasonic echolocation detection (Anabat survey)
- Spotlighting
- Nocturnal call playback (nocturnal birds, mammals and amphibians)
- Herpetofauna active search
- Targeted Koala habitat and scat search
- Fauna habitat assessment.

Supplementary sites were selected to target specific habitat features likely to be used by threatened species of fauna. Supplementary surveys also included the following addition methodologies:

- Harp trapping
- Nest boxes trapping
- Remote camera trapping
- Targeted Koala habitat and scat search
- Call playback (amphibians).

A summary of the total fauna survey effort and summary of the fauna survey methodologies for threatened species is provided in section 2.5.3 and Figure 2.2 of the *Biodiversity Assessment Report* (WSP | Parsons Brinckerhoff, 2016a) attached as Appendix A.

Habitat assessment

Fauna habitat assessments were completed to assess the likelihood of threatened species of animal occurring in the study area. Habitat assessments included the assessment and identification of habitat features through targeted meander surveys.

During habitat assessments and targeted meander surveys, opportunistic recordings of species were made through incidental sightings, aural recognition of calls and observations of indirect evidence of species' presence (such as Glossy-black Cockatoo chewed cones, nests/dreys, whitewash, burrows and scats). This provided supplementary information on faunal species presence.

Fauna habitats were assessed generally by examining characteristics such as the structure and floristics of the canopy, understorey and ground vegetation, the structure and composition of the litter layer, and other habitat attributes important for feeding, shelter roosting and breeding.

7.1.3 Existing environment

Vegetation communities

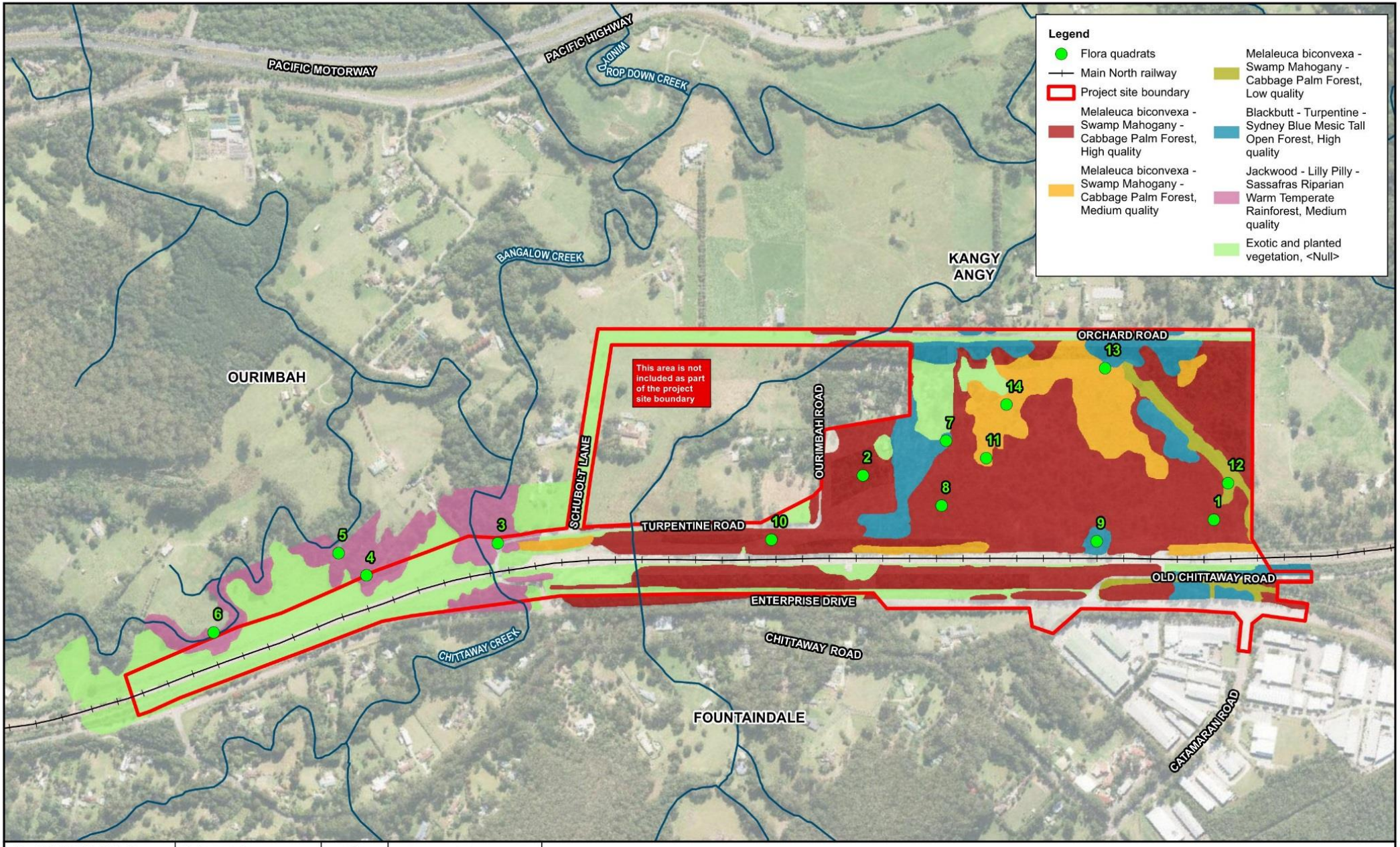
The desktop analysis of existing vegetation mapping and field validation surveys identified that the vegetation within the Project site was comprised of four vegetation communities, the distribution of which are related to geological, topographical and geomorphological characteristics as well as previous and current land uses. The vegetation communities mapped within the Project site are provided in Table 7.2 and shown in Figure 7.1.

Table 7.2 Vegetation communities identified within the study area

WSP | PB 2016	EMM 2015[1]	TSC Act status	EPBC Act Status	Extant within area of impact (ha)[2]	Extant within project site boundary (ha)
Melaleuca biconvexa – Swamp Mahogany – Cabbage Palm Forest	Swamp Mahogany Forest	Endangered – Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions	Not listed	25.5	32.4
Jackwood – Lilly Pilly – Sassafras Rainforest	Jackwood – Lilly Pilly	Not listed	Not listed	1.1	1.6
Blackbutt – Turpentine – Sydney Blue Gum Mesic Tall Open Forest	Not mapped	Not listed	Not listed	3.6	4.5
Exotic and planted vegetation	Not mapped	Not listed	Not listed	12.1	12.6

Note 1 *Previous vegetation mapping undertaken as part of the Preliminary Ecological Assessment: New Intercity Maintenance Facility (EMM 2015)*

Note 2 *Areas identified as part of field surveys for Biodiversity Assessment Report (WSP | PB 2016).*



Map: 2202522A_GIS_F012_A5	Author: suansrir
Date: 5/05/2016	Approved by: -

Data source: - © Land and Property Information 2015

0 100 200 m

1:9,500

Coordinate system: GDA 1994 MGA Zone 56

Scale ratio correct when printed at A4

Note: Design is indicative only.
Subject to detailed design

WSP | PARSONS BRINCKERHOFF

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New Intercity Fleet Maintenance Facility Project
Figure 7.1
Vegetation communities and flora survey effort

Melaleuca biconvexa – Swamp Mahogany – Cabbage Palm Forest

This was the dominant vegetation community within the Project site occurring predominantly within the northern portion of the Project site. The vegetation type was in Moderate to Good (High and Medium Quality) and in Low condition dependent on its location within the landscape and the level of disturbance the community is or had been subjected to. Some areas of this community, particularly along the railway line, roads and access tracks experienced sparse to dense weed infestations.

A summary description of this community is provided in Table 7.3 and shown in Photo 7.1 and Photo 7.2.

Table 7.3 Summary description of *Melaleuca biconvexa* – Swamp Mahogany – Cabbage Palm Forest within the Project site

***Melaleuca biconvexa* – Swamp Mahogany – Cabbage Palm Forest**	
Conservational significance	High: This community forms part of the Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions threatened ecological community listed as Endangered under the TSC ACT. This community provides habitat for a variety of threatened flora and fauna species including *Melaleuca biconvexa* which was recorded within this vegetation type.
Condition	Moderate to Good (High Quality): Areas of good quality *Melaleuca biconvexa* – Swamp Mahogany – Cabbage Palm Forest predominantly within areas which retained a canopy and contained a high abundance and diversity of native species. These areas generally showed resilience to weed infestations as a result of an intact groundcover, shrub and canopy layers. These areas generally occurred in areas of lower disturbance and where vegetation was more intact i.e. few clearings, access tracks etc. Moderate to Good (Medium Quality): Areas of medium quality *Melaleuca biconvexa* – Swamp Mahogany – Cabbage Palm Forest predominantly occurred along the peripheries of the community or in areas where the canopy was absent. Within these areas the community lacked one or more strata and experienced low to moderate densities of exotic species, native species diversity did remain high. Low: Areas of low condition *Melaleuca biconvexa* – Swamp Mahogany – Cabbage Palm Forest occurred along the access track to the north of the Project site. Within this area the vegetation lacked one or more strata layers and was generally dominated by exotic groundcover species (native species <50%).
Extent and distribution within the site	This community covered the majority of the northern portion of the Project site covering an extant of 32.4 ha or 62 per cent of the Project site. The community was situated on sandy alluvial soils with poor drainage with large stands of water observed in some locations. This community integrated with the Blackbutt – Turpentine – Sydney Blue Gum Mesic Tall Open Forest and Jackwood – Lilly Pilly – Sassafras Rainforest community preferring soils with lower drainage potential and at slightly lowered elevations.

Photo 7.1 ***Melaleuca biconvexa*** **– Swamp Mahogany – Cabbage Palm Forest Moderate to High (High Quality)**

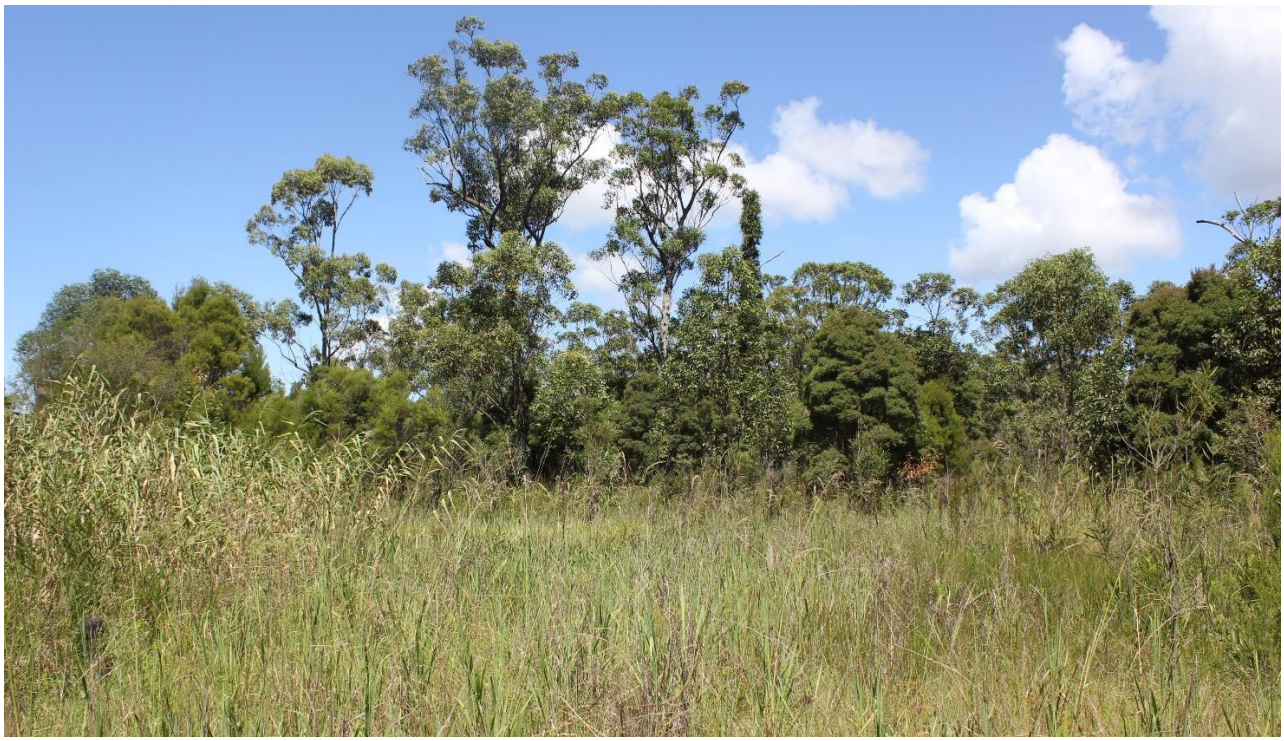


Photo 7.2 ***Melaleuca biconvexa*** **– Swamp Mahogany – Cabbage Palm Forest Low Condition**

Jackwood – Lilly Pilly – Sassafras Rainforest

This was the dominant vegetation type in the southern portion of the Project site, occurring along Bangalow Creek and Chittaway Creek. The vegetation type was in Moderate to Good (Medium Quality) condition with high native species richness and low to moderate weed infestations. Some areas of this community experienced sparse to dense woody weed infestations.

A summary description of this community is provided in Table 7.4 and shown in Photo 7.3 and Photo 7.4.

Table 7.4 Summary description of Jackwood – Lilly Pilly – Sassafras Rainforest within the Project site

Jackwood – Lilly Pilly – Sassafras Rainforest	
Conservational significance	Moderate: This community does not form part of any listed threatened ecological community under the TSC ACT or the EPBC Act. This community does however provide habitat for a variety of threatened flora and fauna species. The community also creates a narrow wildlife corridors in some areas of the Project site linking vegetation to remnants of vegetation within the locality.
Condition	Moderate to Good (Medium Quality): Areas of medium quality Jackwood – Lilly Pilly – Sassafras Rainforest occurred within the southern portion of the Project site along Bangalow Creek and Chittaway Creek. Within these areas the community generally lacked an intact native groundcover layer, instead dominated it was dominated by exotic species. This is likely to be attributed to a high edge ratio. All other strata layers generally had a high diversity of native species.
Extent and distribution within the site	This community was the dominant vegetation type within the southern portion of the Project site covering an extant of 1.5 ha or 3% of the Project site. The community occurred along Bangalow Creek which flows into Chittaway Creek and ultimately Ourimbah Creek. This community integrated with the Melaleuca biconvexa – Swamp Mahogany – Cabbage Palm Forest and exotic and planted vegetation.

Photo 7.3 Jackwood – Lilly Pilly – Sassafras Rainforest Moderate to Good (Medium Quality)

Photo 7.4 Jackwood – Lilly Pilly – Sassafras Rainforest Moderate to Good (Medium Quality) grazed understorey

Blackbutt – Turpentine – Sydney Blue Gum Mesic Tall Open Forest

This community occurred as patches within the Project site; integrating with the *Melaleuca biconvexa* – Swamp Mahogany – Cabbage Palm Forest vegetation type. This community generally occurred on alluvial sandy soils which had higher drainage potential and were at slightly higher elevations that the surrounding vegetation. This community occurred in good condition with high native species diversity.

A summary description of this community is provided in Table 7.5 and shown in Photo 7.5 and Photo 7.6.

Table 7.5 Summary description of Blackbutt – Turpentine – Sydney Blue Gum Mesic Tall Open Forest within the Project site

Blackbutt – Turpentine – Sydney Blue Gum mesic tall open forest	
Conservational significance	Moderate: This community does not form part of any listed threatened ecological community under the TSC ACT or the EPBC Act. This community does however provide habitat for a variety of threatened flora and fauna species. The community also creates a narrow wildlife corridors in some areas of the Project site linking vegetation to remnants of vegetation within the locality.
Condition	Moderate to Good (High Quality): Areas of good quality Blackbutt – Turpentine – Sydney Blue Gum Mesic Tall Open Forest retained an intact canopy and contained a high abundance and diversity of native species. These areas generally showed resilience to weed infestations as a result of an intact groundcover, shrub and canopy layers. Some areas of this community has been exposed to understorey clearing however retains a high diversity of native groundcover species which had good regeneration potential.
Extent and distribution within the site	This community occurred as scattered patches within the north western portion of the Project site covering an extant of 4.5 hectares or nine percent of the Project site. This community integrated with *Melaleuca biconvexa* – Swamp Mahogany – Cabbage Palm Forest preferring slightly perched sandier alluvial soils which had higher drainage potential.

Photo 7.5 **Blackbutt – Turpentine – Sydney Blue Gum Mesic Tall Open Forest Moderate to Good (High Quality)**

Photo 7.6 **Blackbutt – Turpentine – Sydney Blue Gum Mesic Tall Open Forest Moderate to Good (High Quality)**

Exotic and planted vegetation

This vegetation type occurs across the Project site in areas subjected to past and current land uses such as residential properties, access tracks, infrastructure associated with the railway line and hobby farms. As a result of this vegetation types poor condition it is not consistent with any native vegetation community.

A summary description of this community is provided in Table 7.6 and shown in Photo 7.7.

Table 7.6 Summary description of exotic and planted vegetation within the Project site

Exotic and planted vegetation	
Conservational significance	Low: These areas generally contained planted or exotic vegetation with no or limited native vegetation. These areas provide limited habitat for threatened species and generally create small to large gaps between remnant vegetation reducing connectivity within the Project site.
Condition	Poor: This community is in low condition as it is dominated by planted and exotic species. The structural integrity of this vegetation type generally lacks one more stratum and low regeneration potential.
Extent and distribution within the site	This community occurred throughout the Project site covering an extant of 12.6 hectares or 25 per cent of the Project site. The community was not associated with soil or geology occurring on a variety of soil and geology types instead was associated with previous and current disturbances such as clearing for residential properties, access tracks, infrastructure associated with the railway line and hobby farms. This community bordered all other native vegetation communities recorded.

Photo 7.7 Exotic and planted vegetation

Flora Species

A total of 173 species of plant were recorded within the Project site, of which 132 species (76 per cent) were native. The most diverse family was the Poaceae with 20 species, the Myrtaceae with 16 species and the Fabaceae with 12 species.

Weeds

Of the 41 exotic species recorded, three are declared as noxious weeds under the *Noxious Weeds Act 1993* (NW Act) for the (former) Wyong Shire Council Local Control Authority. In addition two of these noxious species and one additional exotic species recorded within the Project site are listed as Weeds of National Significance (Fireweed, Blackberry and Lantana) (Australian Weeds Committee 2016).

Fauna Habitats

Fauna habitats present within the study area correlate broadly with the vegetation communities identified. These areas provided habitat for a range of birds, reptiles, amphibians and mammals. Habitat features recorded in the study area generally included those associated with swamp forest types occurring on flood plains in the Central Coast and wet sclerophyll forests occurring in sheltered gullies and drainage lines in the foot hills of near coastal ranges. The fauna habitats identified within the study area are described below.

Rainforest

Isolated patches of rainforest habitats within the study area were associated with Bangalow Creek (refer to Photo 7.3) and contained a variety of native broad-leaved trees providing seasonal fruits for frugivorous animals, such as fruit eating birds, flying foxes and possums. The understorey and canopy provides foraging habitats for insectivorous birds and bats and potential roosting sites for forest owls. The substrates associated with Bangalow and Chittaway Creeks and the flowing nature of the water column is suited to the breeding cycles of rainforest frog species, such as the Barred Frogs (*Mixophyes* sp.), but does not suit the ephemeral pond breeding preferences of other species such as Green-thighed Frog (*Litoria brevipalmata*). Some patches of this forest type have emergent *Eucalyptus saligna* in the upper canopy, which would provide seasonal nectar foraging resources for nectarivorous birds and bats, including threatened species.

Swamp forest

Much of the study area was characterised by floodplain topography perched above Bangalow Creek. Throughout the swampy sections of the study area *Eucalyptus robusta* (Swamp Mahogany) is the dominant canopy tree, sometimes associated with ferns and mesic mid-storey trees (refer to Photo 7.8), while other wetter areas with *Gahnia* sp. (Saw Sedge) and *Baloskion* sp. (Tassel Rush) species, with melaleucas dominating the mid-storey (refer to Photo 7.9). Due to the relatively large numbers of Swamp Mahogany within the study area, it is likely that the study area's swamp forests would be used seasonally by nectarivorous birds and bats, including threatened species, during Swamp Mahogany flowering events.

Photo 7.8 Swamp Mahogany forest with ferns and mesic plants at standard survey Site S1

The structural complexity of swamp forest community habitats within the study area was relatively diverse. Such habitats are well suited to the foraging and nesting requirements of many common forest birds, although the diversity of such species was limited in this and adjacent forest habitats by the domination of Bell Miners in the canopy and mid-storey strata. In those sections where mesic mid-storey trees occur, the presence of fruit-bearing trees, shrubs and vines provide fruit for local frugivorous birds, such as Satin Bowerbird (*Ptilonorhynchus violaceus*), Australian King-Parrot(*Alisterus scapularis*), Lewin's Honeyeater (*Meliphaga lewinii*) and White-headed Pigeon (*Columba leucomela*). The dense understorey provided shelter, nesting opportunities and excellent foraging opportunities for wet forest understorey animals and arboreal mammals such as Common Ringtail Possum.

Where swamp forest community occurred in lower areas (refer to Photo 7.9), the canopy was dominated by Swamp Mahogany, the mid-storey strata by melaleucas and the understorey by *Gahnia sieberana*. This habitat provided cover and foraging microhabitats for smaller forest animals, with seasonal blossom from Swamp Mahogany and melaleucas likely to attract a range of nectarivorous animals including threatened nomadic species when they occur locally.

Photo 7.9 Swamp Mahogany forest with *Melaleuca biconvexa* and *Gahnia sieberana* near standard survey Site S2

In the northern sections of the study area swamp forest habitats are reduced to understorey strata, with only occasional emergent trees, largely *Syncarpia glomulifera* (Turpentine) and melaleucas (refer to Photo 7.10). This habitat is suitable to understorey frequenting animals for shelter and foraging opportunities, but, for many native animals, its habitat value is compromised by large areas without mid-storey and canopy strata.

Photo 7.10 Swamp forest reduced to understory strata near standard survey Site S3

Wet open forest

Wet open forest canopy-strata were dominated by *Eucalyptus pilularis* (Blackbutt) with some areas also *Corymbia gummifera* (Red Bloodwood), *Eucalyptus saligna* (Sydney Blue Gum) or *Syncarpia gummifera* (Turpentine). Understorey strata was usually dominated by ferns and *Leptospermum* sp. (Tea Tree) (see refer to Photo 7.11), but other areas were more open and grassy in the lower strata (refer to Photo 7.12). The canopy stratum of this forest type provides summer seasonal nectar foraging resources for nectarivorous birds, bats and arboreal mammals. This community contains the largest and most mature trees in the study area which are most likely to contain hollows, however very few hollows were observed within the study area, with total numbers appearing consistent with the 12 recorded in the EMM report (2015). As such, although the study area is likely to represent part of the home range for large forest owls occurring locally, the canopy trees within the study are not of sufficient age-class to develop hollows of the dimensions required for nesting forest owls or cockatoos; especially the larger species.

Understorey shrubs in the vicinity of Plot 2 (refer to Photo 7.11) provide good cover for smaller forest birds and both nesting and foraging opportunities for common arboreal mammals, such as Common Ringtail Possum and Sugar Glider.

Photo 7.11 Wet open forest with leptospermum, fern and mesic plant understorey near standard survey Site S1

Photo 7.12 shows wet open forest habitat occurring on more elevated substrates, hence the dryer understorey plants dominated by grasses with bracken fern. This section of the community contained Red Bloodwood amongst the dominant Blackbutts, which would provide nectar and pollen during late summer for canopy nectarivorous fauna, including birds, bats and arboreal mammals. The under-storey stratum in this section of habitat was open with little structural diversity, so fauna habitat opportunities in this stratum were relatively poor.

In the northeast of the study area an isolated patch of this community (refer to Photo 7.13) is surrounded by swamp forest reduced to the understorey layer (refer to Photo 7.10). This patch of wet open forest is subject to incursions of *Lantana camara* (Lantana), which provides sufficient shelter for small animals, but displaces the natural structure provided by native vegetation.

Photo 7.12 Wet open forest with a grassy understorey near standard survey Site S2

Photo 7-13 Wet open forest with under-storey *Gahnia* sp. and lantana at standard survey site S3

Cleared open land with scattered trees

Relatively large areas of land within and surrounding the study area have been managed for residential and rural land-uses, largely horse husbandry. While these areas are dotted with scattered trees suited to larger canopy animals understorey strata are highly managed and do not offer any cover for small animal species. As a consequence these areas are suited to open common country birds and introduced mammals.

Fauna Species

A total of 92 species of animal were recorded during field surveys (refer to Table 7.7), including five threatened species; Varied Sittella (*Daphoenositta chrysoptera*), Little Bentwing-bat (*Miniopterus australis*), Eastern Bentwing Bat (*Vespadelus pumilus*)**,** Southern Myotis (*Myotis macropus*), and Grey-headed Flying-fox (*Pteropus poliocephalus*) (refer to Table 7.7). A total of 14 native mammal species were recorded. Two introduced species including Spotted Turtle-dove and Rabbit were recorded. No threatened aquatic species were identified that would be considered likely to occur within the Project site.

Table 7.7 Species of animal recorded

Group	Introduced	Native	Threatened	Total
Frogs	–	6	-	6
Reptiles	–	6	-	6
Birds	1	59	1	61
Mammals	1	14	4	19
Total	**2**	**85**	5	**92**

Further detail regarding the recorded fauna species is provided in section 3.6 of the *Biodiversity Assessment Report* (WSP | Parsons Brinckerhoff, 2016a) attached as Appendix A.

Threatened fauna species

Five threatened fauna species were recorded during WSP | Parsons-Brinckerhoff fauna surveys conducted over the study area, being; Varied Sittella (*Daphoenositta chrysoptera*), Little Bentwing-bat (*Miniopterus australis*), Eastern Bentwing Bat (Miniopterus fuliginosus), Southern Myotis (*Myotis aelleni*), and Grey-headed Flying-fox (*Pteropus poliocephalus*). All threatened species recorded within the study area are listed as Vulnerable under the TSC Act, while the Grey-headed Flying-fox is listed as Vulnerable under the EPBC Act as well. Of the remaining 48 threatened fauna species, 33 were considered to have a moderate or greater chance of occurring within the study area. 11 of the species potentially occurring within the area were listed on the EPBC Act.

Migratory species

Two migratory species listed under the EPBC Act were observed during the current site assessment, they are, Rufous Fantail (*Rhipidura rufifrons*) and Black-faced Monarch (*Monarcha melanopsis*). After onsite habitat assessments a further four EPBC Act listed Migratory species were considered to have a moderate or greater likelihood of occurring within the study area (refer below).

Koala habitat assessment

The study area was found to contain two Koala feed tree species as listed in Schedule 2 of SEPP 44, being *Eucalyptus robusta* (Swamp Mahogany) and *E. tereticornis* (Forest Red Gum). *Eucalyptus robusta* (Swamp Mahogany) occurred within the study area at a density of greater than 15 per cent of the canopy layer therefore the study area was assessed as potential Koala habitat under the conditions contained in SEPP 44. A Spot Assessment Technique methodology was employed at three locations within Swamp Mahogany stands with no sign of Koala activity with these stands. Opportunistic surveys over the study area found no evidence of Koala habitation with the study area.

Threatened biodiversity

Threatened ecological communities

Results of the desk based investigation have predicted that 16 threatened ecological communities could occur within the locality. One of these communities was recorded during the recent survey; *Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregion* listed as Endangered under the TSC Act.

One vegetation community within the study area *Melaleuca biconvexa* – Swamp Mahogany – Cabbage Palm swamp forest of the Central Coast is considered consistent with the Swamp Sclerophyll Forest threatened ecological community based on the NSW Scientific Committee Determination (Office of Environment and Heritage 2016c). This threatened ecological community was previously also recorded during previous surveys (EMM 2015; GHD 2014). The EMN report (2015) for the Project indicated that the Project would be likely to have a potentially significant impact upon this community.

The Lowland Rainforest in the NSW North Coast and Sydney Basin Bioregions was also identified as a threatened ecological community in the EMN report (2015). Detailed field survey and analysis of this vegetation has revealed that this plant community type does not qualify to form part of this threatened ecological community. A detailed rational for this position is outlined in section 4.1.2 of the *Biodiversity Assessment Report* (WSP | Parsons Brinckerhoff, 2016a).

Further detail regarding the recorded threatened ecological communities is provided in section 4.1 of the *Biodiversity Assessment Report* (WSP | Parsons Brinckerhoff, 2016a) attached as Appendix A.

Endangered populations

Two Endangered populations are known to occur within the (former) Wyong LGA which include:

- *Eucalyptus oblonga* population at Bateau Bay, Forresters Beach and Tumbi Umbi in the Wyong LGA
- *Eucalyptus parramattensis* C. Hall. subsp*. parramattensis* in Wyong and Lake Macquarie LGA's.

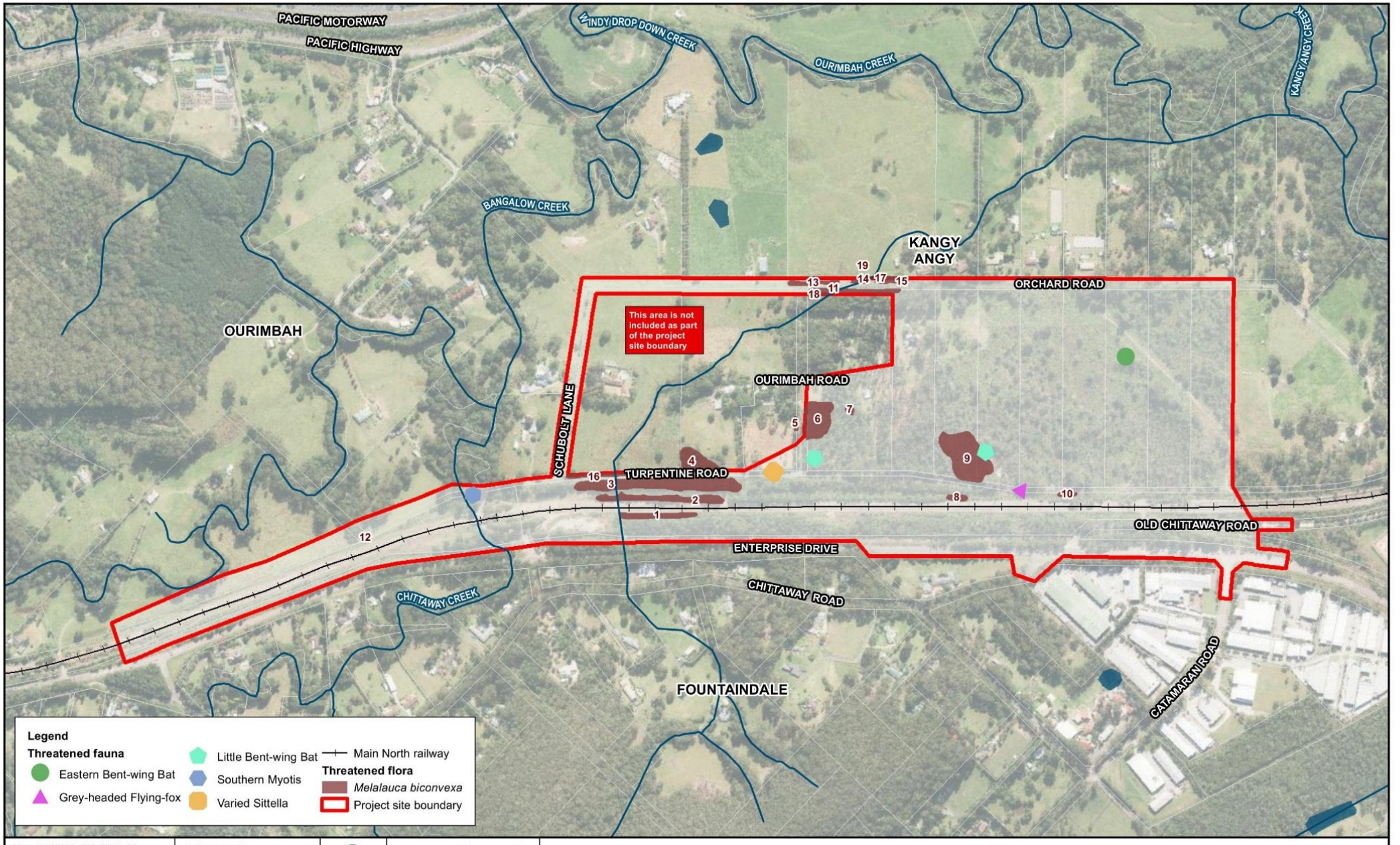
Neither of these populations are considered likely to occur within the study area based on the lack of available habitat within the study area, species known distributions and as they were not recorded during previous or current surveys.

Threatened species of plant

One threatened flora species, *Melaleuca biconvexa,* was recorded during previous and current surveys (refer to Figure 7.2). The initial assessment undertaken as part of the SIS (Section 3), which is being prepared concurrent to this report, identified 51 threatened flora species as potentially occurring within the locality. Six of these species are 'subject species' that have been identified in the CER's for the proposed New Intercity Fleet Maintenance Facility.

In addition to *Melaleuca biconvexa* recorded, four species were identified as having potential habitat within the Project area. The likelihood of these species occurring within the Project site was determined as moderate. Threatened species that could occur within the study area are listed in Table 7.8.

Melaleuca biconvexa recorded within the Project site were subjected to population counts and age class estimates to identify the number of plant stems likely to be impacted upon by the Project. Given that determining the population size of *Melaleuca biconvexa* through visual inspections is difficult the population size and abundance within the Project site were estimated via total counts or density average quadrats which included stem counts and a broad visual abundance assessment. In order to gain a more accurate extent and population estimate, the distribution of *Melaleuca biconvexa* within the Project site boundary was split into 20 areas as shown in Figure 7.2.



Map: 2202522A_GIS_F013_A4	Author: suansrir
Date: 5/05/2016	Approved by: -

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Coordinate system: GDA 1994 MGA Zone 56

Scale ratio correct when printed at A4

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New Intercity Fleet Maintenance Facility Project
Figure 7.2
Location of recorded threatened flora and fauna

Table 7.8 Threatened species of flora recorded or considered to have potential habitat within the survey area

Scientific Name	Common Name	TSC Act[1]	EPBC Act[2]	Likelihood of occurrence
Melaleuca biconvexa	Biconvex Paperbark	V	V	Recorded
Syzygium paniculatum	Magenta Lilly Pilly	E	V	Moderate
Maundia triglochinoides	-	V	-	Moderate
Senna acclinis	Rainforest Cassia	E	-	Low
Prostanthera askania	Tranquillity Mintbush	E	E	Low
Streblus pendulinus	Siah's Backbone	-	E	Low
Caladenia tessellata	Thick-lipped Spider Orchid	E	V	Low
Epacris purpurascens var. purpurascens	-	V	-	Low

Note 1 E = Endangered, V = Vulnerable as listed on the TSC Act

Note 2 E = Endangered, V = Vulnerable as listed on the EPBC Act

Further detail regarding the recorded threatened species of plant is provided in section 4.3 of the *Biodiversity Assessment Report* (WSP | Parsons Brinckerhoff, 2016a) attached as Appendix A.

Threatened species of animal

The initial assessment undertaken as part of the SIS, (which is available on the Transport for NSW website) identified 68 threatened fauna species that could occur within the locality.

Five threatened species were recorded within the study area, being; Varied Sittella, Little Bentwing-bat, Eastern Bent-wing Bat**,** Southern Myotis, and Grey-headed Flying-fox (refer to Figure 7.2). In addition to the five threatened species recorded, 33 species have been identified as having potential habitat within the Project site boundary (refer to Table 4.2 of Appendix A). The likelihood of these species occurring within the Project site was determined based on the results of the survey and is also shown in Table 4.2 of Appendix A.

Migratory species

Migratory species are protected under international agreements to which Australia are a signatory, including Japan-Australia Migratory Bird Agreement (JAMBA), China-Australia Migratory Bird Agreement (CAMBA), Republic of Korea-Australia Migratory Bird Agreement (RoKAMBA) and the Bonn Convention on the Conservation of Migratory Species of Wild Animals. Migratory species are considered Matters of National Environmental Significance and are protected under the EPBC Act.

Based on EMM's EPBC Protected Matters area search and other desk-top database searches, nine migratory fauna species were identified that could occur within the locality. In addition to EMM's report, the WSP | Parsons-Brinckerhoff field survey and desktop assessment identified a further six migratory species listed by the EPBC Act as having a potential habitat within the Project. Two of these migratory species, the Rufous Fantail and Black-faced Monarch, were observed during the current field survey. These species are identified in Table 7.9.

Table 7.9 Migratory species with the potential to occur within 10 kilometres of the study area

Common Name	Scientific Name	EPBC Act[1]	Likelihood of occurrence
Black-faced Monarch	*Monarcha melanopsis*	M	Recorded
Cattle Egret	*Ardea ibis*	M	Moderate
Rainbow Bee-eater	*Merops ornatus*	M	Moderate
Rufous Fantail	*Rhipidura rufifrons*	M	Recorded
Satin Flycatcher	*Myiagra cyanoleuca*	M	Moderate
Spectacled Monarch	*Monarcha trivirgatus*	M	Moderate

Note 1 M=Migratory as listed on the EPBC Act

Groundwater dependent ecosystems

Groundwater dependant ecosystems (GDE's) are communities of plants, animals and other organisms whose extent and life processes are dependent on groundwater (Department of Land and Water Conservation 2002). GDE's include a diverse range of ecosystems, from those entirely dependent on groundwater to those that use groundwater opportunistically (Hatton & Evans 1998).

An ecosystems level of groundwater dependence depends in part on their location in the landscape relative to the groundwater level. Dependence (or interaction) of the vegetation on groundwater was determined by aligning it with the groundwater dependant ecosystem types identified by the *Risk Assessment Guidelines for Groundwater Dependant Ecosystems, Volume 1* (Serov et al. 2012).

Two plant communities within the Project site were determined as being groundwater dependent within the Project site. These consisted of:

- *Melaleuca biconvexa* – Swamp Mahogany – Cabbage Palm Forest
- Jackwood – Lilly Pilly – Sassafras Rainforest.

Blackbutt – Turpentine – Sydney Blue Gum Mesic Tall Open Forest was determined as not being groundwater dependent. This was determined by following the GDE classification decision tree provided in the *Risk Assessment Guidelines for Groundwater Dependant Ecosystems Volume 1* (Serov et al. 2012).

Pelagic, estuarine or wetland fauna

Due to the Project site's location within coastal floodplain topography it occurs in relatively close proximity to pelagic, estuarine and wetland habitats. As a consequence, a number of records of these threatened species came up in database searches of the study area locality.

As there is no suitable habitat within the study area for threatened species dependent upon pelagic, estuarine and/or wetland species, these were not considered further as part of the overall assessment.

7.1.4 Construction impacts

Potential impacts to biodiversity resulting from the construction and operation phases of the proposed Project are considered in this section and summarised in Table 7.10.

Table 7.10 Potential impacts associated with the proposal

Potential impact	Potential phase of impact	
	Construction	Operation
Removal of native vegetation (including threatened ecological communities)	•	
Removal of threatened fauna species habitat	•	
Removal of threatened plant species	•	
Aquatic impacts	•	•
Impacts to groundwater dependant ecosystems (Swamp Forest)	•	•
Changes to hydrology	•	•
Erosion and sedimentation	•	•
Increase in fauna injury and/or mortality	•	•
Wildlife connectivity and habitat fragmentation	•	•
Edge effects on adjacent native vegetation and habitat	•	•
Potential environmental impact of noise, light and vibration on wildlife	•	•
Weed and pest invasion	•	•
Invasion and spread of pathogens and disease	•	•

Removal of native vegetation and fauna habitat

Clearing of native vegetation is listed as a Key Threatening Process under both the TSC Act and the EPBC Act. Under the TSC Act, native vegetation is made up of plant communities, comprising primarily indigenous species. Clearing is defined as the destruction of a sufficient proportion of one or more strata layers within a stand or stands of native vegetation so as to result in the loss, or long-term modification, of the structure, composition and ecological function of a stand or stands (NSW Scientific Committee 2001).

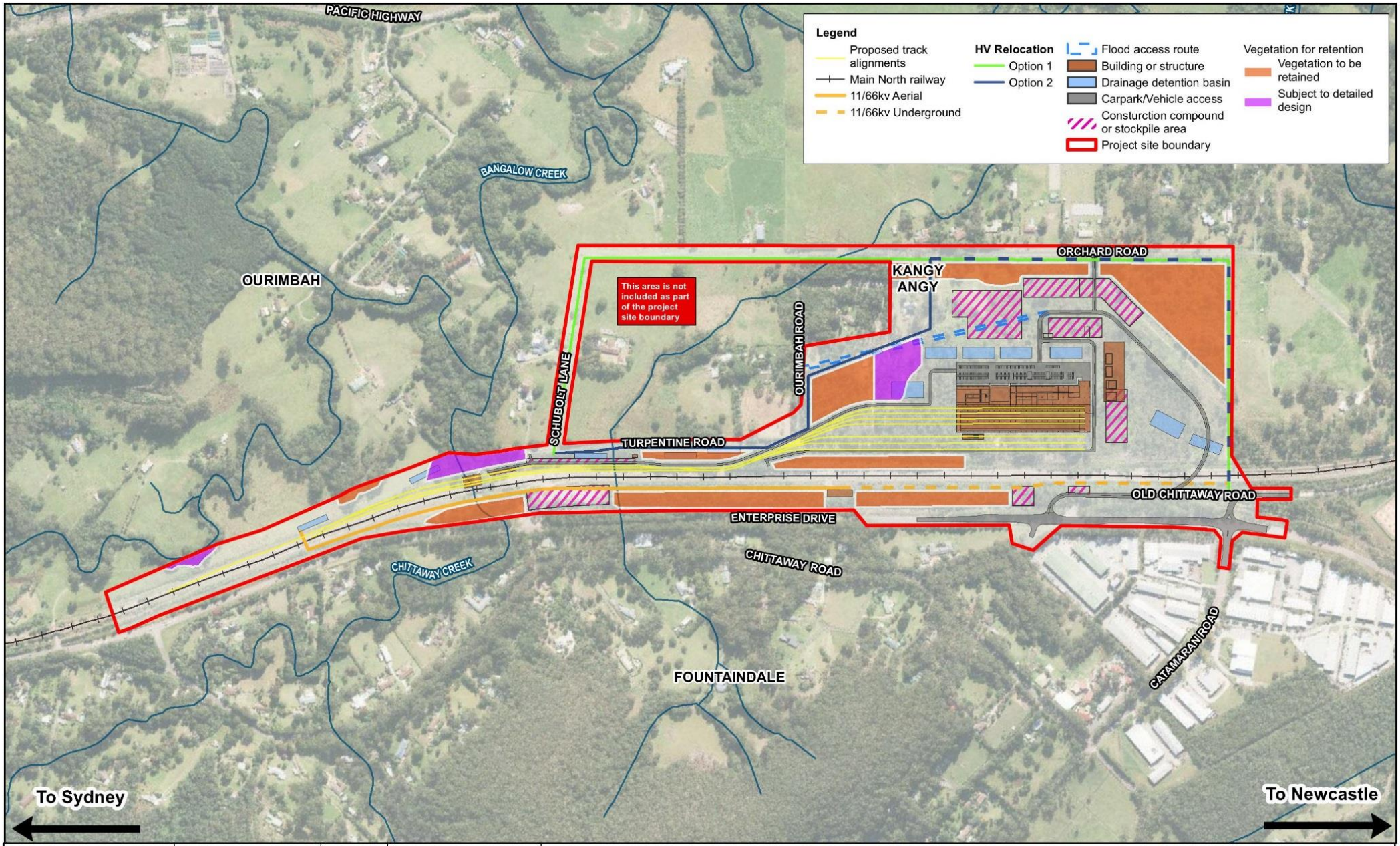
Construction of the Project would require the clearing of vegetation and habitats as summarised in Table 7.11. The potential clearing identified includes the whole of the identified Project site and would be refined during the detailed design of the Project with the aim of reducing the overall impact.

Table 7.11 Potential loss of native vegetation and corresponding fauna habitat within the Project site

Vegetation community	Fauna Habitat	Potential vegetation clearing (ha)
Melaleuca biconvexa – Swamp Mahogany – Cabbage Palm Forest[1]	Swamp Forest	25.5
Jackwood – Lilly Pilly – Sassafras Rainforest	Rainforest	1.1
Blackbutt – Turpentine – Sydney Blue Gum Mesic Tall Open Forest	Wet Open Forest	3.6
Cleared and disturbed land	Cleared land	12.1
Potential total area of vegetation to be impacted (subject to detailed design)		**42.3**

Note 1 *This native vegetation forms part of the endangered ecological community, Swamp Sclerophyll Forest on the Coastal Floodplains on the NSW North Coast, Sydney Basin and South East Corner Bioregion listed as Endangered under the TSC Act*

Where possible, areas of vegetation within the Project site have been identified for retention to minimise potential vegetation impacts. The areas of vegetation proposed to be retained are shown on Figure 7.3.



Map: 2202522A_GIS_F086_A1	Author: goganovskiM
Date: 30/05/2016	Approved by: -

Data source: - © Land and Property Information 2015

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Coordinate system: GDA 1994 MGA Zone 56

Scale ratio correct when printed at A4

Note: Design is indicative only.
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New Intercity Fleet Maintenance Facility Project
Figure 7.3
Areas of vegetation proposed to be retained

The potential clearing identified in Table 7.11 includes the loss of habitat features, such as a seasonal foraging resource for threatened blossom nomads and variations in micro elevation that provide a mosaic of soaks after rain. However, it is evident by the general lack of understorey debris, the relatively young age cohort of canopy trees, the lack of canopy strata in some areas and the dense understorey strata; that the vegetation communities are recovering from previous widespread disturbance. Consequently, the vegetation communities do not occur as old-growth forms and important fauna habitat attributes such as hollows, fallen timber, and large patch size are typically lacking. The general lack of these habitat attributes reduce the study area's capacity for supporting a wide diversity of local native species in isolation from other higher quality habitats in the locality.

Nevertheless, the Project would affect up to approximately 42.3 hectares known and potential habitat for 38 threatened fauna species, inclusive of Varied Sittella, Southern Myotis, Grey-headed Flying-fox, Eastern Bent-wing Bat and Little Bentwing-bat, which were recorded in the study area during targeted surveys.

One vegetation community within the study area (PCT1723/HU937: *Melaleuca biconvexa* – Swamp Mahogany – Cabbage Palm swamp forest of the Central Coast) is considered consistent with the Swamp Sclerophyll Forest on the Coastal Floodplains on the NSW North Coast, Sydney Basin and South East Corner Bioregion which is listed as Endangered under the TSC Act.

Direct removal of threatened plants (*Melaleuca biconvexa*)

Melaleuca biconvexa is listed as Vulnerable under both the TSC Act and EPBC Act. Approximately 5,014 plant stems of *Melaleuca biconvexa* were recorded within the Project site. Of these, approximately 3,984 are to be impacted by the project whilst the remaining 1,030 would be expected to be retained. An additional 1,251 *Melaleuca biconvexa* were recorded immediately adjacent the Project area which would not be directly impacted upon. Due to restricted access, not all neighbouring properties were surveyed during the surveys undertaken to inform this report, subsequently the population within this location is likely to be far larger given suitable habitat available.

