

TECHNICAL REPORT

INLAND
RAIL 

12

Landscape and visual assessment

NARROMINE TO NARRABRI ENVIRONMENTAL IMPACT STATEMENT

 ARTC

The Australian Government is delivering
Inland Rail through the Australian
Rail Track Corporation (ARTC), in
partnership with the private sector.



ARTC Inland Rail
Narromine to Narrabri Project
Landscape and Visual Assessment
Technical Report 12

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Executive summary

The proposal

The Australian Government has committed to delivering a significant piece of national transport infrastructure by constructing a high performance and direct interstate freight rail corridor between Melbourne and Brisbane, via central-west New South Wales (NSW) and Toowoomba in Queensland. Inland Rail is a major national program that will enhance Australia's existing national rail network and serve the interstate freight market.

The proposal consists of about 306 kilometres of new single-track standard gauge railway with crossing loops. The proposal also includes changes to some roads to facilitate construction and operation of the new section of railway, and ancillary infrastructure to support the proposal.

The proposal would link the Parkes to Narromine section of Inland Rail located in central western NSW, with the Narrabri to North Star section of Inland Rail located in north-west NSW.

Australian Rail Track Corporation Ltd (ARTC) ('the proponent') is seeking approval to construct and operate the Narromine to Narrabri section of Inland Rail ('the proposal').

The proposal is State significant infrastructure and is subject to approval by the NSW Minister for Planning and Public Spaces under the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act). The proposal is also determined to be a controlled action under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), and requires approval from the Australian Minister for the Environment.

This report

This Landscape and Visual Assessment has been prepared on behalf of ARTC for the proposal to support the environmental impact statement (EIS) for the proposal and responds to the Secretary's Environmental Assessment Requirements (SEARs) for visual amenity.

The assessment presented in this report has included a review of relevant legislation, consideration of the existing conditions, an impact assessment to determine the significance of landscape and visual impacts as a direct result of the construction and operation of proposal, a cumulative impact assessment and discussion of the potential visual impacts of the proposal from lighting. Recommended mitigation and management measures were identified in response to the impact assessment findings.

Existing landscape and visual context

A study area for the Landscape and Visual Assessment was established and was defined as land within five kilometres of the proposal.

State and local legislation and policies relevant to the protection of landscape character, views and lighting within the study area are identified in this assessment. The key landscape and visual values and features for the study area as reflected in relevant legislation and policy include established vegetation, scenic values of waterways, and the distinctive local character of the rural landscapes.

These values, along with a comprehensive desktop analysis and site inspections informed the definition of the landscape and visual baseline. This information has informed the identification of six distinctive landscape character zones (LCZ) within the study area:

- LCZ 1: Slopes and Plains
- LCZ 2: Waterways and Floodplains

- LCZ 3: Warrumbungles Slopes and Uplands
- LCZ 4: Pilliga Forests
- LCZ 5: Township (alluvial plain)
- LCZ 6: Township (floodplain).

Impact assessment

To address the SEARs, the assessment of the potential impacts on landscape character and visual amenity was undertaken on the six LCZs and from 32 publicly accessible viewpoints. Twenty-three viewpoints focused on the rail and road infrastructure associated with the proposal and nine viewpoints were focused on the borrow pits associated with the proposal.

The impact assessment on landscape character found that the proposal would have a moderate significance of impact on LCZ 4, a moderate to low significance of impact on LCZ 2 and LCZ 3, a low significance of impact on LCZ 1 and LCZ 5, and a negligible significance of impact on LCZ 6. This was due to the proposal elements being characteristic within the existing landscape or a majority of key landscape features such as extensive vegetation and topographical features being retained. Where proposal elements were out of character with the existing landscape, the assessment identified that there was potential to mitigate through the detailed design. The highest impact was due to the magnitude of proposed change associated with vegetation clearing within a dense forested environment, combined with local values in this area.

The visual impact assessment on the 23 viewpoints (VP) associated with the rail and road infrastructure identified sensitive receivers as residents on the outer edges of townships and within rural land, road users, workers, and visitors to recreational areas. The most substantial impacts were found to be moderate from VP14 and VP22, this was due to vegetation removal (VP14) and the introduction of a new rail bridge (VP22). Two recreation areas were assessed, and the impacts were found to be negligible.

The impact assessment on the borrow pits was undertaken from nine viewpoints for three of the borrow pits visited during a site inspection, borrow pit A, B and C. A desktop assessment was undertaken for the fourth borrow pit, borrow pit D. The most significant impacts were found to be moderate from VP28 (borrow pit B) due to the residential receiver and the extent of changes.

The construction impacts were addressed through a general discussion, and assessments were provided at viewpoint locations. The most significant visual construction impacts were from sensitive receiver locations within the viewshed of construction compounds, proposed bridges, and temporary workforce accommodation sites.

A cumulative impact assessment was undertaken, taking into consideration seven major development projects within 50 kilometres of the proposal. The assessment identified the greatest cumulative impact would be associated with the connection point to the Narrabri to North Star section of Inland Rail, due to the similarity to the proposal in scale and form, the likelihood of the project being implemented within a similar timeframe, and the likelihood of combined visibility.

The proposal is located within the Dark Sky Region, an area within 200 kilometres of the Siding Spring Observatory. Potential impacts from lighting during operation were discussed, with no significant impact to the Dark Sky Region. During construction, potential impacts are expected to be limited, and managed in accordance with *AS 4282-1997 Control of the Obtrusive Effects of Outdoor Lighting*, principles provided within the *Dark Sky Planning Guideline: Protecting the observing conditions at Siding Spring* (Department of Planning and Environment, 2016), and through consultation with Siding Spring Observatory.

Recommended mitigation measures

Mitigation and management measures were provided in response to potential impacts identified in the landscape and visual assessment. These were developed for the detailed design, construction and operation phases of the proposal.

During detailed design, an urban design and landscape framework and plan would be undertaken, incorporating mitigation measures such as vegetation screening in strategic locations near structures and within the viewshed of sensitive receivers, and urban design of proposed structures for integration into the existing landscape character and visual environment. Vegetation removal may be avoided by minimising the construction and operation footprints of the proposal, and batter slopes are recommended to be integrated into the surrounding landscape and appropriately stabilised to ensure successful planting. Lighting would be designed in accordance with relevant standards and guidelines, and borrow pits would be rehabilitated as per the *ARTC Inland Rail Narromine to Narrabri Borrow Pit Rehabilitation Strategy* (JacobsGHD, 2020c).

During construction, recommended measures are proposed to reduce impacts associated with construction compounds, temporary workforce accommodation, tree removal and light spill, including sensitive design of construction compounds incorporating screening where required, tree protection measures, and appropriate lighting design to minimise glare and light spill on potentially affected visual receivers.

During operation, mitigation measures integrated through detailed design such as proposed vegetation, would be subject to ongoing monitoring and maintenance in accordance with standard operating procedures.

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Glossary and abbreviations

Acronym / term	Definition
ARTC	Australian Rail Track Corporation
CPTED	Crime prevention through environmental design
DEM	Digital elevation model
EIA	Environmental Impact Assessment
EIS	Environmental Impact Statement
EP&A Act	<i>Environmental Planning and Assessment Act 1979</i>
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i>
GIS	Geographic Information Systems
landscape	All aspects of a tract of land, including landform, vegetation, buildings, villages, towns, cities and infrastructure.
landscape quality (condition)	A measure of the physical state of the landscape. It may include the extent to which typical character is represented in individual areas, the intactness of the landscape, and the condition of individual elements.
landscape value	The relative value that is attached to different landscapes by society. A landscape may be valued by different stakeholders for a whole variety of reasons.
LVA	Landscape and Visual Assessment
LCZ	Landscape Character Zone
LGA	Local Government Area
LIHEMA	Landscape Institute and Institute for Environmental Management and Assessment
MNES	Matters of National Environmental Significance
NSW	New South Wales
OEH	Office of Environment and Heritage
photomontage	A visualisation which superimposes an image of a proposed development upon a photograph or series of photographs.
the proposal	Defined as the construction and operation of the Narramine to Narrabri section of Inland Rail.
the proposal site	Defined as the area that would be directly affected by construction of the proposal (also known as the construction footprint). It includes the location of proposal infrastructure, the area that would be directly disturbed by the movement of construction plant and machinery, and the location of the compounds and laydown areas that would be used during construction.
rail corridor	The corridor within which the rail tracks and associated infrastructure would be located.
SEARs	Secretary's Environmental Assessment Requirements
SEPP	State Environmental Planning Policy
sensitive visual receiver	Person and/or viewer group that has the potential to experience a visual impact.
SRTM	Shuttle Radar Topography Mission

Acronym / term	Definition
SSI	State Significant Infrastructure
viewshed	Area within which the proposal may be visible, based on ZTV modelling and field validated.
Viewshed tool	A modelling tool used in ESRI ArcGIS to model the ZTV.
Visual quality (amenity)	The overall pleasantness of the views people enjoy of their surroundings, which provides an attractive visual setting or backdrop for the enjoyment of activities of the people living, recreating, visiting or travelling through an area.
VP	Viewpoint
ZTV	Zone of Theoretical Visibility

1. Introduction

1.1 Overview

1.1.1 Inland Rail and the proposal

The Australian Government has committed to delivering a significant piece of national transport infrastructure by constructing a high performance and direct interstate freight rail corridor between Melbourne and Brisbane, via central-west New South Wales (NSW) and Toowoomba in Queensland. Inland Rail is a major national program that will enhance Australia's existing national rail network and serve the interstate freight market.