The population of *Melaleuca biconvexa* recorded forms part of a local population (number two) within the (former) Wyong Shire described by Duncan (2001). This population is separate to the *Melaleuca biconvexa* an identified population at Lisarow which is currently subject to potential impact from a Roads and Maritime Pacific Highway upgrade Project to the south of the proposed New Intercity Fleet Maintenance Facility.

Hydrological changes

The Project is likely to require the installation of additional culverts or water crossings along Chittaway Creek. Waterway crossings could modify the natural hydrology of creeks in the study area, which could ultimately affect the aquatic assemblages that use the area (Fairfull & Witheridge 2003). Impacts from waterway crossings may include:

- Excessive flow velocities, which could erode creek banks and lead to changes in water quality, as well as acting as a barrier to fish movement
- Modified water depths of the creek
- Increased water turbulence, which could lead to the avoidance of the area by various aquatic organisms.

Excavation and earthworks undertaken during the construction phase of the Project would expose soils that have potential to enter receiving environments. Sediment runoff during earthworks has the potential to introduce storm flow and increase suspended solids in adjacent streams and drainage lines. Further, it is likely that runoff intensity would increase and any drainage design or improvements to existing structures would need to consider the existing receiving environment.

Impacts to groundwater dependant ecosystems

The Project is likely to have potential impacts on approximately 33.3 hectares of GDE's identified within the study area; *Melaleuca biconvexa* – Swamp Mahogany – Cabbage Palm Forest and Jackwood – Lilly Pilly – Sassafras Riparian Warm Temperate Rainforest.

Within the study area the Project would require the removal of vegetation from these GDE's and modifications to the existing hydrology within the study area. Changes in hydrology may include alteration of natural flow regimes as a result of installing culverts and water crossings, potentially affecting the current water supply for these plants. However, given the existing groundwater and hydrological conditions within the Project site, changes in the natural flow regimes as a result of the Project are not expected to be such that this would have an impact on the existing GDE's. Additionally excavation and earthworks associated with vegetation clearing and levelling of the land for the Project may impact on the groundwater present which could lead to modifications of the existing natural ecological function of these GDE's.

Aquatic disturbance

Much of the study area was characterised by floodplain topography perched above Bangalow Creek, Chittaway Creek and Ourimbah Creek with the underlying substrates subject to variations in elevation, which form a mosaic of low water-holding soaks, as well as more elevated substrates less subject to waterlogging. The Project would require the in-filling of such areas to accommodate the proposed development. Up to approximately 25.5 hectares of Swamp Forest, which provides potential habitat for threatened frogs (Wallum Froglet and Green-thighed Frog) has the potential to be impacted (subject to detailed design and refinement of the footprint for the Project site).

The Project traverses Chittaway Creek and Bangalow Creek in the southern portion of the study area. Construction of the Project would directly impact riparian rainforest habitat and potentially important in-stream microhabitat features (e.g. woody debris, snags and rocks). Such riparian rainforest habitat also provided potential habitat for the threatened Stuttering Frog and Giant Barred Frog.

Run-off from disturbed surfaces and earthworks could potentially affect water quality in adjacent creeks and drainage lines due to sedimentation during construction and operation of the Project. In addition, there is the potential for accidental spillage/leakage of rail construction materials including fuels, lubricants and hydraulic oils from construction plant and equipment. During operation, increased paved surfaces associated with the proposal would likely result in an increase in stormwater run-off volumes and flows. This could potentially increase flow velocities in drainage lines downstream.

Direct fauna mortality

Fauna injury or death could occur as a result of the Project's construction phase when vegetation and habitats are being cleared. Fauna injury or mortality also has the potential to occur as a result of collisions with increased road and rail traffic. While some mobile species, such as birds, have the potential to move away from the path of clearing, other species that are less mobile may have difficulty moving over relatively large distances. Species of animal that may be at particularly high risk of injury or death during vegetation clearing include, amphibians, nocturnal arboreal mammals, microchiropteran bats, reptiles, small terrestrial mammals and nesting birds.

Habitat fragmentation and wildlife connectivity

Habitat fragmentation is the division of a single area of habitat into two or more smaller areas, with the occurrence of a new habitat type in the area between the fragments. This new dividing habitat is often artificial and inhospitable to the species remaining within the fragments ((Bennett 1990), (Johnson et al. 2007)). Although newly created habitat is generally used by some species, those species are usually generalists and are often aggressive (i.e. Noisy Miners (Grey et al. 1998)), further decreasing population levels of the species remaining in the fragments. Habitat fragmentation can result in a number of impacts including, barrier effects to the movement of small and sedentary fauna such as ground-dwelling mammals, reptiles and amphibians. Habitat fragmentation can also create barriers to pollination (movement of pollinator vectors), such as restricting insect movements, thereby affecting the lifecycle of both common and threatened flora.

Within the Project locality, key wildlife corridors are associated with the large contiguous tracts of native vegetation associated with the coastal ranges, foothills and sheltered gullies, which occur to the west, north-west and south of the study area. Land immediately adjacent to the Project site is fragmented due to historical clearing for rural residential land holdings. This has created a mosaic of smaller, fragmented patches of habitat. The Project locality creek lines, Ourimbah Creek and Bangalow Creek, retain sufficient riparian habitat that provide connectivity through an otherwise largely cleared and managed landscape.

Whilst vegetation in the study area is not likely to be used solely in isolation of surrounding high quality vegetation for most mobile guilds of animal, the study area would be used as a stepping stone between habitat patches. Construction and operation of the Project would add incrementally to the fragmentation of habitat in an approximate north – south alignment from the coastal range south of the existing rail corridor to riparian habitat associated with Ourimbah Creek in the north. The existing rail corridor, however, may already act as a barrier in the landscape to less mobile species of animal, in which case the Project would add incrementally to the width of an existing barrier.

Edge effects

Edge effects are zones of changed environmental conditions (i.e. altered light levels, wind speed and/or temperature) occurring along the edges of habitat fragments. These new environmental conditions along the edges can promote the growth of different vegetation types and allow invasion by pest animals specialising in edge habitats and/or change the behaviour of resident animals. Edge zones can be subject to higher levels of predation by introduced mammalian predators and native avian predators.

It is evident that the vegetation communities are recovering from previous widespread disturbance. Further, the existing rail corridor abuts the south-eastern boundary of the study area, whilst rural and residential land holdings adjoins the majority of the remaining study area. Accordingly, as areas adjoining the study area occur as largely managed and high disturbed areas, it is not likely that the proposed Project would increase edge effects any more than is occurring within and adjoining the study area.

Potential environmental impact of noise, light and vibrations on wildlife

It is likely that noise from the existing rail corridor and arterial roads would already impact background levels of noise in the study area. Variation in ambient noise is part of the natural environment and many animals display behavioural adaptations to this variation. However, construction and operation phases of the Project (along with its ancillary activities) may cause disturbance to animals. The impacts from noise emissions are likely to be localised close to the Project and are not likely to have a major long-term impact on wildlife populations, given that populations are already exposed to noise associated with the existing rail and road corridors. Furthermore, it is likely that most animal species will habituate to periodic noise disturbance from regular maintenance activities (Forman *et al*. 2000; Larkin 2005).

Weeds

A total of 41 exotic species were recorded within the Project site during the survey period. Of the 41 environmental weeds identified within the Project site, three exotic species are listed as noxious weeds under the NW Act for the Wyong Shire Council Local Control Authority. Although not noxious weeds within the Wyong Shire Local Control Area other environmental weeds recorded have potential to spread rapidly if not managed appropriately; *Lonicera japonica** (Japanese Honeysuckle), *Ligustrum lucidum** (Large-leaved Privet), *Ligustrum sinense** (Small-leaved Privet) and *Chloris gayana** (Rhodes Grass).

Construction within the study area has the potential to disperse weeds into areas where they do not currently occur. The most likely causes of weed dispersal associated with the proposed construction would include earthworks, movement of soil and attachment of seed (and other propagules) to vehicles and machinery. This may, in turn, reduce the habitat quality of the sites for threatened species. Spread of weeds during the operation phase would relate generally to the vehicles travelling along access tracks.

Invasion and spread of pathogens and disease

Plant and animal pathogens can affect threatened biodiversity through direct mortality and modification to vegetation structure and composition. The following pathogens are considered to have potential to affect the biodiversity of the site and are the subject of Key Threatening Processes listings:

- Amphibian Chytrid Fungus (*Batrachochytrium dendrobatidis*)
- Exotic Rust Fungi (order Pucciniales, e.g. Myrtle rust fungus *Uredo rangelii*)
- Phytophthora Root Rot Fungus (*Phytophthora cinnamomi*).

These three pathogens have all been recorded in the Sydney Basin bioregion and have potential to occur within the study area at present or in the future. Amphibian Chytrid Fungus can be spread through water, soil, mulch or other landscape material containing spores of Chytrid Fungus being imported onto the work site. Alternatively, Chytrid Fungus can be spread through the movement of infected individuals.

The main way in which Exotic Rust Fungi and Phytophthora Root Rot Fungus may be spread is through the movement of infected plant material and/or soil. The construction and operation of the Project may increase the risk of disturbing and spreading these pathogens. With the implementation of hygiene procedures for the use of vehicles and the importation of materials to the site, the risk of introducing these pathogens would, however, be low. Preferential use of plant materials sourced on-site (e.g. mulch, seeds) used for vegetation restoration would also help to minimise this risk.

7.1.5 Operational impacts

A number of impacts expected during construction of the Project may also occur (albeit to a lesser extent) during the operational phase of the Project. These impacts include potential aquatic impacts, changes to GDE's, changes to hydrology, increase in fauna injury, wildlife connectivity and habitat fragmentation, edge effects, weeds and pests, noise, light and vibration and spread of pathogens and disease. These potential impacts have previously been described in section 7.1.4.

7.1.6 Key threatening processes

Key Threatening Processes are listed under Schedule 3 of the TSC Act, the FM Act and EPBC Act.
A process is defined as a Key Threatening Process if it threatens or may threaten the survival, abundance, or evolutionary development of a native species or ecological community. A process can be listed as a key threatening process if it could cause a native species or ecological community to become eligible for adding to a threatened list (other than conservation dependant), or cause an already listed threatened species or community to become more endangered, or if it adversely affects two or more listed threatened species or ecological communities.

The Project has the potential to contribute to the following threatening processes:

- Clearing of native vegetation – EPBC Act and TSC Act
- Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants – EPBC Act
- Invasion of native plant communities by exotic perennial grasses – TSC Act
- Loss of hollow-bearing trees – TSC Act
- Invasion, establishment and spread of *Lantana camara* – TSC Act
- Invasion of native plant communities by African Olive *Olea europaea* L. subsp. *cuspidate* – TSC Act
- Invasion and establishment of exotic vines and scramblers – TSC Act
- Instream structures and other mechanism that alter natural flow – FM Act
- Degradation of native riparian vegetation along NSW water courses – FM Act.

7.1.7 Management and mitigation measures

As part of overall CEMP for the Project, a vegetation management plan (VMP) would be developed to address potential biodiversity impacts. The following general measures would be incorporated into the VMP to ensure ecological impacts are minimised (in particular during construction):

- Opportunities to reduce the clearing of native vegetation would be investigated during detailed design.
- Implement pre and construction-clearing protocols, including:
  - An experienced fauna ecologist would check for the presence of flora and fauna species and habitat on site before clearing begins (such as the presence of bird nests) and would be present to supervise vegetation clearing and capture and relocate fauna where required
  - Prior to construction, site personnel should be adequately informed of environmental management procedures including, but not limited to, issues related to flora and fauna management, weed control, erosion and sediment control (in accordance with Landcom's *Soil and Construction Managing Urban Stormwater,* March 2004).
  - Establish exclusion zones to protect vegetation and fauna habitat outside of the assessed and approved clearing limits, including the threatened ecological communities recorded within the study area (including Swamp Sclerophyll Forest, *Biconvex Melaleuca* and riparian areas). Vegetation to be retained are to be clearly defined on ground and 'no go zones' clearly signposted and fenced to prevent unauthorised clearing and vehicular and/foot traffic.
  - The limits of clearing would be clearly demarcated on-site (where appropriate) prior to construction to avoid unnecessary vegetation and habitat removal. This could include the installation of fencing around the Project site footprint.
  - Carefully clearing vegetation so as not to mix topsoil with debris and to avoid impacts to surrounding native vegetation.
  - Avoid excessive soil disturbance.
  - When accessing construction sites, contractors should only use designated access tracks.
- During construction, the following general measures would be implemented:
  - All workers would be provided an environmental induction prior to starting work on site. This would include information on the ecological values of the site, protection measures to be implemented to protect biodiversity, and penalties for breaches.
- Implement flora and fauna control measures including:
  - Clearing of vegetation would be minimised, to only vegetation that is absolutely required to be removed in order to undertake work.
  - Noxious weeds would be managed in accordance with the *Noxious Weeds Act 1993.*
  - Protocols to prevent the introduction and/or spread of Chytrid fungus would be implemented. These protocols would be based on OEH Hygiene Protocol for the Control of Disease in Frogs.
- Weed species within the study area would be managed in order to control them from further spread. Management techniques may include immediate weed removal and disposal without stockpiling, disposal of weed-contaminated soils at appropriate weed disposal facilities and to ensure that all equipment is cleaned prior to and on completion of works to ensure weeds are not introduced or spread to other locations.
- A Biodiversity Offset Strategy would be prepared in accordance with the BioBanking Assessment Methodology to offset impacts associated with the project on biodiversity values in particular impacts to Swamp Sclerophyll Forest and *Melaleuca biconvexa*.

A more detailed set of mitigation measures including biodiversity offsets, revegetation and rehabilitation would also be developed for specific species identified within the Project site and these would be provided within the SIS for the Project which will be complete prior to any works commencing on site. The SIS will be placed on public exhibition under a separate process to the REF.

7.2 Noise and vibration

A *Noise and Vibration Assessment* which assesses the potential construction and operational noise and vibration impacts associated with the new intercity maintenance facility has been undertaken by WSP | Parsons Brinckerhoff (WSP | Parsons Brinckerhoff, 2016b). This assessment is attached as Appendix B of this REF. A summary of this assessment is provided in the following sections.

7.2.1 Assessment Criteria

The assessment has been prepared with reference to the following guidelines, policies and standards:

- *Industrial Noise Policy* (EPA, 2000)
- *Interim Construction Noise Guideline* (DECC, 2009)
- *Construction Noise Strategy* (Transport for NSW, 2013b)
- *Road Noise Policy* (EPA, 2011)
- *Assessing Vibration: A Technical Guideline (Vibration Guideline)* (DEC, 2006)
- DIN Standard 4150-2 Part 3: Structural Vibration in Buildings: Effects on Structures (DIN Deutsches Institut für Normung, 1999).

A summary of the noise and vibration assessment criteria is provided below, with additional detail provided in Chapter 5 of the *Noise and Vibration Assessment* (WSP | Parsons Brinckerhoff, 2016b) attached as Appendix B.

Noise

Construction

Noise impacts from construction noise are assessed using the *Interim Construction Noise Guideline* (ICNG) (DECCW, 2009) and the TfNSW *Construction Noise Strategy* (CNS) (Transport for NSW, 2013b). The ICNG defines a noise management level for residential and other sensitive land uses. Above this level, feasible and reasonable mitigation should be considered to reduce noise levels.

Table 7.12 defines noise management levels (NML) as specified in the ICNG and how they are applied for residential receivers. NMLs are the level of noise above which receivers are considered to be 'noise affected'. They are based on the measured RBL as defined in the INP plus an additional allowance of 10 dB during standard hours and 5 dB outside of standard hours. Where construction noise levels are above 75 dBA at residential receivers during standard hours, they are considered 'highly noise affected' and require additional considerations to mitigate potential impacts.

Table 7.12 Interim Construction Noise Guideline construction noise management levels for residential receivers and working hours

Time of day	NML ($L_{eq,15min}$[1,2] dBA)	How to apply
Recommended standard hours: Monday to Friday 7.00 am to 6.00 pm Saturday 8.00 am to 1.00 pm No work on Sundays or public holidays	Noise affected RBL + 10 dB	The noise affected level represents the point above which there may be some community reaction to noise. Where the predicted or measured $L_{eq,15min}$ dBA is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to meet the noise affected level. The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.

Time of day	NML ($L_{eq,15min}$[1,2] dBA)	How to apply
	Highly noise affected 75 dBA	The highly noise affected level represents the point above which there may be strong community reaction to noise. Where noise is above this level, the relevant authority (consent, determining or regulatory) may require respite periods by restricting the hours that the very noisy activities can occur, taking into account: → Times identified by the community when they are less sensitive to noise (such as before and after school for works near schools, or mid-morning or mid-afternoon for works near residences). → If the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.
Outside recommended standard hours	Noise affected RBL + 5 dB	A strong justification would typically be required for works outside the recommended standard hours. The proponent should apply all feasible and reasonable work practices to meet the noise affected level. Where all feasible and reasonable practices have been applied and noise is more than 5 dB above the noise affected level, the proponent should negotiate with the community.

Note 1 *Noise levels apply at the property boundary that is most exposed to construction noise, and at a height of 1.5 metres above ground level. If the property boundary is more than 30 metres from the residence, the location for measuring or predicting noise levels is at the most noise-affected point within 30 metres of the residence. Noise levels may be higher at upper floors of the noise affected residence.*

Note 2 *The RBL is the overall single-figure background noise level measured in each relevant assessment period (during or outside the recommended standard hours). The term RBL is described in detail in the NSW Industrial Noise Policy (INP) (EPA 2000).*

Table 7.13 provides a summary of the applicable NMLs based on the background noise monitoring conducted. In addition, Table 7.14 lists the NMLs that have been adopted for non-residential sensitive receivers as required by the ICNG. Table 7.15 also provides a summary of common noise sources and their typical noise levels in order to allow for a comparative analysis throughout this report.

Table 7.13 Construction noise management levels for residential receivers

Noise monitoring location	NML $L_{eq,15min}$			
	Day (standard hours)	Day (out-of-hours)	Evening (out-of-hours)	Night (out-of-hours)
BG1	55	50	50	48
BG2	54	49	45	40
BG3	59	54	49	40
BG4	57	52	53	50

Table 7.14 Noise management levels at sensitive land uses (other than residences)

Land use	NML $L_{eq,15\ min}$ dBA (applies when properties are being used)
Industrial	75 (external)
Commercial	70 (external)
Child care centre[1]	55 (external)
School	55 (external)

Note 1 *Based on the maximum recommended internal noise level as specified in AS 2107 Recommended design sound levels and reverberation times for building interiors. An external noise level has been specified based on an outside to inside correction of 10 dB, assuming windows are partially open for ventilation.*

Table 7.15 Common noise sources and their typical noise level

dBA (approx.)	Indicative A-weighted decibel (dBA) noise levels
0	Threshold of hearing
20	Inside a bedroom with windows closed
30	Quiet countryside
40 to 50	Quiet suburban area
60	Busy office
70 to 80	Busy city street at kerbside
90 to 100	Jackhammer near operator
110	Rock concert
120 to 130	Jet take off from a distance of approximately 100 metres
140	Threshold of pain (indicative)

Note *Table generated based on indicative noise sources as shown in Noise Guide for Local Government – Part 2 Noise assessment, Figure 2.2 (EPA, 2013)*

Operational

Operational noise is assessed according to the *Industrial Noise Policy* (INP) (EPA, 2000). The INP is the considered to be the appropriate assessment method for the Project as the *Rail Infrastructure Noise Guideline* (RING) (EPA, 2013) assessment method specifically excludes noise from maintenance and stabling yards. The INP defines two criteria for the assessment of noise; the intrusive and amenity criteria. The more onerous criterion is then adopted as the Project specific noise level (PSNL) which the Project is assessed against.

The intrusive criterion is intended to protect residential receivers against intrusive noise in the short term. The amenity criterion is intended to maintain noise amenity and limit cumulative noise increases for sensitive land uses.

The residential receivers are defined as suburban amenity receivers in a rural residential zone as defined in the INP. The suburban amenity category has been selected as the area has intermittent traffic flows and limited commerce and industry in the area and has decreasing noise levels in the evening and night. The presence of the constant background noise from the Pacific Motorway at all receivers would exclude it from being categorised as a rural amenity receiver.

Table 7.16 presents the criteria and Project specific noise level for residential receivers at each of the measurement locations.

Table 7.16 Operational criteria for residential receivers

Noise monitoring location	Time period[1]	RBL dBA	Intrusive criteria $L_{eq,15min}$ dBA	Existing industrial noise level $L_{eq,15min}$ dBA	Acceptable noise level $L_{eq,period}$ dBA	Amenity criteria[1] $L_{eq,period}$ dBA	PSNL $L_{eq,15min}$ dBA[5]
BG1	Day	45	50	N/A	55	55	50
	Evening[2]	45	50	N/A	45	45	45
	Night	43	48	N/A	40	40	40

Noise monitoring location	Time period[1]	RBL dBA	Intrusive criteria $L_{eq,15min}$ dBA	Existing industrial noise level $L_{eq,15min}$ dBA	Acceptable noise level $L_{eq,period}$ dBA	Amenity criteria[1] $L_{eq,period}$ dBA	PSNL $L_{eq,15min}$ dBA[5]
BG2	Day[3]	44	49	<50	55	53	49
	Evening[3]	40	45	<42	45	42	42
	Night[3]	35	40	<33	40	40	40
BG3	Day[3]	49	54	<49	55	55	54
	Evening[3]	44	49	<50	45	40	40
	Night[2]	35	40	35	40	38	38
BG4	Day[4]	47	52	47	55	55	52
	Evening[4]	48	53	47	45	37	37
	Night[4]	45	50	47	40	37	37

Note 1 *Day is defined as Monday to Saturday 7.00 am to 6.00 pm; 8.00 am to 6.00 pm Sundays and Public Holidays, Evening is 6.00 pm to 10.00 pm and Night is the remaining periods.*

Note 2 *The measured RBL for evening was higher than the day. Therefore the RBL for the evening period has been set at the same as for day in accordance with the INP application notes.*

Note 3 *The existing industrial noise level was set at 10 dB less than the existing ambient noise level.*

Note 4 *The existing $L_{eq,period}$ industrial noise was set at the measured industrial noise level on site.*

Note 5 *The PSNL has been set as a $L_{eq,15min}$ in order to provide a conservative assessment. Where compliance is achieved over a 15 minute period is therefore implied it will occur over the day, evening or night period.*

Table 7.17 presents the Project specific noise level for non-residential receivers as presented in the INP.

Table 7.17 Operational criteria for non-residential receivers

Receiver	Time period	Amenity criteria[1] ($L_{eq,period}$ dBA)
Industrial	When in use	70
Commercial	When in use	65
School	Noisiest 1-hour period when in use	45 (external)
Child care centre[2]	Noisiest 1-hour period when in use	35 (internal) or 45 (external)

Note 1 *The PSNL has been set as a $L_{eq,15min}$ in order to provide a conservative assessment. Where compliance is achieved over a 15 minute period is therefore implied it will occur over the day, evening or night period.*

Note 2 *Noise criteria for the child care is considered to be similar in nature to school classroom land use and assumes a 10 dB outside to inside correction, assuming windows are partially open.*

Sleep disturbance

Operational and construction noise during the night have the potential to disturb people's sleep patterns. Guidance in the ICNG and INP Application Notes references further information in the RNP that discusses criteria for the assessment of sleep disturbance. The RNP and the INP application notes suggest a screening level of $L_{1,1min}$ dBA, equivalent to the RBL+15 dB.

The guidance within the RNP indicates that internal noise levels of 50 to 55 dBA are unlikely to cause sleep awakenings. Therefore at levels above 55 dBA, sleep disturbance would be considered likely. Assuming that receivers may have windows partially open for ventilation, a 10 dB outside to inside correction has been adopted as indicated in the INP. Therefore sleep disturbance screening criteria of RBL+15 dB and L_{max} 65 dBA have been adopted for the Project.

Off-site road traffic

As described in Chapter 4, the Project requires vehicle movements on the surrounding roads in addition to the construction of a new access road from Old Chittaway Road which would also provide an additional link between Enterprise Drive and Orchard Road for potential future use by local residents (subject to agreement with Central Coast Council). The *Road Noise Policy* (RNP) has been used to assess both the noise from traffic generated by the Project and the impact of the new access road. Table 7.18 presents the road traffic noise criteria from the RNP for land use developments with a potential to create additional traffic on an existing road.

Table 7.18 Road Noise Policy assessment criteria

Road category	Type of Project/land use	Day (7.00 am to 10.00 pm)	Night (10.00 pm to 7.00 am)
Collector/sub-arterial/arterial/ freeway	Existing residences affected by additional traffic on existing freeways/arterial/sub-arterial roads generated by land use developments.	$L_{eq,15hr}$ 60 dBA	$L_{eq,9hr}$ 55 dBA
	New road	$L_{eq,15hr}$ 55 dBA	$L_{eq,9hr}$ 50 dBA
Local road	Existing residences affected by additional traffic on existing freeways/arterial/sub-arterial roads generated by land use developments.	$L_{eq,1hr}$ 55 dBA	$L_{eq,1hr}$ 50 dBA

Vibration

Vibration from construction and operation can lead to:

- Cosmetic and structural building damage
- Loss of amenity due to perceptible vibration, termed human comfort.

Cosmetic building damage

Cosmetic damage is regarded as minor in nature; it is readily repairable and does not affect a building's structural integrity. Damage of this nature is typically described as hairline cracks on drywall surfaces, hairline cracks in mortar joints and cement render, enlargement of existing cracks, and separation of partitions or intermediate walls from load bearing walls. If there is no significant risk of cosmetic damage then structural damage is not considered a significant risk and is not further assessed.

There is currently no guidance in NSW specifically addressing cosmetic damage to buildings from vibration. Two international standards are typically referenced for the assessment of cosmetic damage in buildings; British Standard BS 7385-2: *1993 Evaluation and measurement for vibration in buildings* and German Standard *DIN 4150-3: 1999 Structural Vibration – Part 3: Effects of vibration on structure.*

The criteria adopted for assessing potential cosmetic building damage and guideline values for short term vibration on structures associated with the Project are provided in Table 7.18 and Table 7.19 respectively of the *Noise and Vibration Impact Assessment* (WSP | Parsons Brinckerhoff, 2016b) attached as Appendix B.

Human comfort (amenity)

Table 7.19 presents the limits (vibration dose values) above which there is considered to be a risk that the amenity and comfort of people occupying buildings would be affected by construction work. The limits are taken from *Assessing Vibration: A Technical Guideline* (DEC, 2006).

Table 7.19 Vibration limits (human exposure), Vibration dose value, $m/s^{1.75}$

Location	Assessment period	Preferred values	Maximum values
Critical areas	Day or night time	0.10	0.20
Residences	Daytime	0.20	0.40
Residences	Night time	0.13	0.26
Offices, schools, educational institutions, and places of worship	Day or night time	0.40	0.80
Workshops	Day or night time	0.80	1.60

7.2.2 Methodology

Noise monitoring

Short term attended and long term unattended noise measurements were taken between 17 February 2016 and 29 February 2016, and 30 March 2016 and 6 April 2016. The noise monitoring was conducted with reference to Australian Standard AS 1055 *Acoustics, Description and Measurement of Environmental Noise*. Table 7.20 describes the noise monitoring locations for each of the background noise monitoring sites. The location of these sites is also shown on Figure 7.4.

Table 7.20 Background noise monitoring sites

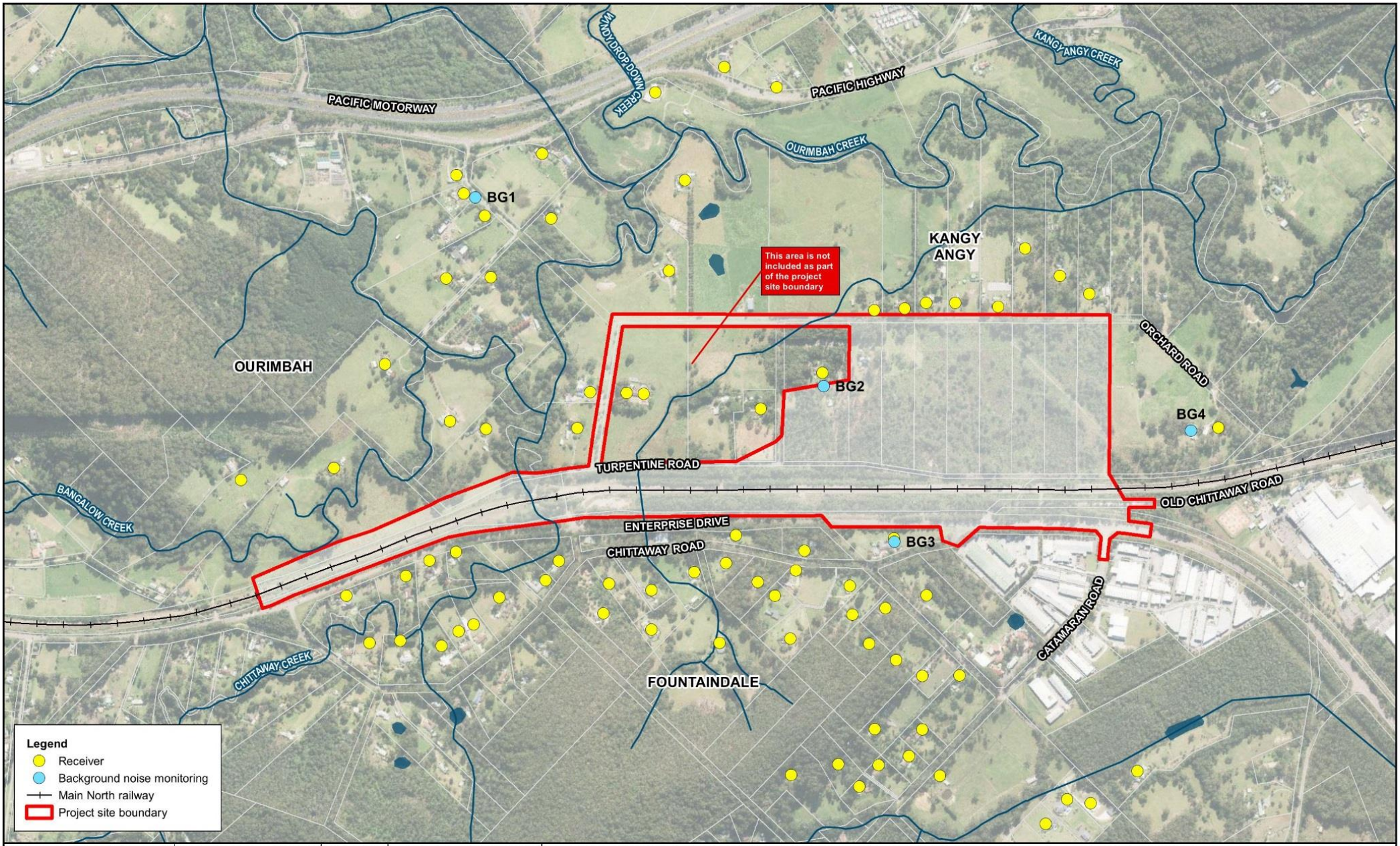
ID	Equipment Description	Location	Date[1]
BG1	Environmental noise monitor	11 Bridge Street, Ourimbah	17 to 29 February 2016
BG2	Environmental noise monitor	19 Ourimbah Road, Kangy Angy	30 March 6 April 2016
BG3	Environmental noise monitor	170 Old Chittaway Road, Fountaindale	17 to 29 February 2016
BG4	Environmental noise monitor	139 Orchard Road, Kangy Angy	30 March 6 April 2016

Note 1 Measurements initially carried out at BG2 between 17 and 29 February 2016, were adversely affected by insect noise and were repeated between 30 March and 6 April 2016.

The data was gathered over a period of typical traffic movement and activity in the area (i.e. outside of school holiday periods). Operator attended noise surveys and observations were also conducted at the noise monitoring locations on 17 February 2016, 29 February 2016, 30 March 2016 and 31 March 2016. The primary purpose of the attended monitoring was to characterise the existing ambient environment based on a short term noise measurement sample.

Road traffic counts

Road traffic counts were also undertaken on Enterprise Drive between 30 March and 6 April 2016 at the same time as the noise monitoring undertaken at BG2 and BG4.



Map: 2202522A_GIS_F028_A2	Author: goganovskiM
Date: 30/05/2016	Approved by: -

Data source: - © Land and Property Information 2015

0 130 260 m

1:12,500

Coordinate system: GDA 1994 MGA Zone 56

Scale ratio correct when printed at A4

Note: Design is indicative only.
Subject to detailed design

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New Intercity Fleet Maintenance Facility Project
Figure 7.4
Receiver and background monitoring locations

7.2.3 Existing environment

Sensitive receivers

The site is surrounded by residential receivers in the suburbs of Kangy Angy and Fountaindale. To the north, east and south of the site, the nearest sensitive residential receivers are located on Orchard Road, Ourimbah Road, Turpentine Road and Schubolt Lane. Residential receivers are also located across the main railway on Old Chittaway Road, Station Road and Enterprise Drive. Two commercial/light industrial areas are located to the north-east and the south-east of the site on Catamaran Road and Sanitarium Road. A child care centre is located at 98 Old Chittaway Road and the Central Coast Rudolf Steiner School is also located at 10 Catamaran Road, Fountaindale.

Figure 7.4 shows the location of the receivers and Table 3.1 of the *Noise and Vibration Impact Assessment* (attached as Appendix B) provide a summary of the nearest, potentially most affected sensitive receivers to the site.

As part of the Project, 53 Orchard Road and 11 Ourimbah Road are to be acquired and have not been considered in the assessment. Other partial acquisitions of private land on Turpentine Road are not expected to result in the existing occupants having to vacate their respective premises, and these receivers have therefore not been considered in the assessment.

Noise monitoring results

Table 7.21 summaries the long term unattended noise monitoring results which were received. The data is reported as the average equivalent continuous average sound levels ($L_{eq,15min}$) and rating background levels (RBL) as defined in the NSW *Industrial Noise Policy* (INP) (EPA, 2000).

Table 7.21 Unattended noise measurement results (dBA)

ID	Address	Day $L_{eq,15min}$	Day RBL	Evening $L_{eq,15min}$	Evening RBL	Night $L_{eq,15min}$	Night RBL
BG1	11 Bridge Street, Ourimbah	53	45	55	46	49	43
BG2	19 Ourimbah Road, Kangy Angy	60	44	52	40	43	35
BG3	170 Old Chittaway Road, Fountaindale	59	49	60	44	55	35
BG4	139 Orchard Road, Kangy Angy	59	47	59	48	57	45

Note *Day is defined as Monday to Saturday 7.00 am to 6.0 0pm; 8.00 am to 6.00 pm Sundays and Public Holidays, Evening is 6.00 pm to 10.00 pm and Night is the remaining periods.*

The most considerable noise source at BG1 during the day was traffic noise from the Pacific Motorway, with bird and insect noise also contributing to the background noise environment. At night, insect noise and constant traffic noise from the Pacific Motorway contributed to background noise level. There was no audible industrial noise present during either the day or night periods.

At BG2 the acoustic environment generally consisted of distant traffic and birds during the daytime and during the night insects also contributed to the noise environment. During the day, noise was equally audible from the Pacific Motorway and Enterprise Drive. At night, traffic noise was more noticeable from Pacific Motorway than Enterprise Drive. Traffic noise made a larger contribution to the overall noise levels at night. There was no audible industrial noise measured during the day or night.

At BG3 during the day, the acoustic environment was controlled by constant traffic along Enterprise Drive, with peaks from occasional train passbys as well as birds and insects also being present. During the daytime, no industrial noise was present, and traffic noise due to Pacific Motorway was not audible.

The acoustic environment during the night at BG3 was dominated by distant traffic noise from the Pacific Motorway, with smaller traffic noise contributions coming from Enterprise Drive (approximately one car per minute).

The acoustic environment at BG4 during the day, evening and night periods was dominated by industrial noise from the Sanitarium factory. Other audible noise sources during the day included bellbirds, the Pacific Motorway and Enterprise Drive. Occasional peaks from train passbys also contributed to the noise environment at this location. Other audible background noise sources at night consisted of traffic noise from the Pacific Motorway and from insects, with Enterprise Drive contributing less than during the day.

Short term attended noise monitoring and train pass-by noise measurements were also recorded during the monitoring period. The results for this monitoring are presented in Table 4 3 and Table 4 4 respectively of the *Noise and Vibration Impact Assessment* (WSP | Parsons Brinckerhoff, 2016b) attached as Appendix B. This monitoring included the measurement of train passbys to provide an indication of the existing impacts from train passbys in the area. The attended noise monitoring indicated that the most dominant ambient noise sources close to the Project site was road traffic with intermittent peaks from rail passbys with birds and insects also contributing to the background noise level at all locations except BG4. At BG4 it was observed that noise from the Sanitarium factory controlled the noise environment during the day, evening and night.

7.2.4 Construction impacts

Construction noise assessment

Noise modelling methodology and assessment scenarios

In order to assess the potential noise impacts associated with the construction of the Project, noise modelling was used to assess 12 different construction scenarios representing each construction stage. These scenarios were based on various construction phases such as the early works (scenarios 1 to 4), main works (scenarios 5 to 10) and compound works (scenarios 11 and 12) and based on the location and equipment used. This allowed noise impacts from activities within one stage that occur at different locations to be determined for the nearest receivers.

The construction scenarios considered in the assessment, in addition to the assumed noise levels of the proposed construction equipment are presented in Table 8 1 and Section 8.3 respectively of the *Noise and Vibration Impact Assessment* (WSP | Parsons Brinckerhoff, 2016b) attached as Appendix B.

Predicted noise levels

Construction noise levels at residential receivers were predicted for each of the construction scenarios during the applicable time period. Table 7.22 and Table 7.23 present the noise levels predicted during standard hours, outside of standard hours and L_{max} events for the assessment of sleep disturbance for the nearest receivers respectively.

Table 7.22 Predicted construction noise levels during standard hours ($L_{eq,15min}$ dBA)

Receiver	NML (standard hours)	1	2	3	4	5	6	7	8	9	10	11	12
12 Ourimbah Road, Kangy Angy	54	49	47	**64**	**59**	**69**	**70**	**70**	**66**	**67**	**65**	41	**67**
19 Ourimbah Road, Kangy Angy	54	52	50	**62**	**57**	**69**	**70**	**71**	**63**	**67**	**65**	43	**67**
15 Schubolt Lane, Kangy Angy	54	45	43	**59**	53	**56**	**56**	**57**	**60**	53	52	38	54
16 Turpentine Road, Kangy Angy	54	41	38	**62**	**57**	**59**	**60**	**60**	**63**	**57**	**55**	34	**57**
26 Turpentine Road, Kangy Angy	54	43	41	**63**	**58**	**60**	**61**	**61**	**65**	**58**	**56**	36	**58**
50 Orchard Road, Kangy Angy	54	54	53	**58**	52	**60**	**60**	**61**	**59**	**57**	**56**	44	**58**

Receiver	NML (standard hours)	1	2	3	4	5	6	7	8	9	10	11	12
53 Orchard Road, Kangy Angy	54	54	53	**61**	**56**	**72**	**72**	**73**	**62**	**69**	**68**	45	**70**
54 Orchard Road, Kangy Angy	54	**55**	**55**	**57**	52	**61**	**62**	**62**	**59**	**59**	**57**	45	**59**
62 Orchard Road, Kangy Angy	54	**57**	**56**	**57**	52	**61**	**62**	**63**	**58**	**59**	**57**	46	**59**
72 Orchard Road, Kangy Angy	54	**58**	**59**	**56**	51	**62**	**62**	**63**	**58**	**59**	**58**	47	**60**
80 Orchard Road, Kangy Angy	54	**60**	**63**	53	48	**61**	**61**	**62**	**55**	**58**	**57**	48	**59**
127 Old Chittaway Road, Fountaindale	59	48	46	**60**	55	**60**	**61**	**61**	**61**	58	56	40	58
141 Old Chittaway Road, Fountaindale	59	49	47	58	53	58	58	59	59	55	54	40	56
149 Old Chittaway Road, Fountaindale	59	51	49	58	53	59	59	**60**	59	56	55	42	57
150 Old Chittaway Road, Fountaindale	59	51	49	**61**	56	**65**	**65**	**66**	**62**	**62**	**61**	42	**63**
157 Old Chittaway Road, Fountaindale	59	43	39	57	52	56	57	58	58	54	52	36	54
161 Old Chittaway Road, Fountaindale	59	51	48	53	48	52	52	53	55	49	48	43	50
165 Old Chittaway Road, Fountaindale	59	53	51	58	52	59	59	**60**	59	56	55	44	57
170 Old Chittaway Road, Fountaindale	59	56	56	**62**	57	**70**	**71**	**71**	**64**	**68**	**66**	46	**68**
3 Station Road, Fountaindale	59	52	50	55	50	54	55	56	56	52	50	43	52
7 Station Road, Fountaindale	59	52	50	54	48	53	53	54	55	50	49	44	51
16 Station Road, Fountaindale	59	57	55	57	51	57	57	58	58	54	53	47	55
98 Old Chittaway Road (child care)	45	**46**	42	43	**64**	**59**	**67**	**67**	**68**	**66**	45	**64**	**63**
10 Catamaran Street (school)	45	29	29	29	29	31	33	29	30	29	29	29	29

Note: Exceedances of the 'noise affected' management level are highlighted in grey with bold text.

Table 7.23 Predicted construction noise levels outside of standard hours ($L_{eq,15min}$ dBA)

Receiver	NML Day (out-of-hours)	NML Evening (out-of-hours)	NML Night (out-of-hours)	1a	3	4	8a
12 Ourimbah Road, Kangy Angy	49	45	40	45	**64**	**59**	43
19 Ourimbah Road, Kangy Angy	49	45	40	*48*	**62**	**57**	42
15 Schubolt Lane, Kangy Angy	49	45	40	41	**59**	**53**	*46*
16 Turpentine Road, Kangy Angy	49	45	40	37	**62**	**57**	**51**
26 Turpentine Road, Kangy Angy	49	45	40	39	**63**	**58**	*48*
50 Orchard Road, Kangy Angy	49	45	40	**50**	**58**	**52**	40
53 Orchard Road, Kangy Angy	49	45	40	**50**	**61**	**56**	41
54 Orchard Road, Kangy Angy	49	45	40	**52**	**57**	**52**	40
62 Orchard Road, Kangy Angy	49	45	40	**53**	**57**	**52**	39

Receiver	NML Day (out-of-hours)	NML Evening (out-of-hours)	NML Night (out-of-hours)	1a	3	4	8a
72 Orchard Road, Kangy Angy	49	45	40	**55**	**56**	**51**	39
80 Orchard Road, Kangy Angy	49	45	40	**57**	**53**	*48*	38
127 Old Chittaway Road, Fountaindale	54	49	40	44	**60**	**55**	45
130 Old Chittaway Road, Fountaindale	54	49	40	44	**64**	**58**	44
141 Old Chittaway Road, Fountaindale	54	49	40	45	**58**	**53**	44
149 Old Chittaway Road, Fountaindale	54	49	40	*47*	**58**	**53**	43
150 Old Chittaway Road, Fountaindale	54	49	40	*47*	**61**	**56**	43
157 Old Chittaway Road, Fountaindale	54	49	40	39	**57**	**52**	44
161 Old Chittaway Road, Fountaindale	54	49	40	*47*	**53**	*48*	43
165 Old Chittaway Road, Fountaindale	54	49	40	*49*	**58**	**52**	42
170 Old Chittaway Road, Fountaindale	54	49	40	**52**	**62**	**57**	41
3 Station Road, Fountaindale	54	49	40	*48*	**55**	**50**	42
7 Station Road, Fountaindale	54	49	40	*49*	**54**	*48*	41
16 Station Road, Fountaindale	54	49	40	**53**	**57**	**51**	40

Note: *Exceedances of the OOHW 'noise affected' management level for day, evening and night time periods are highlighted in grey with bold text.*
Exceedances of the OOHW 'noise affected' management level for evening and night time periods are highlighted in blue in italic text.
Exceedances of the OOHW 'noise affected' management level for night time periods are highlighted in green and underlined.

Sleep disturbance

Noise from intermittent high level noise events has the potential to cause sleep disturbance at the nearest residential receivers if conducted during the night time hours. These events were assessed assuming the L_{max} is approximately 5 dBA higher than the total sound power level of each scenario that takes place during the night period. Table 7.24 provides a summary of the predicted construction noise levels outside of standard hours.

Table 7.24 Predicted construction noise levels outside of standard hours (L_{max} dBA)

Receiver	Screening criteria	1a	3	4	8a
50 Orchard Road, Kangy Angy	65	55	63	57	45
53 Orchard Road, Kangy Angy	65	55	**66**	61	46
54 Orchard Road, Kangy Angy	65	57	62	57	45
62 Orchard Road, Kangy Angy	65	58	62	57	44
72 Orchard Road, Kangy Angy	65	60	61	56	44
80 Orchard Road, Kangy Angy	65	62	58	53	43
84 Orchard Road, Kangy Angy	65	59	57	52	42
12 Ourimbah Road, Kangy Angy	65	50	**69**	64	48

Receiver	Screening criteria	1a	3	4	8a
19 Ourimbah Road, Kangy Angy	65	53	**67**	62	47
15 Schubolt Lane, Kangy Angy	65	46	64	58	51
16 Turpentine Road, Kangy Angy	65	42	**67**	62	56
26 Turpentine Road, Kangy Angy	65	44	**68**	63	53
127 Old Chittaway Road, Fountaindale	65	49	65	60	50
130 Old Chittaway Road, Fountaindale	65	49	**69**	63	49
141 Old Chittaway Road, Fountaindale	65	50	63	58	49
149 Old Chittaway Road, Fountaindale	65	52	63	58	48
150 Old Chittaway Road, Fountaindale	65	52	**66**	61	48
157 Old Chittaway Road, Fountaindale	65	44	62	57	49
161 Old Chittaway Road, Fountaindale	65	52	58	53	48
165 Old Chittaway Road, Fountaindale	65	54	63	57	47
170 Old Chittaway Road, Fountaindale	65	57	**67**	62	46

Note *Values in highlighted grey with bold text indicate exceedances of the sleep disturbance screening criteria.*

Assessment of predicted noise levels

Based on the predicted noise levels presented in the tables above, the predicted construction noise levels at the sensitive receivers indicate the following key construction noise impacts:

- No receivers identified for this assessment exceed the 'highly noise affected' NML.
- A number of residential properties on Orchard Road, Schubolt Lane, Turpentine Road and Old Chittaway Road exceed the 'noise affected' NML for works conducted during the standard hours. Single properties on Catamaran Road, Enterprise Drive and Ourimbah Road were also predicted to exceed the 'noise affected' NML.
- The majority of the residential receptors exceed at least one of the NML's for the out-of-hours construction assessment with scenarios 3 and 4 (enabling works) which are predicted to be the noisiest stages of the construction.
- The predicted construction noise levels at the child care centre were predicted to exceed the NML's for works conducted during the standard hours except for scenarios 1, 2 (enabling works) and 11 (compound site).
- Noise levels at the Central Coast Rudolf Steiner School (10 Catamaran Street) during construction were predicted to be within the NML for all of the assessment scenarios.
- Predicted noise levels at the industrial land use area during construction were predicted to be within the applicable NML for any of the out-of-hours working periods. The only exceedance of the NML was identified to be at 2 Catamaran Road for the standard daytime hours for construction scenarios 1 and 2 (enabling works).