The Inland Rail route, which is about 1,700 kilometres long, involves:

- using the existing interstate rail line through Victoria and southern NSW
- upgrading about 400 kilometres of existing track, mainly in western NSW
- providing about 600 kilometres of new track in NSW and south-east Queensland.

The Inland Rail program has been divided into 13 sections, seven of which are located in NSW. Each of these projects can be delivered and operated independently with tie-in points on the existing railway.

Australian Rail Track Corporation Ltd (ARTC) ('the proponent') is seeking approval to construct and operate the Narramine to Narrabri section of Inland Rail ('the proposal').

1.1.2 Approval and assessment requirements

The proposal is State significant infrastructure and is subject to approval by the NSW Minister for Planning and Public Spaces under the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act). The proposal is also determined to be a controlled action under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), and requires approval from the Australian Minister for the Environment.

This report has been prepared by the JacobsGHD Joint Venture as part of the environmental impact statement (EIS) for the proposal. The EIS has been prepared to support the application for approval of the proposal, and address the environmental assessment requirements of the Secretary of the NSW Department of Planning, Industry and Environment (the SEARs), dated 9 September 2020.

1.2 The proposal

The proposal consists of about 306 kilometres of new single-track standard gauge railway with crossing loops. The proposal also includes changes to some roads to facilitate construction and operation of the new section of railway, and ancillary infrastructure to support the proposal.

The proposal would be constructed to accommodate double-stacked freight trains up to 1,800 metres long and 6.5 metres high. It would include infrastructure to accommodate possible future augmentation and upgrades of the track, including a possible future requirement for 3,600 metre long trains.

The land requirements for the proposal would include a new rail corridor with a minimum width of 40 metres, with some variation to accommodate particular infrastructure and to cater for local topography. The corridor would be of sufficient width to accommodate the infrastructure currently proposed for construction, as well as possible future expansion of crossing loops for 3,600 metre long trains. Clearing of the proposal site would occur to allow for construction and to maintain the safe operation of the railway.

1.2.1 Location

The proposal would be located between the towns of Narromine and Narrabri in NSW. The proposal would link the Parkes to Narromine section of Inland Rail located in central western NSW, with the Narrabri to North Star section of Inland Rail located in north-west NSW.

The location of the proposal is shown in Figure 1.1.

1.2.2 Key features

The key design features of the proposal include:

Rail infrastructure

- a new 306 kilometre long rail corridor between Narromine and Narrabri
- a single-track standard gauge railway and track formation within the new rail corridor
- seven crossing loops, at Burroway, Balladoran, Curban, Black Hollow/Quanda, Baradine, The Pilliga and Bohena Creek
- bridges over rivers and other watercourses (including the Macquarie River, Castlereagh River and the Namoi River/Narrabri Creek system), floodplains and roads
- level crossings
- new rail connections and possible future connections with existing ARTC and Country Regional Network rail lines, including a new 1.2 kilometre long rail junction between the Parkes to Narromine section of Inland Rail and the existing Narromine to Cobar Line (the Narromine West connection)

Road infrastructure

- road realignments at various locations, including realignment of the Pilliga Forest Way for a distance of 6.7 kilometres
- limited road closures.

The key features of the proposal are shown in Figure 1.2.

Ancillary infrastructure to support the proposal would include signalling and communications, drainage, signage and fencing, and services and utilities.

Further information on the proposal is provided in the EIS.