Further details regarding the potential noise impacts to specific receivers is provided in Section 8.6 of the *Noise and Vibration Impact Assessment* (WSP | Parsons Brinckerhoff, 2016b) attached as Appendix B. As a result of the majority of receivers predicted to experience noise levels in excess of the noise management

levels, a series of noise and vibration mitigation and management measures have been identified which are included in section 7.2.6 of this REF.

Construction vibration assessment

The most dominant construction vibration sources from the assessed scenarios including the use of sheet piling rigs, vibratory rollers and rock breakers which have the potential to result in vibration impacts on nearby sensitive receivers, if appropriate mitigation measures are not implemented.

All identified sensitive receivers are located at least 75 metres or greater from the track laying and earthworks areas. The nearest commercial receiver to the proposed new access road bridge site is approximately 100 metres and the nearest residential receiver is approximately 300 metres away.

Table 9.1 of the *Noise and Vibration Impact Assessment* presents indicative safe working distances for the most dominant vibration generating plant. Where work is required within these distances, site-specific safe working distances should be developed on-site through vibration monitoring prior to the works commencing. The vibration levels and associated safe working distances indicate that cosmetic damage is not considered be a substantial risk due to construction at the nearest sensitive receivers. Vibration may be perceptible at the nearest houses, however it is unlikely to be a substantial risk for the majority of receivers.

7.2.5 Operational impacts

Operational noise assessment

Noise modelling methodology and assessment scenarios

The maintenance facility is expected to have a number of activities take place that generate noise which has the potential to impact the surrounding receivers. Similarly to the construction noise assessment, noise modelling was used to assess 16 different operational scenarios representing various elements of the operation of the New Intercity Fleet Maintenance Facility such as:

- Train arrival/train departure (scenarios 1 and 2)
- Train travels within maintenance facility to the wheel lathe (scenario 3)
- Trains standing on standing roads within the maintenance facility in various configurations (scenarios 4, 6 and 7)
- Preparing trains for return to service, on standing roads 1, 3 and 4 (scenario 5)
- External train carriage cleaning (scenario 8)
- Car park activities (scenarios 9 and 15)
- Substation operation (scenarios 10 and 16)
- Train travelling on the 70 kilometre per hour section (scenario 11)
- Country horn testing (scenario 12)
- Movement alarm used outdoors on standing tracks (scenario 13)
- Brake testing (scenario 14).

Details of all 16 scenarios and the operation activity assumptions associated with these scenarios are provided in Section 6.1 and Table 6.1 of the *Noise and Vibration Impact Assessment* (WSP | Parsons Brinckerhoff, 2016b) attached as Appendix B. Noise source levels used for each of the scenarios are also provided in provided in Section 6.3 and Table 6.2 of the *Noise and Vibration Impact Assessment.*

Other noise sources

The project is currently in the concept phase and therefore some details and specifications of activities and equipment are not known yet and therefore the noise emission cannot be fully quantified. The sources would, where possible and feasible, be designed to reduce potential impacts on surrounding receivers when they are specified in the further detailed design stages of the Project.

These sources would include Project elements such as the following:

- Shunt vehicle(s) used to pull trains through the wheel lathe
- Vehicle movement alarm systems, mechanical plant and public address (PA) systems
- Backup generator (for used during emergencies only). While the generator would only be used in an emergency, it would be considered as part of the detailed design stage to minimise any noise impacts associated with emergency use of the generator.

Additionally to the sources identified above, during the preparation of trains to re-enter service, a number systems tests would be undertaken. These are expected to include testing of doors opening and closing, audible door warning alerts, internal PA announcements among other tests. These tests may add additional noise sources to the preparation activities of trains. Details of these tests are not currently available and would be determined as part of the ongoing selection and design of the proposed new train fleet.

Predicted noise levels

Predicted $L_{eq,15min}$ noise levels (scenarios 1 to 10) produced using the noise assumptions presented in Section 6.1 of the *Noise and Vibration Impact Assessment* are presented in Table 7.25 and Table 7.26 for neutral and adverse meteorological conditions respectively. It should be noted that the predicted levels identified in Table 7.25 and Table 7.26 are unmitigated operational noise levels.

Table 7.25 Predicted operational noise levels for each scenario, $L_{eq,15min}$ dBA neutral meteorological conditions (without mitigation)

Receiver	Criteria			Scenario									
	Day	Evening	Night	1	2	3	4	5	6	7	8	9	10
12 Ourimbah Road	49	42	40	40	**41**	40	**41**	**42**	27	39	28	28	29
19 Ourimbah Road	49	42	40	38	38	38	38	*45*	29	**42**	30	31	22
15 Schubolt Lane	49	42	40	35	32	31	29	31	20	28	28	21	20
16 Turpentine Road	49	42	40	37	31	23	24	25	<20	22	23	<20	<20
26 Turpentine Road	49	42	40	**42**	35	28	27	28	<20	25	26	<20	<20
50 Orchard Road	49	42	40	33	33	32	33	38	29	36	29	31	<20
54 Orchard Road	49	42	40	32	32	32	32	38	29	35	30	32	<20
62 Orchard Road	49	42	40	32	32	31	32	37	29	35	29	32	<20
72 Orchard Road	49	42	40	31	31	31	31	35	30	33	30	33	<20
80 Orchard Road	49	42	40	30	30	30	30	34	29	32	29	31	<20
127 Old Chittaway Road	54	40	38	34	34	34	34	35	22	32	32	23	32
130 Old Chittaway Road	54	40	38	**39**	**39**	**39**	**39**	38	24	35	33	25	**40**

Receiver	Criteria			Scenario									
	Day	Evening	Night	1	2	3	4	5	6	7	8	9	10
141 Old Chittaway Road	54	40	38	33	33	33	35	35	23	32	32	23	30
149 Old Chittaway Road	54	40	38	33	33	33	36	37	26	35	35	26	27
150 Old Chittaway Road	54	40	38	36	36	36	**39**	**40**	27	38	37	27	32
157 Old Chittaway Road	54	40	38	31	30	30	31	31	<20	28	22	*<20*	27
161 Old Chittaway Road	54	40	38	28	28	28	32	32	22	30	31	22	21
165 Old Chittaway Road	54	40	38	33	33	33	38	38	28	36	38	28	20
170 Old Chittaway Road	54	40	38	36	36	36	*45*	*42*	32	**40**	48	32	21
3 Station Road	54	40	38	30	30	30	35	35	25	32	35	26	<20
7 Station Road	54	40	38	28	28	28	34	33	24	30	36	24	<20
16 Station Road	54	40	38	31	31	31	**39**	36	28	33	41	28	<20
11 Station Road	54	40	38	31	30	30	37	35	27	33	39	27	<20
11 Enterprise Drive	54	40	38	**40**	37	21	22	23	<20	20	21	<20	<20
21 Enterprise Drive	54	40	38	38	36	<20	<20	20	<20	<20	<20	<20	<20
14 Enterprise Drive	54	40	38	**40**	37	20	21	22	<20	<20	20	<20	<20
16 Enterprise Drive	54	40	38	38	36	<20	20	21	<20	<20	20	<20	<20
98 Old Chittaway Road	45	45	45	39	38	38	34	32	20	29	30	21	24
10 Catamaran Road	45	45	45	26	26	26	35	29	25	28	37	25	<20

Note: Exceedances of the night criteria only are highlighted in grey with bold text;
Exceedances of both the evening and night criteria are highlighted in blue with italic text;
Exceedances of all three day, evening and night criteria are highlighted in green with underlined text
Scenario 8 would only occur during the daytime and has not been assessed for the evening and night periods.

Table 7.26 Predicted operational noise levels for each scenario, $L_{eq,15min}$ dBA adverse meteorological conditions (without mitigation)

Receiver	Criteria			Scenario									
	Day	Evening	Night	1	2	3	4	5	6	7	8	9	10
12 Ourimbah Road	49	42	40	**42**	**42**	**42**	**42**	*44*	29	**42**	31	31	31
19 Ourimbah Road	49	42	40	40	40	40	40	*46*	30	*44*	31	33	25
15 Schubolt Lane	49	42	40	38	36	34	33	35	23	32	33	24	23
16 Turpentine Road	49	42	40	39	35	27	28	29	<20	27	28	<20	<20
26 Turpentine Road	49	42	40	*43*	38	31	31	32	21	30	31	22	<20
50 Orchard Road	49	42	40	36	36	35	36	**42**	30	39	31	34	<20
54 Orchard Road	49	42	40	34	34	34	34	**41**	30	38	31	35	<20
62 Orchard Road	49	42	40	34	34	34	34	40	30	38	31	35	<20
72 Orchard Road	49	42	40	33	33	33	33	38	30	36	31	36	<20

Receiver	Criteria			Scenario									
	Day	Evening	Night	1	2	3	4	5	6	7	8	9	10
80 Orchard Road	49	42	40	32	32	32	32	37	29	35	30	34	<20
127 Old Chittaway Road	54	40	38	37	36	37	37	38	25	35	36	25	33
130 Old Chittaway Road	54	40	38	**40**	**40**	**40**	*41*	*41*	26	38	38	27	**40**
141 Old Chittaway Road	54	40	38	36	36	36	38	**39**	25	36	37	26	32
149 Old Chittaway Road	54	40	38	36	36	36	**39**	**40**	27	38	40	28	30
150 Old Chittaway Road	54	40	38	38	38	**39**	*41*	*43*	28	**40**	41	29	33
157 Old Chittaway Road	54	40	38	33	33	33	33	35	<20	32	26	<20	29
161 Old Chittaway Road	54	40	38	32	32	31	35	36	24	33	36	25	24
165 Old Chittaway Road	54	40	38	35	35	35	**40**	*41*	29	38	42	29	22
170 Old Chittaway Road	54	40	38	38	38	38	*47*	*45*	33	*42*	51	33	24
3 Station Road	54	40	38	33	33	33	38	38	27	36	40	27	<20
7 Station Road	54	40	38	32	32	31	37	36	26	34	40	26	21
16 Station Road	54	40	38	33	33	33	*41*	**39**	29	36	45	29	<20
11 Station Road	54	40	38	33	33	33	**39**	**39**	28	36	43	28	21
11 Enterprise Drive	54	40	38	*42*	**39**	25	27	28	<20	25	26	<20	<20
21 Enterprise Drive	54	40	38	**40**	38	22	24	25	<20	22	23	<20	<20
14 Enterprise Drive	54	40	38	*42*	**39**	24	26	27	<20	24	25	<20	<20
16 Enterprise Drive	54	40	38	*41*	38	24	25	26	<20	24	25	<20	<20
98 Old Chittaway Road	45	45	45	40	39	39	37	36	23	33	34	24	26
10 Catamaran Road	45	45	45	27	28	28	38	32	26	30	41	26	<20

Note: *Exceedances of the night criteria only are highlighted in grey with bold text;*
Exceedances of both the evening and night criteria are highlighted in blue with italic text;
Exceedances of all three day, evening and night criteria are highlighted in green with underlined text
Scenario 8 would only occur during the daytime and has not been assessed for the evening and night periods

Maximum noise events

Predicted L_{max} noise levels (scenarios 11 to 15) produced using the noise assumptions presented in Section 6.1 of the *Noise and Vibration Impact Assessment* are presented in Table 7.27 and Table 7.28 for neutral and adverse meteorological conditions respectively. It should be noted that the predicted levels identified in Table 7.27 and Table 7.28 are unmitigated operational noise levels.

Table 7.27 Predicted operational noise levels for scenarios 9 to 13, L_{max} dBA neutral meteorological conditions (without mitigation)

Receiver	Criteria		Scenario					
	RBL+15	RNP	11	12	13	14	15	16
12 Ourimbah Road	55	65	36	**71**	51	47	31	**59**
19 Ourimbah Road	55	65	41	**68**	50	46	37	52
15 Schubolt Lane	55	65	53	**63**	45	33	20	51
16 Turpentine Road	55	65	**57**	**59**	40	20	<20	44
26 Turpentine Road	55	65	**61**	**62**	45	26	23	49
50 Orchard Road	55	65	40	**61**	46	40	37	44
54 Orchard Road	55	65	38	**60**	44	38	38	47
62 Orchard Road	55	65	37	**60**	37	32	37	46
72 Orchard Road	55	65	36	**59**	35	30	37	45
80 Orchard Road	55	65	36	**58**	35	28	37	45
127 Old Chittaway Road	53	65	38	**63**	44	37	28	**58**
130 Old Chittaway Road	53	65	**54**	**66**	50	40	30	**70**
141 Old Chittaway Road	53	65	49	**62**	44	37	28	**60**
149 Old Chittaway Road	53	65	46	**63**	45	40	30	**60**
150 Old Chittaway Road	53	65	46	**65**	47	43	31	**62**
157 Old Chittaway Road	53	65	47	**61**	42	36	28	**58**
161 Old Chittaway Road	53	65	44	**59**	40	32	26	53
165 Old Chittaway Road	53	65	34	**62**	44	38	30	47
170 Old Chittaway Road	53	65	42	**65**	47	43	34	53
3 Station Road	53	65	42	**60**	43	35	29	52
7 Station Road	53	65	40	**58**	41	32	27	49
16 Station Road	53	65	38	**59**	37	36	30	45
11 Station Road	53	65	40	**59**	42	33	29	50
11 Enterprise Drive	53	65	**65**	**57**	40	<20	20	40
21 Enterprise Drive	53	65	**65**	**56**	39	<20	<20	39
14 Enterprise Drive	53	65	**64**	**55**	38	<20	<20	39
16 Enterprise Drive	53	65	**64**	**54**	36	<20	<20	37

Note *Exceedances of the RBL+15 dB criteria are highlighted in grey with bold text and exceedances of the 65 dBA criteria are highlighted in green with underlined text.*

Table 7.28 Predicted operational noise levels for scenarios 9 to 13, L_{max} dBA adverse meteorological conditions (without mitigation)

Receiver	Criteria		Scenario					
	RBL+15	RNP	11	12	13	14	15	16
12 Ourimbah Road	55	65	42	**72**	51	49	32	**61**
19 Ourimbah Road	55	65	46	**68**	50	48	38	**56**
15 Schubolt Lane	55	65	**57**	**64**	46	35	21	54
16 Turpentine Road	55	65	**61**	**60**	41	22	<20	48
26 Turpentine Road	55	65	**64**	**63**	46	28	24	53
50 Orchard Road	55	65	46	**62**	47	42	38	47
54 Orchard Road	55	65	43	**61**	45	40	38	50
62 Orchard Road	55	65	43	**60**	37	34	38	50
72 Orchard Road	55	65	42	**60**	36	32	38	48
80 Orchard Road	55	65	41	**58**	36	30	38	49
127 Old Chittaway Road	53	65	42	**63**	45	39	29	**60**
130 Old Chittaway Road	53	65	**58**	**66**	50	42	30	**70**
141 Old Chittaway Road	53	65	**54**	**62**	44	39	29	**62**
149 Old Chittaway Road	53	65	51	**64**	45	42	30	**62**
150 Old Chittaway Road	53	65	51	**66**	47	45	32	**64**
157 Old Chittaway Road	53	65	51	**62**	43	38	28	**60**
161 Old Chittaway Road	53	65	49	**59**	41	34	27	**56**
165 Old Chittaway Road	53	65	39	**62**	45	40	31	50
170 Old Chittaway Road	53	65	47	**65**	47	45	35	**56**
3 Station Road	53	65	47	**61**	43	37	29	**55**
7 Station Road	53	65	46	**58**	41	34	28	53
16 Station Road	53	65	43	**60**	38	38	30	48
11 Station Road	53	65	45	**60**	43	35	30	**54**
11 Enterprise Drive	53	65	**66**	**57**	41	<20	20	44
21 Enterprise Drive	53	65	**66**	**57**	40	<20	<20	43
14 Enterprise Drive	53	65	**65**	**56**	38	<20	<20	43
16 Enterprise Drive	53	65	**66**	**54**	36	<20	<20	41

Note *Exceedances of the RBL+15 dB criteria are highlighted in grey with bold text and exceedances of the 65 dBA criteria are highlighted in green with underlined text.*

Assessment of predicted noise levels

The predicted noise levels indicated that noise levels would not exceed the day time noise criteria, however a number of the closest receivers were predicted to experience noise levels in excess of the $L_{eq,15min}$ criteria during either the day, evening or night. These receivers are as follows:

- 12 and 19 Ourimbah Road
- 26 Turpentine Road
- 50 and 54 Orchard Road
- 11, 14, 16 and 21 Enterprise Drive
- 96, 130, 141, 149, 150, 165, 170 Old Chittaway Road
- 11 and 16 Station Road.

The predicted $L_{eq,15min}$ noise levels indicate the following:

- Scenarios 1, 4, 5 and 7 would have the highest predicted impacts. Scenario 5 has the highest predicted impact with exceedances of the evening and night criteria by up to 5 dB and 7 dB respectively.
- The potentially most affected receiver is 12 Ourimbah Road where the night criteria are exceeded in scenarios 1 to 5 and 7. Both the evening and night criteria are exceeded in Scenario 5 under adverse conditions. The largest exceedance was predicted to be 4 dB under adverse conditions for Scenario 5.
- Other potentially affected receivers include 26 Turpentine Road, 19 Ourimbah Road, 150 and 170 Old Chittaway Road and 11 and 14 Enterprise Drive which were predicted to experience exceedances of the evening and night criteria by between 1 and 7 dB.
- Noise levels generally increase between 2 to 3 dB during adverse wind and temperature inversion conditions. The effect of adverse conditions causes additional exceedances of the evening period at 26 Turpentine Road, 11, 14 and 16 Enterprise Drive, 12 and 19 Ourimbah Road, 150, 165 and 170 Old Chittaway Road and 16 Station Road.
- The train wash facility impacts 26 Turpentine Road with a predicted exceedance during the night period and in the evening period under adverse conditions.
- Noise impacts are not expected when trains are powered down and when the maintenance shed is in-use with the doors closed.
- The substation is expected to exceed the INP criteria only at the nearest receiver 130 Old Chittaway Road during the night period.
- External cleaning only takes places during the day and is not expected to cause an exceedance of the INP criteria during the day.
- The predicted noise levels indicate that the school at 10 Catamaran Road and the child care centre at 98 Old Chittaway Road are not expected to experience noise levels in excess of the INP criteria due to the project.

Analysis of the predicted noise levels indicated that the most dominant noise sources at these receivers are:

- Standing trains on the standing tracks outside the maintenance shed and on the standing tracks to the south of the maintenance shed
- Train washing
- Trains entering and existing the facility
- Rail movements on the 70 kilometres per hour section
- Substation operation.

Receivers on Ourimbah Road and Orchard Road would generally be impacted by the standing trains on the tracks outside of the main fleet maintenance building and the breakout noise from the maintenance shed during the evening and night.

Further south, receivers on Turpentine Road would be impacted by the movement of trains on the 70 kilometres per hour section during the night and the trains going through the train wash as well as the train washing facility itself.

On the other side of the Main North railway, the receivers on Old Chittaway Road opposite the maintenance facility would be primarily impacted by the standing trains and external cleaning during the evening and night. Where the predicted level of exceedances are within 2dB or less of the criteria, the exceedance is considered marginal as typically a difference in noise level of 2dB or less is not typically considered to be perceptible.

For receivers in the south of the Project on Enterprise Drive, the noise sources from the facility have been identified as being associated with trains entering and exiting the main line which are likely to be similar in nature to those already experienced due to existing rail movements on the Main North railway and are therefore considered unlikely to cause additional impacts.

As a result of the predicted exceedances, noise mitigation and management measures have been developed which are described in section 7.2.6 of this REF.

Maximum noise events

The predicted noise levels of maximum noise events from horns, alarms and car park activities indicate that the most dominant events would be testing of country horns, the substation and trains moving along the 70 kilometres per hour section of the track.

The country horn tests are anticipated to exceed the criteria at all of the closest receivers under adverse meteorological conditions by up to 22 dB above the RBL+15 criteria. Receivers 12 and 19 Ourimbah Road, 11, 21 and 16 Enterprise Drive and 130 and 150 Old Chittaway Road were predicted to experience external noise levels of 66 dBA or above under adverse conditions.

The trains travelling on the 70 kilometres per hour section also indicated exceedances of the sleep disturbance criteria were predicted at receivers on Old Chittaway Road at the south of the Project, Schubolt Lane and Turpentine Road.

For receivers in the south of the project on Enterprise Drive, the noise sources from the maintenance facility would be associated with trains entering and exiting the main line and are likely to be similar in nature to those already experienced due to existing rail movements on the Main North railway and are therefore considered unlikely to cause additional impacts. Additionally, the maximum noise levels presented indicate that receivers are already exposed to maximum noise levels in excess of the sleep disturbance criteria. The predicted noise levels would be of a similar level to those measured on site and as a result, maximum noise levels associated with train passbys would not be expected to cause additional adverse impacts above those already caused by the Main North railway given that they are of a similar character and noise level.

Predicted noise levels with proposed mitigation applied

As described, Table 7.25 to Table 7.28, presents the unmitigated noise levels associated with the operation of the Project. The scenarios with the highest potential impact on L_{eq} noise levels were used to predict noise levels with the implementation of the mitigation measures outlined in section 7.2.6 below. The noise model was used with the proposed noise barriers for scenarios 1 and 5 (which were identified to have the potentially largest impact on L_{eq} noise levels).

Table 7.29 provide a summary of the predicted L_{eq} noise levels under neutral and adverse metrological conditions during operation.

Table 7.29 Predicted mitigated operational noise levels for scenarios 1 and 5 for $L_{eq,15min}$ dBA neutral and adverse meteorological conditions

Receiver	Criteria			Neutral	Adverse	Neutral	Adverse
	Day	Evening	Night	1	1	5	5
12 Ourimbah Road	49	42	40	39	40	39	**41**
19 Ourimbah Road	49	42	40	35	37	**41**	**42**
15 Schubolt Lane	49	42	40	34	36	31	34
16 Turpentine Road	49	42	40	37	38	24	28
26 Turpentine Road	49	42	40	39	40	28	31
50 Orchard Road	49	42	40	32	34	37	39
54 Orchard Road	49	42	40	31	33	36	38
62 Orchard Road	49	42	40	31	33	36	38
72 Orchard Road	49	42	40	31	32	34	36
80 Orchard Road	49	42	40	30	31	33	35
127 Old Chittaway Road	54	40	38	35	36	35	38
130 Old Chittaway Road	54	40	38	**39**	**40**	38	**40**
141 Old Chittaway Road	54	40	38	33	35	36	38
149 Old Chittaway Road	54	40	38	33	35	38	**40**
150 Old Chittaway Road	54	40	38	36	38	*41*	*43*
157 Old Chittaway Road	54	40	38	31	33	32	34
161 Old Chittaway Road	54	40	38	29	31	33	35
165 Old Chittaway Road	54	40	38	33	35	**39**	*41*
170 Old Chittaway Road	54	40	38	37	38	*43*	*45*
3 Station Road	54	40	38	31	33	35	38
7 Station Road	54	40	38	29	31	33	36
16 Station Road	54	40	38	31	33	36	38
11 Station Road	54	40	38	31	33	36	38
11 Enterprise Drive	54	40	38	**40**	*41*	23	27
21 Enterprise Drive	54	40	38	38	**39**	20	24
14 Enterprise Drive	54	40	38	**40**	*41*	22	26
16 Enterprise Drive	54	40	38	38	**40**	21	25
98 Old Chittaway Road	45	45	45	39	40	32	35
10 Catamaran Road	45	45	45	26	27	30	33

Note Exceedances of the night criteria are highlighted in grey with bold text, exceedances of the evening criteria are highlighted in blue with italic text and exceedances of the day criteria are highlighted in green with underlined text.

Should the management and mitigation measures outlined in section 7.2.6 below be implemented, the predicted L_{eq} noise levels indicated the following outcomes:

- The predicted noise levels could be reduced by up to 3 dB for receivers on Ourimbah Road affected by standing trains and reduced the exceedance at 19 Ourimbah Road to within 2 dB above the criteria
- Using the identified combination of noise barriers, noise levels could be reduced by up to 3 dB at 26 Turpentine Road indicating that the criteria could be met at this location using a barrier to shield train wash noise.

Residual impacts

As shown in Table 7.29, the predicted L_{eq} noise level results with the application of the mitigation measures summarised in section 7.2.6 below indicate that the following receivers would still be impacted by noise levels above the assessment criteria during operation:

- 12 and 19 Ourimbah Road, especially under adverse meteorological conditions
- 130, 150, 165 and 170 Old Chittaway Road
- 11, 14,16 and 21 Enterprise Drive.

The predicted noise levels indicate the following:

- Residual impacts from standing trains and train movements in the facility would still be expected during the evening and night where barriers are implemented
- The predicted noise levels with the mitigation at the train wash indicate that a barrier at the train wash could be expected to reduce noise levels to within the INP criteria at 26 Turpentine Road
- Maximum noise levels from trains arriving and departing would still be predicted to impact receivers on Enterprise Drive and Old Chittaway Road.

Operational vibration assessment

As it is expected that the rail vehicles would comply with Transport for NSW vibration limit standards, substantial operational vibration impacts are not expected.

7.2.6 Management and mitigation measures

The following management and mitigation measures would be implemented to minimise impacts of noise and vibration associated with the construction and operation of the Project. Further detail regarding some of the proposed mitigation measures (such as the development of an operational noise and vibration management plan) is provided in Section 6.6 of the *Noise and Vibration Impact Assessment* (WSP | Parsons Brinckerhoff, 2016b) attached as Appendix B.

During detailed design

As part of the ongoing design of the maintenance facility, the following elements of the Project would be further considered with the aim of reducing potential noise and vibration impacts associated with the Project:

- When additional details are available for substations and other mechanical plant, they would be assessed and designed so that overall noise emission of the Project with all mobile and fixed noise sources does not exceed the environmental noise objectives of the project.
- Noise mitigation for sources such as shunt vehicles; vehicle movement alarm systems; mechanical plant (including backup generator(s)) and PA systems would be addressed during the detailed design to ensure they meet the environmental noise objectives of the Project.

- An acoustic enclosure or insulation for the substation would be considered during the detailed design so as to meet the relevant environmental noise objectives.
- Alternative systems would be investigated for vehicle movement alarms, such as the use of visual alarms.
- The design and suitability of noise barriers would be determined where required. Noise barriers have been considered to reduce noise levels from train arrivals and departures in addition to standing trains. The final height and locations of any proposed barriers would be subject to further investigation. Currently proposed barriers for consideration include (refer to Figure 6.1 of the *Noise and Vibration Impact Assessment)*:
  - A barrier of approximately five metres high above the track along the standing tracks south of the maintenance shed. The side of the barrier facing the noise sources would be acoustically absorptive or the barrier should include a combination of a vegetated earth berm and barrier.
  - A barrier to the full height of the train wash building which extends to fully block line of sight from the train wash exit to 26 Turpentine Road.

  Where noise barriers are considered to be the preferred treatment method, they would be required to be constructed so as to be solid and continuous with no gaps between the ground and barrier and between barrier panels. The barriers would be constructed of a material with a surface density of at least 12 kilograms per square metre.
- The adoption of any proposed treatments measures at the source of residential receivers would be considered (such as architectural upgrades).

During construction

As part of overall CEMP for the Project, a construction noise and vibration management plan (CNVMP) would be developed for the Project, prior to commencement of works. The management plan would include (but is not limited to) the following:

- Identified nearby residences and other sensitive land uses
- Approved hours of work and what work would be undertaken
- Substantial noise and vibration generating activities
- Details of noise mitigation and management measures to be applied
- Information for worker training to minimise noise impacts
- Community consultation protocol(s)
- Complaints handling protocol(s).

During construction the standard mitigation measured contained within the Transport for NSW *Construction Noise Strategy* (CNS) would be used as the basis for the proposed mitigation measures to be included in the CNVMP. These measures would include:

- All employees, contractors and subcontractors would receive an environmental induction
- No swearing or unnecessary shouting or loud stereos/radios would be allowed on site
- No dropping of materials from height, throwing of metal items and slamming of doors would be permitted
- A noise monitoring program would be carried out for the duration of the works in accordance with the CNVMP and any approval and licence conditions
- Where feasible and reasonable, construction would be carried out during the standard daytime working hours. Work generating high noise and/or vibration levels should be scheduled during less sensitive time periods
- High noise and vibration generating activities would only be carried out in continuous blocks, not exceeding three hours each, with a minimum respite period of one hour between each block

- Quieter and less vibration emitting construction methods would be used where feasible and reasonable
- The noise levels of plant and equipment would have operating sound power or sound pressure levels that would meet the predicted noise levels
- Noise emissions would be considered as part of the selection process
- Simultaneous operation of noisy plant within discernible range of a sensitive receiver would be avoided where possible
- The offset distance between noisy plant and adjacent sensitive receivers would be maximised, where possible
- Plant used intermittently would be throttled down or shut down when not in use
- Noise-emitting plant to be directed away from sensitive receivers, where feasible
- Traffic flow, parking and loading/unloading areas would be planned to minimise reversing movements within the site
- Non-tonal reversing beepers (or an equivalent mechanism) would be fitted and used on all construction vehicles and mobile plant regularly used on site and for any out-of-hours work
- Loading and unloading of materials/deliveries would occur as far as possible from sensitive receivers
- Dedicated loading/unloading areas would be shielded if close to sensitive receivers
- Delivery vehicles would be fitted with straps rather than chains for unloading, wherever possible
- Stationary noise sources would be enclosed or shielded whilst ensuring that the occupational health and safety of workers is maintained
- Structures to shield residential receivers from noise such as site shed placement; earth bunds; fencing; erection of operational stage noise barriers would be used (where practicable) and consideration of site topography when situating plant would be undertaken.

In addition to the standard mitigation measures identified in the Transport for NSW CNS, the following specific mitigation measures have been developed as a result of the predicted impacts associated with the proposal.

- To minimise noise levels, the following work practices would be implemented:
  - Respite periods would be defined by those periods where the community is less sensitive to noise such as avoiding early morning and late afternoon.
  - Vehicles, obstacles and stockpiles would be used on site to provide shielding to receivers, especially for static noise sources such as generators, mulchers, mobile cranes and the piling rigs
  - Minimising the potential for construction vehicles to access the site prior to 7.00 am along the new access road.
- To minimise the risk of vibration impacts, the following would be considered:
  - Where possible, the use of less vibration intensive methods of construction or equipment would be considered to reduce the potential for cosmetic damage.
  - All equipment would be maintained and operated in an efficient manner, in accordance with manufacturer's specifications, to reduce the potential for adverse vibration impacts.
  - Where work requiring the use of vibratory rollers is required within 75 metres of a receiver, a roller of less than 200 kilo-newton (kN) rating would be used, where practical.
  - Where work is required within close distances to sensitive receivers, site-specific safe working distances would be established on-site prior to the relevant vibration generating works commencing.

- If vibration intensive equipment is to be used within the safe working distances, attended vibration measurements would be undertaken when work commences to determine site specific safe working distances.
- Vibration intensive work would not proceed within the safe working distances unless a permanent vibration monitoring system is installed approximately one metre from the building footprint, to warn operators when vibration levels are approaching the peak particle velocity trigger levels.

→ To minimise the potential for sleep disturbance, where night works are proposed to be undertaken, the following controls would be implemented where feasible and reasonable:

- Avoiding conducting noise intensive night works for more than two consecutive nights
- Scheduling noise intensive activities to before 10.00 pm
- Schedule activities which are likely to cause maximum noise events such as deliveries, moving material or equipment and compacting works to avoid the night time period (10.00 pm to 7.00 am)
- Educate workers on the importance of minimising noise and avoid creating short duration high noise level events
- Inform surrounding residents by mail of planned works prior to the works commencing.

During operation

To mitigate impacts during operations an operational noise and vibration management plan would be developed which would include management strategies designed to meet the environmental noise objectives for the project and would include consideration of:

→ Alternative methodologies for horns, warning signals and horn testing at the facility

→ Standing of trains outside of the maintenance building and on standing tracks 6 and 7 during evening and night periods

→ Restrictions on external cleaning during the evening and night period

→ Strategies to control other noise sources such as shunt vehicles; vehicle movement alarm systems; mechanical plant (including backup generator(s)) and PA systems.

The following would also be considered to mitigate impacts during operations:

→ The maintenance shed would be constructed to achieve a sound insulation performance no less than 26 dB R_w (weighted sound reduction index).

→ The maintenance shed doors would remain closed when activities are occurring inside the sheds, where reasonable.

7.3 Landscape and visual character

A *Landscape Character and Visual Impact Assessment* has been prepared by Clouston Associates (Clouston Associates, 2016) to assess the potential landscape character and visual impacts associated with the new intercity maintenance facility, This assessment is attached as Appendix C of this REF. A summary of this assessment is provided in the following sections.

7.3.1 Methodology

The landscape character and visual impact assessment was carried out based on the structure outlined in the Roads and Maritime Services (Roads and Maritime) Environmental Impact Assessment Guidance Note EIA-N04 – *Guidelines for landscape character and visual impact assessment.*

This assessment methodology assesses both potential landscape character impacts and potential visual impacts of the Project on the surrounding areas. To facilitate landscape character impacts, the impacted area has been divided into a series of different landscape character zones (described in detail below).

These zones are defined as areas having distinct, recognisable and consistent patterns of elements, consisting of either a natural or human built form. The visual impacts associated with the construction of the New Intercity Fleet Maintenance Facility have been assessed from a number of viewpoints within and around the Project site boundary.

The overall visual impact rating or impact to any given landscape character zone or is based on two main factors which consist of:

- *Visual sensitivity* — the degree to which a particular landscape type can accommodate change arising from a development, without detrimental effects on its character.
- *The magnitude of the visual change* — magnitude of visual change relates to aspects such as how extensive the alteration is to the natural or existing landform, any vegetation loss, the difference in scale of new structures to the surrounding area and the contrast in colour and materials.

Table 7.30 illustrates the relationship between these two factors and the overall impact rating of the Project at a given location.

Table 7.30 Visual and landscape character impact ratings

		Magnitude			
		High	Moderate	Low	Negligible
Sensitivity	High	High	High/Moderate	Moderate	Negligible
	Moderate	High/Moderate	Moderate	Moderate/Low	Negligible
	Low	Moderate	Moderate/Low	Low	Negligible
	Negligible	Negligible	Negligible	Negligible	Negligible

Landscape character zones

For the purposes of the impact assessment, the study area specific to the landscape character assessment comprised the land within and surrounding the Project site to a distance of approximately 1.5 kilometres.

The landscape character zones for study area which were established are shown in Figure 7.5 and described in Table 7.31.

Table 7.31 Landscape character zones

Landscape character zone	Description
Open farmland	This landscape character zone is of a large scale and mostly open with a gently rolling landform. The overall landscape pattern within and surrounding the vicinity of the Project site consists of a patchwork of fields with grazed grass pasture that is smooth, regular and uniform. Vegetation is present in groups or as isolated trees. Denser tree plantings also surround a majority of the rural dwellings and are typically located along driveways and existing riparian corridors.

Landscape character zone	Description
Woodland	This landscape character zone occurs in across both the wider study area and the immediate Project site. Vegetation is predominately native and occurs in dense stands with little understory. This zone lines some road verges and riparian corridors, blocking wider views. The darker coloured foliage of wooded areas contrast against the surrounding backdrop of lighter toned pasture and cultivated areas.
Rural residential	This character zone is dispersed across the wider study area, consisting of a combination of low density residential dwellings and farm buildings. The identified rural residential properties generally consist of one or two storey buildings and are located on large blocks of land. Many of the identified rural residential properties are set back from the local road network and are often surrounded by dense vegetation, often planted as windbreaks or visual screens. Within the immediate vicinity of the Project site, rural residential development is generally concentrated along Orchard Road, Turpentine Roads and Ourimbah Road. Rural residential properties are also located around the adjoining parts of the Project site (to the east of Enterprise Drive) in the suburb of Fountaindale.
Transport corridors	This landscape character consists of the existing road and rail network within the local area. A network of lightly trafficked rural roads spread through the study area, linking rural properties to the wider road network. The quality of the road surfacing varies but is mostly sealed and lined with no permanent kerb, gutter or footpath. The roads traverse areas of open farmland as well as areas enclosed by trees and shrubs. Where the roadside is clear of trees, broad views of the surrounding landscape are available. The Main North railway also passes through the Project site with similar rural views from the train where these are not restricted by existing vegetation and embankments.
Industrial development	Light industrial and commercial development is found to the south of the Project site, concentrated along Enterprise Drive. Development within this landscape character zone primarily consists of larger buildings including warehouses and storage facilities up to approximately 12 metres in height. Sparse and fragmented vegetation is also scattered through this character zone, typically as general landscaping for the industrial zone.

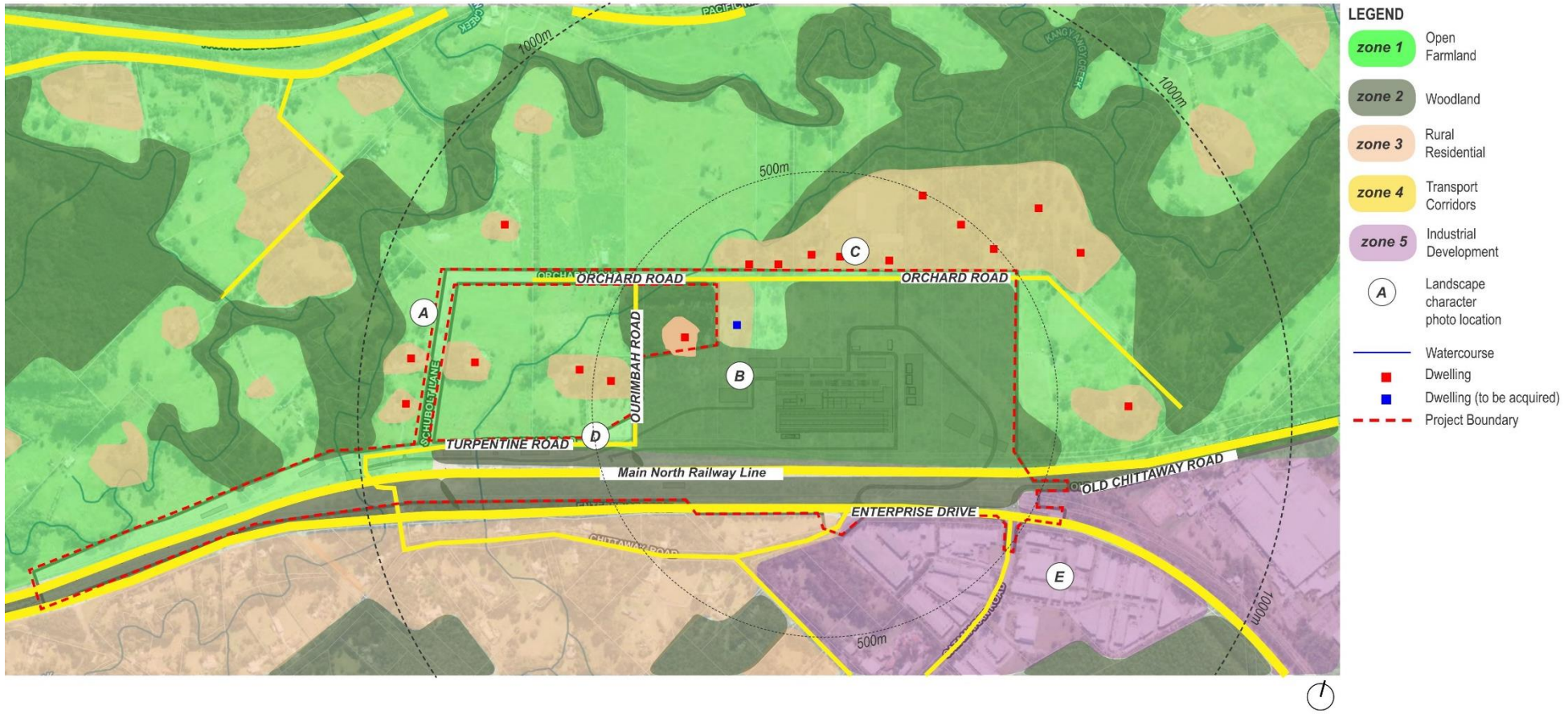


Figure 7.5 Landscape character zones

Visual impact assessment

The study area for the visual impact assessment comprises the area of land within and beyond the Project site that could be potentially visually affected by the Project. Similar to the landscape character zones, a study area of approximately 1.5 kilometres offset from the Project site was identified based on topography, vegetation, receptor location and viewing distance.

The visual impact has been assessed with regard to both private and public domain impacts. A number of representative viewpoints were chosen within the visual impact study area to represent the potential receivers who would be sensitive to visual impacts as a result of the Project. These locations are identified as follows and are shown in Figure 7.6.

Public Viewpoints

- PU1 – Enterprise Drive
- PU2 – Turpentine Road
- PU3 – Turpentine Road

Private Viewpoints

- PR1 – 15 and 16 Schubolt Lane
- PR2 – 50, 54 and Lot 20 Orchard Road
- PR3 – 72 and 80 Orchard Road
- PR4 – Lot 8660 and Lot 24 Orchard Road
- PR5 – 139 Orchard Road
- PR6 – Lot 31 Orchard Road
- PR7 – Lot 121 Ourimbah Road.

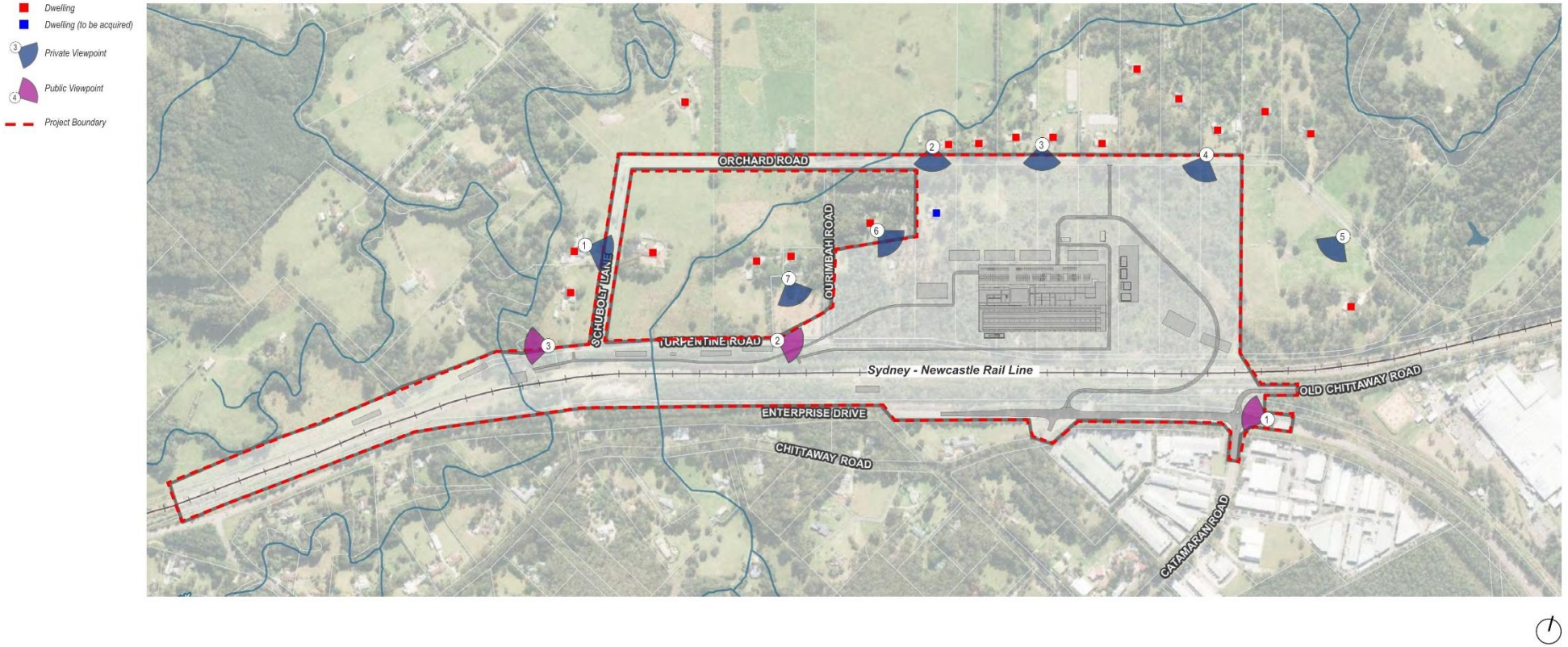


Figure 7.6 Location of viewpoints

7.3.2 Existing environment

The Project site is generally bordered by the Main North railway corridor to the south, and Orchard Road to the north-west. The M1 Pacific Motorway is located approximately 850 metres to the north-west, and Tuggerah Lake is approximately 3.5 kilometres to the east of the site. Chittaway Creek crosses the Project towards the southern end of the Project site and Ourimbah Creek to the north.

The earliest parish map available for the area dates to 1924, and indicates that the pattern of subdivision has not changed substantially since this time compared with surrounding areas.

Immediate surrounding land uses

A number of rural residential properties surround the site to the north, south and west, with two main industrial precincts located to the south east and north east of the Project site (on the opposite side of the Main North railway corridor). The typically low density of development, patchwork of cleared paddocks and stands of woodland vegetation give the area a scenic nature and valuable spatial quality. The visual amenity of the woodland zones is considered to be high. Conversely, the visual landscape amenity of the transport corridors and industrial development zones, having previously been developed, is considered to be generally low.

Photos of some of the key landscape character zones which show examples of each of the identified landscape character zones within the Project site are shown in Figure 7.7 to Figure 7.11.

Source: Clouston Associates, 2016

Figure 7.7 Landscape character zone 1 – Open farmland

Source: Clouston Associates, 2016

Figure 7.8 Landscape character zone 2 – Woodland

Source: Clouston Associates, 2016

Figure 7.9 Landscape character zone 3 – Rural residential

Source: Clouston Associates, 2016

Figure 7.10 Landscape character zone 4 – Transport corridor

Source: Clouston Associates, 2016

Figure 7.11 Landscape character zone 5 – Industrial development

7.3.3 Construction impacts

As identified in section 4.4 of this REF, the construction period is expected to occur for approximately 33 months. During this time, the construction of the Project would be expected to temporarily reduce visual amenity for surrounding residents, adjacent businesses and road users nearby due to elements such as:

- The clearing of vegetation from the site
- Erection of fencing, barricades, gates and lighting to provide safe and secure worksites
- The presence of construction machinery and materials storage
- General construction activities within the construction footprint, such as vegetation clearing, earthworks, stockpiling materials and the parking/use of construction plant and vehicles
- Additional construction vehicle movements and minor traffic disruption associated with construction traffic.

During the construction period, all viewpoints identified would be likely to have increased visual impacts as follows:

- Moderate impact during construction
  - PU1
  - PU2
  - PU3
  - PR1
  - PR2
  - PR4
  - PR5
- Moderate to high impact during construction
  - PR3
  - PR6
  - PR7

Views of various construction equipment, tall construction cranes, site compounds, storage areas and increased site traffic (including trucks) on the local road network (refer to section 7.6 for details) would lead to a reduction in visual amenity throughout the proposed construction period. These impacts would be the highest for properties in close proximity to the Project site, reducing as distance and screening vegetation increases. These visual impacts would be of a generally temporary nature (albeit throughout the length of the identified construction period) and the impact would reduce for many viewpoints during the operational phase of the Project.

The impact of the Project on individual sensitive receivers during the construction phase would depend on their respective locations and the severity of the impact. In general, these visual changes are likely to result in moderate/high to high impacts for properties with views towards the Project site.