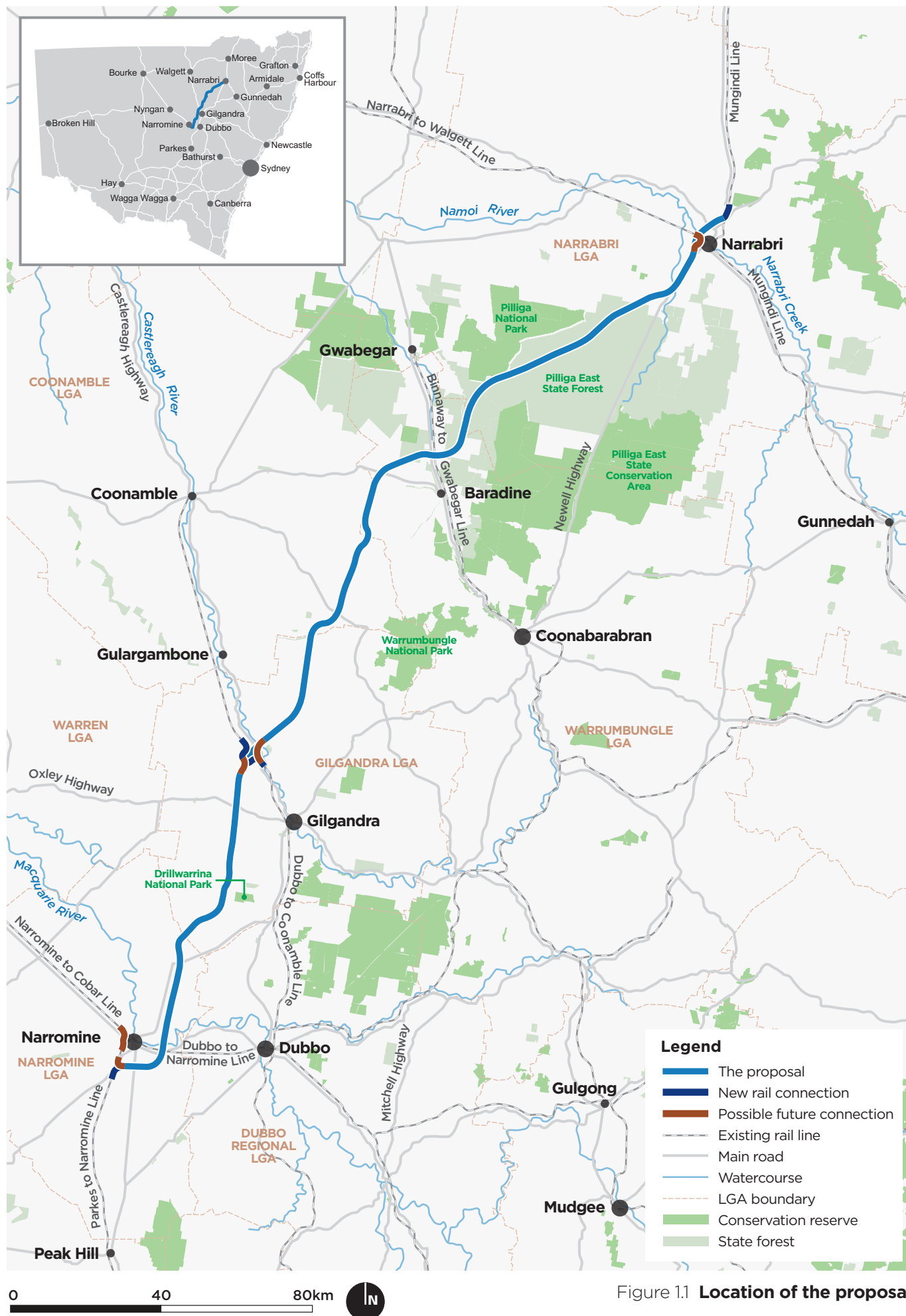


Figure 1.1 **Location of the proposal**

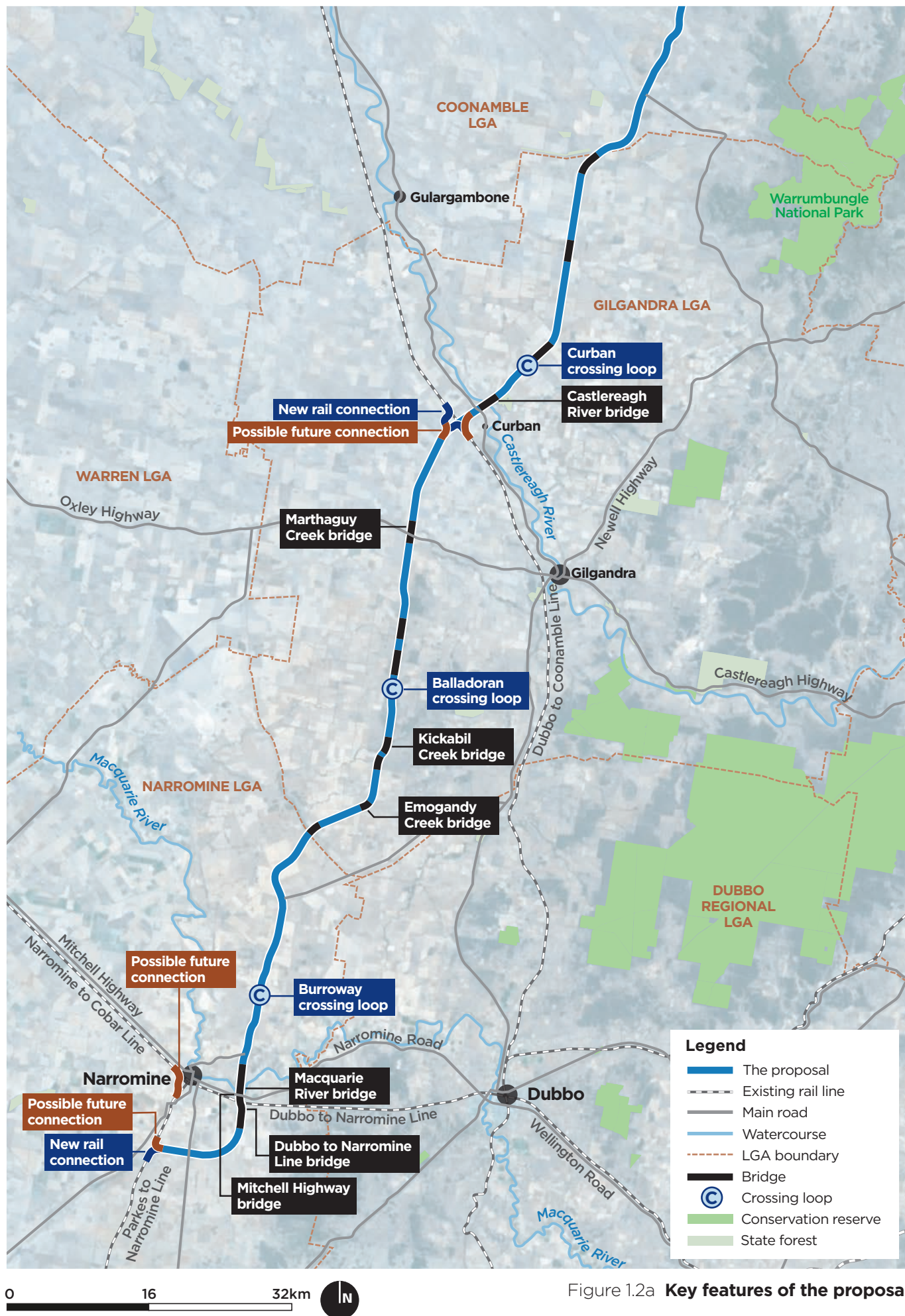


Figure 1.2a Key features of the proposal

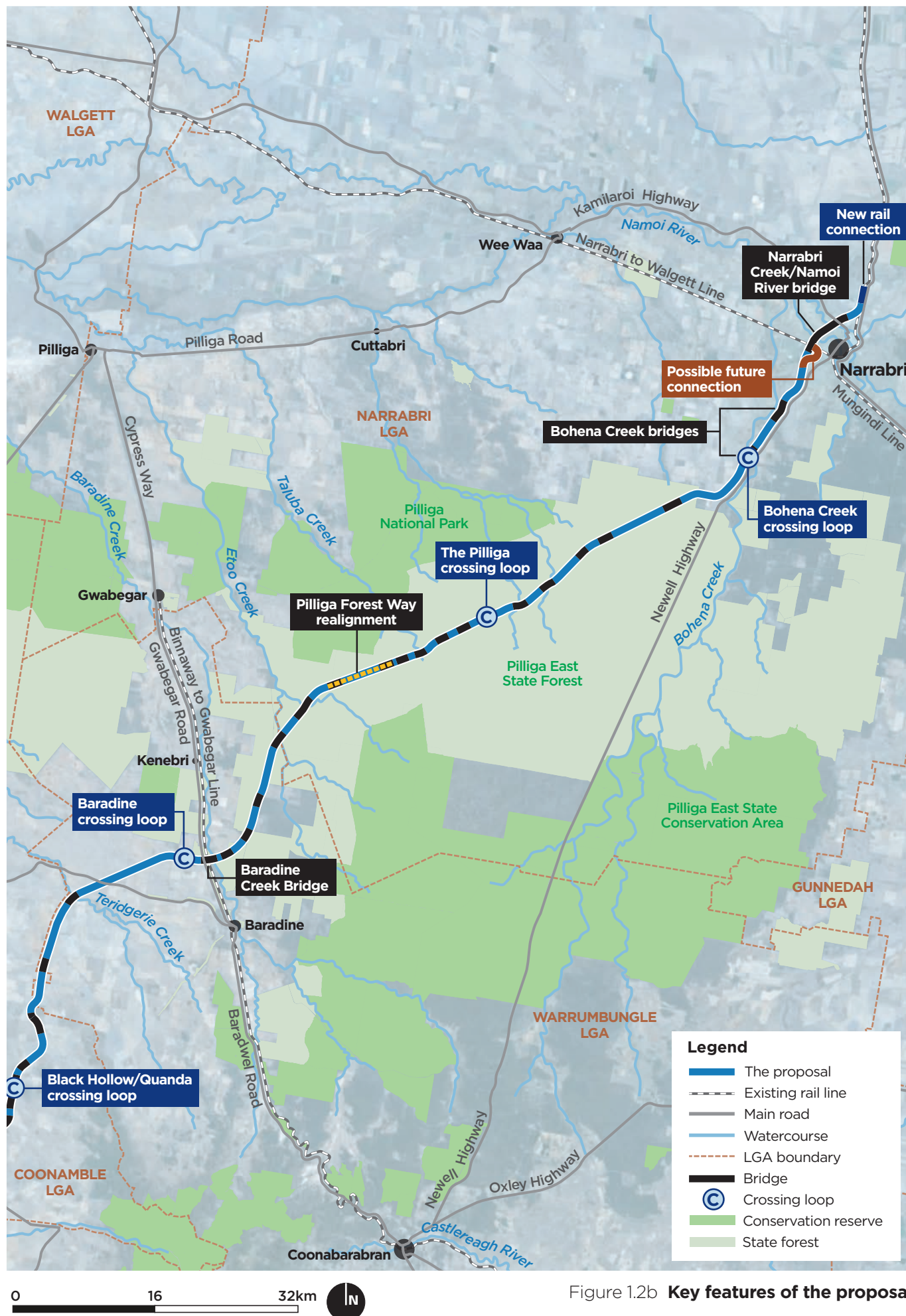


Figure 1.2b Key features of the proposal

1.2.3 Construction overview

An indicative construction strategy has been developed based on the current reference design to be used as a basis for the environmental assessment process. Detailed construction planning, including programming, work methodologies, staging and work sequencing would be undertaken once construction contractor(s) have been engaged and during detailed design.

Timing and work phases

Construction of the proposal would involve five main phases of work as outlined in Table 1.1. It is anticipated that the first phase would commence in late 2021, and construction would be completed in 2025.

Table 1.1 Main construction phases and indicative activities

Phase	Indicative construction activities
Pre-construction	• Establishment of areas to receive early material deliveries • Delivery of certain materials that need to be bought to site before the main construction work
Site establishment	• Establishment of key construction infrastructure, work areas and other construction facilities • Installing environmental controls, fencing and site services • Preliminary activities including clearing/trimming of vegetation
Main construction works	• Construction of the proposed rail and road infrastructure, including earthworks, track, bridge and road works
Testing and commissioning	• Testing and commissioning of the rail line and communications and signalling systems
Finishing and rehabilitation	• Demobilisation and decommissioning of construction compounds and other construction infrastructure • Restoration and rehabilitation of disturbed areas

Key construction infrastructure

The following key infrastructure is proposed to support construction of the proposal:

- borrow pits:
 - borrow pit A – Tantitha Road, Narromine
 - borrow pit B – Tomingley Road, Narromine
 - borrow pit C – Euromedah Road, Narromine
 - borrow pit D – Perimeter Road, Narrabri
- three main compounds, which would include a range of facilities to support construction ('multi-function compounds'), located at:
 - Narromine South
 - Curban
 - Narrabri West
- temporary workforce accommodation for the construction workforce:
 - within the Narromine South multi-function compound
 - Narromine North
 - Gilgandra
 - Baradine
 - within the Narrabri West multi-function compound.

The key construction infrastructure are shown in Figure 1.3.

Other construction infrastructure would include a number of smaller compounds of various sizes located along the proposal site, concrete batching plants, laydown areas, welding yards, a concrete pre-cast facility and groundwater bores for construction water supply.

1.2.4 Operation

The proposal would form part of the rail network managed and maintained by ARTC. Train services would be provided by a variety of operators. Inland Rail as a whole would be operational once all 13 sections are complete, which is estimated to be in 2025.

It is estimated that Inland Rail would be trafficked by an average of 10 trains per day (both directions) in 2025, increasing to about 14 trains per day (both directions) in 2040. This rail traffic would be in addition to the existing rail traffic using other lines that the proposal interacts with.

The trains would be a mix of grain, bulk freight, and other general transport trains. Total annual freight tonnages would be about 10 million tonnes in 2025, increasing to about 17.5 million tonnes in 2040.

Train speeds would vary according to axle loads, and range from 80 to 115 kilometres per hour.

1.3 Purpose and scope of this report

The purpose of this report is to assess the potential impacts to landscape character and visual amenity from constructing and operating the proposal. This report:

- addresses the relevant SEARs listed in Table 1.2
- describes the existing environment with respect to landscape character and visual amenity
- assesses the impacts of constructing and operating the project on landscape and visual amenity
- recommends measures to mitigate and manage the impacts identified.

The methodology for the assessment is described in section 3.