7.3.4 Operational impacts

The potential visual and landscape character impacts are discussed in this section with regard to the presence and operation of the Project within the landscape.

Landscape character zone impacts

Visual sensitivity

The potential visual sensitivity of each of the landscape character zones is discussed below in Table 7.32.

Table 7.32 Visual sensitivity of landscape character zones

Landscape character zones	Visual sensitivity of landscape character zones	Rating
Open farmland	There is a general absence of development throughout this landscape zone. Extensive views to ridgelines and hills are currently available from a range of open areas. The structure of the landform is simple, containing only a few distinct features. New infrastructure development therefore has the potential to be somewhat prominently discernible within the landscape.	Low
Woodland	The removal of existing vegetation across the site in order to construct the New Intercity Fleet Maintenance Facility would alter its character, and is therefore considered to have a high sensitivity to change.	High
Rural residential	The isolation, large plot sizes and lack of surrounding development are important features of this character zone. Many residents value this rural character highly, which is often an important factor in their decision to reside at this location. Any large infrastructure development may alter the character of the area, including lighting of the facility during night time periods.	Moderate
Transport corridor	The roads surrounding the Project site are lightly trafficked and mainly used by local residents to access their residential properties. Although highly scenic (with views over the surrounding rural landscape) these roads predominately serve the local community and are not used as scenic drives. Receptors move through this zone relatively quickly, with road and rail passengers only viewing the Project site in a transient manner.	Low
Industrial development	This landscape zone constitutes a medium density of urban development with associated infrastructure and large commercial and industrial buildings. This landscape character only contains a few potentially sensitive receptors and is considered to have a high ability to absorb change.	Low

Magnitude of visual change

The potential magnitude of visual change for each of the landscape character zones is discussed below in Table 7.33.

Table 7.33 Magnitude of visual change for each landscape character zones

Landscape character zones	Magnitude of visual change	Rating
Open farmland	The main part of the Project site is not located within this character zone and would have a highly limited magnitude of change.	Low
Woodland	The Swamp Sclerophyll Forest EEC occurs across much of the Project site, covering approximately 30 hectares. A section of moderate to good condition vegetation would be cleared within the main portion of the site, however a buffer of vegetation will be retained along Orchard and Ourimbah Road.	Moderate

Landscape character zones	Magnitude of visual change	Rating
Rural residential	The Project would be of an increased scale and bulk compared to existing development within the area. Several properties in close proximity to the facility are likely to experience a moderate magnitude of change, especially where filtered views are available, or when the facility is lit during night time periods.	Moderate
Transport corridor	The Project would be in close proximity to the Orchard, Ourimbah and Turpentine Road corridors, however the main change would be the construction of a new access road from Enterprise Drive over the Main North railway. However, this access road would reduce the impact of increased vehicles on the existing local roads as well as providing alternative flood free access. Alterations to the road layout are likely to have a moderate impact on this character zone.	Moderate
Industrial development	The Project is of a similar scale and bulk to this industrial development and would not adversely impact the character of the zone.	Low

Overall effect on landscape character zones

The overall effect of the Project on the landscape character zones is identified below in Table 7.34.

Table 7.34 Summary of landscape character zone impacts

Landscape character zones	Magnitude of visual change	Rating
Open farmland	Whilst potentially visible from this zone, the Project would have a low impact on the character of the open farmland landscape character zone.	Low
Woodland	The Project would require the clearance of a large are of vegetation, fragmenting the vegetation and leading to moderate-high impacts on the character of this zone.	Moderate–High
Rural residential	Whilst the Project may not be directly visible from a majority of the properties within the local vicinity, the large nature of the facility, associated vegetation removal and lack of existing development in the local area would contribute to a moderate change in character to the immediate area surrounding the Project.	Moderate
Transport corridor	Alterations to the road layout, views of ancillary Project elements and increases in traffic/vehicle size would lead to a moderate/low impact to the character of this zone.	Moderate–Low
Industrial development	Although parts of the Project, including the elevated access road may be visible from the locally surrounding receivers, the low sensitivity of this zone to change would ensure there would be limited impacts as a result of the Project.	Low

Visual impacts

Visual impacts to viewpoints

The potential visual impacts of each of the viewpoints identified in Figure 7.6 is discussed below in Table 7.35

Table 7.35 View point visual impacts

Viewpoint	Current view	Visual impact
PU1	The road at this viewpoint has a densely vegetated northern verge that screens the majority of views to the north. An industrial park is located to the south of the road, consisting of large warehouse units and a planted streetscape.	The elevated access road connecting the Project site to Enterprise Drive would be visible from this location, partially screened by foreground vegetation. The presence of existing transport infrastructure, low sensitivity of receptors and short duration of view have led to an overall visual impact rating of low.

Viewpoint	Current view	Visual impact
PU2	The existing view from the narrow road is dominated by dense vegetation on either side of the road corridor.	Vegetation removal would be required in this location, associated with the realignment of Turpentine Road further north. The proposed rail alignment, moving trains and security fence would be visible to the southern side of the road leading to a moderate/low visual impact on road users.
PU3	The existing view from the narrow road is dominated by dense vegetation on either side of the road corridor.	Vegetation removal would be required in this location, associated with the construction of the new track alignment, train wash facility and security fence. These elements may be visible from the road corridor leading to a moderate/low visual impact on road users.
PR1	Two properties are located for this viewpoint on slightly elevated land above the floodplain to the west of the Project site. The main parts of the dwellings have extensive views over open farmland to the north with screening vegetation filters views west towards the Project site.	Despite the relatively close proximity to the Project site, it is highly unlikely that the main portion of the maintenance facility would be visible from these dwellings. A small amount of vegetation removal may be noticeable from the land to the north of these properties. However, overall a high impact on visual amenity is not expected.
PR2	Three properties are located along Orchard Road for this view point. The dwellings are set back from the road and the foreground is dominated by vegetation planted within the property boundary and alongside the road verge. Some filtered views through gaps in the vegetation are available to the south.	Although screening vegetation would block the majority of views towards the Project site, glimpses of some elements of the Project would be available through gaps in the vegetation. These would potentially include the tops of the main facility building, light poles and the security fence. There may also be a somewhat noticeable increase in traffic volumes associated with workers accessing the site.
PR3	The properties associated with this viewpoint are located along Orchard Road, set back slightly from the road corridor. The foreground is dominated by stands of native vegetation with filtered views through gaps to the Project site beyond.	Although screening vegetation would block some Project elements, filtered views of the main facility building, light poles and the security fence are likely through gaps in the trees. There may also be a somewhat noticeable increase in traffic volumes associated with workers accessing the site.
PR4	The properties associated with this viewpoint are located along Orchard Road, set back over 60 metres from the road corridor. The foreground is dominated by stands of native vegetation within the property boundary with filtered views to a denser area of vegetation along the southern verge of Orchard Road.	Screening vegetation along Orchard Road would block the majority of views towards the Project site. It is unlikely that any Project elements would be visible from these two properties.
PR5	The property associated with this viewpoint is located at the end of Orchard Road surrounded by stands of native tree planting. Views from the dwelling are highly constrained by this planting although the surrounding fields have expansive views south and west towards a tree line in the middle distance.	Screening vegetation would block views of the majority of elements associated with the Project from the main part of this dwelling. Filtered views of the elevated access road would be available from the fields to the west of the property. The elevated road would be up to 12 metres high; much greater in scale and bulk than existing elements within the visual scene. Removal of some vegetation may be noticeable, as will the proposed 132 kV transmission line along the boundary of the site.

Viewpoint	Current view	Visual impact
PR6	The property associated with this viewpoint is located off Ourimbah Road and is set back from the road down a long driveway. The dwelling is surround by tall and dramatic native tree planting with grass lawns to the front and rear of the property. Very little built form is visible from the property.	This property is in close proximity to the Project site although dense screening vegetation may filter the majority of views of the Project. Filtered views of elements such as the main facility building, light poles and security fence may be visible from the front and back of the house. The level of visual impact would depend on the final amount of vegetation removal associated with the Project.
PR7	The property associated with this viewpoint is located off Ourimbah Road, set back from the road corridor. The dwelling is surround by tree planting with a large field to the south. The dwelling is likely to have filtered views across this field to the boundary with Turpentine Road.	It is proposed to widen Turpentine Road in this location requiring the purchase of a small corner of this property. This would bring the road into closer proximity to the dwelling and require the removal of some vegetation. Filtered views would be available to the realigned road, rail tracks, trains and security fence.

Overall effect on viewpoints

Overall, the visual impacts of the Project on the studied viewpoints including the following:

- One viewpoint received an impact rating of low
- Two viewpoints received an impact rating of moderate/low
- Five viewpoints received an impact rating of moderate
- Two viewpoints received an impact rating of moderate/high.

The overall visual impact ratings at each viewpoint is shown in Figure 7.12 and summarised in Table 7.36.

In summary, moderate/high visual impacts associated with the Project are expected to be limited to those properties which are in close proximity to the Project site including two dwellings along Ourimbah Road and Orchard Road. These dwellings are likely to have filtered views of the most prominent elements of the Project including the main facility building, light poles, fences and potentially, moving trains within the Project site. Although there would be some noticeable changes in the visual scene from public roads that pass close to the Project site, the low sensitivity of these receptors and relatively short duration of view would potentially lead to low to moderate/low impacts.

The Project site is surrounded by dense and tall tree planting that screens or blocks many views of the Project from surrounding roads and dwellings. The retention and enhancement of this visual buffer is crucial for limiting visual impacts. Some dwellings that recorded a moderate and moderate/high visual impact are likely to have a lower rating if a sufficient buffer of screen planting is able to be retained as part of the ongoing design of the Project.

For visual impacts related to increases in traffic (associated with workers and equipment accessing the site), it is assumed that the majority of site access would be via the new elevated road off Enterprise Drive, limiting the impacts to dwellings west of the Project site. To the south, visual impacts are likely to be low to negligible due to the low sensitivity of receptors and presence of dense screening vegetation. The most visible element of the Project from Enterprise Drive would be the new elevated access road which would be approximately 12 metres high.

Residual impacts

A full planting scheme within the Project site will greatly assist in reducing the visual impact for properties located close to the Project boundary. Combined with the implementation of the mitigation measures identified in section 7.3.5, including the potential for off-site screen planting at specific property locations (such as PR5 and PR7), visual impacts identified may be reduced further (refer to the residual impacts identified in Table 34).

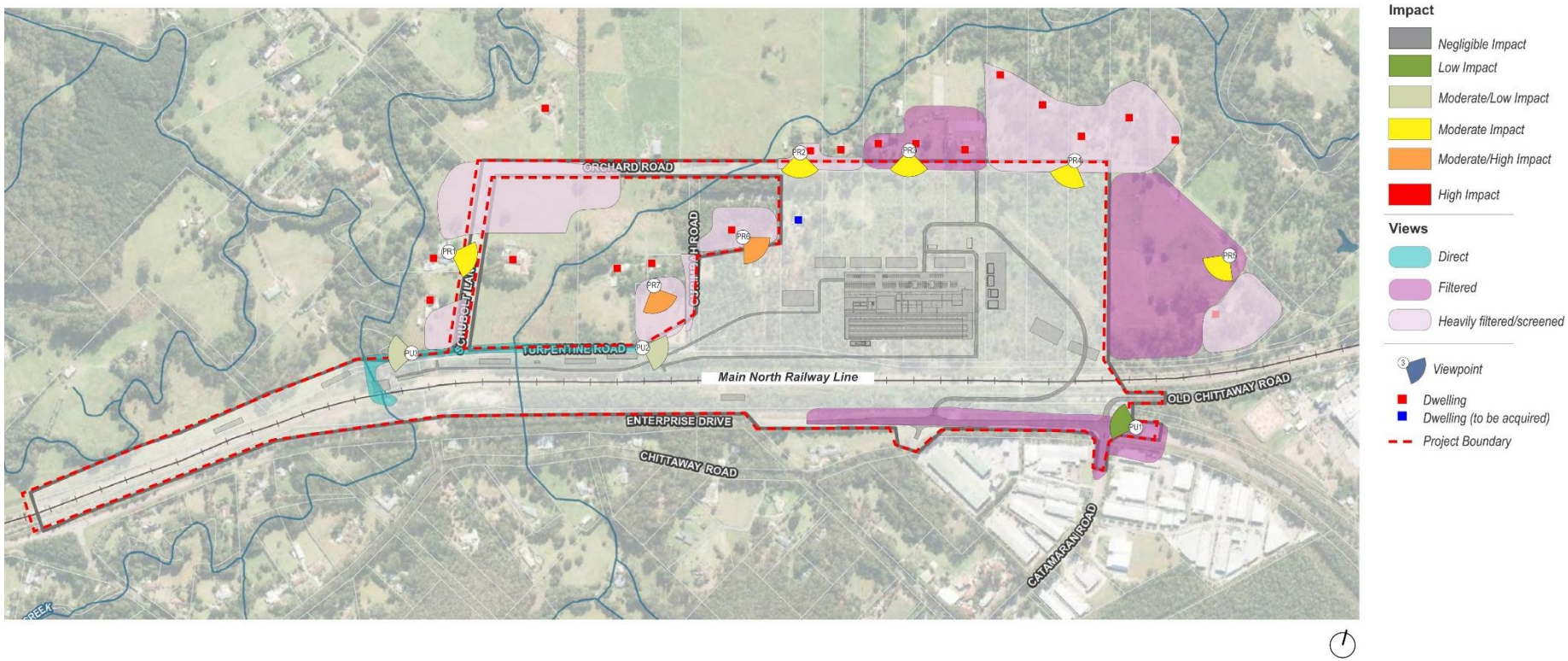


Figure 7.12 Summary of viewpoint visual impacts

Table 7.36 Summary of impact ratings at all viewpoints

Receptor location	Receptor Identification	Receptor Sensitivity	Magnitude					Overall visual impact rating	Residual impacts post mitigation (indicative only)
			Distance	Quantum of View	Period of View	Scale of change	Summary of ratings		
Enterprise Drive	PU1	Low	High	Moderate	Low	Low	Low	Low	Low
Turpentine Road	PU2	Low	High	Moderate	Low	Moderate	Moderate	Moderate–Low	Moderate–Low
Turpentine Road	PU3	Low	High	Moderate	Low	Moderate	Moderate	Moderate–Low	Moderate–Low
15 and 16 Schubolt Lane	PR1	High	Low	Low	Low	Low	Low	Moderate	Moderate
50, 54 and Lot 20 Orchard Road	PR2	High	Moderate	Low	Moderate	Low	Low	Moderate	Moderate
72 and 80 Orchard Road	PR3	High	Moderate	Low	Low	Moderate	Low	Moderate	Moderate
Lot 8660 and Lot 24 Orchard Road	PR4	High	Moderate	Low	Low	Low	Low	Moderate	Moderate
139 Orchard Road	PR5	Moderate	Moderate	Moderate	Low	Moderate	Moderate	Moderate	Moderate
Lot 31 Orchard Road	PR6	High	Moderate	Moderate	High	Moderate	Moderate	Moderate–high	Moderate
Lot 121 Ourimbah Road	PR7	High	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate–high	Low

7.3.5 Management and mitigation measures

Recommended mitigation to mitigate any construction and operational impacts include the following:

Landscape design and vegetation

The following measures would be considered with respect to landscape design and vegetation impacts for the New Intercity Fleet Maintenance Facility:

- Restricting vegetation clearing to those areas where it is necessary. Opportunities to minimise clearing would be identified as part of the ongoing development of the Project design
- Ensuring a vegetation buffer of existing planting is left between within or outside the Project site boundary to provide visual screening of the facility
- Locating storage areas and associated works in cleared or otherwise disturbed areas away from sensitive native vegetation
- Avoiding stockpiling materials in areas supporting vegetation where possible
- Trimming rather than the removal of trees should be considered where possible and to be conducted by a qualified arborist
- Rehabilitating vegetated areas where ground is disturbed
- Planting native trees and shrubs to screen built form and reduce the scale of the infrastructure
- Reinforcing the local semi-rural landscape character through the use of appropriate native vegetation, including that from the identified endangered vegetation communities
- Planting a graded screen of vegetation at varied heights that includes groundcover, shrub and tree layers to form an effective visual screen
- Considering the use of advanced size trees for instant effect
- Restoring areas disturbed by construction to match existing condition as far as practicable
- Consider additional measures to reduce potential visual privacy impacts (such as overlooking of adjacent properties) from the new access road.

Materials and finishes

The following measures would be considered with respect to the final materials and finishes for the New Intercity Fleet Maintenance Facility:

- All elements including lighting columns, roof lines, cladding etc. to be considered as a whole to simplify the structure and reduce clutter
- Avoid reflective surfaces.

Lighting

Lighting within and external to the maintenance facility would consist of security and other facility lighting. The security lighting would automatically switch on in low light conditions to provide minimal light for safe access and security. Other lighting would be used while maintenance works are being undertaken during night time periods. All lighting would be required to be installed in a manner which minimises light spill to areas beyond the maintenance facility site boundary.

Off site mitigation

Tree planting outside the works boundary may assist in visually screening the facility and would be considered further during the design. Offset planting for the removed vegetation would be required and would be undertaken with specialist ecological advice (refer to section 7.1).

7.4 Non-Aboriginal heritage

A *Non-Aboriginal Assessment* which assesses the potential impacts of the new intercity maintenance facility Project on non-Aboriginal heritage has been undertaken by Artefact Heritage (Artefact, 2016a). This assessment is attached as Appendix D of this REF. A summary of this assessment is provided in the following sections.

7.4.1 Methodology

The study area for the assessment of non-Aboriginal heritage was identified as the Project site boundary and immediately adjacent areas. A search of existing heritage items within the study area was undertaken through a search of the following heritage lists and registers:

- World Heritage List
- National Heritage List
- Commonwealth Heritage List
- State Heritage Register
- *Wyong LEP 2013*
- Section 170 Heritage and Conservation Registers.

The following non-statutory heritage lists were also searched:

- Register of the National Estate
- National Trust Register.

An inspection of the site was also conducted on the 19 February 2016. The main aims of the site inspection were to gain an overall impression of the intactness of the Project site and surrounding area and to identify whether unidentified Historical archaeological relics and heritage items occur or were likely to occur within the Project site.

7.4.2 Existing environment

Historical archaeological potential

The Project site is part of a wider property that was granted by c.1830. However, the only development known to have taken place in the period before the construction of the railway line in the 1880s was the creation of Old Chittaway Road, the original alignment of which ran through the eastern corner of the Project site boundary. This is likely to have been an unsurfaced road, and archaeological evidence is therefore unlikely to remain.

The present fabric of the railway line indicates that the rail, sleepers and underlying ballast have been replaced since construction. It is also possible that the existing bridge carrying the line over Turpentine Road/ Chittaway Creek replaced an earlier timber structure. However, it is unlikely that archaeological evidence of the possible timber bridge remains, as it would have been removed during earthworks for the present structure.

By the mid-twentieth century, Turpentine Road had been laid out to the west of Ourimbah Road. As with Old Chittaway Road this was an unsurfaced road, and archaeological remains of the early period of its use are therefore unlikely to remain. Development of the study area since the 1950s has included construction of two houses and residential buildings, and vegetation clearance for use of part of the study area as pasture. While some remains may be present from this period any relics associated with this period have low potential to reach the level of local significance.

Potential heritage items

There are no listed heritage items within or in proximity to the Project site. However, the investigation undertaken for the present report resulted in the identification of several items which may be of some heritage significance (Figure 7.13). These are discussed below.

Main North railway and Turpentine Road/Chittaway Creek underpass

The Project site boundary includes a section of the Main North railway line. The construction of the Main North railway in the late 1880s was of great importance in the development of the state. In the local region, it played a considerable role in opening the area to settlement and allowing local produce to reach the market. The line within the Project site appears to follow the original railway alignment, although most of the fabric has been replaced over the course of time.

The Turpentine Road/Chittaway Creek underpass may retain elements constructed in the late 1880s, although these have since been modified.

Old Chittaway Road

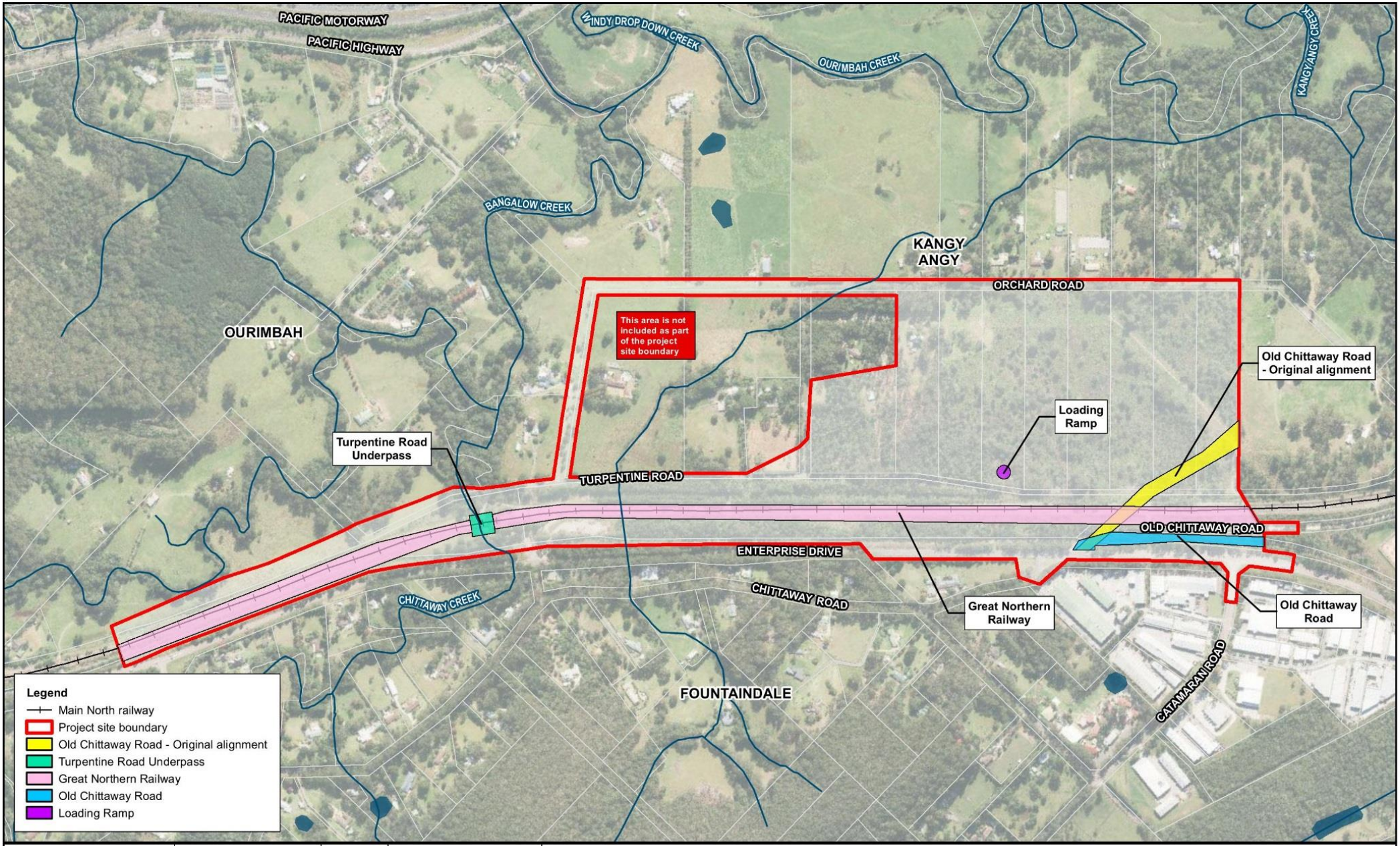
Old Chittaway Road was in existence by the late 1880s, when it was realigned to accommodate the construction of the railway line. It appears to have been one of the main roads through the location region. The Project site boundary includes part of the original alignment, although evidence of this is unlikely to survive. That part of the current alignment included in the Project site boundary was laid out in the late 1880s and remained unsurfaced through to at least the mid-twentieth century. Similarly, fabric from the earlier part of its use is unlikely to remain.

Loading ramp

Remains of a stockyard and loading ramp were identified between the railway line and the eastern extension of Turpentine Road. These remains are likely to relate to pastoral use of the area in the late twentieth century. They are therefore considered unlikely to be of heritage value.

Street side plantings

The survey highlighted several areas of linear pine plantings along boundary lines within the Project site boundary, along Turpentine Road and Enterprise Drive. The documentary evidence suggests that these plantings date to the late twentieth century. Although they now form a distinctive landscape element, they are considered unlikely to be of heritage value.



Map: 2202522A_GIS_F027_A2	Author: goganovskiM
Date: 30/05/2016	Approved by: -

Data source: - © Land and Property Information 2015

0 100 200 m

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Coordinate system: GDA 1994 MGA Zone 56

Scale ratio correct when printed at A4

Note: Design is indicative only.
Subject to detailed design

New Intercity Fleet Maintenance Facility Project
Figure 7.13
Potential heritage items

7.4.3 Significance assessment

Of the four potential heritage items within the study area, two are considered not to be of heritage value. The significance of the remaining two is assessed in this section:

- Main North railway and Turpentine Road/Chittaway Creek underpass
- Old Chittaway Road.

Main North railway and Turpentine Road/Chittaway Creek underpass

The Main North railway, as it passes through the study area, is considered to be of state heritage significance in accordance with Criterion A of the *NSW heritage significance assessment criteria* (Office of Environment and Heritage, 2001) which noted that, *an item is important in the course, or pattern, of NSW's cultural or natural history (or the cultural or natural history of the local area).*

The Main Northern Line is of importance in the history of the state as it increased the speed and ease of communication, travel and transport between Sydney and the north. It was also important in the history of the local area specifically, allowing increased settlement of an area that was previously relatively inaccessible. Within the Project site, this value is represented in the alignment of the railway, which follows the original alignment. However, original fabric is limited to elements of the Turpentine Road/Chittaway Creek underpass.

Old Chittaway Road

Old Chittaway Road is of local heritage significance in accordance with Criterion A (Office of Environment and Heritage, 2001). It relates to the sparse pre-railway development of the area and was one of the main routes through the district for the early settlers. Within the study area, this is represented by the location of part of the original alignment, which is unlikely to retain archaeological remains, and part of the c.1889 realignment, the fabric of which is not considered to be of heritage significance.

7.4.4 Construction and operational impacts

The potential heritage impacts of the New Intercity Fleet Project on the items of potential heritage identified above is outlined below.

Main Northern Railway and Turpentine Road/Chittaway Creek underpass

The Project would not result in alterations to the current railway alignment. It would involve construction of a new branch line, leaving the northern side of the existing line and running parallel to this until it reaches the main portion of the maintenance facility site. Although this would involve impact to the existing fabric of the line, the fabric to be affected is unlikely to relate to the original construction of the line. The Project would also involve construction of two additional rail bridges, passing over Turpentine Road and Chittaway Creek, adjacent to the existing underpass. The proposed works would not to involve impact to the fabric of the existing underpass, but would affect the setting of the item, as the view from the north would be obscured.

Old Chittaway Road

The Project would involve construction across the former alignment of Old Chittaway Road. This alignment is no longer evident, and no archaeological remains are likely to be present. The Project would involve works along the current, post-c.1890 alignment of Old Chittaway Road. It would involve removal of fabric post-dating c1954, but this is not considered to be integral to the significance of the road. No archaeological remains from the earlier part of the twentieth century are likely to be present. The c.1890 alignment would remain evident.

A summary of the potential impacts is outlined in Table 7.37.

Table 7.37 Summary of potential impacts

Item	Impacts to fabric	Impacts to archaeological remains	Impacts to setting
Main Northern Line	Nil The fabric to be affected is modern.	Nil No archaeological remains are likely to be present.	Nil The setting of the Line in general in this area has not been identified as being of heritage significance.
Turpentine Road/ Chittaway Creek underpass	Nil The intact fabric of the bridge will be retained.	Nil No archaeological remains are likely to be present.	Minor The setting of the underpass will be impacted.
Old Chittaway Road	Nil The fabric to be affected is modern.	Nil No archaeological remains are likely to be present.	Minor The c1890 alignment will be slightly altered.

7.4.5 Management and mitigation measures

As the two sites potentially affected by the Project are non-listed items of heritage significance, are unlikely to comprise archaeological relics, there are no statutory requirements regarding their management. Management recommendations have been based on the assessed significance of the items, and the nature of the proposed impact.

The following management and mitigation measures have been identified:

- If the proposed development is changed to affect areas not included in the present report, further assessment of potential non-Aboriginal heritage impact would be undertaken.
- Prior to commencement of works, a photographic archival record would be completed of the Turpentine Road/Chittaway Creek underpass. Copies of the record would be lodged with Sydney Trains, Central Coast Council, the local historical society and the Heritage Division, as required by these agencies.
- Unexpected archaeological relics remain protected by the *Heritage Act 1977*. If a potential relic is found in the course of the work, work would cease in the vicinity, and the Heritage Division of the Office of Environment and Heritage would be contacted for advice.

7.5 Aboriginal heritage

An *Aboriginal Archaeological Survey Report* which assesses the potential impacts of the new intercity maintenance facility Project on Aboriginal heritage has been undertaken by Artefact Heritage (Artefact, 2016b). This assessment is attached as Appendix E of this REF. A summary of this assessment is provided in the following sections.

7.5.1 Methodology

The *Aboriginal Archaeological Survey Report* was completed in accordance with the OEH *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales* (DECCW, 2010a) (the 'code of practice').

A survey of the Project site was conducted on 19 February 2016 with two representatives from Artefact Heritage and one representative from each of the Darkinjung Local Aboriginal Land Council (LALC) and the Guringai Tribal Link Aboriginal Corporation. The survey was conducted in accordance with the OEH *Code of practice* (DECCW, 2010a). The survey was conducted on foot, using a handheld GPS as well as physical maps. A photographic record was kept of all sections of the study area. Photographs were taken to record different aspects of the landform units within the study area, vegetation, levels of disturbance and potential for Aboriginal sites.

An extensive search of the Aboriginal Heritage Information System (AHIMS) database was conducted on 15 January 2016. The AHIMS search area encompasses the wider region around the study area, in order to give context to the findings in the study area.

7.5.2 Existing environment

Geology and soils

Soil landscapes have distinct morphological and topological characteristics that result in specific archaeological potential. They are defined by a combination of soils, topography, vegetation and weathering conditions; soil landscapes are essentially terrain units that provide a useful way to summarise archaeological potential and exposure.

The Project site and surrounding landscape is generally located within a system of quaternary sediments comprised of gravel, sand, silt and clay. This landscape is comprised of an infilled river valley with a local topography of typically less than 10 metres across the Project site. The alluvial valley is flanked by the more rugged terrain of Narrabeen sandstone. The geology and relatively flat topography of the area identifies that indicative features such as rock outcrops, are not present.

Aboriginal archaeological context

The Project site is within the boundary of the Darkinjung LALC and in the parish of Tuggerah County of Northumberland. A number of previous archaeological investigations have been undertaken in the region, and across the Project site specifically. A study by Vinnicombe (1980) identified that water was not a critical determinant in location of Aboriginal heritage sites in the area as water is not typically more than a kilometre away in this region. Vinnicombe summarised the patterns of site locations as shown in Table 7.38.

Table 7.38 Aboriginal heritage site patterns

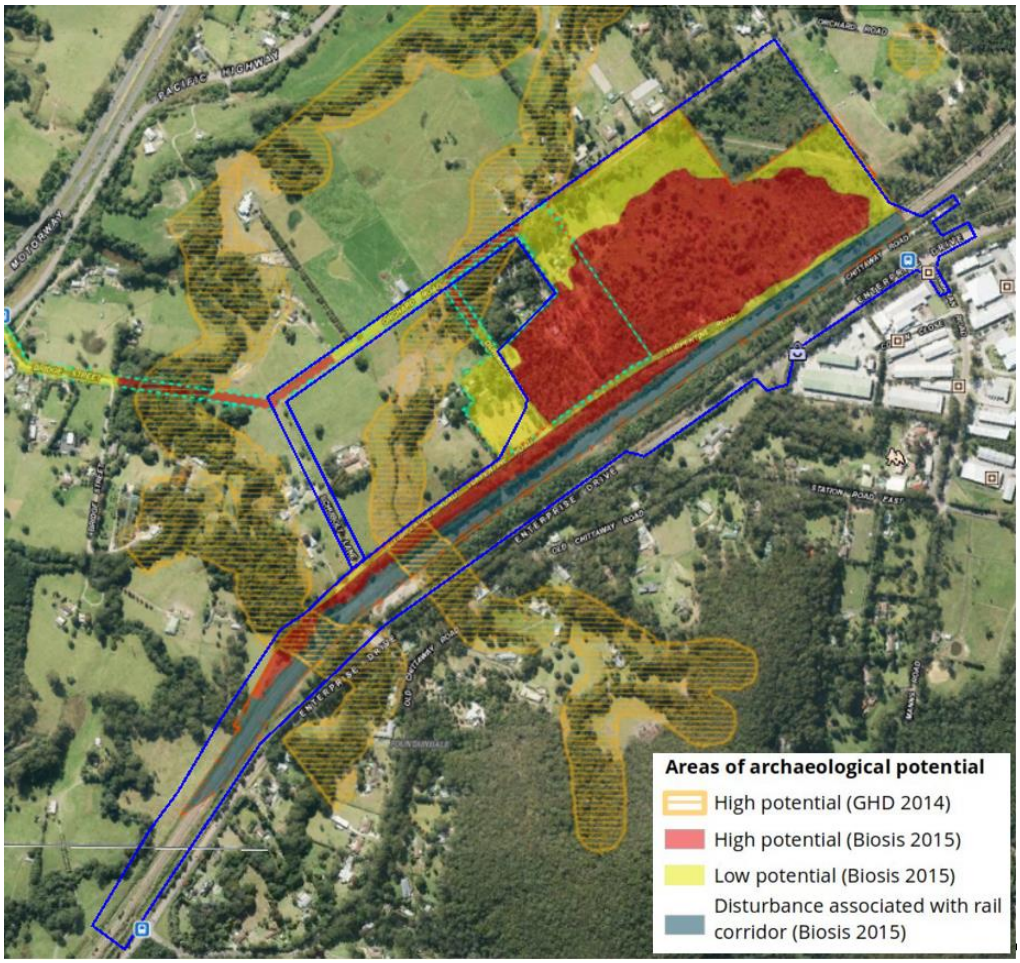
Open middens	Occur on sand, alluvium and sandstone, often at the junction between valley bottom and hillslope. They are in protected positions near water.
Open camp sites	They can occur in any position where the terrain is sufficiently flat and water is available.
Rock shelters with evidence of Aboriginal occupation	Occur most frequently immediately below ridge ops and above the watercourses along or just above the valley floors. They can also occur anywhere up the slopes where sandstone is exposed. Habitation sites are more likely to occur near the valley floor, while art sites tend to occur in large shelters below the ridge tops. Availability of water is not a factor in site selection.
Grinding grooves	Where Hawkesbury Sandstone is dominant, the majority of grinding sites occur at the heads of valleys in the creek beds. They also occur around rock pools on ridge tops and rock platforms. They are almost always associated with a ready water supply.
Art sites	These can occur anywhere on sandstone or along the ridges. There is a small preference for shelters immediately below the ridge tops.
Engravings	Mostly found on ridge tops and on saddles between ridges, on high platforms with extensive views on or near the heads of valleys.

A due diligence assessment of the New Intercity Fleet Maintenance Facility site was completed in 2015 (Biosis, 2015), and covered approximately the same area as the present study area. The due diligence assessment resulted in the identification of an area of potential archaeological deposit (PAD) across an elevated area overlooking a watercourse, within Lot 82. Previous disturbance of this area appeared to be minimal and the location in proximity to permanent water suggested that there was potential for the presence of Aboriginal objects.

The zones as identified in the due diligence assessment (Biosis, 2015) are shown in Figure 7.14. In general, the due diligence assessment identified that the Project site had a high archaeological potential across most of the study area, corresponding with locations that appeared to have been subject to relatively low levels of historical ground disturbance. These areas were noted as having a high potential for artefact scatters to be present with minimally disturbed elevated areas overlooking creek lines. The study also identified a moderate potential for the presence of scarred trees in uncleared areas, and high potential for the presence of grinding grooves or rock engravings on suitable sandstone outcrops.

In addition, due to the extent of existing vegetation on the site, the likelihood of unknown Aboriginal objects or places being identified within the Project site was assessed by Biosis as being high. The due diligence assessment also did not identify any previously unrecorded sites or objects within the Project site.

Further information regarding the archaeological potential of the Project site is provided in the *Aboriginal Archaeological Survey* (Artefact, 2016b) attached as Appendix E of this REF.



Source: Artefact, 2016b – Figure 5

Figure 7.14 Archaeological potential of the study area

In addition, as part of the geotechnical investigations for the New Intercity Fleet Maintenance Facility, an additional due diligence assessment was undertaken (RPS, 2015a). This assessment resulted in a revision of the identified area of high potential due to an area identified as being disturbed and another being identified as flood prone. These areas were re-assessed at this time as therefore having low potential archaeological significance, leaving a more concentrated area of high potential towards the southern end of the main facility site.

Registered Aboriginal heritage sites in the study area

As identified above, an extensive search of the AHIMS database was conducted on 15 January 2016. This search identified 31 sites within the search areas of which one has since been determined not to be a site, leaving a total of 30 sites. No registered sites were located within the immediate Project site boundary. The most frequently recorded site within the AHIMS search area were artefacts (19 sites), grinding grooves (nine sites) and art sites (five sites). Single instances of the following items were also identified: a modified tree; shell site; stone quarry site; and a water hole.

Most of the sites within the search area were recorded in the hills of the Narrabeen Sandstone country, to the north and south of the valley containing the Project site. All of the site features associated with sandstone (grinding groove, art, water hole, quarry) were located in the hills. However, a number of sites were also recorded on the alluvial land alongside Wyong and Ourimbah Creeks. The site feature recorded for all of these sites was ‘artefact’.

The closest of these sites to the study area is AHIMS No. 45-3-1146 (Tangy Dangy), located approximately 200 metres to the north-east of the northern end of the Project site.

7.5.3 Construction impacts

The proposed works within the railway corridor are unlikely to result in harm to Aboriginal objects. This part of the study area has been assessed as having low archaeological potential.

The remainder of the Project site has been assessed as having moderate archaeological potential, although this has not been confirmed. The proposed works within this part of the Project site could result in harm to Aboriginal objects (if confirmed to be present), as excavation may involve removal of archaeological deposits that may be present in this part of the Project site. However, the depth of the soil profile varies across the Project site, and it may not be necessary to excavate across the whole of the footprint. It is therefore possible that the proposed works may not result in complete removal of any archaeological deposit.

7.5.4 Operational impacts

There would not be expected to be any impacts to Aboriginal heritage generated by the operation of the Project. Work at the site would take place within the facility and the rail corridor and would not be expected to disturb other Aboriginal heritage sites.

7.5.5 Management and mitigation measures

Mitigation measures recommended vary depending on the assessment of archaeological significance of an area, which is based on the research potential, rarity, representativeness and educational value. Where no archaeological evidence is recorded for a site area, preliminary assessment of archaeological significance considers the potential significance of an area as a guide to future work.

Part of the Project site is considered to have moderate archaeological potential and are possibly of high archaeological significance, although this has yet to be confirmed. The recommendations below are based on this assessment. However, it should be noted that sub-surface investigation would be required to confirm the assessment. Recommendations would be revised following the additional investigation.

The following management and mitigation measures would be applied as part of the ongoing development of the Project:

- If the extent and nature of the Project is altered, additional archaeological assessment would be undertaken to address this.
- Due to the inability to adequately access and assess some parts of the site, an Aboriginal cultural heritage assessment report (ACHAR) would be completed for the areas of the Project site identified as having moderate or high potential for Aboriginal heritage. This would include Aboriginal community consultation and archaeological test excavation. This process would be undertaken in accordance with the following guidelines issued by the OEH:
  - *Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW* (OEH 2011)
  - *Code of practice for archaeological investigation of Aboriginal objects in New South Wales* (DECCW 2010)
  - *Aboriginal cultural heritage consultation requirements for proponents* (DECCW 2010).
- If the results of the ACHAR confirm that Aboriginal objects are present and would be harmed by the proposed development, it would be necessary to apply for an Aboriginal Heritage Impact Permit (AHIP) prior to commencement of works.
- During construction, should Aboriginal heritage items be uncovered, all work within the vicinity would cease and the Project Manager and Transport for NSW staff would be notified. The Department of Planning and Environment would also be notified in accordance with the *National Parks and Wildlife Act 1974*. Investigation of the significance of the find and approval by a suitably qualified archaeologist would be required prior to recommencement of works.

7.6 Traffic, transport and access

A *Traffic and Transport Impact Assessment* which assesses the potential traffic and transport impacts associated with the construction and operation of the new intercity maintenance facility has been undertaken by WSP | Parsons Brinckerhoff (WSP | Parsons Brinckerhoff, 2016c). This assessment is attached as Appendix F of this REF. A summary of this assessment is provided in the following sections.

7.6.1 Existing environment

Road Network

The key surrounding roads include:

- *Enterprise Drive* — a Regional Road which runs generally in an east-west direction between Wyong in the north and the Pacific Highway in the south. It is a two-lane, two-way undivided road with a posted speed limit of 90 kilometres per hour speed limit adjacent to the Project site. It has good horizontal alignment and 1.0 to 1.5 metre sealed shoulder lane marked with solid edge lines and bicycle logo pavement markings.
- *Old Chittaway Road (East)* — a Local Road which runs along the western side of the railway track, linking Enterprise Drive to the south and Hereford Street to the north. This road has a sealed width which varies between four to five metres. The narrowness of the road offers minimal lateral clearance between passing vehicles.
- *Old Chittaway Road (West)* — a Local Road that serves as an access to residential properties, and forms a priority controlled T-intersection with Enterprise Drive. It is a two-lane, two-way undivided road, approximately 5.5 metres wide with a posted speed limit of 60 kilometres per hour.

- *Turpentine Road, Ourimbah Road and Orchard Road* — two-lane, two-way undivided no-though local roads that connect approximately 25 properties with the Enterprise Drive. These roads do not have a speed limit posted, although a 20 kilometres per hour speed limit has been applied adjacent to the railway overpass. Turpentine Road forms a priority controlled intersection with Enterprise Drive at the south-east section of the Project site.
- *Burns Road* — a Local Road which runs generally in an east-west direction between the Pacific Highway in the west and Enterprise Drive/Chittaway Road in the east. It is a two-lane, two-way undivided road with a posted speed limit of 50 kilometres per hour. Immediately north of Chittaway Road, only single lane vehicle movements are allowed at the rail overpass. As a consequence, traffic approaching the rail overpass from west gives way to traffic entering from the other side. A 5 tonne load limit applies on Burns Road.
- *Catamaran Road* — a Local Road that serves as an access to an industrial estate with dedicated U-turn area for heavy vehicles via mountable roundabout control and a school (Central Coast Rudolf Steiner School) with 40 kilometres per hour school zone. It is a two lane, two-way undivided wide road with a posted speed limit of 50 kilometres per hour.
- *Pacific Highway (SH10)* — a State Road which runs in a north-south direction and provides connection to the M1 Pacific Motorway with both Chittaway Road and Burns Road linking Enterprise Drive. The Pacific Highway provides an alternate heavy vehicle access route to the site from the M1 Pacific Motorway or from the general Gosford area.

Intersections

A majority of vehicles would access the Project site via the proposed new access road from Enterprise Drive (refer to Chapter 4). This intersection would accommodate all heavy vehicle traffic and be the primary access during construction and operation.

The existing intersections within the vicinity of the Project site also include:

- *Turpentine Road and Enterprise Drive* — a basic T-intersection which is two lane, two-way undivided on Enterprise Drive with no turning or passing facilities and two lane ,two-way undivided and unmarked on Turpentine Road. Turpentine Road at Enterprise Drive has a widened pavement area which narrows further west of the intersection.
- *Enterprise Drive and Old Chittaway Road (East)* — a basic T-intersection which is two lane, two-way undivided on Enterprise Drive with no turning or passing facilities and two lane, two-way undivided and unmarked on Old Chittaway Road. Old Chittaway Road at Enterprise Drive has a widened pavement area which narrows further north of the intersection.
- *Enterprise Drive and Old Chittaway Road (West)* — a basic T-intersection which is two lane, two-way undivided on Enterprise Drive with no turning or passing facilities and two lane, two-way undivided and unmarked on Old Chittaway Road. A left turn lane is provided into Old Chittaway Road at Enterprise Drive westbound.
- *Burns Road and Chittaway Road* — a basic T-intersection which is two lane, two-way undivided on Enterprise Drive with no turning or passing facilities and two lane, two-way undivided and unmarked on Burns Road. Burns Road at Enterprise Drive has a widened pavement area which includes a concrete centre median nose and narrows to one traffic lane (at the rail bridge) within a short distance west of the intersection. Vehicles travelling westbound from Enterprise Drive onto Burns Road have priority over those travelling eastbound on Burns Road approaching the rail bridge.

Intersection layouts and performance

Intersection traffic modelling was undertaken to determine the performance of the Enterprise Drive and Old Chittaway Road intersection under existing layout and traffic conditions. The results are summarised in Table 7.39. Further details regarding the intersection modelling is provided in the *Traffic and Transport Impact Assessment* attached as Appendix F of this REF.

Table 7.39 Intersection performance – existing (2016)

Intersection	Control type	Peak period	Average vehicle delay (seconds)	Level of service [1]	Queue (metres)
Enterprise Drive and Old Chittaway Road (West)	Priority Control	Morning (7.45–8.45)	26	B	2
		Afternoon (4.45–5.45)	44	D	5
Enterprise Drive and Old Chittaway Road (East)	Priority Control	Morning (7.45–8.45)	23	B	1
		Afternoon (4.45–5.45)	35	C	1

Note 1 The level of service (LoS) is a qualitative measure used to describe the potential for delay during traffic operation, usually in peak demand situations. LoS is designated by assigning ratings from A to F, with A the best and F the worst. A LoS of D or better is considered acceptable.

Analysis of the intersection performance indicates that both intersections would perform satisfactorily, achieving a Level of Service (LoS) D or better during morning and afternoon peak hours. The right turning traffic from a side road would experience a minor delay, but the major though traffic movement on Enterprise Drive would achieve a LoS A.

Rail services

The nearest railway stations for passenger services are located at Ourimbah, to the south and at Tuggerah to the north. Both stations are well outside the extent of the Project site and surrounding area.

Bus services

Bus services currently operate along Enterprise Drive and the Pacific Highway. The services are operated by Red Bus Services and include the Route 47 bus service. Existing bus services that operate in the region are shown in Figure 7.15 and their route and frequency is detailed in Table 7.40.

Table 7.40 Bus service routes and frequency within the study area

Bus route	Description	Hours of operation	Number of services
47	Bateau Bay Square to Wyong via Ourimbah University Service operates Monday to Friday	From Bateau Bay Square (from 7.10 am to 2.00 pm)	3 services a day AM peak: 1 Mid-day: 2 PM peak: 0
		From Wyong (from 8.25 am to 3.40 pm)	3 services a day AM peak: 1 Mid-day: 2 PM peak: 0

Source: Red Bus Services timetable

Pedestrians and cyclists

There are no formalised pedestrian footpaths adjacent to the Project site. On road bicycle facilities are provided on both sides of Enterprise Drive between 50 metres south of Old Chittaway Road (south) and Wyong Road (further north of the study area) within between 1.0 and 1.5 metre sealed shoulders.

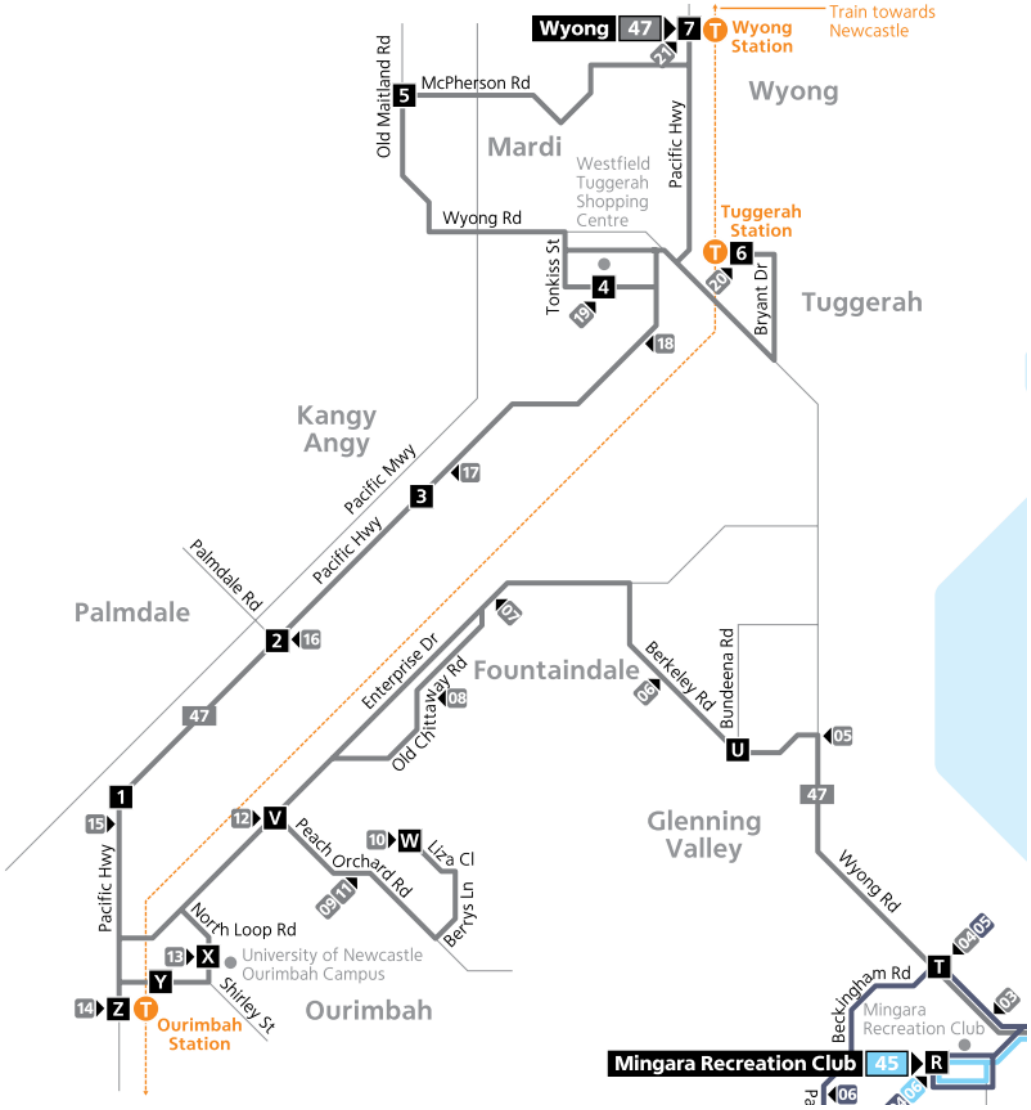


Figure 7.15 Bus services within the study area

7.6.2 Construction impacts

Vehicle trip generation

There would be an increase in both light and heavy vehicle use on the local roads as a result of the construction of the Project. The maximum daily workforce on a standard day is anticipated to be 200 employees. This number would increase to approximately 300 employees when rail possessions are proposed during construction.

The number of vehicle movements during construction is anticipated as follows (note these numbers are indicative and would be refined as part of the ongoing design of the Project and preferred construction methodology):

- 400 light vehicles for workers throughout per day (200 in/200 out per day)
- 600 light vehicles for workers at peak periods per day (300 in/300 out per day)

- 1,500 truck movements for concrete over a 12 month period (averaged at 6 per day, 1 per peak hour)
- 2,700 truck movements for imported fill over a 6 month period (averaged at 21 per day, 2 per peak hour)
- 1,900 truck movements for structural steel over a 30 month period (averaged at 3 per day, 1 per peak hour)
- 400 truck movements for concrete pumps over a 30 month period (averaged at 1 per day, 1 per peak hour)
- 6,000 truck movements for steel over a 12 month period (averaged at 23 per day, 2 per peak hour) – potentially transported by rail
- 1,000 truck movements for miscellaneous deliveries over 18 month period (averaged at 3 per day, 1 per peak hour)
- 3,500 truck movements for ballast over 6 month period (averaged at 27 per day, 3 per peak hour).

Based on the above, Table 7.41 provides a summary of the anticipated trip generation by vehicle type during construction for daily and peak hourly movements.

Table 7.41 Trip generation (one-way) during construction

STAGE	Daily (ONE-WAY)		Morning peak [1] (one way)		Afternoon peak [2] (one way)	
	Light vehicle	Heavy vehicle	Light vehicle	Heavy vehicle	Light vehicle	Heavy vehicle
Construction – Standard	**200**	**84**	**50**	**11**	**50**	**11**
Construction – During Possessions	**300**	**84**	**75**	**11**	**75**	**11**

Note 1 *The weekday AM background traffic peak occurs between 7.45 am and 8.45 am. This does not coincide with the Projects peak in the AM. For the purposes of this assessment it has been assumed that 25 per cent of the Projects construction traffic and 100 percent of the general office based operational traffic (0 per cent shift based operational traffic) will coincide with the background traffic AM peak.*

Note 2 *The weekday PM background traffic peak occurs between 4.45 pm and 5.45 pm. This does not coincide with the Projects peak in the PM. For the purposes of this assessment it has been assumed that 25 per cent of the Projects construction traffic and 100 per cent of the general office based operational traffic (0 per cent shift based operational traffic) will coincide with the background traffic PM peak.*

Movements of shift workers to and from site are not anticipated to coincide with standard peak traffic times as shift changeover points fall outside these hours. Office based staff are assumed to work 9.00 am to 5.00 pm and so their movements will coincide with peak traffic periods.

Construction of the maintenance facility would not be anticipated to require road closures or restrictions.

Trip distribution

Employee trip distribution has been estimated and it has been assumed that the majority would travel from the nearby major centres of Newcastle and Wyong to the north and Gosford and Sydney to the south. For the purposes of the assessment, it is expected that an even 50 per cent north and south split would travel along Enterprise Drive during both the construction and operation phases.

Vehicle travel routes

The majority of the traffic accessing the site during construction would be directed to use the new access road as the primary access. The occasional light vehicle may need to use Turpentine Road and Orchard Road via the Enterprise Drive and Turpentine Road intersection (as a secondary access) however this would be limited to light vehicles. There is also likely to be some form of traffic crossing on Orchard Road and Turpentine Road between the main facility and the western end of the Project.

Given the proximity of the site to the Follyfoot Farm Childcare Learning Centre and Central Coast Rudolf Steiner School, care would however need to be taken for the movement of large vehicles to the site particularly prior to the construction of the new access road and bridge. The vehicle routes are proposed to and from the site for both construction and operation phases have previously been shown in Figure 4.9.

Intersections

Intersection traffic modelling was undertaken to determine the performance of the proposed intersection layout of the Enterprise Drive, Old Chittaway Road and new access road intersection during the peak construction period in 2017. The results of this modelling are shown in Table 7.42.

Table 7.42 Intersection Performance – Future year with construction

Intersection	Control type	Peak period	Average vehicle delay (seconds)	Level of service	Queue (metres)
Enterprise Drive, Access Road and Old Chittaway Road (West)	Priority Control	Morning 7.45–8.45	142	F	10
		Afternoon 4.45–5.45	2539	F	182

Table 7.42 indicates that the proposed layout of the Enterprise Drive, Old Chittaway Road and the new access road intersection would operate at a LoS F with construction traffic for both the morning and afternoon peak hours in 2017. Even with low traffic volumes to and from the Project site, some reduced intersection performance is anticipated during peak periods.

Under a priority controlled intersection, the right turn movement from a side road is the critical movement through the intersection in terms of the delay and level of service. Under existing conditions, right turning traffic from side roads are only required to cross one or two lanes to turn into Enterprise Drive. However, due to the increased number of lanes on Enterprise Drive, right turning traffic from both Old Chittaway Road and the new access road would require longer crossing time to turn onto Enterprise Drive. As a result, the right turn movement from the side roads would experience longer delays during both the morning and afternoon peak hours.

Rail services, pedestrians and cyclists

The Project would have no anticipated impacts to public transport services (with the exception of the scheduled possessions for the Main North railway), pedestrians or cyclists during construction.

7.6.3 Operational impacts

Vehicle trip generation

Three nominal eight hour shifts are proposed during normal day to day operations and include:

- 6.00 am to 2.00 pm
- 2.00 pm to 10.00 pm
- 10.00 pm to 6.00 am.

The following vehicle trips are anticipated as part of the operation of the Project:

- Approximately 50 to 60 light vehicle trips at any one time at shift changeover points
- 20 light vehicle movements a day for office based staff (10 in/10 out)

- 10 light vehicle movements per day for maintenance, service and delivery
- 10 heavy vehicles per day for maintenance, service and delivery

In addition, a peak of 50 trucks per day is anticipated approximately once every ten years (i.e. a 1 in 10 year spike). This is to allow for the delivery every 10 years or so that includes delivery of large maintenance equipment, new bogies, etc. and would be a rare occurrence delivery type. Typically, heavy vehicle movements would be between approximately one and five trucks per day (excluding worker vehicles).

Based on the above, Table 7.43 provides a summary of the anticipated trip generation by vehicle type during construction for daily and peak hourly movements.

Table 7.43 Trip generation (one-way) during operation

STAGE	Daily (ONE-WAY)		Morning peak (one way)		Afternoon peak (one way)	
	Light vehicle	Heavy vehicle	Light vehicle	Heavy vehicle	Light vehicle	Heavy vehicle
Operation – Standard [1]	220	10	11	1	11	1

Note 1 This assumes three working shifts across a day where all staff vehicle movements occur outside of peak hour times. The only exception is general office based staff who are likely to work a standard day (9.00 am to 5.00 pm). Office based staff have been included as light vehicle trips for both the AM and PM peaks.

Movements of shift workers to and from site are not anticipated to coincide with standard peak traffic times as shift changeover points fall outside these hours. Office based staff are assumed to work 9.00 am to 5.00 pm and so their movements will coincide with peak traffic periods.

Intersections

Intersection traffic modelling was undertaken to determine the performance of the proposed intersection layout of the Enterprise Drive, Old Chittaway Road and new access road intersection during operation. The results of this modelling are shown in Table 7.44.

Table 7.44 Intersection Performance – Future year with operation

Intersection	Control type	Peak period	Average vehicle delay (seconds)	Level of service	Queue (metres)
Enterprise Drive, Access Road and Old Chittaway Road (West)	Priority Control	Morning 7.45–8.45	184	F	12
		Afternoon 4.45–5.45	1368	F	92

Table 7.44 indicates that the proposed layout of the Enterprise Drive, Old Chittaway Road and new access road intersection would operate at a LoS F with operation traffic for both the morning and afternoon peak hours in 2019.

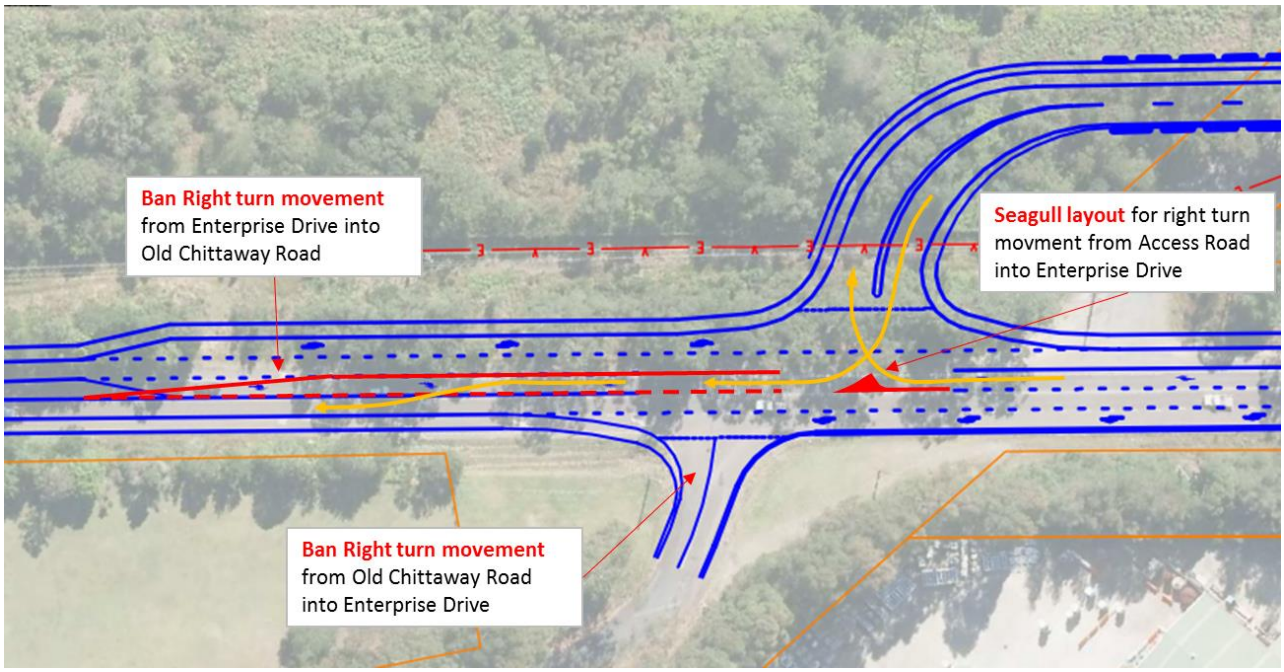
The number of vehicles that access the New Intercity Fleet Maintenance Facility would be reduced compared to the construction period; however the right turning movement on the new access road and Old Chittaway Road would continue to experience delays.

Proposed new intersection at Enterprise Drive

As described in Chapter 4, the new access road intersection at Enterprise Drive would consist of be a four-way intersection between Enterprise Road, the new access Road and Old Chittaway Road (west) as shown in Figure 4.2.

As described above, modelling of the traffic conditions during construction at peak morning and afternoon hours, showed that the initial proposed intersection would not achieve a satisfactory LoS during both the construction and operational periods of the Project. As a consequence, a series of mitigation measures have been proposed for considered for the new intercity maintenance facility traffic at this intersection. These measures are provided in section 7.6.4 below.

This indicative proposed intersection layout incorporating some of the mitigation measures listed above is shown in Figure 7.16.



Note: Design and layout of the facility is indicative only and subject to detailed design

Figure 7.16 Proposed modified intersection layout

The implementation of the proposed intersection layout will improve the intersection performance compared to the concept design layout, and subsequently the intersection would operate at a satisfactory level of service (LoS D or better) for both the morning and afternoon peak hours (refer to Table 7.45).

Table 7.45 Performance of proposed intersection layout

Scenario	Control type	Peak period	Degree of Saturation (DoS)	Average vehicle delay (secs)	Level of Service (LoS)	Queue (m)
Future year with construction in 2017	Priority Control with seagull arrangement	AM 7.45–8.45	0.47	13	A	2
		PM 4.45–5.45	0.57	56	D	10
Future year with operation in 2019		AM 7.45–8.45	0.49	13	A	1
		PM 4.45–5.45	0.60	48	D	2

Consultation with the relevant road authority may be undertaken to convert this intersection to a signalised intersection or roundabout with the aim of improving operation, performance and safety. The implementation of traffic signals or a roundabout will provide improved intersection operation without limiting or restricting traffic movements. The implementation of traffic signals or a roundabout will provide good operation with good level of service A or B.

Rail services, pedestrians and cyclists

The Project would have no impacts to public transport services, pedestrians or cyclists during operation.

7.6.4 Management and mitigation measures

During design

The following mitigation measures would be considered for the new intersection of Enterprise Drive and the proposed access road to the new intercity maintenance facility as part of the detailed design:

- Removal of existing northbound right turn movements from Enterprise Drive into Old Chittaway Road, and conversion of this part of the roadway into a southbound short merge lane for right turners out of the new access road into Enterprise Drive.
- Providing a seagull arrangement (a type of three-way road intersection usually used on high traffic volume roads and dual carriageways) to improve right turn movement from the new access road into Enterprise Drive.
- Prohibiting right turn movements from Old Chittaway Road into Enterprise Drive.
- The use of a roundabout or signalised intersection at this location.

During construction

The following management and mitigation measures would be implemented during construction:

- A construction traffic management plan (CTMP) would be prepared as part of the pre-construction planning. The plan would be developed to address construction traffic and transport management and would also be used to develop site-specific traffic management measures once the construction methods and haulage routes are finalised.
- Heavy vehicles would be restricted to the routes specified.
- Disruption on the local road network would be minimised through the use of nominated haulage routes which aim to avoid sensitive areas such as schools, where possible (particularly the Central Coast Rudolf Steiner School and Follyfoot Farm Child Care Learning Centre).
- Signs would be provided at each access point to assist in deliveries to each work site.
- Traffic controllers would be located at each access point, where required and direct vehicle movements, vehicle deliveries, pedestrians and cyclists.
- Emergency response protocols would be included in the CTMP for construction traffic incidents. Police/emergency services would respond to emergencies.
- A pre and post construction assessment of road pavement assets would be conducted in areas likely to be used by construction traffic.
- The flooding on access roads would be identified and alternative access roads identified(as required).
- Installation of environmental controls at access roads so that mud or gravel is not tracked onto the road network from the access roads by construction vehicles (as required).
- Public communications would be conducted to inform the community and local residents of vehicle movements and anticipated effects on the local road network relating to the site works. These methods would be detailed in the CTMP.

- Access to all private properties adjacent to the works would be maintained during construction.
- During Project inductions, all heavy vehicle drivers would be provided with the emergency response plan for construction traffic incidents.
- Undertake road safety audits as part of the development of the detailed design (where required or deemed necessary).
- Co-ordination of Project staging, vehicle movement and scheduling, equipment and resourcing.

During operation

The following management and mitigation measures would be implemented during operation:

- Undertake a road safety audit following the commencement of operation of the new intersection to assess the intersection performance, and to validate the recommendations/requirements of the road safety audit prepared as part of the detailed design development.
- Limit vehicle trips to outside of the road network peak hour for improved safety and intersection operation, where possible or practicable.
- Schedule delivery and service vehicles to the site out of peak hour periods, where possible or practicable.
- Inform staff and visitors to the site of the preferred travel route and primary site access.
- Monitor intersection access and obtain feedback from staff on its operation.
- Monitor any parking overflow on the surrounding road network (if any).

7.7 Socio-economic

A *Socio-economic Impact Assessment* which assesses the potential socio-economic impacts associated with the construction and operation of the new intercity maintenance facility has been undertaken by WSP | Parsons Brinckerhoff (WSP | Parsons Brinckerhoff, 2016d). This assessment is attached as Appendix G of this REF. A summary of this assessment is provided in the following sections.

7.7.1 Existing environment

Study area

For the purposes of the *Socio-economic Impact Assessment*, the geographical and social statistical areas used for the assessment included the following geographic/statistical areas:

- Immediate/local
- Regional area.

Immediate/local area of impact

The immediate area of impact is typically considered to be any property or neighbouring property that is impacted by the development of the proposal. Impacts are considered to be direct if they relate to the acquisition, use of land or placement of site infrastructure on a property. Indirect impacts would be experienced adjacent near neighbours who notice flow on effects such as noise, air quality or visual impacts.

The site of the New Intercity Fleet Maintenance Facility lies within the semi-rural suburb of Kangy Angy within the Central Coast Shire LGA, with residential receivers on rural properties generally surrounding the site to the north, south and west, with industrial precincts to the south east and north-east (on the opposite side of the rail corridor to the site). The immediate area of impact lies principally within the suburb of Kangy Angy to the north and north-west and the suburb of Fountaindale to the south and south-east.

Regional area

As noted above, the Project is located within the Central Coast LGA. Due to the recent council amalgamation with Gosford LGA, for the purpose of the *Socio-economic Impact Assessment*, the regional area of for the assessment was initially was defined as the (former) Wyong Shire LGA. This area is located within the Central Coast of NSW, between 60 and 90 kilometers north of Sydney. Settlement within the region is generally based around the major service centres of Wyong and Tuggerah and numerous townships surrounding lakes of Tuggerah, Budgewoi, Munmorah and Macquarie.

Community profile

Based on existing Australian Bureau of Statistics data, the overall population of the suburb of Kangy Angy is relatively small with approximately 316 people. Additionally, the suburb is generally characterised by a somewhat older population, with a higher than average percentage of residents over 65 (18.3 per cent compared to the State average of 14.7).

By comparison, the main suburb adjacent to the Project site, Fountaindale, is characterised by a substantial proportion of the working population employed as professionals with all dwelling types comprising separate dwellings and the prevalent household type is family households mainly couple families with children.

Steady population growth of around 1.2 per cent/annum is expected for the (former) Wyong LGA region. Key challenges faced by the region include an unemployment rate higher than the state average, particularly youth unemployment as well as out-commuting from the area for work purposes. Social infrastructure within the Wyong region includes a range of education, health and other community facilities including:

- Seven schools within approximately five kilometres of the Project site
- A range of health services, generally located within the larger centres
- Emergency services facilities
- Carious arts, culture leisure and sporting facilities.

A more detailed breakdown of the community profile and socio-economic nature of the local area is provided in Chapter 5 of the *Socio-economic Impact Assessment* (WSP | Parsons Brinckerhoff, 2016d) attached as Appendix G.

7.7.2 Construction benefits and impacts

This section provides a summary of the potential direct and indirect socio-economic benefits and impacts that may arise during the construction of the Project. Further detail regarding the potential benefits and impacts is provided in Chapter 7 of the *Socio-economic Impact Assessment* (WSP | Parsons Brinckerhoff, 2016d).

Local amenity, character, environment

The proposal has the potential to impact on the local amenity and character of the local environment of Kangy Angy and Fountaindale through changes to visual amenity, air quality and noise impacts. Each of these values have been assessed separately as separate technical papers to the REF and are summarised in the following sections.

Visual amenity

Construction of the Project would have the potential to adversely affect the local amenity, character and environment of the immediate local area for the current residential populations, through vegetation clearing and site works and the construction of industrial elements within a predominantly rural environment. Further discussion regarding the potential visual impacts during construction are provided in section 7.3.3.

Air quality

The Project has the potential to adversely impact air quality through the generation of nuisance dust and visible dust plumes due to dust generating activities and exhaust emissions from diesel-powered equipment. These impacts would particularly impacts on sensitive receivers within the immediate vicinity of the Project. Any effects of construction on airborne particle concentrations would generally be temporary. Further discussion regarding the potential air quality impacts during construction are provided in section 7.13.2.

Noise and vibration

The majority of the construction works would be undertaken during the standard construction hours. However, exemptions and approval for works outside of the above standard construction hours would be required. The noise impact assessment predicts that during construction, noise level exceedances would be experienced at a number of surrounding sensitive receptors, with the two noisiest activities being associated with bulk earthworks and the laying of tracks, which would likely impact on the overall amenity for local residents and other sensitive receivers along Orchard, Ourimbah, Turpentine and Old Chittaway Roads, Schubolt Lane and Bridge Street.

The *Noise and Vibration Impact Assessment* (WSP | Parsons Brinckerhoff, 2016b) concluded that the Central Coast Ruldolf Steiner School would not be impacted be impacted by construction noise from the facility, however, Follyfoot Farm Childcare Learning Centre would be potentially impacted when construction activities occur close to the centre.

It is considered that there is a minimal risk of damage, as a result of vibration caused by construction of the Project. Further discussion regarding the potential noise and vibration impacts during construction are provided in section 7.2.4.

Access and traffic

The majority of the traffic accessing the site during construction would be directed to use the new access road as the primary access. The occasional light vehicle may need to use Turpentine Road and Orchard Road via the Enterprise Drive and Turpentine Road intersection (as a secondary access) however this would be limited to light vehicles. There is also likely to be some form of traffic crossing on Orchard Road and Turpentine Road between the main facility and the western end of the facility.

With the new access road and intersection from Enterprise Drive to facilitate the movement of large vehicles to the site, and the Pacific Motorway being a major transport network it is unlikely that the Project would create any adverse impacts to access and traffic routes during construction. Given the proximity of the site to the Follyfoot Farm Childcare Learning Centre and Central Coast Rudolf Steiner School to the site care would however need to be taken for the movement of large vehicles to the site particularly prior to the construction of the new access road and bridge. Further discussion regarding the potential traffic and access impacts during construction are provided in section 7.6.2.

Community services and infrastructure

It is expected that there would be limited changes to local services as a result of the construction of the Project. The majority of the workforce for the construction is expected to come from the region, providing a local benefit for these worked.

As described in section 4.4.5, some rail shut down periods would be required during construction of the Project. During these periods rail services and access to train services would be suspended and replacement buses would operate which may have some temporary impact on local and regional uses of the rail network during these times.

Health and wellbeing

The construction of the Project is likely to cause impacts to noise and vibration, air quality and visual amenity (as described previously). These impacts have the potential to cause some stress and anxiety to local residents, which in turn could potentially impact on their health and wellbeing.

In addition, it is likely that parents and caregivers from children attending the Follyfoot Farm Child Care Learning Centre in Fountaindale may be concerned about excessive noise, dust and emissions.

Business and employment

As described in section 4.4, construction of the Project would generate approximately 200 jobs, with up to 300 employees required during the peak construction phase. In addition to direct job generation, local businesses, particularly those catering to food and petrol and to a lesser extent accommodation could experience flow-on benefits from the increase in the number of workers coming into the locality on a daily basis.

Safety and security

The main risk to public safety during construction of the Project would be the use of heavy machinery (e.g. bull-dozers, excavators), however, heavy machinery and equipment would be contained within the construction work site and is not likely to impact or pose a risk to the public under normal circumstances. Overall, the construction of the Project is unlikely to have a negative impact on safety and security.

7.7.3 Operational impacts

This section provides a summary of the potential direct and indirect socio-economic benefits and impacts that may arise during the operation of the New Intercity Fleet Maintenance Facility. Further detail regarding the potential benefits and impacts is provided in Chapter 7 of the *Socio-economic Impact Assessment* (WSP | Parsons Brinckerhoff, 2016d).

Local amenity, character, environment

Visual amenity

Once the Project is operational, the visual impact is likely to be lessened as management measures to reduce visual impacts (i.e. screening vegetation) are implemented and become established. Landscaping and trees would provide a buffer and barrier to the proposal, minimising visual impacts to surrounding sensitive receivers.

As the proposed maintenance facility would involve a 24 hour, seven day a week operation, lighting would be required onsite. Light spill resulting from the proposal would potentially affect sensitive receivers located along Orchard and Ourimbah Roads.

Air quality

Operation of the Project is not anticipated to generate air quality impacts as upon completion of construction activities as dust generating sources should be removed. The facility would service electric passenger trains only. The operation of the Project is therefore not anticipated to have a substantial air quality amenity impact on local sensitive receivers.

Noise and vibration

Operational noise from the Project would include noise associated with the maintenance facility, and would affect local sensitive receivers at Orchard, Ourimbah, Turpentine and Old Chittaway Roads. Standing, arrival and departure of trains and the train wash facility are expected to generate the most noise and have the largest impact to sensitive receivers during operation of the Project. Exceedance of sleep disturbance criteria are also predicted to occur at some sensitive receivers located at Ourimbah Road and Old Chittaway Road, however, mitigation measures have been proposed to manage these impacts (refer to section 7.2.5 and section 7.2.6 of this REF).

Property value

The detailed design of the facility would assist in ensuring that the design of the facility is as sensitive as possible to the amenity of the surrounding landscape, particularly through the retention and enhancement of vegetative screening of the facility from surrounding residents would assist with minimising potential adverse impacts on property values.

Access and traffic

As described in section 7.6.3, all traffic movements into and out of the maintenance facility site are generally low and would be spread out over the 24-hour operational cycle of the facility. Access to the site would also occur via the new access road and bridge. As such, the potential increase in traffic is not expected to substantially impact on the local community. Additionally due to the proposed access road, operational vehicles would not direct pass sensitive receptors, resulting in minimal social or community impacts to local residents.

The provision of the new access road and flood free access from Ourimbah Road would also provide improved access for local residents during flooding emergencies.

Community services and infrastructure

As with construction, it is expected that there would be limited changes to local services as a result of the operation of the Project. As with construction workers, it is anticipated that a majority of the operational workforce would come from the wider region and therefore only limited numbers of people are expected to move into the area as a result of the Project. The number of workers who choose to relocate are not considered to be substantial and therefore not enough to alter the demand for services within the area.

Development of the Project would provide a high standard of maintenance facility to allow for the maintenance of a new fleet of intercity trains, for commuters within the wider regional area. This would provide a direct benefit from the Project.

Health and wellbeing

The operation of the Project is likely to cause some localised amenity impacts, in particular impacts such as noise and vibration and light spill impacts during night time periods. These impacts may have the potential to cause stress and anxiety to local residents who are opposed to the development, which in turn could potentially impact on their health and wellbeing. The potential for these impacts to occur however is considered to be low.

Business and employment

Operation of the proposal would generation a maximum of 200 new jobs. This would include approximately 50 to 60 people being on duty at any one time during the operational phase.

Safety and security

It is unlikely that public safety would be adversely affected by the Project. However, if unauthorised persons enter the site, the risk would be considered to be high due to the possible conflict with trains or contact with overhead wires. However, the risk of this is unlikely to be any greater than that which already exists with the presence of the existing Main North railway.

7.7.4 Management and mitigation measures

In addition to the mitigation measures identified throughout this REF for specific environmental issues, the following addition measures are proposed:

- Local amenity, character, environment:
  - undertake consultation with sensitive receivers and adjacent residents about their concerns and suggestions for reducing the proposals impact, such as type of fencing, screening vegetation etc.
  - ensure that consideration is given to lighting impacts from the proposal and that where possible lighting spill is directed away from surrounding residents
  - develop and maintain a mechanism for recording and responding to complaints from the community with respect to air quality impacts on sensitive receptors
  - consult with and inform all sensitive receptors regarding the timing of construction activities and provide advanced notice for activities which may be particularly dusty, noisy activities or which would involve night works
  - develop and maintain a complaints register to monitor noise and vibration impacts on sensitive receivers.
- Access and traffic:
  - disruption on the local road network would be minimised by using nominated haulage routes, which aim to avoid sensitive areas such as schools, where possible (particularly the Central Coast Rudolf Steiner School and Follyfoot Farm Child Care Learning Centre).
- Community services and infrastructure:
  - rail customers would be notified in advance of any rail possession periods where works are proposed to be undertaken as part of the Project.
- Business and employment:
  - where practicable, Transport for NSW would ensure that employment opportunities for the local and regional population are maximised
  - where practicable, Transport for NSW would look to target sectors where unemployment is greatest, and maximise opportunities (through training opportunities) for youths and indigenous members of the community.
- Safety and security
  - best practices and processes would be adopted for safety and security in compliance with a Workplace Health and Safety Management Plan
  - all construction areas would be fenced off to restrict access to public
  - the facility would be designed to clearly delineate public areas from restricted areas
  - clear sightlines would be provided throughout the maintenance facility, where possible
  - a lighting design which conforms to Australian and Sydney Trains standards and provides well-lit and uniform lighting to maintenance facility would be provided
  - vegetation in and around the site would be maintained to a low height to improve surveillance opportunities

- where required, vandal resistant fittings and graffiti resistant surfaces would be considered as part of the detailed design
- high security perimeter fencing and signage would be provided to deter unauthorised access to the maintenance facility, including suitable vehicle and pedestrian gates at appropriate locations around the perimeter of the site
- high security locking devices, window treatments and electronic access control would be considered as part of the detailed design
- intruder alarm system(s) and closed-circuit television (CCTV) to monitor nominated restricted areas would be considered during detailed design
- external lighting would be provided to vehicular and pedestrian movement areas, including roads, paths and car parks, in order to provide visibility and safety at night
- potential noise barriers would be included within the perimeter fencing to reduce potential for graffiti.

7.8 Land use and property

7.8.1 Policy setting

This section provides an overview of the legislative and policy framework relevant to the land use and property within the Project site that has the potential to impact the Project, including State and local government land use policies and strategies. The relevant land use and property strategies that have previously been discussed in Chapter 5 of this REF include:

- NSW State Plan
- NSW Long Term Transport Master Plan and Sydney's Rail Future
- NSW State Infrastructure Strategy.

Additional land use and property strategic documents that are relevant to the proposal are outlined below.

Wyong Settlement Strategy

The *Wyong Settlement Strategy* (Wyong City Council, undated) was prepared by the (former) Wyong City Council to identify how the shire's growing population and demographic changes can be accommodated up to 2031, as well as identifying ways to support business growth and employment within the Shire. Key focus areas and considerations for the Settlement Strategy include:

- A population growth to about 70,000 people in the next 18 years, needing 39,500 new homes and 27,000 new jobs
- Plan for and managing future urban growth strategically so that current and future residents are able to lead a liveable lifestyle
- Balancing new urban release areas with urban consolidation
- Considers existing land uses and infrastructure, environmental values, social and economic aspects and natural hazards like flooding and bushfires.

A small area to the north of the Project site (to the north of the M1 Pacific Highway) is identified as an area of potential rural residential development as part of the Settlement Strategy. The Kangy Angy site is however not identified as part of the identified sites for future development under the settlement strategy, either as potential metropolitan development sites or as potential in-fill development precincts.

Policy for Sustainable Agriculture in NSW

The *Policy for Sustainable Agriculture in NSW* (Industry and Investment NSW – Primary Industries, 1998) sets a broad strategic framework for the management and use of agricultural land in NSW. The policy forms part of the process of incorporating principles and objectives of ecologically sustainable development into the ethos of agricultural industries. The policy also aims to facilitate a change in agricultural production towards ecologically and economically sustainable practices and farming systems.

The Project would minimise impacts on any existing agricultural land by generally avoiding any land which is currently utilised for agricultural purposes and, where possible, locating infrastructure within the existing rail corridor. This would limit the potential severance of existing agricultural land and also assist in sustaining any existing agriculture within and adjoining the Project site.

7.8.2 Existing environment

Land use

The existing land use on the Project site is generally vacant, and rural-residential land which contains a mixture of vegetation including generally forested areas, lower-lying scrub and some areas of regrowth forest (refer to section 7.1 for details). One existing residential dwelling is located within the Project site boundary (53 Orchard Road) which is proposed to be acquired as part of the Project (refer to section 4.3 of this REF).

The remaining land uses within the Project site boundary consist of various transport land uses including:

- The Main North railway
- Existing roadways including Enterprise Drive, Turpentine Road, Schubolt Lane, Ourimbah Road, Orchard Road and Old Chittaway Road.

The land uses outside of the Project site boundary consist of typically of small, recreational farming, disused agricultural land and rural residential properties. An industrial area is also located the north and east of Enterprise Drive which includes a number of larger industrial including the Sanitarium Health Food Company, Masterfoods, and a series of other, smaller warehouses. A childcare centre, Follyfoot Farm, is located to the east of the Project site between Enterprise Drive and Old Chittaway Road approximately 200 metres to the north of the intersection of Enterprise Drive with Turpentine Road. The Central Coast Rudolf Steiner School is also located to the south of the industrial part along Catamaran Road, approximately 400 metres from the Project site.

Photographs of the typical land uses within and surrounding the Project site have previously been shown in section 7.3.1 of this REF.

Future land uses

The provision of future residential land in the vicinity of the Project site is restricted by the availability of critical infrastructure such as water and wastewater treatment, the topography and the proposed zoning whose intention is to maintain the existing environmental qualities of the area. In addition, as discussed in section 7.8.1 above, no future land rezoning or substantial development proposals have been identified within close proximity to the Project site.

Planning controls

The land use and development within the area is controlled through the zoning provisions of the Wyong Local Environmental Plan (LEP). Under this LEP, a majority of the Project site is zoned as E2 Environmental Conservation and E3 Environmental Management (refer to Figure 5.3). The remainder of the Project site, consisting of the existing rail corridor for the Main North railway, is zoned SP2 Infrastructure.

Surrounding the Project site, the land is generally zoned as E2 and E3 to the north of Enterprise Drive in addition to a mix of E4 Environmental Living and E3 zones to the south. There is also an IN1 General Industrial zone in Berkeley Vale, to the east of the Enterprise Drive. The Pacific Highway, Pacific Motorway to the north of the site and Enterprise Drive running along the south of the site are zoned as SP2 Infrastructure.

7.8.3 Construction impacts

Temporary land take

In addition to the permanent property acquisition required for the Project (refer to section 7.8.4), the Project would require the temporary leasing of some additional land for construction activities, such as construction compounds, temporary access and drainage control works, where these are located outside of the permanent footprint of the New Intercity Fleet Maintenance Facility. As described in section 4.3, the following properties would require temporary land take during construction

- Lot 82, DP 737040 to accommodate temporary works during construction.
- Some portions of the Main North railway and Old Chittaway Road reserve to accommodate construction compounds for proposed early works.

Temporary land that is required for the construction period (i.e. the stockpile site) would be leased from the owners for the duration of the construction period. This land would then be returned to the owner after being rehabilitated to its original state or a state agreed upon through consultation with the landowner.

The main land uses that would be impacted by the temporary land take during construction would be rural residential land (for Lot 82) and existing rail and road transport corridors.

Buildings and structures

As described in section 4.3, one residential property would be impacted by the Project (53 Orchard Road). This would include the need to demolish and remove one residential building (and any associated shed structures on the site) during the construction phase of the Project. The Project may also have the potential to impact on some unknown structures (such as unidentified culverts within the rail corridor) that may be identified during detailed design or found during construction.

Indirect impacts

Construction of the Project would result in indirect impacts to surrounding land uses particularly residential dwellings that are located in close proximity to the Project site. Such impacts would include noise, visual, traffic and transport and air quality; assessment of these impacts is discussed in sections 7.2, 7.3, 7.6 and 7.13 of this REF respectively.

7.8.4 Operational impacts

Property acquisition

As described in section 4.3, property acquisition of a number of existing properties would be required for the Project. There are 12 properties (i.e. individual lots), including that would be required to be either wholly or partially acquired. The majority of properties (seven lots) comprise land currently owned by Central Coast Council and consist of vacant, vegetated land. Only one existing residential property (53 Orchard Road) would be required to be wholly acquired.

The potential land acquisition required for the Project (including temporary leasing of land) has been discussed previously in Table 4.1 and shown on Figure 4.7. There would be no acquisition or leasing of national park land or Crown Land as part of the Project.

Property access

The development of the Project site for the New Intercity Fleet Maintenance Facility would not restrict any existing property access for adjacent properties during operation. Through the creation of the new access road, the Project would also provide an alternative emergency access road for local residents during times of emergency (such as flooding) when existing access points may be restricted (such as Turpentine Road).

Future land use impacts

The Project is not expected to result in any direct impacts on the viability of land identified for future urban development within the wider Central Coast LGA. The cumulative land use impact of the Project is not expected to have a substantial effect on any future strategic land use planning for Central Coast Council.

It is not anticipated that any properties within the immediate vicinity of the Project site would be affected to an extent that it would limit their future potential for subsequent development.

Indirect impacts

During the operation of the Project, indirect impacts to surrounding land uses are expected. These impacts would include noise, visual and air quality impacts; assessment of these impacts is located in sections 7.2, 7.3 and 7.13 respectively.

7.8.5 Management and mitigation measures

The following management and mitigation measures would be implemented to minimise impacts on land use and other property impacts associated with the construction and operation of the Project:

- Opportunities to further minimise impacts to properties (i.e. reduction to the Project footprint) would be undertaken during detailed design
- Consultation and communication would be undertaken with property owners near the Project about any changes to property access and local access during construction and operation
- Ongoing consultation and communication with directly affected property owners about potential property acquisition would be undertaken prior to commencement of construction. This would include the provision of information on the timing of acquisition and the process for property acquisition
- Property acquisition would be managed in accordance with the *Land Acquisition (Just Terms Compensation) Act 1991*
- On completion of construction activities, land used for the temporary construction site, stockpiles and drainage sumps/basins would be revegetated and left in a stable condition. Where these properties have been leased by Transport for NSW, these properties would be returned to the original landowners following rehabilitation of the site(s).

7.9 Hydrology, drainage and flooding

A desktop *Flooding, Drainage and Water Quality Technical Assessment* has been prepared by WSP | Parsons Brinckerhoff (WSP | Parsons Brinckerhoff, 2016e) to assess the potential surface water and flooding impacts associated with the construction and operation of the New Intercity Fleet Maintenance Facility. This assessment is attached as Appendix H of this REF. A summary of this assessment is provided in the following sections.

7.9.1 Existing environment

Regional hydrological environment

The Project site is bounded by Ourimbah Creek and its flood plains to the north and east, Bangalow Creek in the west and the Main North railway in the south. The proposal also crosses over Chittaway Creek towards the southern end of the site and a tributary of Ourimbah Creek towards the south of Ourimbah Road. The topography typically falls south to north from the Main Northern Rail line into the Ourimbah Creek catchment which is part of the larger Tuggerah Lake catchment.

Flows from Ourimbah Creek originate from Kulnura and flow through the State forest and rural bushland before passing beneath the Sydney to Newcastle M1 Pacific Motorway and Pacific Highway near Palmdale. It continues to flow in a northern and then easterly direction before passing beneath the Main North railway and Wyong Road and eventually discharging into Tuggerah Lake at Chittaway Point (Catchment Simulation Solutions, 2013).

The Ourimbah Creek catchment also incorporates a number of substantial tributaries including Bangalow Creek, Cut Rock Creek, Chittaway Creek, Dog Trap Gully, Canada Drop Down Creek and Kangy Angy Creek. Typically the upper reaches of these catchments are covered by natural bushland, while the lower reaches comprise of low density urbanised areas.

The existing railway tracks adjacent to the Project cross over a number of existing drainage systems, most critically the Turpentine Road railway underpass at Chittaway Creek which derives its headwaters from rural bush land along Brush Road and drains through Fountaindale. It then flows in a northerly direction beneath Old Chittaway Drive and then west beneath Enterprise Drive and the Main Northern Railway line before entering Bangalow Creek which then drains to its confluence with Ourimbah Creek.

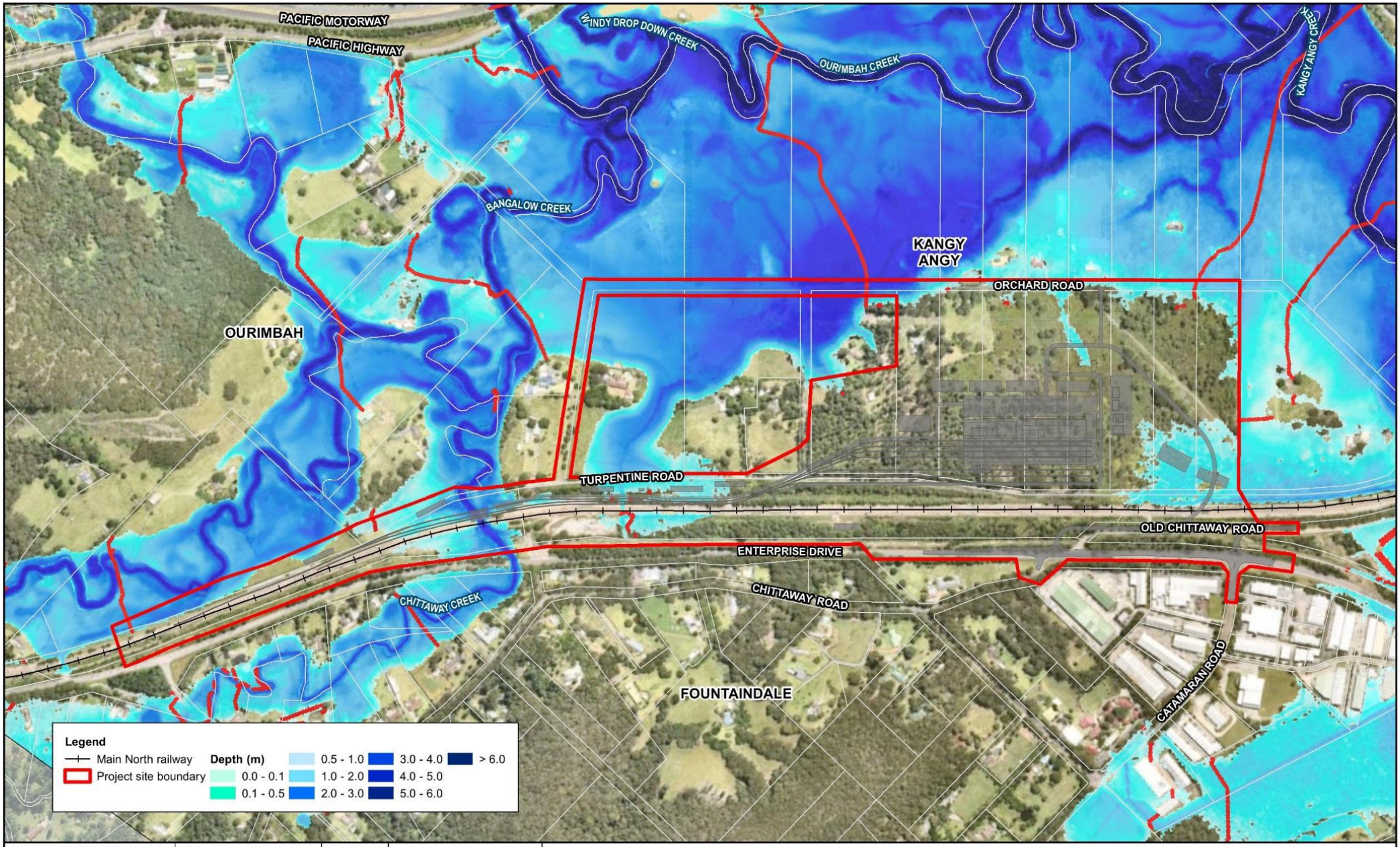
Flooding

A number of flood studies have been carried out for Ourimbah Creek for both the former Wyong and Gosford City Councils, including the *Lower Ourimbah Creek Floodplain Risk Management Study Review and Plan* (Paterson Consultants, 2011) and more recently the *Ourimbah Creek Catchment Flood Study* (Catchment Paterson Consultants, 2011, *Lower Ourimbah Creek Floodplain Risk Management Study Review and Plan*. Prepared for Wyong City Council, July 2011.