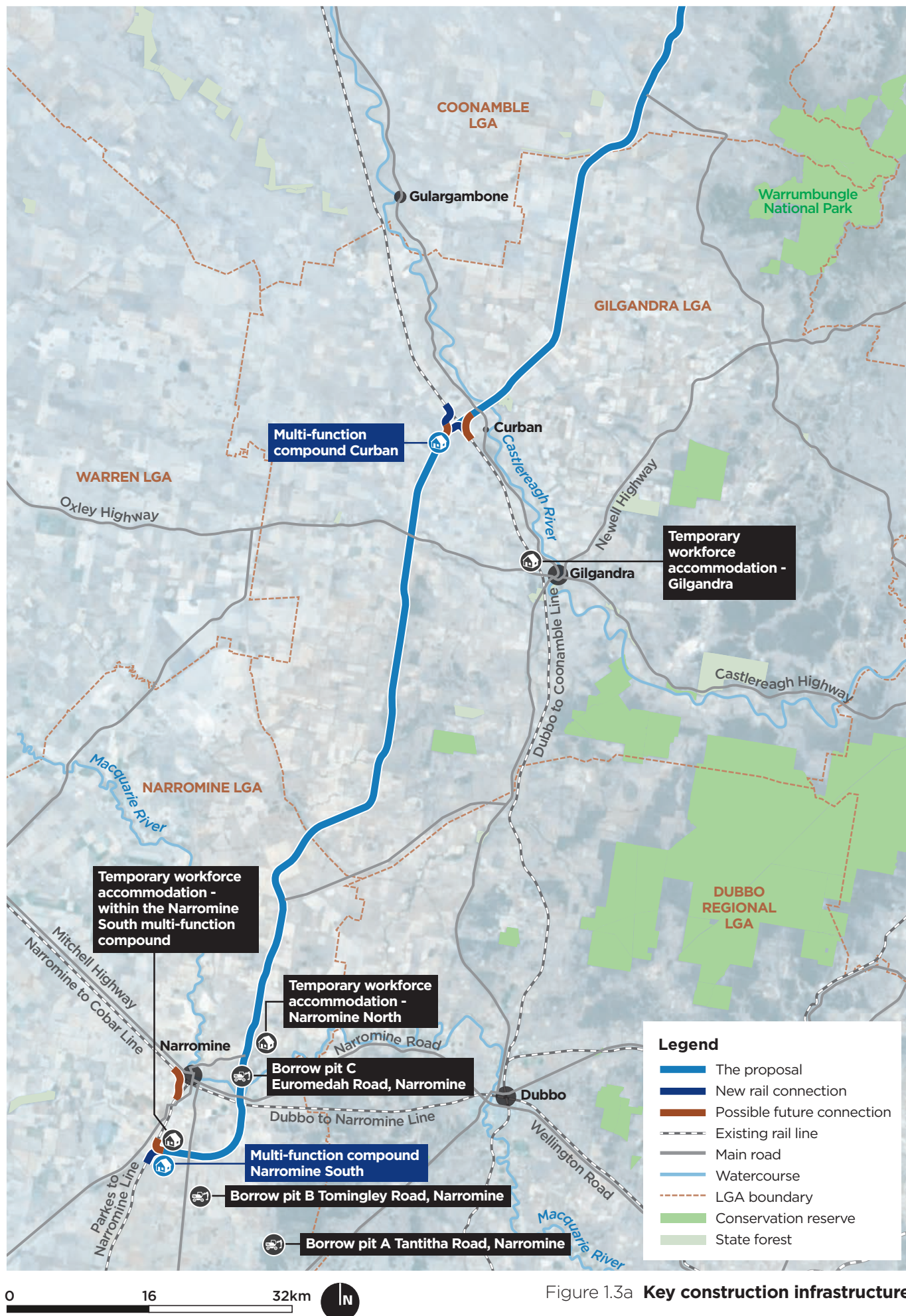


Figure 1.3a **Key construction infrastructure**

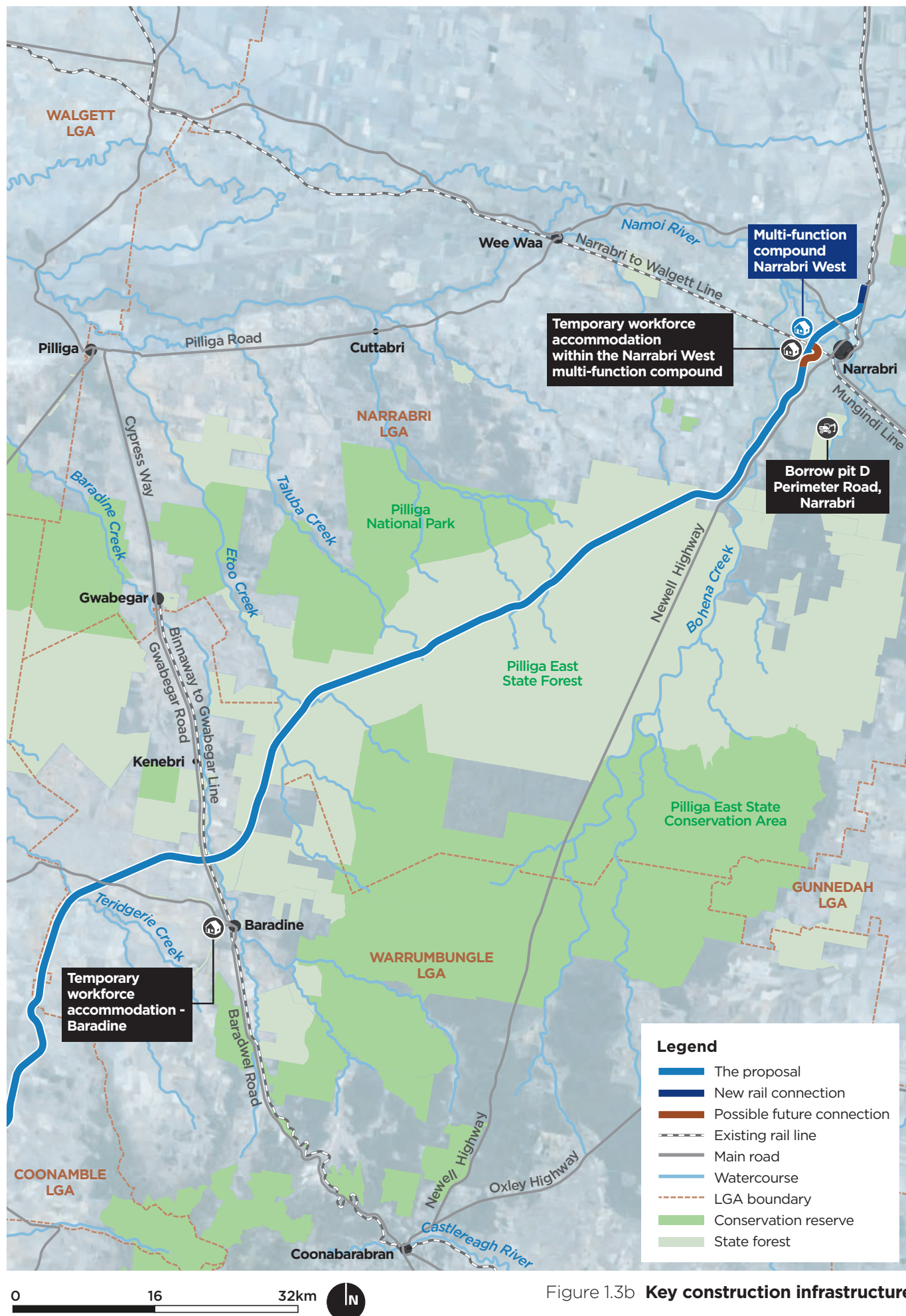


Table 1.2 SEARs relevant to this assessment

SEAR number	Requirements	Where addressed in this report
18.1	The Proponent must assess the visual impact of the project (including permanent spoil mounds, borrow sites, rail formation, bridges, viaducts, and over or underpasses) and any ancillary infrastructure on:	The visual impact of the proposal on views and vistas is assessed in section 6 through the viewpoint assessment, viewpoints covering views and vistas include section 6.1.3 to section 6.1.25, and section 6.2.3 to section 6.2.12.
	a. views and vistas	
	b. streetscapes, key sites and buildings	The visual impact of the proposal on streetscapes, key sites and buildings is assessed in section 5, section 5.3.5, section 5.3.6, and in section 6 including viewpoints in section 6.1.3, section 6.1.16, section 6.1.17 section 6.1.18, section 6.1.19, section 6.1.25, section, 6.3.2, section 6.3.3, section 6.3.4, section 6.3.6.
	c. heritage items including Aboriginal places and environmental heritage	The visual impact of the proposal on heritage items including Aboriginal places and environmental heritage is assessed in section 5 including section 5.3.1, section 5.3.2, section 5.3.3 and section 5.3.4 and in section 6 including viewpoints in section 6.1.16, section 6.1.7 section 6.1.18, section 6.1.9, and section 3.9.
	d. private landowners and the local community	The visual impact of the proposal on private landowners and the local community is assessed in section 5 and section 6 including viewpoints in section 6.1.3 to section 6.1.17, and section 6.1.20 to section 6.1.24.
18.2	The Proponent must provide artist impressions and perspective drawings of the project to illustrate how the project has responded to the visual impact through urban design and landscaping.	Appendix A contains eight photomontages representing the proposed views following construction of the proposal.

1.4 Structure of this report

The structure of the report is outlined below.

- Section 1 – provides an introduction to the report, including a description of the proposal.
- Section 2 – provides an overview of legislation, policies and guidelines applicable to this assessment.
- Section 3 – describes the methodology and approach for the assessment.
- Section 4 – includes a description of the approach to urban design and rehabilitation objectives for the proposal.
- Section 5 – provides a description of the existing landscape character and assessment of impact of the proposal on landscape character.
- Section 6 – provides a description of the existing visual character and assessment of impact of the proposal on visual amenity.
- Section 7 – provides an overview of potential visual impacts from lighting.
- Section 8 – provides an assessment of cumulative impacts.
- Section 9 – provides recommended mitigation and management measures.
- Section 10 – concludes the key findings and recommendations from the landscape character and visual assessment.
- Section 11 – provides a list of the references used in this assessment.

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2. Legislation and policy

The relevant legislation and state and local policies that apply to the proposal and that are of relevance to considerations of landscape and visual impacts within the study area (refer section 3.1) are summarised below.

2.1 Commonwealth legislation framework

2.1.1 Environment Protection and Biodiversity Conservation Act 1999

The EPBC Act provides a legal framework to protect and manage prescribed Matters of National Environmental Significance (MNES).

Under the EPBC Act, an action will need approval from the Minister for the Environment if the action has, will have, or is likely to have a significant impact on MNES. The proposal has been declared a controlled action and approval under the EPBC Act is required, but only in relation to specified threatened species and ecological communities which are listed under the EPBC Act.

In determining whether to grant approval, the Environment Minister must consider, relevantly, the likely impact on MNES for which approval is required and economic and social matters.

2.2 State legislation framework

2.2.1 Environmental Planning and Assessment Act 1979

The proposal is SSI by operation of Division 5.2 of the EP&A Act. As SSI, the proposal needs approval from the NSW Minister for Planning and Public Spaces, and the application for approval must be supported by an EIS. The EIS should be prepared having regard to the SEARs, which have been issued for that purpose by the Secretary of the Department of Planning, Industry and Environment.

Land use planning, including zoning and development control, is governed primarily by local environmental plans (LEPs) made under the EP&A Act. LEPs include lists of local heritage items and local heritage precincts, and provide controls on development which may affect those items or be located in those precincts. Although LEP controls do not apply to SSI, relevant LEPs were reviewed for the purpose of preparing this report.

2.2.2 Environmental Planning and Assessment Regulation 2000

Under the Part 10, Clause 193A of *Environmental Planning and Assessment Regulation 2000*, a proponent must, when preparing an environmental impact statement for SSI on land less than 200 kilometres from the Siding Spring Observatory, take into consideration the *Dark Sky Planning Guideline: Protecting the observing conditions at Siding Spring* (Department of Planning and Environment, 2016).

2.2.3 Dark Sky Planning Guideline

The *Dark Sky Planning Guideline: Protecting the observing conditions at Siding Spring* (Department of Planning and Environment, 2016) came into effect in 2016. The Guideline informs development controls that apply to land within the local government areas (LGAs) of Coonamble, Dubbo, Gilgandra and Warrumbungle and the assessment of significant development within 200 kilometres of the observatory. It supports the design and operation of development in the region and provides key information to ensure that lighting used in development does not impact the effectiveness of the Siding Spring Observatory. The proposal lies about 30 kilometres west of Siding Spring Observatory at its closest point.

2.2.4 Brigalow and Nandewar Community Conservation Area Act 2005 No 56

The majority of land within the study area falls within the *Brigalow and Nandewar Community Conservation Area Act 2005 No 56*. This Act aims to facilitate the reservation of forested land in the Brigalow and Nandewar area to create a Community Conservation Area that provides for permanent conservation of land, protection of areas of natural and cultural heritage significance to Aboriginal people, and sustainable forestry, mining and other appropriate uses. The Act also aims to give local communities a strong involvement in the management of the land.

2.2.5 Forest Management Plan for the Western Forests of NSW

The Forestry Corporation manages land within state forests. The *Forest Management Plan for the Western Forests of NSW* (NSW Forestry Corporation, 2019) summarises their approach to sustainable forest management. White Cypress forests such as within the Pilliga region state forests, are actively managed through the use of approved silvicultural practices for timber production, with the management objective to optimise timber production and maintain a healthy functioning forest ecosystem. Extensive road networks are maintained within state forests for the transport of harvested wood, for adequate fire protection and management, and to provide public access. Protection of certain landscape features, communities and habitat components is recognised as an important part of maintaining a balance between wood production and conservation outcomes. Biodiversity is a recognised value within state forest areas. Other activities undertaken with these forests include recreation and tourism, grazing, and apiculture.

2.3 Local planning policy framework

The proposal traverses five LGAs within the Landscape and Visual Assessment (LVA) study area (refer to section 3.1), which is land within five kilometres of the proposal (refer to section 3.1). These include the Shires of Narromine, Gilgandra, Coonamble, Warrumbungle, and Narrabri. The following section outlines local planning policies within each LGA relevant to LVA.

2.3.1 Narromine Local Environmental Plan 2011

Relevant aims of the Narromine LEP 2011 include the following:

- to protect and conserve the natural environment including surface and ground water, soil, air and native vegetation by encouraging sustainable development.

Narromine LEP objectives relevant to landscape and visual values within the study area are outlined in Table 2.1.

Table 2.1 Land use zones within Narromine LEP relevant to LVA

Zone	Objective relevant to LVA
R5 – Large Lot Residential	• To provide residential housing in a rural setting while preserving, and minimising impacts on, environmentally sensitive locations and scenic quality
RE1 – Public Recreation	• To protect and enhance the natural environment for recreational purposes
W2 – Recreational Waterways	• To protect the ecological, scenic and recreation values of recreational waterways
Heritage Conservation	• To conserve the heritage significance of heritage items and heritage conservation areas, including associated fabric, settings and views

2.3.2 Gilgandra Local Environmental Plan 2011

Relevant aims of the Gilgandra LEP 2011 include the following:

- to promote development that is ecologically sustainable
- to promote the proper management of the natural and human-made resources of the Gilgandra local government area
- to ensure quality of design of buildings and public spaces to achieve a locality that is safe and accessible and has a vibrant social, cultural and community focus
- to minimise land use conflicts and adverse environmental impacts
- to protect places and buildings of archaeological or heritage significance, including Aboriginal relics and places.

Gilgandra LEP 2011 objectives relevant to landscape and visual values within the study area are outlined in Table 2.2.