According to the Ourimbah Creek Catchment Flood Study report, Chittaway Creek floods frequently at the Turpentine Road railway underpass and cuts access for local residence in minor storms events (less than the 20 per cent annual exceedence probability (AEP) event). Figure 7.17 depicts the flood extent for the Project site and surrounding area based on the 1:100 AEP event level, with an allowance of 10 per cent made for potential future climate change impacts. The flooding levels have been developed based on the regional model for Ourimbah Creek. The 1:100 AEP storm and climate change flood level was used as the basis for assessing the potential flooding impacts for the proposed New Intercity Fleet Maintenance Facility Project.

Local drainage

There are a number of existing drainage culverts under the Main North railway which may be impacted by the Project. The currently known cross drainage structures include both major and minor culverts. Details of the known drainage structures within the vicinity of the Project site are provided in Section 2.2 of the *Flooding, Drainage and Water Quality Technical Assessment* (WSP | Parsons Brinckerhoff, 2016e) attached as Appendix H.



Map: 2202522A_GIS_F022_A2	Author: goganovskiM
Date: 30/05/2016	Approved by: -

Data source: - © Land and Property Information 2015

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Coordinate system: GDA 1994 MGA Zone 56

Scale ratio correct when printed at A4

Note: Design is indicative only.
Subject to detailed design

New Intercity Fleet Maintenance Facility Project
Figure 7.17
1:100 year flood level with 10% rainfall increase

Existing water quality

Wyong City Council *State of Environment Report* (2003–2004) found that Ourimbah Creek and Wyong River total nitrogen and ammonia levels regularly exceed Australian and New Zealand Environment and Conservation Council (ANZECC) guidelines. This may reflect the influence of farming fertilisers and animal waste. (Wyong Council, 2004).

Tuggerah Lakes drains a large catchment (approximately 670 square kilometres) and is prone to the build-up of nutrients and sediment as result of vegetation clearing and agricultural practices. Tuggerah Lake also collects bacteria such as enterococci and faecal coliforms as a result of sewage and stormwater runoff. Tuggerah Lakes is estuarine and the balance of salt and fresh water is important for marine and bird life.

According to the Wyong Council Tuggerah Lake Estuary report 2014, 2013 and 2012, the estuary health grading is only fair (C) suggesting that the water quality has not been improved notably since 2004 study.

7.9.2 Construction impacts

During construction, potential impacts would likely be focused on erosion and sedimentation as a result of land disturbance, which, if uncontrolled, could potentially result in the following impacts:

- Fluctuations in the stream flow characteristics
- Increased sediment load and organic matter as a result of construction site runoff, resulting in adverse impacts to benthic fauna (species that live on the bottom of water bodies)
- Reduction in photosynthetic productivity of water bodies from increasing turbidity
- Reduction in channel habitat from sediment deposition
- Scour of stream banks due to high discharge velocities and increased flows
- Gross pollutants entering receiving creeks
- Declining water quality from the influx of man-made substances (refer below for details)
- Contamination of surface water due to contaminated soils entering the surrounding drainage network.

The Project would also reduce the permeability of the site due to the compaction of soil as a result of earthworks and remediation works on site; however the site would remain permeable (such as between the tracks into and out of the maintenance facility. This would result in a minor increase in overland flows.

This increase is not considered to substantially impact upon the drainage of the site because drainage works would be undertaken early in the Project construction phase meaning that overland flows would begin to be collected by the system during the construction activities proposed after earthworks are complete. Impacts of overland flows would also be minimised as diversion drains would be put in place to direct any upstream runoff around the site.

Local drainage and stormwater impacts

Temporary diversions of local overland flows paths during construction would not have any considerable impact on the local stormwater system but would be required to be maintained during the construction period.

Water quality impacts

Stormwater runoff from construction works would generally flow towards Chittaway Creek and into Ourimbah Creek. The Project has the potential to adversely impact water quality within the Ourimbah Creek catchment and floodplain, and Tuggerah Lake during construction and operation if activities are not appropriately managed.

The construction activities with the highest potential water quality impacts are:

- General earthworks, including stripping of topsoil, excavation or placement of fill
- Construction of drainage infrastructure
- Works in low lying areas or wet weather
- Leaks or spills from chemicals or fuels used.

The impacts from these activities could include:

- Sedimentation within the local waterways
- Increased levels of nutrient, metals and other pollutants transported downstream
- Chemical, oil and grease and petroleum hydrocarbons in waterways from spills.

7.9.3 Operational impacts

Regional flood impacts

The New Intercity Fleet Maintenance Facility would be required to provide flood immunity from the 1:100 AEP event level, with the identified allowance of 10 per cent for climate change.

As shown on Figure 7.17, the current design for the proposed New Intercity Fleet Maintenance Facility is broadly unaffected by the flood waters during the 1:100 AEP event level (inclusive of climate change predictions) extreme flooding event. However, some localised elements of the proposed maintenance facility may be affected by low levels of the 1:100 AEP event level in particular the proposed access driveway between the fleet maintenance facility and Orchard Road. In addition, a culvert crossing at an unnamed intermittent watercourse approximately half way along the rail corridor would also be inundated by the back waters of the Ourimbah Creek during the 1:20 AEP. Widening the rail embankment in these areas would reduce the available flood plain storage and would potentially impact the existing flood plain and local drainage processes. The impacts would likely be minor, however would be further investigated during detailed design.

In addition to locating the maintenance facility outside of the identified 1:100 AEP flood event levels, the following design elements have also been incorporated into the New Intercity Fleet Maintenance Facility in order to minimise the impacts of flooding on the Project site and neighbouring sites:

- The access road would be designed so as to be immune from the 1:100 AEP flows
- Detention basins have also been proposed as part of the maintenance facility, designed to attenuate the 1:100 AEP flows
- The track connection from the Main North railway to the Project site would be at the same elevation as the existing so that the 1:100 AEP flood immunity is preserved. The new bridge structures at this location over Turpentine Road would be designed to have no impact on existing flood levels.

Local drainage and stormwater impacts

Once the maintenance facility has been constructed, there would be minimal impacts to local drainage since existing culverts and existing bridges would be retained (or if required, extended). The proposed bridge piers and abutments would be built directly in line with existing structures to minimise effects on water flow during a flood event. Scour protection at culvert outlets would also be designed based on current best practice guidelines using soft engineering solutions. These changes would potentially induce additional energy loss to the drainage system but this is not expected to be substantial.

The Project would result in an increase in impervious surfaces, leading to more runoff from the maintenance facility site, however stormwater runoff would be managed through the new drainage network and a combination of catch drains, cess drains and other subsurface drains.

With respect to predicted climate change, the predicted change in rainfall intensity may increase the peak flows in the local drainage and track drainage systems, leading to an increased peak flow discharging into the downstream detention basin and subsequent waterways. The detailed design capacity of the track drainage and stormwater drainage networks would consider increased flows due to climate change.

Water quality impacts

As with the construction impacts, stormwater runoff from operation of the maintenance facility would generally flow towards Chittaway Creek and into Ourimbah Creek. Operation impacts which may impact on water quality would include:

- Contaminants such as suspended solids, nutrients, oil and grease, hydrocarbons and litter from operational activities being transported off-site to local waterways
- Increased concentration in runoff resulting in increased erosion to creek banks.

7.9.4 Management and mitigation measures

The following management and mitigation measures would be implemented to minimise impacts on flooding, drainage and water quality impacts associated with the construction and operation of the Project.

During detailed design

- Flooding:
  - A detailed Flood Impact Assessment of the site would be undertaken to provide more certainty regarding the impact the Project on the regional flood and local drainage processes, and identify any required addition management and mitigation measures to minimise any potential flooding impacts.
- Stormwater and drainage:
  - A Hydrologic and Hydraulic assessment would be undertaken to confirm that additional structures with the same cross-sectional area as existing would not affect the existing drainage, and identify any required addition management and mitigation measures to minimise any potential stormwater and drainage impacts.

During construction

- Flooding:
  - Site offices, staff facilities and construction compound would be located at least above the 1:100 AEP flood level, including an allowance for climate change. This may require these temporary structures to be installed on fill pads or piers
  - Any temporary flood diversion works would be sized for a 1:20 AEP event to allow for the proposed construction program
  - A flood evacuation plan would be developed prior to any work commencing on-site as part of the construction documentation
  - No stockpiles would be located within high/medium flood risk areas or adjacent to existing culverts in order to reduce the potential impacts to surface water systems
  - The proposed pier locations for the new rail bridge crossings would be situated so as to minimise the Projects impact on surface water flows and flooding.

- Stormwater and drainage
  - All track drainage would be designed to meet Transport for NSW standards and Engineers Australia's Australian Rainfall and Runoff
  - The existing track drainage system would remain operational throughout the construction of the main line siding and turnouts within the facility.
- Water quality:
  - Water quality impacts would generally be managed in accordance with an Erosion and Sediment Control Plan (ESCP) for the Project (refer to section 7.11.5).

During operation

- Flooding:
  - Where possible, all Project components would be design to be above the 1:100 AEP flood event (including climate change assumptions)
  - Culvert openings across the floodplain would be sized to minimise the impact on the existing floodplain and local drainage processes.
- Stormwater and drainage:
  - All culvert extensions would be designed to match the existing culvert openings to minimise impacts to the capacity of existing drainage infrastructure.
- Water quality:
  - Scour protection would be provided at both ends of culvert extensions to reduce erosion and water quality impacts
  - The proposed detention ponds would be designed so as to reduce sediment loads and pollutants entering streams. These detention ponds would be installed as early as possible during the construction phase of the Project
  - Stormwater from heavily polluted areas such as workshop facilities should be treated with oil interceptors or other treatment measures to ensure that the quality of discharged waters is in accordance with the requirements of the POEO Act.

7.10 Groundwater

A desktop *Groundwater Assessment* has been prepared by WSP | Parsons Brinckerhoff (WSP | Parsons Brinckerhoff, 2016f) to assess the potential groundwater impacts associated with the construction and operation of the New Intercity Fleet Maintenance Facility. This assessment is attached as Appendix I of this REF. A summary of this assessment is provided in the following sections.

7.10.1 Existing environment

Aquifers

The Project site is located inland and upstream of a coastal lake (Tuggerah Lake) in an in-filled river valley. The Gosford 1:100 000 scale geological sheet shows that the ancient valley is filled with Quaternary alluvium and that the underlying bedrock is the Terrigal Formation. There are two aquifers associated with the Quaternary alluvium and the underlying Terrigal Formation and include:

- *Quaternary alluvium* – the alluvial aquifer is unconfined and has a shallow water table. The local groundwater flow is expected to follow the general topography and there is expected to be a level of connectivity between the groundwater and surface water. Recharge to the aquifer is through direct rainfall infiltration and stream discharge.
- *Terrigal Formation* – groundwater flow in the Terrigal Formation is through pores and structural features such as bedding plane partings. The Terrigal Formation was typically considered to have low yields and variable water quality. The groundwater level of the Terrigal Formation was determined to be between approximately 1.1 metres and 6.2 metres below ground level.

The *NSW Office of Environment and Heritage acid sulphate soil risk map* (Wyong Sheet, 2nd edition) also indicates that there is one area within the Project site boundary that has a low probability of acid sulphate soil occurrence in profiles greater than 3 metres depth from ground surface; near the corner of Ourimbah Road and Orchard Road (refer to Figure 7.18).

Registered groundwater bores

A search of the NSW Department of Primary Industries | Water registered groundwater bore database did not identify any registered groundwater bores within the Project site, however the search did identify 23 registered bores within a one kilometre radius of the Project site. The majority of the bores are used for stock or domestic purposes. The yields from these bores are low to moderate, at between approximately 0.3 to 2.5 litres per second (L/s). The location of the registered bores is shown in Figure 7.18.

Further details of the bores are provided in the *Groundwater Assessment* attached as Appendix I of this REF.

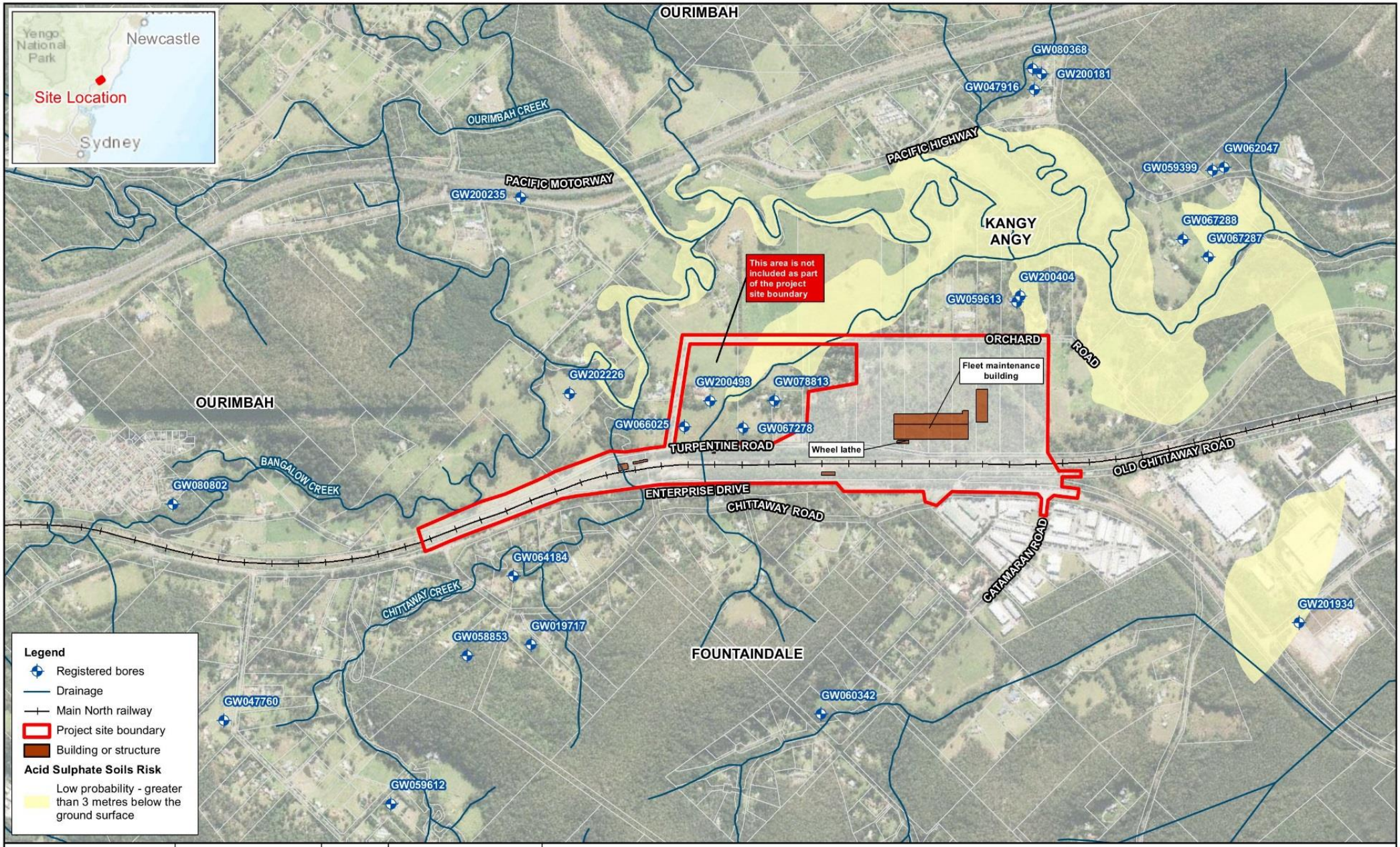
Groundwater levels and water quality

Groundwater levels were recorded during testing of a series of boreholes and test pits as part of the concept design of the New Intercity Fleet Maintenance Facility (Coffey 2016a). These investigations noted that the water table across the sites is generally shallow, with ground water levels ranging from the existing surface level to approximately 4.7 metres below ground level within the Project site (and up to 5.2 metres to the south near Bridge Street). Deeper groundwater levels would also be expected in drier conditions. Groundwater quality information available from registered boreholes shows that the groundwater is relatively fresh in the alluvial aquifer and Terrigal Formation.

Groundwater dependant ecosystems

A review of the Bureau of Meteorology *Atlas of GDE's* did not identify any GDE's within a three kilometre radius of the Project site. However, as discussed in section 7.1, two plant communities within the Project site were determined as being groundwater dependent within the Project site, consisting of the following:

- Melaleuca biconvexa – Swamp Mahogany – Cabbage Palm Forest
- Jackwood – Lilly Pilly – Sassafras Rainforest.



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Data source: - © Land and Property Information 2015

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Coordinate system: GDA 1994 MGA Zone 56

Scale ratio correct when printed at A4

Note: Design is indicative only.
Subject to detailed design

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New Intercity Fleet Maintenance Facility Project
Figure 7.18
Site location, registered bores and acid sulphate soils

7.10.2 Construction impacts

Impact to groundwater

Excavation on site is proposed and includes the following areas:

- Across the main portion of the site
- The main fleet maintenance building
- The wheel lathe (and associated pit).

Based on the current Project design, the maximum excavation depths for these Project elements are expected to be approximately 1.5 metres below ground level for the main site, approximately 2.0 metres below ground level for the main fleet maintenance building and up to approximately 4.0 metres below ground level for the wheel lathe/pit. Given the identified shallow groundwater table across the site, ranging from at surface to approximately 4.7 metres below ground level within the Project site, the interception of groundwater is expected to occur as part of the Project, particularly where groundwater occurs within a couple of meters from the existing surface and where areas of deeper excavation, such as the main buildings and wheel lathe, are proposed.

Areas where intersection with groundwater are expected during construction include:

- Near Chittaway Creek crossing and Main North railway
- The eastern end of the location for the main fleet maintenance building (inflows at this location would be expected to be relatively high while the excavation is open)
- The location of the wheel lathe (inflows at this location would be expected to be relatively low while the excavation is open).

The groundwater inflow rate into excavations would be dependent on the permeability of the intersected geology and the groundwater level, as indicated in section 7.10.1. The inflow would also depend on the size of excavation, duration the excavation would remain open and control measures used. Given the varied nature of the alluvial material (sand, sandy clay, silt and clay) of the shallow aquifer, discharge volumes would also vary across the site. Areas with deeper sand profiles may experience higher inflow rates due to the higher permeability of the material. Excavation inflow rates would be considerably reduced in areas where there is a higher proportion of clay in the alluvial profile.

The calculation or modelling of groundwater inflow rates and dewatering volumes would be undertaken during the detailed design phase. An assessment of potential impacts associated with dewatering would also be undertaken, including localised drawdown of the water table. The requirement for the obtaining of water licences would also be sought at this time, with Department of Primary Industries | NSW Office of Water consulted with to ensure any required licences are obtained prior to construction activities commencing.

Disposal of groundwater encountered during construction

Disposal of groundwater ingress is expected to be required during construction and would need to be managed and disposed of adequately to minimise potential environmental impacts. All groundwater encountered during construction would be managed in accordance with the waste classification guidelines (NSW EPA, 2014) and the water discharge and reuse guideline (Transport for NSW, 2015).

Impact to registered bores

As identified above, 23 groundwater bores were identified within an approximately one kilometre radius of the Project site. A breakdown of the different types of bores and the potential impacts, are provided below:

- Minimal impact due to dewatering of the alluvium is expected to be experienced in seven of the bores that are located in the underlying hard rock (coal, sandstone and shale).
- There are a number of bores that have no screened geology information, however due to the depth of the bores, it is reasonable to assume that there are located in the Terrigal Formation, and as such, minimal impact to these bores would be expected.
- Due to the low permeability of clay, the three bores identified as being located within this material are unlikely to be substantially impacted by short-term dewatering from excavation.
- Two bores located to the south of Ourimbah Road (GW078813 and GW067278 – refer to Figure 7.18) are located in sand and would be within relatively close proximity to the main building site, where dewatering would be expected to occur. However, given the identified groundwater levels at these bores are between approximately three and six metres below ground level, and the anticipated excavations would be up to approximately two metres, impacts to these bores is unlikely.

Overall, the potential impacts to registered groundwater bores during the construction phase of the Project are considered to be negligible. Further consideration and assessment of the potential impacts to registered bores would be undertaken during detailed design, following the calculation or modelling of groundwater inflow rates, dewatering volumes and drawdown.

Contamination of groundwater

Accidental spills and leakage of fuel, lubricants and oils from vehicles, equipment and the storage of liquids have the potential to contaminate groundwater. The potential for groundwater contamination can be managed through the use of appropriate control and emergency measures. Given there is only a small area of low probability acid sulphate soils (refer to Figure 7.18) at greater than three metres below ground level, potential water quality impacts are not anticipated.

Impacts to groundwater dependent ecosystems

The Project is likely to have impacts on two GDE's identified within the study area; *Melaleuca biconvexa* – Swamp Mahogany – Cabbage Palm Forest and Jackwood – Lilly Pilly – Sassafras Riparian Warm Temperate Rainforest.

Within the study area the Project would require the removal of vegetation from these GDE's and modifications to the existing hydrology within the study area. Changes in hydrology may include alteration of natural flow regimes as a result of installing culverts and water crossings. Additionally excavation and earthworks associated with vegetation clearing and levelling of the land for the Project may impact on the groundwater present which could lead to modifications of the existing natural ecological function of these GDE's.

Further information regarding the potential impacts to GDE's is provided in section 7.1 of this REF.

7.10.3 Operational impacts

It is understood that there would be no new or residual excavations that would require dewatering through pumping during the operational phase. Therefore, there is considered to be a negligible potential for impact to groundwater during operational activity.

Accidental spills and leakages has the potential to contaminate groundwater. This risk would be reduced through hazardous material procedures, including spill mitigation measures (refer to section 6).

7.10.4 Management and mitigation measures

Design

Measures to be implemented during the detailed design phase are as follows:

- Additional investigation and assessment of dewatering requirements associated with the excavation works.
- Quantification of groundwater inflows to excavations and determination of extent of drawdown.
- Preparation of a dewatering management plan, which would include information on the groundwater levels, excavation dimensions, quantification of amount of dewatering required and method of disposal of dewatered groundwater.
- Undertake consultation with Department of Primary Industries | NSW Office of Water regarding their requirements, including licensing. In accordance with the NSW Aquifer Interference Policy, all groundwater take during construction (and operation) would need to be accounted for, with measures to mitigate and avoid/minimise the take of water.

Construction

Potential groundwater impacts associated with construction would be managed through the implementation of the following measures:

- Preparation of a construction groundwater management plan, which would detail the control measures that aim to reduce potential impacts to groundwater. A groundwater monitoring program would be included in the plan, and outline the monitoring network and baseline requirements (number of piezometers, groundwater levels, and analytical suite) prior to the commencement of construction, enabling any changes to groundwater levels and quality during construction to be identified.
- Implementation of excavation techniques and other mitigation measures to minimise impacts to groundwater and reduce the take of water. Factors for consideration include the duration the excavation would remain open, particularly in areas of expected higher inflows; the size of the excavation; the water table depth; and the material to be excavated.
- Management and disposal of any encountered groundwater in accordance with the waste classification guidelines (NSW EPA, 2014) and the water discharge and reuse guideline (Transport for NSW, 2015).
- Preparation and implementation of hazardous material procedures, including procedures for managing spills and refuelling.

Operation

Similarly for during the construction of the Project, during operation, hazardous material procedures, including procedures for managing spills and refuelling, would be developed and implemented to minimise groundwater contamination from chemical spills and leaks.

7.11 Soils, geology and contamination

7.11.1 Methodology

The assessment of the existing environment is based on the information sourced from the following reports:

- *New Intercity Fleet Maintenance Facility Contamination Assessment: Preliminary Site Investigation Report*. Prepared for Transport for New South Wales, 19 January 2016 (Coffey 2016a).
- *New Intercity Fleet Maintenance Facility, Additional Contamination Investigation Report*, Prepared for Transport for New South Wales 22 January 2016 (Coffey 2016b).
- *New Intercity Fleet Maintenance Facility Draft Geotechnical Interpretation Report*. Prepared for Transport for New South Wales, 25 February 2016 (Coffey 2016c).

7.11.2 Existing environment

Geology

The site is located inland and upstream of a coastal lake (Tuggerah Lake) in an in-filled river valley. The Gosford 1:100 000 scale geological sheet shows that the ancient valley is filled with Quaternary alluvium and that the underlying bedrock is the Terrigal Formation (Figure 7.19). The Quaternary alluvium is described as sands, silts and clays, which is consistent with both geotechnical and contamination investigations conducted by Coffey (2016a and 2016c). These investigations found alluvial deposits up to 43 metres deep overlying sandstone bedrock.

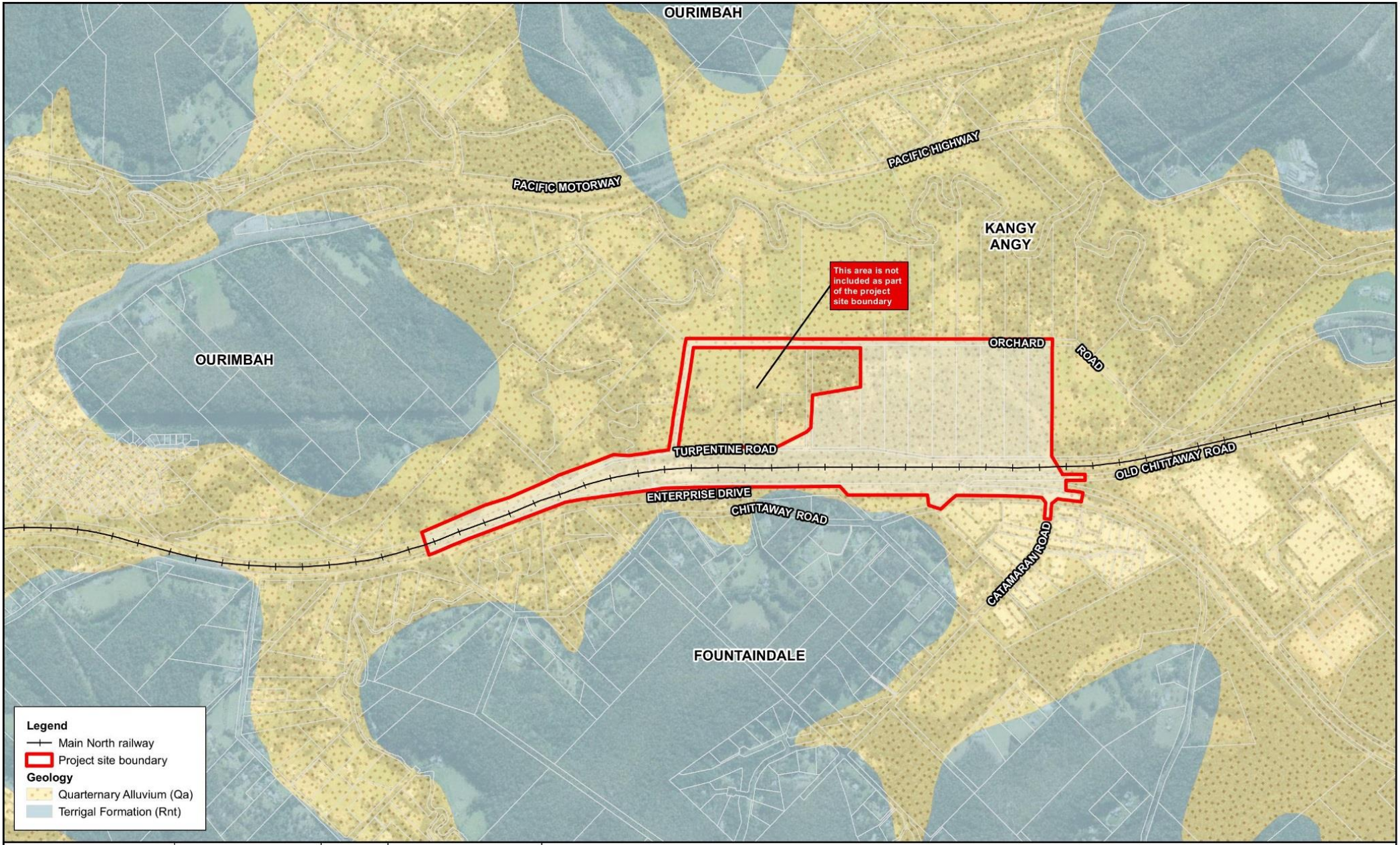
The Terrigal Formation bedrock is described in the Gosford 1:100 000 scale geological sheet as interbedded laminite, shale and fine to coarse grained quartz to quartz-lithic sandstone with minor red claystone. The bedrock is described as a heavily weathered fine to medium grained sandstone, is shallowest in the south western area of the site and dips to the north east. There are two sandstone bedrock outcrops near the start of Turpentine Road on the approach to the underbridge from Enterprise Drive.

Laminate layers were observed in various cores taken as part of the geotechnical investigation across the site. The actual buried bedrock surface may vary as a series of sub-horizontal benches and sub-vertical cliff lines (Coffey 2016a).

Acid sulfate soils

As described in section 7.10.1, *NSW Office of Environment and Heritage acid sulphate soil risk map* (Wyong Sheet, 2nd edition) indicates no known acid sulfate soil occurrence across the majority of the site. However, two small areas have been identified that have a low probability of acid sulfate soil occurrence in soil profiles greater than three metres depth. These areas are (refer to Figure 7.17):

- The vicinity of the proposed Ourimbah Creek bridge crossing on Bridge Street
- The vicinity of a tributary near the intersection of Ourimbah Road and Orchard Road.



Map: 2202522A_GIS_F005_A3	Author: goganovskiM
Date: 30/05/2016	Approved by: -

Data source: - © Land and Property Information 2015

0 200 400 m

1:17,000

Coordinate system: GDA 1994 MGA Zone 56

Scale ratio correct when printed at A4

Note: Design is indicative only.
Subject to detailed design

New Intercity Fleet Maintenance Facility Project
Figure 7.19
Geology

Contamination

Table 7.46 presents a summary of the areas of environmental concern within the Project site and surrounding area. These were based on a review of the NSW EPA Contaminated Land Record, site interviews, Transport for NSW data and investigation of the site history.

Two potential areas of environmental concern within the site and three potential areas of environmental concern within the rail corridor were identified.

Table 7.46 Areas of environmental concern

Item	Sources and mechanism	Potential contamination	Likelihood of unacceptable level of contamination
Soil stockpiles within rail corridor	Top down weathering or leaching from stockpile, impacts typically localised and superficial.	Total petroleum hydrocarbons (TPH), Polycyclic aromatic hydrocarbons (PAH), heavy metals, asbestos	Low likelihood – The materials would likely have been generated from within the corridor. Materials in corridor were likely derived locally based on cut/fill balance for levelling of corridor. The stockpiles have been covered. Following removal of the stockpiles, the source of potential impact would have been removed.
Soil stockpiles and waste dumping (various types at various locations)	Top down weathering or leaching from stockpile, impacts typically localised and superficial if not spread/mixed. Localised extent	TPH, benzene, toluene, ethylbenzene, and xylenes (BTEX), PAH, organochlorine pesticide (OCP), polychlorinated biphenyls (PCB), phenols, heavy metals, asbestos, pathogens	Low to high likelihood – The degree of contamination would be largely dependent upon the nature of the waste types and stockpiled material. Origin and nature of stockpiles/waste are unknown.
Uncontrolled fill for levelling ground	Contamination may be present in fill and may present a potential for leaching into the groundwater.	TPH, BTEX, PAH, OCP, PCB, phenols, heavy metals, asbestos, pathogens	Low likelihood – Based on site topography, substantial volumes of fill are not expected in the Project area, except in the rail corridor. Levelling of rail corridor would likely have achieved via local cut/fill balance instead of importation of fill.
Train related surface impacts in rail corridor	Top down weathering of train parts and leakage of oil and grease; application of herbicides/pesticides (typically arsenic based); impacts typically localised and superficial.	TPH, heavy metals, asbestos	Low likelihood – The impacts are typically localised and superficial
Buildings, household storages and wastes	Potential asbestos containing building materials and minor household chemicals may present localised and superficial impacts on soil.	TPH, heavy metals, asbestos	Low likelihood – The impacts are typically localised and superficial. Aboveground household wastes and site structures would typically be removed during site clearance prior to earthworks.

7.11.3 Construction impacts

Soil and geology

Construction excavation works would expose the natural ground surface and subsurface increasing the risk of soil to water runoff and erosion. Construction activities that may result in erosions and sediment runoff include excavation for the main building elements of the Project, cut and fill activities required for levelling of the site and vegetation clearing.

Potential impacts associated with soil and geology impacts during construction include erosion or removal of existing topsoil which may lead to increased sediment and turbidity levels in local waterways, such as Turpentine Creek and Chittaway Creek which crosses the southern end of the Project site and Ourimbah Creek and Bungalow Creek to the west and south of the Project site respectively. The movement of soils and other earthworks on the site may also lead to potential air quality impacts (such as dust generation) which are described in greater detail in section 7.13.

Given the site characteristics and the scope and size of the Project, it is anticipated that erosion and sediment risks would be effectively managed through the implementation of standard measures as outlined in the Landcom *Managing Urban Stormwater, Soils and Construction Guidelines* (Landcom 2004).

Contamination

Soil contamination impacts may arise from run-off and sediment transfer due to excavation and transportation of site soils and the use of machinery on site. Where possible, spoil would be reused on site as fill. Spoil that cannot be reused would be appropriately stored and disposed of at a licensed facility.

There is also potential for contaminated soil to be encountered during excavation works, although the areas of environmental concern would be unlikely to present an unacceptable threat to human health or local ecology. Any suspected contaminated material discovered during excavation works would be isolated for assessment by a qualified specialist and transported to an appropriate licensed waste facility.

If contaminants such as heavy metals or asbestos are encountered in the rail corridor during the construction process, work should stop and the materials appropriately dealt with using the appropriate management measures (refer to section 7.11.5).

7.11.4 Operational impacts

Potential operational impacts are contamination of soil and shallow groundwater from spillages/leakages of fuels, oils or other chemicals used within the maintenance site. These impacts would be managed through site operational procedures.

7.11.5 Management and mitigation measures

The following management and mitigation measures would be implemented to minimise soil and contamination impacts prior and during the construction of the Project:

- An Erosion and Sedimentation Control Plan (ESCP) would be developed and maintained for the site in accordance with *Managing Urban Stormwater, Soils and Construction Guidelines* (Landcom, 2004). The plan would include site access controls preventing tracking of sediment from site, limiting the removal of groundcover and ensuring that the excavation works do not block natural drains or create undrained areas.
- All material required for off-site disposal would be appropriately tested and classified against the Waste Classification Guidelines prior to being disposed of off-site (DECC, 2008).
- Excavated material would be reassessed for reuse onsite.
- Stabilised surfaces would be reinstated as quickly as practicable after construction.
- Sediment would be prevented from moving off-site and sediment laden water prevented from entering any watercourse, drainage line or drainage inlet.
- Site rehabilitation of disturbed areas would be undertaken progressively as activities are completed during the Project.
- A hazardous material (hazmat) building survey be undertaken prior to demolition of any building structure, especially any structure likely to have been built (or include materials manufactured) before 1990.
- The CEMP would include a contamination management plan and an asbestos management plan.

- All fuels, chemicals and hazardous liquids would be stored within an impervious bunded area in accordance with Australian standards and EPA Guidelines.
- Spill kits and a temporary refuelling bund would be installed and used onsite (where necessary)
- If fill material is discovered during excavation works, the material should remain on-site where possible (where contaminant concentrations meet the National Environment Protection Council's National *Environment Protection (Assessment of Site Contamination) Measure 1999.*
- Should any signs of contamination be identified during work within the site, the material would be tested against the National Environment Protection Council's National Environment Protection (Assessment of Site Contamination) Measure 1999, and managed accordingly.
- Procedures for handling asbestos contaminated materials (if found on site), including record keeping, site personnel awareness and waste disposal would be undertaken in accordance with WorkCover requirements.
- Characterisation of acid sulfate soil impacts in areas of known occurrence and preparation of an Acid Sulfate Soil Management Plan to manage potential impacts would be undertaken as part of the ESCP.

7.12 Waste and resource management

This section provides an overview of typical waste generated during construction and operations of the New Intercity Fleet Maintenance Facility and the associated waste management and mitigation measures.

7.12.1 Construction impacts

Waste sources

The construction of the New Intercity Fleet Maintenance Facility may generate various types of waste, some of which would be reused or recycled, while others would require disposal. Construction waste associated with the Project would be managed in accordance with *the Waste Avoidance and Resource Recovery Act 2001*.

Typical waste generated during construction would include:

- Green waste from vegetation clearing
- Excess spoil from excavations works
- Demolition waste, including waste from the removal of any structures on the site
- Construction waste, including packaging, concrete, bricks, crushed rock, steel, timber, etc. and surplus materials used during site establishment such as safety fencing and barriers (which may include plastics and metals)
- General litter from site personnel such as food scraps, plastic and glass containers and packages
- Liquid waste such as oils and chemicals from equipment maintenance, in addition to sewage from construction site facilities.

Resource use

Materials selection and use

The Project would require a wide range of materials during construction including steel, paints, concrete, ballast, cabling and timber. Plants and mulch would also be required for landscaping around the maintenance facility site. Opportunities to use recycled and sustainable building materials would be explored where possible throughout the detailed design of the Project.

A majority of the materials used in the construction of the Project would be considered to be common construction materials and would not be considered to be in short supply or have restricted availability. A detailed list of the types and quantities of construction materials required for the construction of the Project would be developed during the detailed design of the New Intercity Fleet Maintenance Facility.

Energy and fuel use

Construction of the Project would require the use of energy and fuels to power plant, equipment and transport vehicles. Fuels would include non-renewable sources such as petroleum, diesel, natural gas and liquefied natural gas.

Water

Water would be required during construction for dust suppression, compaction and pavement stabilisation, concrete batching, washing of plant and equipment, firefighting (if required) and for staff facilities.

7.12.2 Operational impacts

Waste sources

Minimal operational waste or resource impacts are anticipated from the operation of the New Intercity Fleet Maintenance Facility. Typical waste generated from operation of the Project would include:

- General litter from site personnel.
- Green waste associated with the maintenance of landscaping.
- Site sewage and water used by operational staff.
- Waste liquids associated with maintenance activities such as train washing (although it is expected that up to 95 per cent of the wash water used in the automated train wash would be recyclable), graffiti removal, decanting of the toilets and other oils and chemicals.
- General waste generated from the periodic maintenance of the new intercity train fleet (which for major maintenance may include substantial amounts of steel or other metals associated with component change out.

Resource use

It is not anticipated that maintenance and occasional repair of the infrastructure associated with the maintenance facility site or the New Intercity Fleet itself would place a considerable demand on resources.

7.12.3 Management and mitigation measures

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

1. Avoidance of waste – minimise the amount of waste generated during construction by avoiding unnecessary resource consumption
2. Resource recovery – Reuse, reprocess and recycle waste products generated during construction to minimise the amount of waste requiring disposal
3. Disposal – Where resources cannot be recovered, dispose of them appropriately to minimise the potential adverse environmental impacts.

All waste requiring off-site disposal would be classified in accordance with the OEH's *Waste Classification Guidelines* (DECCW 2009) prior to disposal. The following key waste mitigation and management strategies would be implemented throughout the construction of the Project and would be governed by the CEMP:

- Removal of wastes from site would only be undertaken by a licensed contractor with appropriate approvals by the NSW DECCW under the POEO Act
- Construction materials would be purchased in accordance with an established procurement strategy that prioritises the selection of materials that utilise best practice recycled materials and sustainability ratings
- Where possible construction wastes would be diverted from landfill and recycled or reused within the Project areas or with an appropriate recycling contractor
- Sewage waste would be disposed of by a licensed waste contractor in accordance with Sydney Water and OEH requirements
- Construction materials that contain minimal embodied energy would be utilised
- Working areas would be maintained, kept free of rubbish and cleaned up at the end of each working day.

Management of operational wastes would be managed by the operators of the maintenance facility in accordance with relevant legislative and Sydney Trains requirements.

7.13 Air quality

An *Air Quality Construction Impact Assessment* which assesses the potential air quality impacts associated with the construction of the new intercity maintenance facility has been undertaken by Pacific Environment (Pacific Environment, 2016). This assessment is attached as Appendix J of this REF. A summary of this assessment is provided in the following sections.

7.13.1 Existing environment

Local air quality

Air quality standards and goals refer to pollutant levels that include the contribution from specific Projects and existing sources. The following pollutants were considered for the purpose of describing the air quality of the region surrounding the Project site with the following identified:

- *Particulate matter (PM_{10} and $PM_{2.5}$)* – The maximum 24-hour average PM_{10} and $PM_{2.5}$ concentrations occurred in April and September 2009 and were associated with regional dust storms that affected a widespread area of NSW (April 2009) and the eastern coast of Australia (September 2009). Other exceedances may be attributed to bushfires, high winds or other local events. Generally, the 24-hour average and annual average PM_{10} and $PM_{2.5}$ concentrations were below the relevant air quality criteria throughout the monitored period.
- *Total suspended particles (TSP)* – No TSP concentration data are available in the vicinity of the Project. However, annual average TSP concentrations can be estimated from the PM_{10} measurements by assuming that 40 per cent of the TSP is PM_{10}. This relationship was obtained from data collected by co-located TSP and PM_{10} monitors operated for long periods of time in the Hunter Valley.
- *Dust deposition* – Background values for dust deposition in close proximity to the Project are not available, so data from Calga Sands Quarry were used (located approximately 20 kilometres south-west of the site).

No air quality monitoring was undertaken specifically for this Project, however representative locations at Beresfield, Newcastle and Wallsend, north-east of the Project were used. These locations are considered more representative of the existing air quality in the Project area than monitoring locations south-west of the site in the Sydney region. The most recent year of monitoring data (2015) from these stations was used to provide an indication of the ambient background levels in the proximity of the Project.

The most representative site was deemed to be Wallsend, approximately 52 kilometres north-east of the Project site and the Wallsend average was used for the purposes of the air quality assessment.

For the purposes of assessing potential air quality impacts, Table 7.47 shows the assumed existing air quality levels for the study area and compares them to their relevant EPA assessment criterion:

Table 7.47 Regional air quality levels

Pollutant	Annual Average	EPA Assessment Criterion
PM_{10}	17 µg/m3	30 µg/m3
$PM_{2.5}$	6 µg/m3	8 µg/m3
TSP	43 µg/m3	90 µg/m3
Dust deposition	0.7/g/m^2/month	4 g/m^2/month

Air quality levels for all four pollutants assessed were found to be below the limit set by the NSW EPA.

7.13.2 Construction impacts

The main air pollution and amenity issues during construction would include:

- Annoyance due to dust deposition (soiling of surfaces) and visible dust plumes
- Elevated PM_{10} concentrations due to dust-generating activities
- Exhaust emissions from diesel-powered construction equipment
- Other potential impacts including the release of heavy metals, asbestos fibres or other pollutants during the removal of contaminated soils (if identified as occurring on site).

Dust generating activities

The excavation works associated with the construction of the new maintenance facility are likely to have the greatest dust generating potential of the proposed construction activities, however the impacts would be short-term and readily controlled to minimise emissions. Although the qualitative assessment cannot confirm compliance with relevant air quality criteria, anticipated levels of particulate matter are considered to be minor, temporary and easily managed.

For the qualitative assessment, construction, demolition, earthworks, construction and track-out were activities identified with the potential to create air emissions. With regard to the scale and nature of the Project and the sensitivity of the receivers, the potential of these activities to generate air emissions was assessed. The results of this qualitative assessment is summarised in Table 7.48.

Table 7.48 Potential risk profile of construction activities to generate dust emissions

Type of activity	Step 2A: Potential for dust emissions	Step 2B: Sensitivity of area			Step 2C: Risk of dust impacts		
		Dust soiling	Human health	Ecological	Dust soiling	Human health	Ecological
Demolition	Small	High	Low	N/A	Medium Risk	Negligible	N/A
Earthworks	Large	High	Low	Low	High Risk	Low Risk	Low Risk
Construction	Large	High	Low	Low	High Risk	Low Risk	Low Risk
Track-out	Large	High	Low	Low	High Risk	Low Risk	Low Risk

Particulate matter

During construction, the generation of particulate matter could affect the local ambient air environment. Emission sources with potential to generate emissions during construction include:

- Excavation and earthwork operations
- Wind erosion of freshly exposed areas
- Light and heavy vehicle movements.

Dust generation would be primarily be limited to construction activities within the Project site and would be expected to increase where higher dust generating activities are undertaken (such as excavation works). The activity specific nature of construction and the high level of control available enable particulate matter emissions to be effectively managed.

7.13.3 Operational impacts

The proposed maintenance facility would have very little operational impact on air quality. The operation of the main elements of the new intercity maintenance facility would have almost no operating impacts as the new fleet would consist of electrified trains and would therefore result in minimal generation of air quality impacts.

A small amount of gaseous emissions would be expected from some of the site equipment, and from the additional vehicle travel for staff during operation of the facility however this increase is unlikely to result in any substantial air quality impacts. A small amount of gaseous emissions may also be generated during the actual maintenance works within the Project site during operation.

7.13.4 Management and mitigation measures

A range of management and mitigation measures to reduce potential air quality impacts are provided in section 4.6 of the *Air Quality Construction Impact Assessment* attached as Appendix J of this REF. A summary of these management and mitigation measures which would be implemented to minimise impacts on air quality during construction of the Project where reasonable and feasible is provided below:

- A Dust Management Plan would be produced. This would identify specific construction activities with potential to impact air quality and contain details of the site-specific mitigation measures to be applied. Additional guidance on the control of dust at construction sites in NSW is provided as part of the NSW EPA Local Government Air Quality Toolkit.
- A mechanism for making, recording and responding to all air quality complaints from the community would be put in place. This includes provision of relevant contact details and making the complaint log available to the local authority if requested.
- Carrying out and recording regular inspections of the work site to monitor compliance with the Dust Management Plan. This would include an increased frequency of monitoring when activities with a high potential to produce dust are being carried out or during prolonged dry or windy conditions.
- Dust mitigation measures would be developed and implemented prior to and during construction: These include:
  - erection of solid screens around dusty activities
  - planning of dusty work as far away as possible from sensitive receivers
  - use of wet methods and coverings for barriers and stockpiles.
- Construction plant and equipment would be well maintained so that vehicular emissions would be within relevant air quality standards.
- Ensure all on-road vehicles comply with relevant legislative requirements, where applicable, and that all vehicles are switched off when stationary.

- Use of diesel or petrol powered generators would be avoided and mains electricity or battery powered equipment used where practicable. Where the use of this equipment is required, shielding or enclose would be utilised where possible to minimise impacts.
- Appropriate operational and waste management practices including:
  - dust suppression techniques such as ventilation during cutting, grinding or sawing activities
  - covered skips and chutes
  - ensuring adequate supply of water on site for dust/particulate matter suppression, including use of non-potable water where possible.
- During earthworks, visual inspections for dust in windy or dry periods would be undertaken. Dust generating activities should be avoided or minimised during these periods. Appropriate water suppression measures would be used on exposed surfaces and equipment that may be generating dust.
- During track-out:
  - water assisted dust sweepers would be used on the access and local roads to remove any material tracked out by the trucks
  - ensuring vehicles entering and exiting the site are covered to prevent escape of materials during transport.
- During operation of the facility, ancillary service vehicles and maintenance equipment would be operated and maintained in accordance with the manufacturer's requirement and the POEO Act.

During construction, most recommended management measures are routinely employed as 'good practice' on construction sites. At the Project site, particular attention should be paid to controlling dust generated by earthworks and track-out due to the potential risk level of these activities comped to construction.

7.14 Climate change and greenhouse gases

7.14.1 Existing environment

Existing climate

Average temperatures in NSW have been steadily rising since the 1960s. Eight of Australia's ten warmest years on record have occurred since 2002 and the period 2000–2010 was the state's hottest decade on record. This climate change is predicted to cause increases in extreme weather events, warmer temperatures and increased rainfall in some parts and droughts in others.

OEH (2014) describes the local climate of the Central Coast as fairly uniform, with warm temperatures in summer and mild winters. A high level of variability in rainfall is experienced across the Central Coast, with a tendency for higher rainfall experienced along the coastline and drier conditions further inland. The *NSW Climate Impact Profile* (DECCW, 2010) suggests that Projected climate change for the Hunter Region (as a representative example of the Central Coast) is likely to be considerable, including:

- Average annual temperatures to increase by up to two degrees Celsius and extreme temperatures to increase substantially by 2050
- Changes in seasonal rainfall, including increases in summer rainfall and a decrease in winter rainfall by 2050
- Increased frequency and intensity of annual extreme rainfall events (both frequency and intensity) could increase by up to 20 per cent by 2050.

Greenhouse gases

The sources of greenhouse gas (GHG) emission related to the Project can be categorised as part of emissions of three scope types, depending on the sources of these emissions. Table 7.49 describes these categories and the probable sources of emissions.

Table 7.49 Greenhouse gas emission categories

Emission Scope	Definition	Likely source
Scope 1	Direct emissions generated within Project boundaries	*Construction phase* → Fuel combustion emissions from construction. → Activities involved in clearing site vegetation. *Operational phase* → Maintenance activities.
Scope 2	Indirect emissions from consumption of purchased electricity generated offsite	→ Electricity used to operate site offices (during construction) and of electricity to support office and equipment usage (during operation).
Scope 3	Embodied or downstream emissions from the supply chain and upstream emissions from use of the Project	*Construction phase* → Embodied energy in construction materials. → Emissions from transport of materials. → Emissions from landfill and disposed materials. *Operational phase* → Embodied energy in maintenance materials.

7.14.2 Construction impacts

Climate Change

Since 1990, the Intergovernmental Panel on Climate Change (IPCC) has been collecting, managing and researching the potential impacts of climate change on a global scale. The IPCC has developed a set of scenarios to explore potential future climate change using complex, computer-based global climate models. The scenarios differ in their assumptions about future changes in population, economic development, energy technologies and other factors, resulting in growing differences in the GHG concentrations in the atmosphere and hence the degree of Projected climate change. Typical climate change impacts on infrastructure and associated assets include the following scenarios:

- → Higher average temperatures
- → More frequent occurrences of extreme temperatures (days over 35^{o}C)
- → Lower average rainfall
- → More intense extreme rainfall events
- → Increased lightning strikes
- → Higher sea level and storm surge events
- → More frequent extreme (or catastrophic) fire danger days.

Consideration of the above general risks with respect to the Project would indicate that the key risks to the construction of the New Intercity Fleet Maintenance Facility could include the following:

- → Increased storms and increased flooding frequency posing safety risk to workers, impacting construction deadlines construction costs and potentially damaging equipment and infrastructure
- → Increased risk of bushfire during drier months posing a safety risk to workers, potentially damaging work and delaying deadlines
- → Increased precipitation increasing risk of soil erosion and run-off
- → Increased risk of soil shrinkage and building subsidence due to instability from increasing rainfall
- → Water scarcity during drier months leasing to higher demand for water impacting on construction requirements.

Sea level rise

Under clause 228(2)(p) of the EP&A Regulation, Transport for NSW is required to consider any impact on coastal processes and hazards, including those under Projected climate change conditions. Whilst the Project has been identified as being partially within the NSW coastal zone (refer to section 5.3.5), it is considered that the Project would be located such that it would not be impacted by sea level rise, or be impacted by, coastal processes or coastal hazards.

In addition, the Project has been designed so as to be outside the potential 1 in 100 year flood event (including a 10 per cent increase in rainfall to account for climate change).

Greenhouse gases

Greenhouse gas emissions may be emitted directly or indirectly. The direct greenhouse gas-generating activities associated with construction include mobile vehicular emissions (particularly from using heavy vehicles to move materials like spoil and concrete) and, depending on the extent required, removing vegetation (Scope 1 emissions). Indirect greenhouse gas emissions as a result of the Project would include emissions associated with the consumption of electricity within site compounds and construction equipment, extraction of diesel and the emissions embodied in the products used on-site, particularly steel and concrete (Scope 2 emissions).

Typically, the operation of on-site machinery during construction works and general site operations account for the majority of construction-related greenhouse gas emissions. Expected direct sources of greenhouse gas emissions from construction would include:

- Combustion of fuel in construction plant, equipment and vehicles which typically accounts for most direct construction related emissions
- Vegetation clearing (direct emissions from the decomposition of vegetative material and soil carbon releases).

Expected indirect sources of greenhouse gas emissions from construction would include:

- Electricity generation for use in construction (occurring off-site at the power station)
- Disposal and decomposition of waste generated from construction work and staff
- Embodied emissions in construction material including steel and cement (i.e. the emissions that were required to create the construction material).

The volume of greenhouse gas emissions that would be generated during construction would depend on the quantity of construction materials consumed and the types of construction plant and equipment used. Further quantitative assessment of potential greenhouse gas emissions would be undertaken as part of the ongoing detailed design of the maintenance facility.

7.14.3 Operational impacts

Impacts of climate change on operation

Potential climate change impacts on the operation of the maintenance facility have been considered using the typical scenarios identified in section 7.14.2. The potential impacts during operation of the maintenance facility are presented in Table 7.50.

Table 7.50 Potential climate change impacts on the operation of the maintenance facility

Climate Risk	Risk to the New Intercity Fleet Maintenance Facility Project
Mean temperature change and extreme heat (days over 35ºC)	
Increase in the severity, frequency and duration of extreme temperatures and heatwaves	Risk to health and safety of maintenance staff working at the facility.
	Increased air-conditioning and associated power demands.
	Increased frequency and duration of power outages.
	Decreased efficiency and more frequent outages of electrical, signalling and communication systems.
	Accelerated degradation of materials and reduced life of buildings and structures.
	Potential for buckling of rail track.
	Increased capital costs due to the need for more frequent repairs and maintenance.
	Maintenance works suspended resulting in program delays.
Bushfire weather	
Increase in number of severe fire weather days, particularly in spring and summer, resulting in bushfire at or in proximity to the Project site	Risk to health and safety of maintenance staff working at the facility and travelling to/from the facility.
	Damage to maintenance facility and trains, substations, overhead power lines, catenary and signalling/communications infrastructure requiring repair and/or replacement and an increase in capital costs.
	Increased frequency and duration of power outages.
	Maintenance works suspended resulting in program delays.
Mean rainfall change	
Increase in seasonal variability of mean rainfall with increases in autumn rainfall and decreases in winter rainfall	Risks to security of water supply and availability of roof runoff to fill water storage tanks.
	Soil subsidence, movement and cracking as a result of increased variability of periods of wetting and drying causing reduced integrity of building foundations and potential structural failure.
	Accelerated degradation of materials and reduced life of buildings and structures requiring repair and/or replacement and an increase in capital costs.
Extreme rainfall and flood events	
Increased intensity of extreme rainfall events resulting in flooding of the Ourimbah Creek catchment and/or Central Coast region more broadly	Risk to health and safety of maintenance staff working at the facility and travelling to/from the facility.
	Inundation of maintenance facility, access roads and/or rail, causing potential isolation of assets due to flooding.
	Increased frequency and duration of power outages.
	Increased stormwater runoff, with potential damage to surface drainage infrastructure and sewer systems causing localised flooding of the Project site and/or Ourimbah Creek catchment.
	Malfunctioning of electrical equipment, including communications and associated circuitry.
	Loss of traction of trains moving on tracks through the facility, with potential risk of derailment.
	Increased soil erosion and landslip, resulting in reduced integrity of building foundations and potential structural failure.

Climate Risk	Risk to the New Intercity Fleet Maintenance Facility Project
	Damage to maintenance facility and trains requiring repair and/or replacement and an increase in capital costs.
	Accelerated degradation of materials and reduced life of buildings and structures requiring repair and/or replacement and an increase in capital costs.
	Maintenance works suspended resulting in program delays.
Storm events, cyclones and extreme wind	
Increased intensity, severity and frequency of storm events exacerbated by extreme rainfall and sea level rise, with increased frequency and severity of extreme wind causing debris (e.g. fallen trees, branches)	Risk to health and safety of maintenance staff working at the facility and travelling to/from the facility.
	Damage to maintenance facility and trains, substations, overhead power lines, catenary and signalling/communications infrastructure requiring repair and/or replacement and an increase in capital costs.
	Increased frequency and duration of power outages.
	Accelerated degradation of materials and reduced life of buildings and structures requiring repair and/or replacement and an increase in capital costs.
	Maintenance works suspended resulting in program delays.
Sea level rise and coastal inundation	
Rise in sea levels and increased coastal inundation and saltwater intrusion of Tuggerah Lake and Ourimbah Creek	Reduced integrity of building foundations and potential structural failure due to water table elevation.
	Increased acidification and salinity of soils resulting in accelerated degradation of materials and reduced life of concrete buildings and structures.
	Inundation of stormwater drainage and sewer systems increasing the risk and severity of localised flooding of the Project site and/or Ourimbah Creek catchment.

Greenhouse gas impacts of operation

Greenhouse gas emissions would be primarily associated with the operation and maintenance of the facility and its associated infrastructure. Direct and indirect emissions would primarily be generated by:

- Electricity use for tracks, administration buildings and maintenance facilities
- Combustion of fuel in site plant, equipment and vehicles when required
- Disposal of waste from the facility
- Embodied energy in materials used in the maintenance of the facility.

7.14.4 Management and mitigation measures

Overall, climate change and greenhouse gas related emissions and energy usage are considered to be manageable through design and the application of standard mitigation measures. A summary of the proposed management and mitigation measures that would be used to minimise the Project's impacts contribution to climate change is provided below.

Climate change

- Detailed designs for the Project would take into consideration the potential effect of climate change on the Project, including drainage requirements and the potential for increased flood frequency
- Possible treatment measures which be considered during the detailed design phase would include:
  - monitoring weather forecasts and specific weather warnings
  - positioning fire extinguishers at site offices and within construction vehicles (in case of bushfires)
  - being alert to fire warnings and notices
  - keeping the construction site clear of debris wherever possible (in case of severe winds)
  - considering specific measures for wet season as part of the broader ESCP
  - ensuring major earthworks are planned to reasonably not coincide with periods of expected rainfall or high winds
- A climate change risk management plan would be developed as part of the CEMP and would provide opportunities to manage climate change risks to the Project into the future as data on climate change impacts becomes more robust.

Greenhouse gases

While it would not be possible to completely mitigate the generation of greenhouse gas emissions during construction (due to the need to consume energy and resources), the amount of emissions could be reduced by implementing the following mitigation measures:

- Purchasing electrical energy derived from a renewable energy source (where available)
- Using low greenhouse gas-intensive construction materials (where a suitable substitute for a high greenhouse gas-intensive material is available)
- Adopting energy efficient work practices
- Identifying measures for mitigation as part of site inductions, training and pre-start talks
- Procuring construction services and materials locally to minimise the distance travelled and therefore emissions of vehicles accessing the site
- Ensuring that deliveries are managed in an efficient manner to minimise the number of trips required and therefore reduce the amount of emissions
- Implementing energy-efficient work practices, such as switching off construction plant, vehicles and equipment when not in use to minimise idling
- Regularly monitoring, auditing and reporting on energy, resource use and associated greenhouse gas emissions as part of the environmental reporting requirements specified within the CEMP
- Selecting materials during construction planning to ensure products that reduce embodied carbon are considered and used
- Ensuring clearance of vegetation be limited to the minimum that is required for the Project
- Ensuring all vegetation cleared be disposed of at a registered compost facility in the Sydney area and that it is not to be sent to landfill or burnt.

7.15 Bushfire

7.15.1 Existing environment

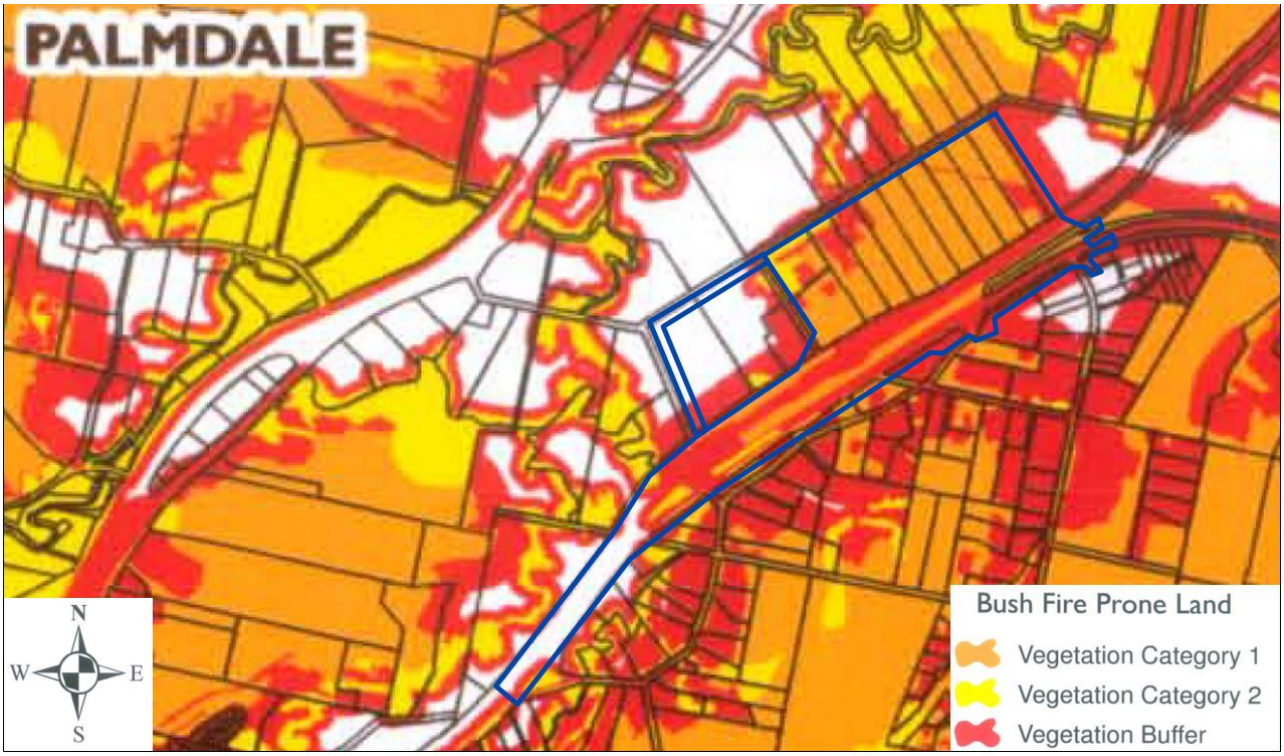
Fire prone land

As described in section 7.1, the Project site is currently highly vegetated across the majority of the site. In addition, the new intercity maintenance facility would continue to be surrounded by highly vegetated bushland following removal of the vegetation required for the construction of the maintenance facility.

Wyong City Council (now Central Coast Council) has mapped and identified bushfire prone land within the LGA (Wyong City Council, 2011). This mapping categorises areas as follows:

- *Vegetation Category 1* (coloured orange) is the most hazardous vegetation category, and refers to forest, woodlands, heath and wetlands greater than 1 hectare in size
- *Vegetation Category 2* (coloured yellow) refers to moist forests, scrublands, open woodlands, malle, grasslands and pockets of category 1 vegetation less than 1 hectare in size. Category 2 vegetation is at less risk from bushfire than category 1 land
- *Vegetation Buffer* (coloured red) refers to land that directly adjoins bushland. These are areas in which developments and people are most likely to be affected by a bushfire burning in the adjacent area.

Many properties within Central Coast Shire have been identified by the NSW Rural Fire Service as Bushfire Prone Land due to a potential fire source being on the property or in the vicinity. Figure 7.20 shows the existing bushfire vegetation mapping for the Project site and the surrounding area.



Source: Extract of Wyong City Council Bush Fire Prone Land Map 2011

Figure 7.20 Bushfire prone land

The mapping of bushfire prone areas within and adjacent to the Project site boundary indicates that a majority of the Project site boundary includes land identified as being mapped as bushfire Vegetation Category 1. In addition, a large proportion of the surrounding areas, in particular to the north and south, are considered to be moderate and high risk bushfire prone areas respectively. Some of the land to the south west and east of the site is also identified as bushfire vegetation buffer zone.

Development within a bushfire prone area requires an assessment under *Australian Standards AS 3959 – Construction of buildings in bushfire prone areas* to determine the mandatory construction standards. This is relevant to all of the building components of the New Intercity Fleet Maintenance Facility such as the following:

- Fleet maintenance building
- Auxiliary workshops
- Material storage, including flammable liquid storage
- Wheel lathe
- Automatic train wash
- Administration building
- Operational control centre
- Security building.

Site conditions

Topography

The local topography including slope and aspect are determinants of the parts of the fire (e.g. head, flank, back) that an asset may be exposed to. The Project is located on a typically flat alluvial plain in a broad open valley. The land within the valley is flat to slightly undulating with the ground surface between approximately 8.5 metres and 15 metres Australian Height datum (AHD). The hills flanking the valley are densely vegetated with generally rolling topography.

Slope

Slope can affect bushfire behaviour with fires burning faster up slope than down slope, in particular when aligned with the prevailing wind direction. A fire burning up a 10 degree slope has the potential to spread at double the rate of a fire on level ground (Bushfire CRC, 2009). Likewise a fire burning up a 20 degree slope will generally spread at a rate that is four times the rate of spread across level ground (Bushfire CRC, 2009). As described, a majority of the Project site and immediately adjoining land is generally flat.

Aspect

Aspect is another topographical factor that can affect bushfire behaviour. North facing slopes receive more solar radiation that dries surface fuel faster than on south facing slopes (Bushfire CRC, 2009). As the general topography of the Project site is within a comparatively flat valley floor, aspect would have little practical impact upon bushfire behaviour within the site.

7.15.2 Construction impacts

The bushfire ignition risk associated with Project construction, by definition, would generally only exist in those areas that are capable of supporting a bushfire. The consequence of an ignition event occurring would depend greatly upon a variety of factors including the location of the ignition, availability of fuel, fire danger rating at the time of the ignition (e.g. catastrophic fire danger) and initial response to the incident.

Some of the potential sources of ignition of bushfires resulting from construction of the Project are described below:

- *Hot works* – Activities that generate both heat and sparks, which are conducted at the construction site, pose a considerable risk of igniting flammable material nearby if these activities are not conducted in accordance with standard work procedures or other hot works licences/permit requirements. Activities such as welding and grinding would have the potential to result in bushfire ignition. The potential risk associated with these works would increase when these activities are undertaken in or adjacent to long dry grass.
- *Construction vehicles and motor vehicles* – The risks associated with vehicles (e.g. construction plant or motor vehicles) include the collision of a vehicle infrastructure that could result in either a spark, arc from a power supply or fire from spilt fuel being ignited. There is also a risk associated with vehicles driving through dry grass that may be ignited either from a spark or due to the hot vehicle exhaust system. Construction machinery (such as graders or dozers) has the potential to ignite flammable material due to the generation of a spark from striking a stone or from electrical equipment on the vehicle.
- *Chemical fire* – The inappropriate storage or isolation of incompatible or flammable chemicals from potential ignition sources including static electricity may cause a chemical fire or explosion. The failure to clean up a flammable chemical spill or address leaking containers could also lead to a potential fire. Flammable chemicals would also need to be secured to prevent arson.
- *Electrical fault* – Equipment used during Project construction, if not maintained in proper working order would present a risk of generating a bushfire through a static discharge or arcing of equipment. This equipment would include generators, power tools, portable lighting, heaters, air conditioners and any powered device.
- *Landscaping* – Mulch storage may present a bushfire risk if a large volume of material is stored in a large pile for an extended period of time. The ability of mulch to self-combust, the production of methane (includes the potential for explosion) under favourable conditions and the potential for arson attack all contribute to the potential bushfire risk associated with storing mulch.

7.15.3 Operational impacts

The following sections identify the potential operational interaction between the Project and potential bushfires and include identification of the following:

- Sources of potential bushfire risk
- Bushfire risks to the Project.

Sources of potential bushfire risks

Power lines

A likely source for the ignition of a bushfire would occur through with the breakage of wires or poles which make up the overhead line equipment for the maintenance facility or supporting electrical equipment (new 33 kilovolt powerlines, substation etc.). This may occur as a result of actions such as:

- Trees or tree branches along the Project alignment causing a breakage to, or arching of, overhead wiring
- Trains or vehicles moving within the maintenance facility site colliding with an overhead line equipment pole, causing it to come down (although this is considered to be unlikely).

Similarly, the equipment associated with the new traction substation may provide a source of ignition for potential bushfires as a result of a spark or other electrical issue (in the unlikely event that this occurs).

Maintenance and repair works

Another potential source of bushfire ignition would be hazards associated with maintenance procedures. These risks are substantively the same as those hazards identified for the construction phase (such as hot works, movement of motor vehicles, etc. – described above) and would be associated with repair and maintenance of track within the maintenance facility as well as repairs to overhead wiring as required throughout operation.

Human activity/arson

A malicious act (e.g. arson) could also pose a potential threat the Project, whether the attack is located within adjacent bushfire prone land or at a Project site where the fire may escape to become a bushfire. Other potential causes of ignition associated with human activities would include the inappropriate actions of individuals such as discarding lit cigarettes and matches, placing hot metal into a general waste bin or failing to correctly dispose of materials that are subject to spontaneous combustion, e.g. solvents.

Lightning

Whilst the potential for a lightning strike cannot be altered, the potential for a lightning strike to start a bushfire within or adjacent to this site would be present.

Bushfire risks to the Project

The primary potential impact of a bushfire on the Project would include damage to Project infrastructure and the maintenance facility itself, and the remote possibly of injury or death to Project staff (e.g. staff at the maintenance facility). The Project infrastructure most at risk of bushfire attack would include:

- *Maintenance facility buildings* – bushfires would presents a potential building and property damage risk to maintenance facility buildings, including any New Intercity Fleet trains which are located at the facility during operation
- *Overhead line equipment* – overhead wiring would be present throughout the maintenance facility site and potential bushfire risks to this infrastructure would be similar to those that exist for other forms of above-ground electrical wiring
- *Substations* – the substation would generally be located at the edges of the facility and adjacent to the rail corridor within close proximity to some vegetated areas that have the potential to carry a bushfire and would therefore at risk of being impacted by a bushfire.

7.15.4 Management and mitigation measures

As described in section 4.2.5 of this REF, the fleet maintenance building would be protected by heat sensors and fire alarms linked to the sprinkler system in the both the administration area, store rooms and specific areas of the main hall to meet building code of Australia (BCA) requirements. A fire ring main would be installed around the buildings and administration area separate from the potable water supply to the building. Water for the ring main would be supplied separately by both Council potable water supply and the recycled non potable water from the storm water harvesting within the site. The drainage detention ponds would also provide water for managing any bushfire threats to the site.

The document entitled *Planning for Bushfire Protection* (NSW Rural Fire Service, 2006), prepared by the NSW Rural Fire Service in cooperation with the NSW Department of Planning and Environment, was reviewed in relation to the Project and relevant management and mitigation measures have been identified with respect to the potential management for bushfires during construction and operation (in addition to the design elements described above).

These measures would include:

- Ensuring a Bushfire Management Plan is incorporated into the overall CEMP.
- Ensuring the provision and maintenance of an asset protection zone (APZ) around the Project site for the life of the development, comprising an area of physical separation between all built structures and potential bushfire hazards. This could include elements such as the new access road and the proposed detention ponds. The specific requirements would be determined in consultation with the NSW Rural Fire Service during detailed design.
- Vehicles on site would be equipped with fire extinguishers.
- Appropriate access tracks would be maintained to all sections of the Project site during construction and operation to allow safe access, egress and a defendable space for emergency services in the event of a bushfire or emergency.
- The CEMP would include emergency evacuation procedures in the event of a bushfire or emergency. This would include a map of all potential access tracks to and from the site, in addition to the primary access route for site personnel.
- The CEMP would stipulate a 'no smoking' policy for site personnel whilst working within or surrounding the Project site during construction or operation of the maintenance facility.
- The emergency/evacuation plan for the site would be prepared in accordance with the relevant NSW Rural Fire Service Guidelines for the preparation of emergency/evacuation plan(s).
- Sources of gas and electricity would be located so as not to contribute to the risk of fire or impede the firefighting effort.
- The CEMP would include emergency contact numbers in the event of a bushfire or emergency.

7.16 Public utilities

7.16.1 Existing environment

A series of existing utilities are located within and adjacent to the Project site boundary. These include the following utility types:

- Electricity
- Potable water supply
- Sewage
- Telecommunications.

Electrical utilities

Existing electrical assets within the Project site including the following:

- An Ausgrid 33 kilovolt power line which currently runs through the proposed maintenance facility site (on the western side of the existing rail corridor
- A Sydney Trains 66 kilovolt power line located generally parallel to the Main North railway on the western side of the railway corridor
- A Sydney Trains 11 kilovolt power line located generally parallel to the Main North railway on the eastern side of the railway corridor
- An Ausgrid 132 kilovolt line which is located within a dedicated easement which runs to the east of Orchard Road and traverses the northern boundary of the site between Orchard Road and Enterprise Drive
- A local power line which runs to the western side of Orchard Road in a north-south direction providing power supply to these residents.

Water utilities

Dial-Before-You-Dig (DBYD) investigations undertaken in the area indicate a number of existing water utility services managed by Wyong Water in the local area, but outside the Project site boundary for the New Intercity Fleet Maintenance Facility. One water main along Turpentine Road under the existing bridge has been identified. Other than the Turpentine Road main, no other water mains have been identified in or directly adjacent to the Project site. The DBYD data also indicates the presence of a trunk water main (300 millimetres in diameter) which commences at Berkeley Road and runs along Enterprise Drive, turning down Catamaran Drive into a 150 millimetre diameter main.

Sewer

There are currently no identified sewer mains in or directly adjacent to the Project site for the maintenance facility. The DBYD data indicates the presence of a sewer connection point located on the east side of Enterprise Drive, approximately 200 metres south of Catamaran Road. This connection runs as a gravity sewer main of 400 millimetre diameter in a north-east direction cross Catamaran Road and along Enterprise Drive towards a sewer pump station, and then to Wyong Treatment Plant.

Telecommunications

Existing telecommunications lines are currently located adjacent to the proposed New Intercity Fleet Maintenance Facility site along Orchard Road, Ourimbah Road and Turpentine Road which provides the local telephone supply to the residents of these streets.

7.16.2 Construction impacts

Construction impacts on services and utilities could include the following

- The need to relocate existing services within the Project site boundary
- Potential damage to services and utilities as well as injury to persons (construction workers or the community) in the unlikely event that cables, mains or pipelines are accidentally damaged during excavation, plant movement or general civil works.

Relocation of services

As described in section 3.2.2 and section 4.2.4 of this REF, the key utility which would be impacted as a result of the Project would be the existing 33 kilovolt feeder line that currently runs through the proposed maintenance site (on the western side of the existing rail corridor). As described, this electrical asset would require relocation as part of the new maintenance facility. Discussion with Ausgrid regarding the preferred alignment for the realignment of the 33 kilovolt power line is currently ongoing. Additionally, the existing Sydney Trains 66 kilovolt line (on the western side of the railway tracks) would be required to be relocated and would be relocated to the eastern side of the railway tracks (installed half as aerial and half as trenched – refer to figure 4.1 and Figure 4.2).

In addition to the impacts to the existing high voltage powerlines, the construction of the new intercity maintenance facility would result in some impacts to existing service utilities, including the need to provide permanent utility connections from the local utility supplier to the maintenance facility site for the following:

- Potable water supply
- Sewage
- Telecommunications
- Local electricity supply.

The location and extent of impact on these services would be confirmed during detailed design, and in consultation with the utility service provider or Sydney Trains. Adjustments would be made to these services as required.

Impacts or strikes to services

Transmission of large electrical currents through the ground (known as 'earth potential rise') could potentially occur as a result of damaged power cables or mains. In the unlikely event that an existing electrical cable is damaged during construction, this could have the potential to injure construction workers and members of the public standing close to the damaged power utility. This potential hazard is highly unlikely to occur due to the management measures proposed as part of the Project. Damage to other mains (such as water or sewer) could also result in injury to construction workers and the general public (as loss of the ability to use these services until they are repaired by the respective utility provider(s).

Users may also experience short disruptions to telecommunication connections, street lighting or water and wastewater mains if these services are required to be relocated as part of the Project.

7.16.3 Operational impacts

Following completion of the construction of the New Intercity Fleet Maintenance Facility (and any associated utility relocation/augmentation), the operation of the Project is not anticipated to result in substantial impacts to utilities.

7.16.4 Management and mitigation measures

The following management and mitigation measures would be implemented to minimise impacts on utilities during the construction and operation of the Project:

- During the detailed design stage of the Project and prior to construction, a further detailed services search would be completed to ensure that construction does not damage existing services.
- Consultation would be undertaken with all affected utility owners as part of the ongoing design.
- Should the location of any utilities be identified to be in conflict with the Project, a formal review of the proposed works at these location(s) would be undertaken in consultation with the construction contractor. Alternative arrangements would then be determined to provide the most beneficial outcome for the community, service provider and proposal in terms of safety and constructability. The strategy for the preferred hierarchy of utilities treatment as part of the Project would be as follows:
  - do nothing – avoid impact on utilities where possible
  - protect – protect utilities in their existing locations where feasible
  - modify access – modify manholes/chambers to provide side access outside the alignment of the Project, where these are located beneath the proposed alignment
  - relocate – utilities to be relocated only where no other options are feasible or acceptable.
- The nominated construction contractor would be responsible for monitoring existing utilities to ensure they are protected properly from damage during construction.
- A contingency management plan would be prepared to detail contingency planning in case of service interruption.
- All construction works which are near or around utilities would be carried out in accordance with the following, but not limited to:
  - *Work Health and Safety Act 2011*
  - *Safety Regulation 2001 on Work near Underground Assets*
  - *Dial Before You Dig Asset Protection Guidelines.*

7.17 Hazard and risk

7.17.1 Construction impacts

The main hazards that would be associated with the construction of the maintenance facility include:

- Working in the vicinity of an operating rail corridor (Main North Line) and the of risk of being hit by a train
- Working in the vicinity of live overhead wires and subsurface utilities
- Impacts to soils and water quality as a result of spills
- Transportation, use and storage of hazardous materials to and on site
- Potential for striking of services (either known or unknown during construction works)
- Vehicle accidents involving construction plant, equipment and/or construction personnel
- Incidents involving construction personnel hit or crushed by plant or other construction equipment
- Handling of contaminated material.

The above risks would be managed through the mitigation measures described in section 7.17.3 which would be incorporated into the overall CEMP for the Project.

7.17.2 Operational impacts

The main hazards associated with the operation of the maintenance facility include:

- Natural events (including flood and bushfire)
- Impacts of climate change
- Utility failure (power or communication failure)
- Train accident (including derailment, collision or impact)
- Stabling and associated buildings or train fire
- Storage of hazardous materials
- Potential spills from trains and other equipment (oil, contaminants, etc.) and materials used for train cleaning.

Operational hazards and risks would be managed through the implementation of Sydney Trains standard measures relating to hazard and risk.

7.17.3 Management and mitigation measures

Management measures that would be implemented to address potential impacts to hazard and risk as a result of the Project are outlined below.

- During construction:
  - Any storage of hazardous materials, and refuelling/maintenance of construction plant and equipment, would be undertaken in clearly marked designated areas that are designed to contain spills and leaks with appropriate bunding.
  - Machinery would be checked daily to ensure there is no leaking oil, fuel or other liquids.
  - An Work Health and Safety Plan would be developed to manage construction safety hazards for the facility.
  - Contingency plans would be developed to deal with any spills which might occur during construction.

- All hazardous materials spills and leaks would be reported immediately to site managers and Transport for NSW or Sydney Trains as required. Actions would be immediately taken to remedy spills and leaks.
- Chemical spill kits would be readily available and accessible to construction workers. Kits would be kept at site compounds and on specific construction vehicles. Environmental control maps and/or site maps would illustrate the location of the spill kits.

→ During operation:

- An incident emergency spill plan would be developed. The plan would include measures to avoid spillages of fuels, chemicals, and fluids onto any surfaces or into any adjacent/nearby waterways. An emergency spill kit would be kept on site at all times.
- All staff would be made aware of incident emergency procedures and the location of emergency spill kits.
- The maintenance facility would be designed to comply with Sydney Trains operational safety, signalling and operating procedures. Operational hazards would be managed through TfNSW's standard procedures for hazard and risk that are currently in place across the entire rail network.

7.18 Cumulative impacts

7.18.1 Overview

This section discusses the potential cumulative impacts that may arise as a result of the construction and operation of the New Intercity Fleet Maintenance Facility Project, and the interaction of these impacts with other identified major developments within the local area. The cumulative impacts relate to both the individual environmental impacts of the Project as well as the combined effects of this and other Projects in the vicinity of the Project site.

While this REF focuses on the potential environmental impacts of the New Intercity Fleet Maintenance Facility Project, it is important these potential impacts are considered in their wider contextual surroundings. Cumulative impacts are those that may not be considered substantial on their own but that may be more substantial when considered in association with other impacts. Cumulative impacts may occur as the result of the interaction of impacts within a single Project or due to the combined effects of a number of Projects occurring simultaneously in a given area.

7.18.2 Cumulative construction impacts

Generally speaking, for developments of the nature of the New Intercity Fleet Maintenance Facility Project, cumulative construction impacts may include:

→ Increased construction vehicle traffic on public roads causing congestion and delays, and increased air pollution and noise for local residents and other sensitive receivers/land uses

→ Cumulative noise impacts associated with multiple construction works, particularly during night periods

→ Reduced local biodiversity as a result of vegetation clearing across multiple construction sites

→ Changes to water quality of nearby waterways

→ Changes to the overall visual amenity of the area.

The severity of potential cumulative impacts on surrounding receivers would vary between locations and would generally be dependent on the following factors:

→ The types of works being undertaken

→ The duration of the works

→ The distance between the works and their respective proximity to the receiver

→ The sensitivity of the receiver.

In general, sensitive receivers that are most likely to be affected by cumulative construction impacts would be those that are located in close proximity to the Project site for the New Intercity Fleet Maintenance Facility works and which are also located within close proximity to other construction work sites and/or along common construction access routes.

7.18.3 Potential co-occurring developments

The consequences that may arise from the effects of incremental or co-occurring development are usually described as 'cumulative environmental impacts'. Cumulative impacts have the potential to arise from the following:

- The interaction of individual elements within the Project and surrounds
- The additive effects of the Project with other external Projects.

In accordance with Clause 228(2) of the EP&A Regulation 2000, any cumulative environmental effects of the Project with other existing and likely future activities must be taken into account in assessing potential environmental impacts. These can be viewed as either positive or negative cumulative impacts.

An assessment of cumulative environmental impacts of the New Intercity Fleet Maintenance Facility Project with other identified potential developments has been undertaken based on the following:

- Size of the proposed or existing Project which was generally limited to major developments
- Type of Project or proposal
- Location of the proposal or Project in relation to the Project site
- Timeframe of the proposal or Project with only those Projects likely to be constructed concurrently with the New Intercity Fleet Maintenance Facility Project being considered.

Major Project applications within the Central Coast LGA were identified using the Department of Planning and Environments' Major Projects Register (majorProjects.planning.nsw.gov.au, accessed 18 April 2016). Of the Projects identified on this register, these developments are not located within close proximity or were not of a size or type of Project that was considered likely to result in impacts that would have the potential to result in cumulative impacts with the Project.

One current infrastructure development which is currently proposed by Roads and Maritime has however been identified that may result in cumulative impacts within the vicinity of the Project site. This Project is discussed below.

Pacific Highway Upgrade, Lisarow

Roads and Maritime Services is currently planning to undertake an upgrade of the Pacific Highway between Ourimbah Street and Parsons Road at Lisarow (Pacific Highway upgrade), approximately five kilometres south of the proposed New Intercity Maintenance Facility site. Key features of the Pacific Highway upgrade include construction of two lanes of traffic in each direction on the Pacific Highway; a new bridge over the rail line; new traffic lights at the Railway Crescent and Tuggerah Street intersections; upgrading the existing traffic lights at Chamberlain Road; improved pedestrian and cycle paths along and across the highway; and improved access to the parking area at Lisarow Railway Station.

An REF for the Pacific Highway upgrade was prepared by Roads and Maritime Services which identified the potential key impacts as including (Roads and Maritime, 2015):

- Removal of approximately 4.15 hectares of vegetation, including approximately 2.23 hectares of Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions and 0.29 hectares of Freshwater Wetlands on the Coastal Floodplains of the NSW North Coast, Sydney Basin and South Basin and South East Corner Bioregions.

- Impact to approximately 2.13 hectares of habitat containing *Melaleuca biconvexa.*
- Potential minor flooding impacts associated with the Narara Creek Catchment.
- Construction and operational noise and vibration impacts for local receivers.
- Localised visual and landscape, heritage impacts and land use and property impacts within the township of Lisarow.

The Pacific Highway upgrade is currently undergoing an environmental approval process (REF and submissions report through Roads and Maritime Services). Of the key environmental impacts identified for the proposed Pacific Highway upgrade, the loss of *Melaleuca biconvexa* has been identified. As part of the environmental approvals for the Pacific Highway upgrade, Roads and Maritime Services is currently preparing a SIS for the potential impacts on this species.

The combined impact of the Pacific Highway upgrade in conjunction with the proposed impacts associated with the New Intercity Fleet Maintenance Facility may have a cumulative impact on the overall *Melaleuca biconvexa* community within the central coast. While it has previously been noted in section 7.1.4 that it is considered that these two populations are separate local populations, the potential cumulative impacts associated with the development of both of these Projects has been considered as part of the SIS for the New Intercity Fleet Maintenance Facility Project.

Of the other key impacts identified for the Pacific Highway upgrade, these are generally considered to be localised to the Lisarow region and would be unlikely to result in substantial impacts when considered in conjunction with the New Intercity Fleet Project.

Draft Ourimbah Land Use Strategy and Town Centre Masterplan

A draft Land Use Strategy and Town Centre Masterplan has been developed for Ourimbah (approximately 2.5 kilometres to the south west of the Project site) to allow for appropriate future planning and development of the area. The aim of the draft Land Use Strategy and Town Centre Masterplan is to promote Ourimbah as a destination centre for residents, students, visitors and also commuters (typically users of the M1 Motorway and Pacific Highway).

The draft Land Use Strategy and Town Centre Masterplan has been developed by the (former) Wyong Shire Council and includes details of the potential public domain, opportunities for improved and dedicated public spaces for the town and opportunities to improve pedestrian and cyclist activity within Ourimbah.

The timing for the implementation of the masterplan is to allow for the design, development and investment in Ourimbah over the next 20 years. Given the timeframe of the master plan, it is unlikely that the draft Land Use Strategy and Town Centre Master Plan would result in any substantial cumulative impacts during the proposed construction period for the Project. During operation, it is considered that any future developments associated with the outcomes of the draft Land Use Strategy and Town Centre Master Plan would be undertaken in consideration of the ongoing operation of the maintenance facility (subject to approval of the Project).

7.18.4 Cumulative operational impacts

Once operational, no cumulative impacts are likely to occur as a result of the Project with any future developments in the local area.

7.18.5 Environmental management measures

The following management and mitigation measures would be implemented to minimise cumulative impacts:

- The potential cumulative impacts associated with the Project would be further considered as the design develops and as further information regarding the location and timing of potential developments is released. Environmental management measures would be developed and implemented as appropriate.

- Transport for NSW and the nominated contractor would consult with the proponents of other major Projects in the area to avoid any potential cumulative impacts.
- Transport for NSW would consult with Road and Maritime Services and the OEH to identify potential opportunities to provide cumulative off-sets for the overall loss of *Melaleuca biconvexa*.

In addition, as described in section 7.1.7, Transport for NSW for also work to further refine the Project site boundary in order to limit impacts to vegetation as part of the New Intercity Fleet Maintenance Facility Project, including impacts to *Melaleuca biconvexa*.

8 ENVIRONMENTAL MANAGEMENT

8.1 Overview of environmental management system

8.1.1 Construction environmental management plan

A CEMP would be prepared for the construction phase of the Project. The CEMP would provide a centralised mechanism through which all potential environmental impacts would be managed. The CEMP would document mechanisms for demonstrating compliance with the commitments made in this REF, the submissions report (to be prepared following the public display of the REF), and other relevant statutory approvals. The CEMP would outline a framework for the management of environmental impacts during construction of the Project. The plan would address (at a minimum) the following elements:

- Traffic management
- Noise and vibration management
- Air quality management (including dust suppression)
- Landscape and rehabilitation plan
- Community and stakeholder involvement
- Aboriginal and non-Aboriginal heritage management
- Water and soil management
- Flora and fauna and weed management
- Soil and erosion management
- Contamination and waste management.

It is anticipated that the contractor appointed to undertake the construction of proposed New Intercity Fleet Maintenance Facility and associated works would prepare a CEMP for the works which would be reviewed and endorsed by Transport for NSW prior to the commencement of construction. It is also anticipated that Sydney Trains would be consulted during the preparation of all CEMP, due to some of the proposed works occurring within the existing rail corridor.

8.1.2 Operational environmental management

The initial responsibility for the operational environmental management of the New Intercity Fleet Maintenance Facility would be undertaken by the nominated supplier/maintenance operator for the New Intercity Fleet. This would revert to NSW Trains control once the fleet maintenance period for the supplier/maintenance operator contract has been completed.

Operational environmental management of the New Intercity Fleet Maintenance Facility would be managed through an operational environmental management plan (OEMP) (or similar plan) which would be developed during detailed design through consultation between Transport for NSW and the nominated maintenance operator for the New Intercity Fleet.

8.2 Management and mitigation measures

The REF has identified a range of environmental impacts that are likely to occur as a result of the Project. Table 8.1 to Table 8.3 provide a summary of the environmental management measures that Transport for NSW proposed to manage the potential environmental impacts associated with the construction and operation of the proposed intercity maintenance facility at Kangy Angy.

The safeguards and management commitments documented in Table 8.1 to Table 8.3 may be revised in response to submissions raised in response to the public display of this REF and/or design changes made subsequent to the public display of the REF. Transport for NSW would consider the final environmental management commitments when making a determination on the Project. If approved, the finalised safeguards and management measures would guide subsequent phases of the Project. The contractors appointed for the construction of the proposed intercity maintenance facility would be required to undertake all works in accordance with these environmental management measures.

8.2.1 Detailed design

Table 8.1 Detailed design environmental management measures

ID number	Environmental management measure
Biodiversity	
A.1	During detailed design, opportunities to further reduce the clearing of native vegetation would be investigated.
Noise and vibration	
B.1	When additional details are available for substations and other mechanical plant, they would be assessed and designed so that overall noise emission of the Project with all mobile and fixed noise sources does not exceed the environmental noise objectives of the project.
B.2	Noise mitigation for sources such as shunt vehicles; vehicle movement alarm systems; mechanical plant (including backup generator(s)) and PA systems would be addressed during the detailed design to ensure they meet the environmental noise objectives of the Project.
B.3	An acoustic enclosure or insulation for the substation would be considered during the detailed design so as to meet the relevant environmental noise objectives.
B.4	Alternative systems would be investigated for vehicle movement alarms, such as the use of visual alarms.
B.5	The design and suitability of noise barriers would be determined where required. Noise barriers have been considered to reduce noise levels from train arrivals and departures in addition to standing trains. The final height and locations of any proposed barriers would be subject to further investigation. Currently proposed barriers for consideration include (refer to Figure 6-1 of the *Noise and Vibration Impact Assessment)*: → A barrier of approximately five metres high above the track along the standing tracks south of the maintenance shed. The side of the barrier facing the noise sources would be acoustically absorptive or the barrier should include a combination of a vegetated earth berm and barrier. → A barrier to the full height of the train wash building which extends to fully block line of sight from the train wash exit to 26 Turpentine Road. Where noise barriers are considered to be the preferred treatment method, they would be required to be constructed so as to be solid and continuous with no gaps between the ground and barrier and between barrier panels. The barriers would be constructed of a material with a surface density of at least 12 kilograms per square metre
B.6	The adoption of any proposed treatments measures at the source of residential receivers would be considered (such as architectural upgrades).

ID number	Environmental management measure
Traffic, transport and access	
C.1	The following mitigation measures would be considered for the new intersection of Enterprise Drive and the proposed access road to the New Intercity Fleet Maintenance Facility as part of the detailed design: → Removal and banning of the northbound right turn from Enterprise Drive into Old Chittaway Road and turning this into a southbound short merge lane for right turners out of the new access road → Providing a seagull arrangement (a type of three-way road intersection usually used on high traffic volume roads and dual carriageways) to improve right turn movement from the new access road into Enterprise Drive → Vanning the right turn from Old Chittaway Road into Enterprise Drive → The use of a roundabout or signalised intersection at this location.
Land use and property	
D.1	Opportunities to further minimise impacts to properties (i.e. reduction to the Project footprint) would be undertaken during detailed design.
Hydrology, drainage and flooding	
E.1	A detailed Flood Impact Assessment of the site would be undertaken to provide more certainty regarding the impact the Project on the regional flood and local drainage processes, , and identify any required addition management and mitigation measures to minimise any potential flooding impacts.
E.2	A Hydrologic and Hydraulic assessment would be undertaken to confirm that additional structures with the same cross-sectional area as existing would not affect the existing drainage, and identify any required addition management and mitigation measures to minimise any potential stormwater and drainage impacts.
E.3	Where possible, all Project components would be design to be above the 1:100 AEP flood event (including climate change assumptions).
E.4	Culvert openings across the floodplain would be sized to minimise the impact on the existing floodplain and local drainage processes.
E.5	All culvert extensions would be designed to match the existing culvert openings to minimise impacts to the capacity of existing drainage infrastructure.
E.6	Scour protection would be provided at both ends of culvert extensions to reduce erosion and water quality impacts.
E.7	The proposed detention ponds would be designed so as to reduce sediment loads and pollutants entering streams. These detention ponds would be installed as early as possible during the construction phase of the Project.
E.8	Stormwater from heavily polluted areas such as workshop facilities should be treated with oil interceptors or other treatment measures discharged to sewers, where feasible.
Groundwater	
F.1	Additional investigation and assessment of dewatering requirements would be undertaken to assess the proposed excavation works.
F.2	Quantification of groundwater inflows to excavations and determination of extent of drawdown would be undertaken as part of the detailed design of the maintenance facility.
F.3	A dewatering management plan would be prepared which would include information on the groundwater levels, excavation dimensions, quantification of amount of dewatering required and method of disposal of dewatered groundwater.
F.4	Consultation with DPI | Water would be undertaken regarding any addition requirements, including licensing.