Table 2.2 Land use zones within Gilgandra LEP relevant to LVA

Zone	Objective relevant to LVA
RU1 – Primary Production	• To minimise the fragmentation and alienation of resource lands • To minimise the conflict between land uses within this zone and land uses within adjoining zones • To allow the development of non agricultural land uses that are compatible with the character of this zone
E1 – National Parks and Nature Reserves	• To enable the management and appropriate use of land that is reserved under the <i>National Parks and Wildlife Act 1974</i> or that is acquired under Part 11 of that Act
Heritage Conservation	• To conserve the heritage significance of heritage items and heritage conservation areas, including associated fabric, settings and views

2.3.3 Coonamble Local Environmental Plan 2011

Relevant aims of the Coonamble LEP 2011 include the following:

- to identify, protect, conserve and enhance Coonamble's natural assets
- to identify and protect Coonamble's built and cultural heritage assets for future generations.

Coonamble LEP 2011 objectives relevant to landscape and visual values within the study area are outlined in Table 2.3.

Table 2.3 Land use zones within Coonamble LEP relevant to LVA

Zone	Objective relevant to LVA
RU1 – Primary Production	• To minimise the fragmentation and alienation of resource lands • To minimise the conflict between land uses within this zone and land uses within adjoining zones

2.3.4 Warrumbungle Local Environmental Plan 2013

Relevant aims of the Warrumbungle LEP 2013 include the following:

- to identify, protect, conserve and enhance Warrumbungle's natural assets
- to identify and protect Warrumbungle's built and cultural heritage assets for future generations.

Warrumbungle LEP 2013 objectives relevant to landscape and visual values within the study area are outlined in Table 2.4.

Table 2.4 Land use zones within Warrumbungle LEP relevant to LVA

Zone	Objective relevant to LVA
RU1 – Primary Production	• To minimise the fragmentation and alienation of resource lands • To minimise the conflict between land uses within this zone and land uses within adjoining zones

2.3.5 Narrabri Local Environmental Plan 2012

Relevant aims of the Narrabri LEP 2012 include the following:

- to encourage the orderly management, development and conservation of resources by protecting, enhancing and conserving:
 - timber, minerals, soil, water and other natural resources
 - areas of high scenic or recreational value
 - native plants and animals including threatened species, populations and ecological communities, and their habitats
 - places and buildings of heritage significance.

Narrabri LEP 2012 objectives relevant to landscape and visual values within the study area are outlined in Table 2.5.

Table 2.5 Land use zones within Narrabri LEP relevant to LVA

Zone	Objective relevant to LVA
B2 – Local Centre	• To generally conserve and enhance the unique sense of place of business centre precincts by ensuring that new development integrates with the distinct urban scale, character, cultural heritage and landscape setting of those places
RE1 – Public Recreation	• To provide a range of recreational setting and activities and compatible land uses • To protect and enhance the natural environment for recreational purposes
RU1 – Primary Production	• To minimise the fragmentation and alienation of resource lands • To minimise the conflict between land uses within this zone and land uses within adjoining zones
RE2 – Private Recreation	• To provide a range of recreational settings and activities and compatible land uses • To protect and enhance the natural environment for recreational purposes
R5 – Large Lot Residential	• To provide residential housing in a rural setting while preserving, and minimising impacts on, environmentally sensitive locations and scenic quality

Zone	Objective relevant to LVA
E1 – National Parks and Nature Reserves	To enable the management and appropriate use of land that is reserved under the National Parks and Wildlife Act 1974 or that is acquired under Part 11 of that Act
E3 – Environmental Management	To protect, manage and restore areas with special ecological, scientific, cultural or aesthetic values

2.4 Other strategies and guidance

2.4.1 Pilliga Outwash Parks Statement of Management Intent

The *Pilliga Outwash Parks Statement of Management Intent* (Office of Environment and Heritage, 2017) document includes management objectives for the Pilliga State Conservation Area, which falls within the study area. This park is one of five parks converted from state forest to conservation area based on a bioregional assessment. Management directions for the parks focus on the conservation of biodiversity and heritage values, including the reintroduction of locally extinct mammals. Key management objectives include the following:

- the Pilliga Outwash parks retain an important place in the network of vegetated, conserved land in the Brigalow Belt South Bioregion
- native plant communities are protected and where necessary restored
- significant historic features are appropriately conserved and managed
- there is a widespread understanding and appreciation of the rich natural and cultural values of the Pilliga Outwash parks
- public access and recreational use of the parks is sustainable and managed to ensure park values are not compromised.

2.4.2 Drillwarrina National Park Community Conservation Area Zone 1 – Statement of Management Intent

A former state forest, Drillwarrina National Park falls just within the study area within the Gilgandra LGA. The park is valued for its habitat provision and ecological forest communities. Key management principles of *Drillwarrina National Park Community Conservation Area Zone 1 – Statement of Management Intent* (Office of Environment and Heritage, 2014) relevant to this LVA include to:

- conserve biodiversity, maintain ecosystem functions, protect geological and geomorphological features and natural phenomena and maintain natural landscapes
- conserve places, objects, features and landscapes of cultural value
- promote public appreciation and understanding of the park's natural and cultural values.

2.4.3 Warrumbungle Land Use Strategy

Visual objectives relevant to LVA within the *Warrumbungle Land Use Strategy* (Warrumbungle Shire Council, 2013) include the following:

- protect our agricultural land as an important component of our rural identity and recognise that our productive agricultural land is a finite resource that is valued and supported
- encourage rural tourism (including that related to Siding Spring Observatory) and our beautiful rural landscape

- protect and enhance authentic and distinctive local characteristics and landscapes throughout the region
- protect the natural landscapes of the Warrumbungle Shire along designated scenic routes and town approaches.

Primary production is also recognised as covering the majority of the landscape within the LGA, and is characterised by sheep and cattle grazing, lucerne, canola, grain crops and forestry. This use at a broad scale has been the traditional use since settlement. The ongoing maintenance and development of this productive landscape is a key objective of this strategy.

2.4.4 Narrabri Shire Growth Management Strategy

The *Narrabri Shire Growth Management Strategy* (Edge Land Planning, 2009) recognises the value of the rural landscape character to the residents and visitors to the Narrabri Shire.

The unique landscape character of the Shire is a visual resource as it generates tourism, development and environmental management. The visual resource also plays an important role in promoting environmental awareness and well being for residents and visitors. This varies from steep vegetated areas to the simplicity of grazing lands and formal patterns of agricultural crops.

It is also important to recognise the visual amenity of open paddocks, post and rail fencing, distant views, heritage items and rural activities. It can be seen therefore that the preservation of the landscape character of the Shire is of importance.

The strategy focuses on ensuring future development is sustainable, and rural lands and settlements continue to contribute positively to the identity and sustainability of the Narrabri Shire.

2.4.5 AS4282-1997 Control of the obtrusive effects of outdoor lighting

AS4282-1997 Control of the obtrusive effects of outdoor lighting has been superseded by *AS/NZS 4282:2019 Control of the obtrusive effects of outdoor lighting* (AS/NZS 4282:2019). The following provides a summary of the current standard.

AS/NZS 4282:2019 sets out guidelines for the control of the effects of outdoor lighting on surrounding properties, the glare to users of adjacent transport systems, and the effects on astronomical observations. It also provides recommended limits for the relevant lighting parameters to contain these effects within tolerable levels.

Section 1 of the document provides an overview of the scope of the document, definitions and how the guidelines are to be applied.

Section 2 provides information on how lighting requirements would have an impact on how much light spills onto places where it is not intended. For example, whether the ground surface is the only element that requires lighting, or objects at a height, such as multiple container stacks at a shipping yard. For the latter example, there is far greater risk of light escaping into the environment. The topography and objects such as buildings in the surrounding area also has an influence on the obtrusiveness of light. Details on the likely effects of light pollution on residents, transport system users, signalling and astronomical observations are also provided.

Section 3 of the document provides guidance on the limits of light technical parameters and how they are applied. This includes various environmental zones and what would constitute an acceptable level of illumination for each zone. Examples include areas of high district brightness such as town and city centres and areas of intrinsic darkness suitable for astronomical observations.

Section 4 of the document provides information on the calculation of light technical parameters, and guidance on the use of computer simulation models to predict light intensity and light spill.

Section 5 of the document provides information on the collection of field data and baseline environmental illumination. This includes how to deal with direct and reflected light, interference from obstructions, and the calibration of instruments.

The document also includes a number of appendices with information on the design, installation, operation and maintenance of light fixtures, design documentation and impact of external lighting on biota.

It is noted in the document that due to the technical nature of the content, a suitably qualified professional should be consulted to interpret and apply the guidelines. The standard does not apply to public lighting but sections of the document contain lighting limits which can be specified by the relevant authority. Generally, the issue of safety takes precedence over the obtrusiveness of light.

2.4.6 Bridge Aesthetics: design guideline to improve the appearance of bridges in NSW

The purpose of the *Bridge Aesthetics: design guideline to improve the appearance of bridges in NSW* (Roads and Maritime Services, 2012) is to assist design teams to produce bridges of aesthetic value. The guideline includes requirements, objectives, design principles and processes to guide the design of bridges, and encourages innovation in the path to meeting these aesthetic outcomes. The guideline is intended for all bridges, from the more common to the iconic, which includes railway bridges.

Of most relevance to this report, the guidelines recognise some fundamental aesthetics of bridge design including the relationship of the bridge to the surrounding natural and built landscape; its form, proportions and scale; and factors such as the use of texture and colour.

Context sensitive design of infrastructure is design that fits sensitively with the landform and the built, natural, ecological, cultural and community context. The aesthetic value of a bridge is dependent on its design response to context – the place.

The visibility of the bridge is an additional important contextual factor. A bridge which is looked on by the community needs to be carefully considered in terms of its visual impact on residents and road users.

A number of key design guidelines relevant to LVA are outlined in Table 2.6.

Table 2.6 Bridge aesthetics design guidance relevant to LVA

Guideline	Objective
Bridges in the landscape	
The built and natural environment should be made as visible as possible through the bridge.	Minimise the profile of a bridge to allow the landscape setting to dominate the view and be appreciated from all viewpoints.
The complexity of a bridge should be minimised in a rural setting.	- Complexity tends to attract the eye and compete with views of the landscape. A simple structure frames the landscape and provides an aesthetically pleasing contrast with the natural textures of the backdrop. - Minimal facets and simple shapes provide a good landscape contrast. Accentuating the primary visual elements of a bridge (parapet and pier) and reducing road furniture to the barest minimum is also important. - Landscape tones are generally subdued and dark, therefore light colours such as plain concrete (for bridge primary elements) provide a good contrast.
Bridges with a horizontal form are generally preferable to bridges on a grade over flood plains and significant expanses of water.	- If this is unable to be achieved due to differing levels either side of the water body then fine-tuning the location of the bridge should be considered, or adjusting the levels along the bridge approaches. - Water always forms a horizontal plane and a bridge structure when skewed to this plane can appear discordant.
Natural vegetation should be protected and augmented.	The aesthetic value of a bridge will be greatly enhanced if the natural bushland around the bridge is protected and recovered by careful siting and design of the bridge and approaches so that significant stands of existing vegetation are retained; by minimising the footprint of the bridge so that the retention of local vegetation is maximised; by minimising the presence and extent of intermediate structures and hard surfaces between the bridge and landscape; by recovering local habitat, in the landscape around the bridge, through careful design of earthworks and planting and the selection of endemic species grown from locally collected seed.
Bridges in urban settings	
Ensure the bridge complements the local vernacular and benefits the local community.	- Maximise views through the bridge from the urban setting. - Minimise adverse visual impacts. - Respecting locally valued structures and their curtilages. - Complementing local styles and materials.
Substructure	
In an open landscape, spill through abutments are generally preferable, as walled abutment structures can block views.	Spill through abutments allow open views to the landscape and better visibility to the road beyond.

Guideline	Objective
Bridge curtilage	
(The bridge curtilage) is integral to the visual success of the structure. It should be considered as part of the project, rather than the existing environment.	Generally, there should be continuity between the existing landscape and the space around the bridge. Where possible, the space should be designed so that it complements the adjacent landscape character.

2.4.7 Sustainable Design Guidelines (Version 4.0)

The *Sustainable Design Guidelines (Version 4.0)* (Transport for NSW, 2017) seek to deliver sustainable development practices by embedding sustainability initiatives into the planning, design, construction, operations and maintenance of transport infrastructure projects.

Requirements relevant to LVA include the following:

Compulsory Requirement 11 - Vegetation offsets

- All projects with non-significant biodiversity impacts to comply with the Infrastructure and Services Vegetation Offset Guide as applicable.

Compulsory Requirement 13 - Urban design

- All projects to address the urban design principles in the TfNSW Interim Urban Design Best Practice Guidelines within their urban design and landscaping plan or equivalent:
 - Principle 4: Integrate the project with the surrounding area
 - Principle 6: Protect and enhance heritage features and significant trees
 - Principle 7: Maximise positive view opportunities
 - Principle 8: Design an efficient and functional transport solution which enhances and contributes to local amenity and prosperity.

2.4.8 Urban Green Cover in NSW: technical guidelines

This technical document *Urban Green Cover in NSW: technical guidelines* (Office of Environment and Heritage, 2015) seeks to minimise the effects of increased urban heat island associated with urbanisation and climate change in cities and towns, through the increase in urban green cover in urban environments. A recognised environmental benefit of urban green cover is improved visual amenity and urban design, among others.

Of most relevance to this proposal is the benefit of vegetation such as canopy trees, understorey planting and bioswales for their cooling provision and contribution to visual amenity.

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3. Methodology

This LVA has been prepared in accordance with the following:

- Environmental Impact Assessment Practice Note - Guideline for landscape character and visual impact assessment (EIA-N04), Version 2.1 (Roads and Maritime Services, 2018).
- *Guidelines for Landscape and Visual Impact Assessment, 3rd Edition* (Landscape Institute and Institute of Environmental Management & Assessment, 2013).

3.1 Study area

The study area for the LVA has been defined as land within five kilometres of the proposal. This area of interest is considered to have direct and indirect impacts from the proposal. This study area has been determined based on the following:

- a desktop study examining aerial photographs and topographic maps considering both landform and land cover
- a site inspection examining the existing visual conditions
- previous studies of a similar type
- relevant guidelines.

Refer to Figure 3.1 for the study area for the LVA.

A Zone of Theoretical Visibility (ZTV) analysis was prepared for the proposed rail alignment using available data (refer to section 3.2.2). Due to the relatively flat topography of the surrounding land and the low profile of the proposed rail alignment, the analysis did not assist to the extent of defining the study area.

3.2 Preliminary analysis

3.2.1 Desktop study

A desktop study was undertaken to obtain the relevant publicly available data on landscape character and visual impact at a national, regional and local level for the study area. This included a comprehensive review of GIS data sets and aerial photography based identification of potential sensitive receiver locations, later ground truthed by a site inspection.

The desktop study included the following:

- review of legislation, policy and guidelines
- GIS data sets including geology, vegetation, soils, hydrology, cultural heritage and land use
- aerial photography
- identification of potential sensitive receiver locations.

3.2.2 Zone of Theoretical Visibility

ZTV mapping is a computer-generated analysis which identifies land from which it is theoretically possible to view the components of a proposal. The purpose of ZTV mapping is primarily to guide the area of site assessment and representative viewpoint selection.

The Viewshed tool within ESRI ArcGIS version 10.6.1 software was used to model the ZTV for the rail alignment. The Shuttle Radar Topography Mission (SRTM) digital elevation model (DEM) was used to model the land surface (data obtained in February 2000 by the National Aeronautics and Space Administration and the National Geospatial-Intelligence Agency), which has a resolution of 30 metre by 30 metre and incorporates the height of vegetation on its surface. More recent and higher resolution terrain data was available, however not to the extent required for the study area.

The ZTV was mapped using parameters outlined in Table 3.1.

Table 3.1 ZTV parameters

Parameter	Value	Comment
Environment, processing extent	LVA study area	The analysis was constrained to the extents of the study area so as to limit it to the area of interest.
Input observer features	Chainage	These are the chainage points along the proposed rail alignment, at the top of rail level at 200 m centres.
Offset B	1.7 km	Offset B specified the height above the DEM from which to calculate the visibility of the proposal. 1.7 m is the typical viewing height of an adult.
Radius 2	5 km	The analysis of each point along the rail alignment was constrained to 5 km to ensure the analysis was limited to the portion of proposed rail alignment within the study area parameters.
SPOT	Top of rail	The top of rail height was used to calculate the zone of theoretical visibility, identifying from which areas in the surrounding landscape where the top of rail would theoretically be visible.

The software digitally determined the likely extent over which the feature (top of rail alignment) would be theoretically visible or not visible. In interpreting the ZTV, the following must be considered:

- The ZTV is only accurate to the resolution of the elevation model and input data.
- The SRTM DEM incorporates vegetation on the surface, therefore the 'Viewshed' tool treats the vegetation as terrain. For this reason, the ZTV shows areas of higher visibility from areas with canopy vegetation, such as tree rows along fence lines and riparian corridors. However, in reality this would not be the case and the trees would act as a visual barriers.
- The SRTM DEM was captured in 2000. Since that time, some areas with vegetation may have been cleared and some areas without vegetation may have experienced vegetation growth. This may have had an undesired effect on the visibility analysis.
- The ZTV may not consider potential visibility below tree canopy.
- The ZTV does not take into account the effect of distance. The greater the distance from the proposal, generally the lower the impact, as the development would take up a smaller portion of the view, and atmospheric conditions may reduce the visual prominence of the proposal.

Refer to section 6.1.1 for a discussion, and Figure 6.1 for mapping.