ID number	Environmental management measure
Climate change and greenhouse gases	
G.1	Detailed designs for the Project would take into consideration the potential effect of climate change on the Project, including drainage requirements and the potential for increased flood frequency.
G.2	Possible treatment measures which be considered during the detailed design phase would include: → Monitoring weather forecasts and specific weather warnings → Positioning fire extinguishers at site offices and within construction vehicles (in case of bushfires) → Being alert to fire warnings and notices → Keeping the construction site clear of debris wherever possible (in case of severe winds) → Considering specific measures for wet season as part of the broader ESCP → Ensuring major earthworks are planned to reasonably not coincide with periods of expected rainfall or high winds.
Public utilities	
H.1	A further detailed services search would be completed to ensure that construction does not damage existing services.
H.2	Consultation would be undertaken with all affected utility owners as part of the ongoing design of the Project.
Cumulative impacts	
I.1	The potential cumulative impacts associated with the Project would be further considered as the design develops and as further information regarding the location and timing of potential developments is released.

8.2.2 Construction

Table 8.2 Construction environmental management measures

ID number	Environmental management measure
General	
J.1	A CEMP would be prepared prior to the commencement of construction. This plan would incorporate the mitigation measures outlined below.
J.2	Consultation with Central Coast Council would be undertaken under the requirements of the Infrastructure SEPP (as detailed in Chapter 6).
Biodiversity	
K.1	As part of CEMP for the Project, a VMP would be developed to address potential biodiversity impacts. The VMP would include a series of measures to ensure ecological impacts are minimised, including the mitigation measures listed below.
K.2	During construction, the following general measures would be implemented: → All workers would be provided an environmental induction prior to starting work on site. This would include information on the ecological values of the site, protection measures to be implemented to protect biodiversity, and penalties for breaches. → The limits of clearing would be clearly demarcated on-site (where appropriate) prior to construction to avoid unnecessary vegetation and habitat removal. This could include the installation of fencing around the Project site footprint.

ID number	Environmental management measure
K.3	Pre-clearing and construction protocols would be implemented including: → An experienced fauna ecologist would check for the presence of flora and fauna species and habitat on site before clearing begins (such as the presence of bird nests) and would be present to supervise vegetation clearing and capture and relocate fauna where required. → Prior to construction, site personnel should be adequately informed of environmental management procedures including, but not limited to, issues related to flora and fauna management, weed control, erosion and sediment control (in accordance with Landcom's *Soil and Construction Managing Urban Stormwater,* March 2004). → Establish exclusion zones to protect vegetation and fauna habitat outside of the assessed and approved clearing limits, including the threatened ecological communities recorded within the study area (including Swamp Sclerophyll Forest, *Biconvex Melaleuca* and riparian areas). Vegetation to be retained are to be clearly defined on ground and 'no go zones' clearly signposted and fenced to prevent unauthorised clearing and vehicular and/foot traffic. → The limits of clearing would be clearly demarcated on-site (where appropriate) prior to construction to avoid unnecessary vegetation and habitat removal. This could include the installation of fencing around the Project site footprint. → Carefully clearing vegetation so as not to mix topsoil with debris and to avoid impacts to surrounding native vegetation. → Avoid excessive soil disturbance. → When accessing construction sites, contractors should only use designated access tracks.
K.4	Flora and fauna control measures would be implemented including: → Clearing of vegetation would be minimised, to only vegetation that is absolutely required to be removed in order to undertake work. → Noxious weeds would be managed in accordance with the *Noxious Weeds Act 1993.* → Protocols to prevent the introduction and/or spread of Chytrid fungus would be implemented. These protocols would be based on OEH Hygiene Protocol for the Control of Disease in Frogs.
K.5	Weed species would be managed in order to control them from further spread. Management techniques may include immediate weed removal and disposal without stockpiling, disposal of weed-contaminated soils at appropriate weed disposal facilities and to ensure that all equipment is cleaned prior to and on completion of works to ensure weeds are not introduced or spread to other locations.
K.6	A Biodiversity Offset Strategy would be prepared in accordance with the BioBanking Assessment Methodology to offset impacts associated with the project on biodiversity values in particular impacts to Swamp Sclerophyll Forest and *Melaleuca biconvexa*.
Noise and vibration	
L.1	As part of overall CEMP for the Project, a construction noise and vibration management plan (CNVMP) would be developed for the Project, prior to commencement of works. The management plan would include (but is not limited to) the following: → Identified nearby residences and other sensitive land uses → Approved hours of work and what work would be undertaken → Substantial noise and vibration generating activities → Details of noise mitigation and management measures to be applied → Information for worker training to minimise noise impacts → Community consultation protocol(s) → Complaints handling protocol(s).

ID number	Environmental management measure
L.2	During construction the standard mitigation measured contained within the Transport for NSW *Construction Noise Strategy* (CNS) would be used as the basis for the proposed mitigation measures to be included in the CNVMP. These measures would include: → All employees, contractors and subcontractors would receive an environmental induction → No swearing or unnecessary shouting or loud stereos/radios would be allowed site → No dropping of materials from height, throwing of metal items and slamming of doors would be permitted → A noise monitoring program would be carried out for the duration of the works in accordance with the CNVMP and any approval and licence conditions → Where feasible and reasonable, construction would be carried out during the standard daytime working hours. Work generating high noise and/or vibration levels should be scheduled during less sensitive time periods → High noise and vibration generating activities would only be carried out in continuous blocks, not exceeding three hours each, with a minimum respite period of one hour between each block → Quieter and less vibration emitting construction methods would be used where feasible and reasonable → The noise levels of plant and equipment would have operating sound power or sound pressure levels that would meet the predicted noise levels → Noise emissions would be considered as part of the selection process → Simultaneous operation of noisy plant within discernible range of a sensitive receiver would be avoided where possible → The offset distance between noisy plant and adjacent sensitive receivers would be maximised, where possible → Plant used intermittently would be throttled down or shut down when not in use → Noise-emitting plant to be directed away from sensitive receivers, where feasible → Traffic flow, parking and loading/unloading areas would be planned to minimise reversing movements within the site → Non-tonal reversing beepers (or an equivalent mechanism) would be fitted and used on all construction vehicles and mobile plant regularly used on site and for any out-of-hours work → Loading and unloading of materials/deliveries would occur as far as possible from sensitive receivers → Dedicated loading/unloading areas would be shielded if close to sensitive receivers → Delivery vehicles would be fitted with straps rather than chains for unloading, wherever possible → Stationary noise sources would be enclosed or shielded whilst ensuring that the occupational health and safety of workers is maintained → Structures to shield residential receivers from noise such as site shed placement; earth bunds; fencing; erection of operational stage noise barriers would be used (where practicable) and consideration of site topography when situating plant would be undertaken.
L.3	To minimise noise levels, the following work practices would be implemented: → Respite periods would be defined by those periods where the community is less sensitive to noise such as avoiding early morning and late afternoon. → Vehicles, obstacles and stockpiles would be used on site to provide shielding to receivers, especially for static noise sources such as generators, mulchers, mobile cranes and the piling rigs. → Minimising the potential for construction vehicles to access the site prior to 7.00 am along the new access road.

ID number	Environmental management measure
L.4	To minimise the risk of vibration impacts, the following would be considered: → Where possible, the use of less vibration intensive methods of construction or equipment would be considered to reduce the potential for cosmetic damage → All equipment would be maintained and operated in an efficient manner, in accordance with manufacturer's specifications, to reduce the potential for adverse vibration impacts → Where work requiring the use of vibratory rollers is required within 75 metres of a receiver, a roller of less than 200 kN rating would be used, where practical → Where work is required within close distances to sensitive receivers, site-specific safe working distances would be established on-site prior to the relevant vibration generating works commencing → If vibration intensive equipment is to be used within the safe working distances, attended vibration measurements would be undertaken when work commences to determine site specific safe working distances → Vibration intensive work would not proceed within the safe working distances unless a permanent vibration monitoring system is installed approximately one metre from the building footprint, to warn operators when vibration levels are approaching the peak particle velocity trigger levels.
L.5	To minimise the potential for sleep disturbance, where night works are proposed to be undertaken, the following controls would be implemented where feasible and reasonable: → Avoiding conducting noise intensive night works for more than two consecutive nights → Scheduling noise intensive activities to before 10.00pm → Schedule activities which are likely to cause maximum noise events such as deliveries, moving material or equipment and compacting works to avoid the night time period (10.00 pm to 7.00 am) → Educate workers on the importance of minimising noise and avoid creating short duration high noise level events → Inform surrounding residents by mail of planned works prior to the works commencing.
Visual and landscape character	
M.1	The following measures would be considered with respect to landscape design and vegetation impacts for the New Intercity Fleet Maintenance Facility: → Restricting vegetation clearing to those areas where it is necessary. Opportunities to minimise clearing would be identified as part of the ongoing development of the Project design → Ensuring a vegetation buffer of existing planting is left between within or outside the Project site boundary to provide visual screening of the facility where possible → Locating storage areas and associated works in cleared or otherwise disturbed areas away from sensitive native vegetation where possible → Avoiding stockpiling materials in areas supporting vegetation where possible → Trimming rather than the removal of trees should be considered where possible and to be conducted by a qualified arborist → Rehabilitating vegetated areas where ground is disturbed → Planting native trees and shrubs to screen built form and reduce the scale of the infrastructure → Reinforcing the local semi-rural landscape character through the use of appropriate native vegetation, including that from the identified endangered vegetation communities → Planting a graded screen of vegetation at varied heights that includes groundcover, shrub and tree layers to form an effective visual screen → Considering the use of advanced size trees for instant effect → Restoring areas disturbed by construction to match existing condition as far as practicable → Consider additional measures to reduce potential visual privacy impacts (such as overlooking of adjacent properties) from the new access road.

ID number	Environmental management measure
M.2	The following measures would be considered with respect to the final materials and finishes for the New Intercity Fleet Maintenance Facility: → All elements including lighting columns, roof lines, cladding etc. to be considered as a whole to simplify the structure and reduce clutter → Avoid reflective surfaces.
M.3	All lighting would be installed in a manner which minimises light spill to areas beyond the maintenance facility site boundary.
M.4	Tree planting outside the works boundary would be considered to assist in visually screening the facility. Offset planting for the removed vegetation would be required and would be undertaken with specialist ecological advice.
Non-Aboriginal heritage	
N.1	If the proposed development is changed to affect areas not included in the present report, further assessment of potential non-Aboriginal heritage impact would be undertaken.
N.2	Prior to commencement of works, a photographic archival record would be completed of the Turpentine Road/Chittaway Creek underpass. Copies of the record would be lodged with Sydney Trains, Central Coast Council, the local historical society and the Heritage Division, as required by these agencies.
N.3	Unexpected archaeological relics remain protected by the *Heritage Act 1977*. If a potential relic is found in the course of the work, work would cease in the vicinity, and the heritage Division of the Office of Environment and Heritage would be contacted for advice.
Aboriginal heritage	
O.1	If the extent and nature of the Project is altered, additional archaeological assessment would be undertaken to address this.
O.2	Due to the inability to adequately access and assess some parts of the site, an Aboriginal cultural heritage assessment report (ACHAR) would be completed for the areas of the Project site identified as having moderate or high potential for Aboriginal heritage. This would include Aboriginal community consultation and archaeological test excavation. This process would be undertaken in accordance with the following guidelines issued by the OEH: → *Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW* (OEH 2011) → *Code of practice for archaeological investigation of Aboriginal objects in New South Wales* (DECCW 2010) → *Aboriginal cultural heritage consultation requirements for proponents* (DECCW 2010).
O.3	If the results of the ACHAR confirm that Aboriginal objects are present and would be harmed by the proposed development, it would be necessary to apply for an Aboriginal Heritage Impact Permit (AHIP) prior to commencement of works.
O.4	During construction, should Aboriginal heritage items be uncovered, all work within the vicinity would cease and the Project Manager and Transport for NSW staff would be notified. The Department of Planning and Environment would also be notified in accordance with the *National Parks and Wildlife Act 1974*. Investigation of the significance of the find and approval by a suitably qualified archaeologist would be required prior to recommencement of works.
Traffic, transport and access	
P.1	A construction traffic management plan (CTMP) would be prepared as part of the pre-construction planning. The plan would be developed to address construction traffic and transport management and would also be used to develop site-specific traffic management measures once the construction methods and haulage routes are finalised.
P.2	Heavy vehicles would be restricted to the routes specified.

ID number	Environmental management measure
P.3	Disruption on the local road network would be minimised through the use of nominated haulage routes which aim to avoid sensitive areas such as schools, where possible (particularly the Central Coast Rudolf Steiner School and Follyfoot Farm Child Care Learning Centre).
P.4	Signs would be provided at each access point to assist in deliveries to each work site.
P.5	Traffic controllers would be located at each access point, where required and direct vehicle movements, vehicle deliveries, pedestrians and cyclists.
P.6	Emergency response protocols would be included in the CTMP for construction traffic incidents. Police/emergency services would respond to emergencies.
P.7	A pre and post construction assessment of road pavement assets would be conducted in areas likely to be used by construction traffic.
P.8	The potential for flooding on construction vehicle access roads would be identified and alternative access roads identified (as required).
P.9	Environmental controls would be installed at access roads so that mud or gravel is not tracked onto the road network from the access roads by construction vehicles (as required).
P.10	Public communications would be conducted to warn the community and local residents of vehicle movements and anticipated effects on the local road network relating to the site works. These methods would be detailed in the CTMP.
P.11	Access to all private properties adjacent to the works would be maintained during construction.
P.12	During Project inductions, all heavy vehicle drivers would be provided with the emergency response plan for construction traffic incidents.
P.13	Road safety audit(s) would be undertaken (where required or deemed necessary).
P.14	Project staging, vehicle movement and scheduling, equipment and resourcing would be co-ordinated throughout construction.
Socio-economic	
Q.1	The following measure would be undertaken to minimise impacts to local amenity and character of the area during construction: → Undertake consultation with sensitive receivers and adjacent residents about their concerns and suggestions for reducing the proposals impact, such as type of fencing, screening vegetation etc. → Ensure that consideration is given to lighting impacts from the proposal and that where possible lighting spill is directed away from surrounding residents → Develop and maintain a mechanism for recording and responding to complaints from the community with respect to air quality impacts on sensitive receptors → Consult with and inform all sensitive receptors regarding the timing of construction activities and provide advanced notice for activities which may be particularly dusty, noisy activities or which would involve night works → Develop and maintain a complaints register to monitor noise and vibration impacts on sensitive receivers.
Q.2	Rail customers would be notified in advance of any rail possession periods where works are proposed to be undertaken as part of the Project.
Q.3	The following measure would be undertaken to minimise impacts to business and other employment services during construction: → Where possible, Transport for NSW would ensure that employment opportunities for the local and regional population are maximised → Where possible, Transport for NSW would look to target sectors where unemployment is greatest, and maximise opportunities (through training opportunities) for youths and indigenous members of the community.

ID number	Environmental management measure
Q.4	The following measure would be undertaken to minimise impacts to safety and security during construction: → Best practices and processes would be adopted for safety and security in compliance with a Workplace Health and Safety Management Plan → All construction areas would be fenced off to restrict access to public → The facility would be designed to clearly delineate public areas from restricted areas → Clear sightlines would be provided throughout the maintenance facility, where possible → A lighting design which conforms to Australian and Sydney Trains standards and provides well-lit and uniform lighting to maintenance facility would be provided → Vegetation in and around the site would be maintained to a low height to improve surveillance opportunities → Where required, vandal resistant fittings and graffiti resistant surfaces would be considered as part of the detailed design → High security perimeter fencing and signage would be provided to deter unauthorised access to the maintenance facility, including suitable vehicle and pedestrian gates at appropriate locations around the perimeter of the site → High security locking devices, window treatments and electronic access control would be considered as part of the detailed design → Intruder alarm system(s) and closed-circuit television (CCTV) to monitor nominated restricted areas would be considered during detailed design → External lighting would be provided to vehicular and pedestrian movement areas, including roads, paths and car parks, in order to provide visibility and safety at night.
Land use and property	
R.1	Consultation and communication would be undertaken with property owners near the Project about any changes to property access and local access during construction and operation.
R.2	Ongoing consultation and communication with directly affected property owners about potential property acquisition would be undertaken prior to commencement of construction. This would include the provision of information on the timing of acquisition and the process for property acquisition.
R.3	Property acquisition would be managed in accordance with the *Land Acquisition (Just Terms Compensation) Act 1991.*
R.4	On completion of construction activities, land used for the temporary construction site, stockpiles and drainage sumps/basins would be revegetated and left in a stable condition. Where these properties have been leased by Transport for NSW, these properties would be returned to the original landowners following rehabilitation of the site(s).
Hydrology, drainage and flooding	
S.1	Site offices, staff facilities and construction compound would be located at least above the 1:100 AEP flood level, including an allowance for climate change. This may require these temporary structures to be installed on fill pads or piers.
S.2	Any temporary flood diversion works would be sized for a 1:20 AEP event to allow for the proposed construction program.
S.3	A flood evacuation plan would be developed prior to any work commencing on-site as part of the construction documentation.
S.4	No stockpiles would be located within high/medium flood risk areas or adjacent to existing culverts in order to reduce the potential impacts to surface water systems.
S.5	The proposed pier locations for the new rail bridge crossings would be situated so as to minimise the Projects impact on surface water flows and flooding.

ID number	Environmental management measure
S.6	All track drainage would be designed to meet Transport for NSW standards and Engineers Australia's Australian Rainfall and Runoff.
S.7	The existing track drainage system would remain operational throughout the construction of the main line siding and turnouts within the facility.
Groundwater	
T.1	A construction groundwater management plan would be prepared which would detail the control measures that aim to reduce potential impacts to groundwater. A groundwater monitoring program would be included in the plan, and outline the monitoring network and baseline requirements (number of piezometers, groundwater levels, and analytical suite) prior to the commencement of construction, enabling any changes to groundwater levels and quality during construction to be identified.
T.2	Excavation techniques and other mitigation measures would be implemented to minimise impacts to groundwater and reduce the take of water. Factors for consideration would include the duration the excavation would remain open, particularly in areas of expected higher inflows; the size of the excavation; the water table depth; and the material to be excavated.
T.3	Management and disposed of any encountered groundwater would occur in accordance with the waste classification guidelines (NSW EPA, 2014) and the water discharge and reuse guideline (Transport for NSW, 2015).
T.4	Preparation and implementation of hazardous material procedures would occur, including procedures for managing spills and refuelling.
Soils, geology and contamination	
U.1	An Erosion and Sedimentation Control Plan (ESCP) would be developed and maintained for the site in accordance with *Managing Urban Stormwater, Soils and Construction Guidelines* (Landcom, 2004). The plan would include site access controls preventing tracking of sediment from site, limiting the removal of groundcover and ensuring that the excavation works do not block natural drains or create undrained areas.
U.2	All material required for off-site disposal would be appropriately tested and classified against the Waste Classification Guidelines prior to being disposed of off-site (DECC, 2008).
U.3	Excavated material would be reassessed for reuse onsite.
U.4	Stabilised surfaces would be reinstated as quickly as practicable after construction.
U.5	Sediment would be prevented from moving off-site and sediment laden water prevented from entering any watercourse, drainage line or drainage inlet.
U.6	Site rehabilitation of disturbed areas would be undertaken progressively as activities are completed during the Project.
U.7	A hazardous material (hazmat) building survey be undertaken prior to demolition of any building structure, especially any structure likely to have been built (or include materials manufactured) before 1990.
U.8	The CEMP would include a contamination management plan and an asbestos management plan (if deemed to be required).
U.9	All fuels, chemicals and hazardous liquids would be stored within an impervious bunded area in accordance with Australian standards and EPA Guidelines.
U.10	Spill kits and a temporary refuelling bund would be installed and used onsite (where necessary).
U.11	If fill material is discovered during excavation works, the material should remain on-site where possible (where contaminant concentrations meet the National Environment Protection Council's National *Environment Protection (Assessment of Site Contamination) Measure 1999.*

ID number	Environmental management measure
U.12	Should any signs of contamination be identified during work within the site, the material would be tested against the National Environment Protection Council's National Environment Protection (Assessment of Site Contamination) Measure 1999, and managed accordingly.
U.13	Procedures for handling asbestos contaminated materials (if found on site), including record keeping, site personnel awareness and waste disposal would be undertaken in accordance with WorkCover requirements.
U.14	Characterisation of acid sulfate soil impacts in areas of known occurrence and preparation of an Acid Sulfate Soil Management Plan to manage potential impacts would be undertaken as part of the ESCP.
Waste and resource management	
V.1	All waste requiring off-site disposal would be classified in accordance with the OEH's *Waste Classification Guidelines* (DECCW 2009) prior to disposal. The following key waste mitigation and management strategies would be implemented throughout the construction of the Project and would be governed by the CEMP:
V.2	Removal of wastes from site would only be undertaken by a licensed contractor with appropriate approvals by the NSW DECCW under the POEO Act.
V.3	Construction materials would be purchased in accordance with an established procurement strategy that prioritises the selection of materials that utilise best practice recycled materials and sustainability ratings.
V.4	Where possible construction wastes would be diverted from landfill and recycled or reused within the Project areas or with an appropriate recycling contractor.
V.5	Sewage waste would be disposed of by a licensed waste contractor in accordance with Sydney Water and OEH requirements.
V.6	Construction materials that contain minimal embodied energy would be utilised.
V.7	Working areas would be maintained, kept free of rubbish and cleaned up at the end of each working day.
Air quality	
W.1	A Dust Management Plan would be produced as part of the overall CEMP. This would identify specific construction activities with potential to impact air quality and contain details of the site-specific mitigation measures to be applied. Additional guidance on the control of dust at construction sites in NSW is provided as part of the NSW EPA Local Government Air Quality Toolkit.
W.2	A mechanism for making, recording and responding to all air quality complaints from the community would be put in place during construction. This would include provision of relevant contact details and making the complaint log available to the local authority if requested.
W.3	Regular inspections of the work site to monitor compliance with the Dust Management Plan would be carried out. This would include an increased frequency of monitoring when activities with a high potential to produce dust are being carried out or during prolonged dry or windy conditions.
W.4	Dust mitigation measures would be developed and implemented prior to and during construction including: → Erection of solid screens around dusty activities where feasible → Planning of dusty work as far away as possible from sensitive receivers, where feasible → Use of wet methods and coverings for barriers and stockpiles → Water assisted dust sweepers would be used on the access and local roads to remove any material tracked out by the trucks → Dust suppression techniques such as ventilation during cutting, grinding or sawing activities would be used where required → Skips and chutes would be covered → An adequate supply of water would be maintained on site for dust/particulate matter suppression, including use of non-potable water where possible.

ID number	Environmental management measure
W.5	Construction plant and equipment would be well maintained so that vehicular emissions would be within relevant air quality standards.
W.6	All on-road vehicles would comply with relevant legislative requirements, where applicable, and where not in use for long periods of time, vehicles would be switched off.
W.7	The use of diesel or petrol powered generators would be avoided and mains electricity or battery powered equipment used where practicable. Where the use of this equipment is required, shielding or enclose would be utilised where possible to minimise impacts.
W.8	During earthworks, visual inspections for dust in windy or dry periods would be undertaken. Dust generating activities should be avoided or minimised during these periods. Appropriate water suppression measures would be used on exposed surfaces and equipment that may be generating dust.
Climate change and greenhouse gases	
X.1	During construction, the following mitigation measures would be implemented in order to reduce the amount of emissions: → Purchasing electrical energy derived from a renewable energy source, where available → Using low greenhouse gas-intensive construction materials (where a suitable substitute for a high greenhouse gas-intensive material is available) → Procuring construction services and materials locally to minimise the distance travelled and therefore emissions of vehicles accessing the site → Ensuring that deliveries are managed in an efficient manner to minimise the number of trips required and therefore reduce the amount of emissions → Implementing energy-efficient work practices, such as switching off construction plant, vehicles and equipment when not in use to minimise idling → Regularly monitoring, auditing and reporting on energy, resource use and associated greenhouse gas emissions as part of the environmental reporting requirements specified within the CEMP → Selecting materials during construction planning to ensure products that reduce embodied carbon are considered and used → Ensuring clearance of vegetation be limited to the minimum that is required for the Project → Ensuring all vegetation cleared be disposed of at a registered compost facility in the Sydney area and that it is not to be sent to landfill or burnt.
Bushfires	
Y.1	A Bushfire Management Plan would be incorporated into the overall CEMP for the Project, including emergency contact numbers in the event of a bushfire or emergency.
Y.2	The construction of the Project would ensure that an asset protection zone (APZ) around the Project site is provided for the life of the development, comprising an area of physical separation between all built structures and potential bushfire hazards. This could include elements such as the new access road and the proposed detention ponds.
Y.3	Appropriate access tracks would be maintained to all sections of the Project site during construction and operation to allow safe access, egress and a defendable space for emergency services in the event of a bushfire or emergency.
Y.4	The CEMP would include emergency evacuation procedures in the event of a bushfire or emergency. This would include a map of all potential access tracks to and from the site, in addition to the primary access route for site personnel.
Y.5	The CEMP would stipulate a ‘no smoking’ policy for site personnel whilst working within or surrounding the Project site during construction or operation of the maintenance facility.
Y.6	The emergency/evacuation plan for the site would be prepared in accordance with the relevant NSW Rural Fire Service Guidelines for the preparation of emergency/evacuation plan(s).

ID number	Environmental management measure
Y.7	Sources of gas and electricity would be located so as not to contribute to the risk of fire or impede the firefighting effort.
Public utilities	
Z.1	Should the location of any utilities be identified to be in conflict with the Project, a formal review of the proposed works at these location(s) would be undertaken in consultation with the construction contractor. Alternative arrangements would then be determined to provide the most beneficial outcome for the community, service provider and proposal in terms of safety and constructability. The strategy for the preferred hierarchy of utilities treatment as part of the Project would be as follows: → Do nothing – avoid impact on utilities where possible → Protect – protect utilities in their existing locations where feasible → Modify access – modify manholes/chambers to provide side access outside the alignment of the Project, where these are located beneath the proposed alignment → Relocate – utilities to be relocated only where no other options are feasible or acceptable.
Z.2	The nominated construction contractor would be responsible for monitoring existing utilities to ensure they are protected properly from damage during construction.
Z.3	A contingency management plan would be prepared to detail contingency planning in case of service interruption.
Z.4	All construction works which are near or around utilities would be carried out in accordance with relevant legislative requirements including, but not limited to: → *Work Health and Safety Act 2011* → *Safety Regulation 2001 on Work near Underground Assets* → *Dial Before You Dig Asset Protection Guidelines.*
Hazard and risk	
AA.1	Any storage of hazardous materials, and refuelling/maintenance of construction plant and equipment, would be undertaken in clearly marked designated areas that are designed to contain spills and leaks with appropriate bunding.
AA.2	Machinery would be checked daily to ensure there is no leaking oil, fuel or other liquids.
AA.3	A Work Health and Safety Plan would be developed to manage construction safety hazards for the facility.
AA.4	Contingency plans would be developed to deal with any spills which might occur during construction.
AA.5	All hazardous materials spills and leaks would be reported immediately to site managers and Transport for NSW or Sydney Trains as required. Actions would be immediately taken to remedy spills and leaks.
AA.6	Chemical spill kits would be readily available and accessible to construction workers. Kits would be kept at site compounds and on specific construction vehicles. Environmental control maps and/or site maps would illustrate the location of the spill kits.
Cumulative impacts	
AB.1	Transport for NSW and the nominated contractor would consult with the proponents of other major Projects in the area to avoid any potential cumulative impacts.
AB.2	Transport for NSW would consult with Road and Maritime Services and the OEH to identify potential opportunities to provide cumulative off-sets for the overall loss of *Melaleuca biconvexa*.

8.2.3 Operation

Table 8.3 Operational environmental management measures

ID number	Environmental management measure
Noise	
AC.1	An operational noise and vibration management plan would be developed which would include management strategies designed to meet the environmental noise objectives for the project and would include consideration of: → Alternative methodologies for horns, warning signals and horn testing at the facility → Standing of trains outside of the maintenance building and on standing tracks six and seven during evening and night periods → Restrictions on external cleaning during the evening and night period → Strategies to control other noise sources such as shunt vehicles; vehicle movement alarm systems; mechanical plant (including backup generator(s)) and PA systems.
AC.2	The maintenance shed would be constructed to achieve a sound insulation performance no less than 26 dB R_w (weighted sound reduction index).
AC.3	The maintenance shed doors would remain closed when activities are occurring inside the sheds, where reasonable.
Traffic, transport and access	
AD.1	The following management and mitigation measures would be implemented during operation, where these are reasonable and feasible: → Limiting of vehicle trips to outside of the road network peak hour for improved safety and intersection operation, where possible or practicable → Scheduling delivery and service vehicles to the site out of peak hour periods, where possible or practicable → Informing staff and visitors to the site of the preferred travel route and primary site access → Monitoring intersection access and obtain feedback from staff on its operation → Monitoring any parking overflow on the surrounding road network (if any).
Groundwater	
AE.1	A hazardous material procedure, including procedures for managing spills and refuelling, would be developed and implemented to minimise groundwater contamination from chemical spills and leaks.
Air quality	
AF.1	During operation of the facility, ancillary service vehicles and maintenance equipment would be operated and maintained in accordance with the manufacturer's requirement and the POEO Act.
Climate change and greenhouse gases	
AG.1	A climate change risk management plan would be developed as part of the CEMP and would provide opportunities to manage climate change risks to the Project into the future as data on climate change impacts becomes more robust.

ID number	Environmental management measure
Hazard and risk	
AH.1	An incident emergency spill plan would be developed for the site. The plan would include measures to avoid spillages of fuels, chemicals, and fluids onto any surfaces or into any adjacent/nearby waterways. An emergency spill kit would be kept on site at all times.
AH.2	All staff would be made aware of incident emergency procedures and the location of emergency spill kits.
AH.3	The maintenance facility would be designed to comply with Sydney Trains operational safety, signalling and operating procedures. Operational hazards would be managed through TfNSW's standard procedures for hazard and risk that are currently in place across the entire rail network.

9 CONCLUSION

9.1 Justification for the New Intercity Fleet Maintenance Facility Project

The need for investment in train maintenance facilities across NSW is ultimately linked to the current fleet size and its composition. The primary need for the proposed New Intercity Fleet Maintenance Facility is a direct result of the current procurement of the New Intercity Fleet trains and the requirement to adequately maintain these trains. However, an opportunity also exists to improve current train operations across the Sydney metropolitan network through the development of the New Intercity Fleet Maintenance Facility at a site in Kangy Angy on the NSW Central Coast.

Overall, the key factors driving the need for development of the New Intercity Fleet Maintenance Facility at Kangy Angy include the following:

- *Need for additional maintenance capacity* – driven by an overarching requirement for additional maintenance capacity to cater for the increase in the intercity fleet size and to mitigate the lack of spare capacity at the current maintenance facility sites to accommodate the new trains
- *The need for a dedicated New Intercity Fleet Maintenance Facility* – development of a New Intercity Fleet Maintenance Facility relates to the need for a dedicated maintenance capacity of the New Intercity Fleet, which is driven by:
  - the preference to consolidate maintenance capability for a given fleet in one location
  - constraints on the design and layout of existing maintenance facilities
  - governance associated with the operation and management of existing maintenance facilities
- *A preference for an outer metropolitan facility* – it has been identified that the provision of such a facility would have a number of benefits including:
  - increasing fleet availability across the broader network
  - avoiding constraints associated with increasing metropolitan train movements and freeing maintenance capacity in Sydney for future growth in the suburban fleet.

Further discussion regarding the overall need and justification for the New Intercity Fleet Maintenance Facility Project has been provided in Chapter 2 of this REF.

9.2 Sustainable development considerations

As described in section 4.2.7, Transport for NSW is committed to ensuring that its Projects are implemented in a manner that is consistent with the principles of ecologically sustainable development (ESD). These principles would be incorporated into Transport for NSW's management systems for the New Intercity Fleet Maintenance Facility Project.

Table 9.1 summarises how the four principles of ESD have been addressed through the New Intercity Fleet Maintenance Facility Project design and assessment processes.

Table 9.1 Adherence with the principles of ESD

ESD principle	Adherence
Precautionary principle	The assessment of the potential impacts of the Project is considered to be consistent with the precautionary principle. The environmental investigations undertaken for this REF have been consistent with accepted scientific and assessment methodologies (refer to Chapter 7, and attached technical assessments in Appendix A to Appendix J). The detailed investigations undertaken have identified a range of potential impacts associated with the construction and operation of the Project. The Project has sought to take a precautionary approach to minimising environmental impacts. This has been applied through the development of a range of environmental management and mitigation measures, as summarised in Chapter 8. These measures would be implemented during construction and operation of the Project. Evaluation and assessment of alternative options for the Project (as detailed in Chapter 3 of this REF) has also aimed to reduce the risk of serious and irreversible impacts on the environment as a result of the Project. No management and mitigation measures have been postponed as a result of lack of scientific certainty. The nominated construction contractor would also be required to prepare a Project CEMP prior to commencing construction. No mitigation measures or management mechanisms would be postponed as a result of a lack of information.
Intergenerational equity	The Project would benefit future generations by providing an improved set of intercity fleet trains to respond to current passenger demands and crowding levels on current intercity services. The New Intercity Fleet Maintenance Facility Project would provide Transport for NSW with the capacity to maintain its new fleet in one location and therefore continue to provide quality services to its customers. The Project would therefore contribute towards regional strategic benefits for future generations by providing the facility to maintain the expanded fleet. It is acknowledged that the Project may have some adverse impacts on the current generation, generally through the proposed environmental impacts, and land acquisition requirements, in addition to temporary impacts during the construction period. However, these are not considered to be of a nature or extent such that they should warrant disadvantage to future generations.
Conservation of biological diversity and ecological integrity	Potential impacts on species and vegetation communities of local, regional, national and State significance were assessed as described in section 7.1. As identified, a significant impact has been identified for one threatened species and EEC (*Melaleuca biconvexa*) which would result in impacts to the biological diversity and ecological integrity of the site. Mitigation measures have been proposed to minimise biodiversity impacts of the Project (refer Chapter 8), with the aim of conserving biological diversity and ecological integrity in the area. In addition, a SIS has also been prepared to assess the specific ecological impacts associated with the Project. A more detailed set of mitigation measures would also be developed for specific species identified within the subject site and these would be provided within the SIS for the Project.
Improved valuation, pricing and incentive mechanisms	Environmental and social issues were considered in the strategic planning and establishment of the need for the Project and in consideration of the various site location options. The value placed on environmental resources was considered throughout the planning, environmental investigations and design for the Project management and mitigation measures summarised in Chapter 8 of this REF.

9.3 Clause 228 considerations

Table 9.2 provides a summary checklist of matters to be considered under clause 228 of the Environmental Planning and Assessment Regulation 2000.

Table 9.2 Clause 228 considerations

	Clause 228 considerations	Impact
a	**Any environmental impact on a community?** Some adverse effects on the local community are anticipated during the construction of the Project, particularly in relation to construction noise and vibration, heavy vehicle movements, visual amenity and dust generation during certain weather conditions. Operational noise impacts are expected residential properties and the child care centre nearby the Project area (refer to section 7.2). Feasible and reasonable noise mitigation measures that could be adopted for the Project are summarised in section 7.2.6. Some visual impacts would be experienced by nearby residences that may have filtered views of the most prominent elements of the Project. Mitigation measures to manage visual impacts of residential receivers are described in section 7.3.5 and Chapter 8.	Long-term negative
b	**Any transformation of a locality?** The Project introduces an industrial element into the landscape of greater scale and bulk than was previously present. This development also has associated noise and visual impacts. This would have an impact on the landscape character of the immediate Project area and the surrounding areas. Visual and noise impacts would be managed through the mitigation measures described in sections 7.2.5 and 7.3.5 and Chapter 8.	Long-term negative
c	**Any environmental impact on the ecosystems of the locality?** The Project would result in clearing of up to approximately 42.3 hectares of vegetation and habitat (including approximately 30.2 hectares of native vegetation), subject to further refinement during detailed design. This vegetation clearing would remove areas of the Swamp Mahogany – Cabbage Palm swamp forest, considered consistent with the Swamp Sclerophyll Forest on the Coastal Floodplains on the NSW North Coast, Sydney Basin and South East Corner Bioregion listed as endangered under the TSC Act. Approximately 5,014 plant stems of *Melaleuca biconvexa* (listed under as Vulnerable under the TSC Act and EPBC Act) were recorded within the Project site. Of these, 3,984 are to be impacted by the project whilst the remaining 1,030 would be expected to be retained, be retained. Additionally, vegetation which acts as habitat for up to 38 threatened fauna species of the area which have the potential to occur in the vicinity of the Project would be impacted. Impacts to aquatic features and groundwater dependant ecosystems are also predicted as a result of the Project. Biodiversity impacts associated with the Project are further discussed in section 7.1 and Appendix A. Impacts on flora and fauna would be managed through a range of best practice management measures (refer Chapter 8 and section 7.1.7). As a significant impact on a threatened species listed as Vulnerable under both the TSC Act and EPBC Act (*Melaleuca biconvexa*) has been identified, a SIS has also been prepared to assess the specific ecological impacts associated with the Project.	Long-term negative
d	**Any reduction of the aesthetics, recreational, scientific or other environmental quality or value of a locality?** The Project is expected to have some ecological and visual impacts on the study area, as described in sections (a) to (c) above, resulting in some reduction to the aesthetic and overall environmental quality of the locality. These impacts would also impact on the rural and bushland landscape character of the locality. The most noticeable impacts would be to the woodland bushland landscape of the area due to vegetation clearing required for construction. The Project would not however result in substantial impacts to the recreational or scientific value of the locality.	Long-term negative

	Clause 228 considerations	Impact
e	**Any effect on a locality, place or building having aesthetic, anthropological, archaeological, architectural, cultural, historical, scientific or social significance or other special value for present or future generations?** No formal non-Aboriginal heritage items have been identified within the study area. Some potential heritage items have been identified, however these items are not anticipated to be substantially impacted by the Project. There are no known Aboriginal heritage items identified within the immediate Project (refer to section 6.2), however a portion of the Project site has been identified as having moderate archaeological potential. Excavation work may uncover or harm previously undiscovered Aboriginal objects. Measures would be adopted during construction to manage and protect any unexpected Indigenous items, should such items be uncovered (refer to Table 8.2). Overall, the Project is not anticipated to have a substantial effect on the aesthetic, anthropological, archaeological, architectural, cultural, historical, scientific or social significance of the locality.	No anticipated impacts
f	**Any impact on the habitat of protected fauna (within the meaning of the *National Parks and Wildlife Act 1974*)?** There would be required clearing of 50.6 hectares of vegetation some of which acts as potential habitat for potentially up to 38 threatened fauna species inclusive of Varied Sittella, Southern Myotis, Grey-headed Flying-fox, Eastern Bent-wing Bat and Little Bentwing-bat, which were recorded in the study area during targeted surveys. There is also potential risk of fauna injury or death during the Project's construction phase. Other potential impacts include habitat fragmentation, increased edge effects, weeds, noise and vibration impacts to fauna and pathogens (refer to section 7.1.4). Measures to mitigate the effects of the construction and operation of the Project are described in section 7.1.7.	Long-term negative
g	**Any endangering of any species of animal, plant or other form of life, whether living on land, in water or in the air?** As discussed in (c) and (f) above, there would be requirement for clearance of native vegetation for the construction of the Project. Parts of this vegetation are consistent with threatened ecological communities and include threated fauna and flora species. Excavation and other works during construction, including noise, light and vibrations may impact local terrestrial and aquatic species as discussed in section 7.1, 7.9 and 7.10 of this REF. The Project would also contribute to a number of key threatening processes listed by the TSC Act, FM Act and EPBC Acts (refer to section 7.1.6). Measures to mitigate the effects of the construction and operation of the Project are described in section 7.1.7, 7.9.4 and 7.10.4.	Long-term negative
h	**Any long-term effect on the environment?** The New Intercity Fleet Maintenance Facility Project would cause some permanent noise and visual impacts to nearby residential receivers. The noise and visual impacts would be localised and managed through the implementation of mitigation measures specified in 7.2.6 and 7.3.5. The facility would also remove several hectares of moderate-good quality bushland. Mitigation measures to minimise the adverse impacts on the natural vegetation of the area are described in section 7.1.7.	Long-term negative
i	**Any degradation of the quality of the environment?** There is the potential for contamination of land, surface and groundwater as a result of the construction and operation of the Project (refer to section 7.9, 7.10 and 7.11). Amenity related impacts associated with the Project may also detract from the quality of the environment, particularly in respect of construction activities resulting in noise and vibration, visual amenity and dust generation. These impacts are expected to be manageable through the implementation of the safeguards and management measures outlined in this REF.	Long-term negative Short-term negative
j	**Any risk to the safety of the environment?** Any construction safety hazards would be managed by a Work Health and Safety Plan. Management measures have been proposed to minimise risks associated with encountering contaminated land, groundwater as well as their subsequent disposal. Through implementation of the proposed management and mitigation measures within this REF, it is not anticipated that the Project would result in any substantial risks to the safety of the existing environment.	Nil

	Clause 228 considerations	Impact
k	**Any reduction in the range of beneficial uses of the environment?** The development of the Project would not result in a reduction in the range of beneficial uses of the environment as the Project site would be located on primarily unused land owned by Central Coast Council and land within the Main North railway corridor. Some reduction to the use of some private property would occur where the Project is not able to be accommodated within Central Coast Council land or within the Main North railway corridor.	Long-term negative
L	**Any pollution of the environment?** There is the potential for water and soil pollution during the construction of the Project as a result of excavation and other construction works. There would also be some exceedances in noise levels during construction and operation. These impacts are expected to be manageable through the implementation of the safeguards and management measures outlined in this REF.	Short-term negative
m	**Any environmental problems associated with the disposal of waste?** Waste generated by the Project would be managed through the waste hierarchy established under the *Waste Avoidance and Recovery Act 2001*. All waste requiring off-site disposal would be classified in accordance with the NSW Office of Environment and Heritage's *Waste Classification Guidelines 2009* prior to disposal.	Short-term negative
n	**Any increased demands on resources (natural or otherwise) that are, or are likely to become, in short supply?** There would be no substantial increase in demand on resources that would likely become in short supply as a result of the Project.	Nil
o	**Any cumulative environmental effect with other existing or likely future activities?** Cumulative environmental effects of the New Intercity Fleet Maintenance Facility Project with other known developments within the study area have been assessed in section 7.18. The safeguards and management measures documented in this REF are considered to be adequate in managing the potential cumulative impacts identified.	Nil
p	**Any impact on coastal processes and coastal hazards, including those under Projected climate change conditions?** As identified in section 5.3 of this REF, part of the New Intercity Fleet Maintenance Facility Project is located within the SEPP 71 coastal zone. However, given the nature of the Project and the location away from the immediate coastline, it is not anticipated that the Project would impact on coastal processes or coastal hazards, including those Projected under climate change conditions.	Nil

9.4 Consideration of matters of national environmental significance

Table 9.3 provides a summary checklist of matters of national environmental significance to be considered under the Commonwealth EPBC Act.

Table 9.3 Check-list of EPBC Act matters

	EPBC Act matter	Impact
a	**Any impact on a World Heritage property?** There are no World Heritage properties in the vicinity of the Project.	Nil
b	**Any impact on National Heritage Places?** There are no National Heritage Places in the vicinity of the Project.	Nil
c	**Any impact on wetlands of international importance (declared Ramsar wetlands)?** There are no wetlands of international importance in the vicinity of the Project.	Nil

	EPBC Act matter	Impact
d	**Any impact on Commonwealth listed threatened species and ecological communities?** A desktop search has predicted that 23 threatened flora species and two EECs listed under the EPBC Act may occur within 10 kilometres of the Project site. Of these the Biconvex Paperbark (*Melaleuca biconvexa*) has been recorded in the Project site and surrounding area and would be impacted by the Project. Three of the remaining species identified have also been identified to have a moderate likelihood of occurrence. As a result of the potential impact to *Melaleuca biconvexa*, a SIS has been prepared to assess the potential impacts. Approval of the SIS would be determined by the NSW OEH. An EPBC Act referral application was also made to the Commonwealth Department of Environment in March 2016 to consider whether the Project would be considered to be a controlled action.	Negative significant impact
e	**Any impact on Commonwealth listed migratory species?** There are 15 migratory species under the EPBC Act which have the potential to occur within the vicinity of the Project. Impact on these species is however considered to be minimal.	Negative impact
f	**Any impact on a Commonwealth marine area?** The Project is not located in the vicinity of a Commonwealth marine area.	Nil impact
g	**Any impact on Commonwealth land?** The Project would not affect Commonwealth land.	Nil impact
h	**Any impact on the Great Barrier Reef Marine Park?** The Project is not located in the vicinity of the Great Barrier Reef Marine Park.	Nil impact
i	**Does any part of the Project involve a nuclear action?** No nuclear actions are proposed as part of the Project.	Nil impact
j	**Is the proposed action to be taken by the Commonwealth or a Commonwealth agency?** The Project would not be undertaken by the Commonwealth or a Commonwealth agency.	Nil impact

9.5 Significance of the environmental impacts

The potential impacts of the Project have been considered in accordance with the requirements of the EP&A Act (section 111), the EP&A Regulation (clause 228) and the EPBC Act. Having regard to these provisions, a significant impact on a threatened species listed as Vulnerable under both the TSC Act and the EPBC Act (*Melaleuca biconvexa*) and one EEC (Swamp Mahogany – Cabbage Palm swamp forest) has been identified.

With respect to the significance of the environmental impacts associated with the Project, Section 112(1C) of the EP&A Act states the following:

> *An environmental impact statement is not required (despite subsection (1) (a)) in respect of an activity that:*
>
> *(a) is on land that is, or is part of, critical habitat, or is likely to significantly affect threatened species, populations or ecological communities, or their habitats, and*
>
> *(b) is not likely to significantly affect the environment except as described in paragraph (a),*
>
> *if the determining authority has obtained or been furnished with a species impact statement in respect of the activity, prepared in accordance with Division 2 of Part 6 of the* Threatened Species Conservation Act 1995*.*

As such, a SIS has been prepared as part of the assessment of the Project. With the implementation of suitable management and mitigation measures which have been identified as part of this environmental assessment and summarised in Chapter 8, the remaining impacts associated with the Project are not anticipated to be significant. Therefore an EIS is not considered to be required for the Project.

9.6 Conclusion

This REF has assessed the construction and operation of the proposed New Intercity Fleet Maintenance Facility at Kangy Angy. The key potential impacts associated with the Project have been identified as comprising:

- Biodiversity – including the loss of existing vegetation, some of which has been identified as threatened species and an ECC
- Noise and vibration – including impacts during both construction and operation of the Project
- Landscape and visual character impacts – including changes to the rural-residential nature of the existing environment
- Traffic and transport – which would primarily occur during the construction of the Project
- Hydrology, flooding and groundwater – including the potential to be impacted by the 1:100 year flooding event, in addition to construction impacts associated with high groundwater levels
- Aboriginal heritage – including the potential to identify currently undiscovered Aboriginal artefacts within the site.

Chapter 7 of this REF provides a detailed assessment of the likely effect of the Project including the key impacts listed above. As identified previously, a significant on a threatened species listed on the TSC Act and one EEC has been identified and a SIS has subsequently been prepared to assess these impacts. Assessment and determination of the SIS would be undertaken by the NSW OEH. The SIS would outline a range of detailed management and mitigation measures to minimise the impacts of the Project on the existing ecological environment.

With respect to the other identified impacts associated with the Project, through the implementation of suitable management and mitigation measures as identified throughout this report, the remaining impacts associated with the Project are not anticipated to be significant, and therefore an EIS is not considered to be required for the Project.

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- EMGA Mitchell McLennan (EMM) 2015, *Preliminary Ecological Assessment, New Intercity Maintenance Facility.* Prepared for Transport for NSW, 15 October 2015.
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