3.2.3 Site inspection

Two site inspections were undertaken by landscape architects to verify the desktop study, allow characterisation of the landscape, identify sensitive receivers and observe how receivers might view the landscape. Site inspections were conducted on 21 to 23 November 2018 for the rail infrastructure component of the proposal, and 9 to 11 December 2019 for the borrow pit sites. Weather conditions and distance of visibility were variable due to dust and bushfire conditions.

During the field survey, the landscape architects drove and walked the study area to gain representative views of the proposal from publicly accessible viewpoints. At each location a photographic record of landscape features, key views and receivers were taken, along with GPS coordinates and field notes. The borrow pits site inspection included access to private property.

3.3 Landscape impact assessment

3.3.1 Definition of the landscape baseline

A landscape baseline assessment was undertaken of the study area to determine the elements, features and aesthetic and perceptual factors contributing to existing landscape character. Key aspects considered include:

- land use and built form
- landform, topography and hydrology
- vegetation
- cultural and historical features
- NSW (Mitchell) landscapes (Office of Environment and Heritage 2016).

3.3.2 Landscape character zones

Landscape character considers common landscape zones defined by typical features and characteristics identified during the desktop assessment and site inspection. Defining landscape character zones (LCZs) identifies areas sharing the same homogenous environmental or cultural qualities or patterns such as topography, vegetation, hydrology, land use and settlement, built form scale and character, cultural and recreational characteristics, which makes each part of the landscape distinct and gives each its particular sense of place.

This approach has been used to establish the existing landscape character around the proposal site and to provide a framework for measuring the impact of the proposal. This assists in:

- defining landscape elements that contribute to defining character
- defining landscape character attributes
- identifying landscape value.

The assessment of the baseline environment also considers factors which have influenced landscape change in the past and those that are likely to do so in the future.

3.3.3 Landscape effects

Assessment of landscape effects deals with the effect of change and development on landscape as a resource. The concern is with how the proposal will affect the elements that make up the landscape, the aesthetic and perceptual aspects of the landscape and its distinctive character.

The consideration of potential impacts on landscape character is determined based on the sensitivity of the existing landscape to change and the magnitude of change that is likely to occur. The sensitivity of a landscape is judged on the extent to which it can accept change of a particular type and scale without adverse effects on existing landscape character. The level of sensitivity is determined on the basis of:

- the landscape's inherent values and any specific values that may apply such as landscape planning designations
- the landscape's ability to absorb changes associated with the proposal.

The magnitude of change to landscape character depends on the nature, scale and duration of the change expected to occur. The magnitude of change also depends on the loss, change or addition of any feature to the existing landscape. It is based on that part of the LCZ which is likely to be impacted to the greatest extent by the proposal.

The sensitivity and magnitude of landscape effects address the following specific criteria:

- sensitivity of landscape to proposed change, based on the susceptibility to change, and the value of landscape (refer Table 3.2)
- magnitude of landscape effect, based on the size or scale of change, the geographical extent of effects, and the duration and reversibility of effects (refer Table 3.3).

A judgement is made on the overall level of significance of the landscape effect in relation to the existing conditions (refer section 3.5).

Table 3.2 Sensitivity criteria (landscape)

Rating	Criteria
High	Landscape character elements in good or above average condition and/or that make a strong positive contribution to the landscape character. May include nationally important features. The type of development proposed could have a detrimental effect on the landscape character, condition or value. The landscape has a low capacity to accommodate the type of change envisaged.
Moderate	Landscape character elements in reasonably good condition and/or that make an average contribution to the local character, which may include state or locally important features. Any change caused by the proposed development would be unlikely to have a considerable adverse effect on the landscape character, condition or value. The landscape may have some capacity to accommodate a degree of the type of change envisaged.
Low	Landscape character elements in average condition and/or that are not particularly distinctive local features. Development of this type is unlikely to have an adverse effect on the landscape character, condition or value. The landscape is likely to have the capacity to accommodate the type of change envisaged.
Negligible	Elements in below average condition and/or that are not distinctive local features. Development of this type is very unlikely to have an adverse effect on the landscape character, condition or value. The landscape has the capacity to accommodate change.

Table 3.3 Magnitude of change criteria (landscape)

Rating	Criteria
High	A substantial/obvious change to the landscape character due to total loss of, or change to, elements, features or characteristics of the landscape. Would cause a landscape to be permanently changed and its quality diminished. Mitigation measures are unlikely to reduce the impacts of the change.
Moderate	Discernible changes in the landscape character due to partial loss of, or change to elements, features or characteristics of the landscape, however has potential to be partly mitigated. The change would be out of scale with the landscape character, and in contrast with the local pattern and landform and would leave an adverse impact on the landscape character.
Low	Minor loss or alteration to one or more key landscape character elements, features or characteristics, or the introduction of components that may be new but may not be uncharacteristic within the existing landscape character. Mitigation measures have potential to be effective in neutralising adverse effects.
Negligible	Almost imperceptible or no change in the landscape character as there is little or no loss of/or change to the elements, features or characteristics of the landscape. Mitigation measures have potential to be effective in neutralising adverse effects and/or improve the landscape character.

3.4 Visual impact assessment

3.4.1 Definition of visual baseline

A visual baseline assessment was undertaken to determine the existing visual baseline environment within the study area. This includes determination of key visual elements, features and values. Key aspects considered include:

- built form and vegetation
- landform and topography
- key views and viewsheds
- visually prominent features
- visual features of interest and value.

3.4.2 Viewpoint locations

Assessment of visual impacts deals with the effects of change and development on the views available to people and their visual amenity. It assesses how the surroundings of individuals or groups of people may be specifically affected by changes in the context and character of views as a result of the change or loss of existing elements of the landscape and/or the introduction of new elements.

Visual receivers have been considered in terms of the views they are likely to obtain from within the study area including consideration of any key vantage points, such as lookouts, where there is particular interest in the view. Visual receivers are identified based on:

- proximity of the receiver to the proposal, as the most affected visual receivers are anticipated to be located closest to the proposal, unless located at an elevated vantage point
- type of receiver, as different viewer types would have different perceptions of the change.

Based on the analysis of the existing landscape and visual environment, including ZTV analysis and site inspections, sensitive visual receivers were identified and viewpoint locations selected as representative locations for assessment.

3.4.3 Panorama and photomontage

Photographic images during the first site inspection were captured using a Nikon D850 digital camera used together with a 25 millimetre - 70 millimetre zoom lens. A focal length of 50 millimetres was used for all viewpoint photographs, as this best approximates the visual field of the human eye. A 35 millimetre full frame format Canon 6D camera with a 50 millimetres fixed focal length lens was used for the second site inspection.

The camera was held at eye level, about 1.7 metres above ground level to take the photographs. GPS coordinates were also recorded on a separate hand held GPS at the locations from which the photographs were taken.

A total of 32 viewpoint locations were assessed. All existing views were represented using a panorama technique, which involves combining up to three individual photographs overlapped by one third using the Adobe Photoshop software program to create a field of view of 80 degrees.

Of the viewpoint locations, eight viewpoints were selected for the production of photomontages to represent proposed views following the construction of the proposal. The software used to model and render the photomontages was Autodesk 3D Studio Max. In order to achieve an accurate photomontage of the proposal and surrounding landscape, a one and five metre contour Digital Elevation Model was used to model the surrounding landform.

Once the 3D model incorporating both the landscape and new proposal elements was created, a virtual camera was placed in the software at the same location the photographs were taken. The film, focal lens and height of the virtual camera matches the real camera utilised to take the photographs. The photographs of the site were used in 3D Studio Max as a background to accurately match the 3D model with the proposal elements to the perspective of the photographs. From the camera view, rendered images of the proposal were produced to match the daylight exposure of the photographs. The rendered images were imported into Adobe Photoshop for post-production editing and collation of the photomontages. The final result is the 3D model of the proposal shown in the correct 3D location in the photographs. The final images were produced to a high resolution, suitable for printing.

The panorama and photomontage methodology is guided by industry accepted techniques recommended in *Visual Representation of Development Proposals, Technical Guidance Note 06/19* (Landscape Institute, 2019).

3.4.4 Visual effects

The evaluation of potential impacts on visual amenity is based on the sensitivity of the viewpoint (and the visual receiver it represents) to change, and the magnitude of change that is likely to occur.

The sensitivity of each viewpoint is considered to be dependent on the:

- value attached to the view, for example through planning designations, its appearance on tourist maps, or by the presence of visitor facilities at the viewpoint location
- the presence of other existing man-made elements in the view
- type of visual receiver and their likely interest in the view
- receiver's duration and viewing opportunity.

The magnitude of change to views and visual amenity depends on the nature, scale and duration of the change that is expected to occur. The magnitude of a change also depends on the loss, change or addition of any feature in the field of view of the receiver including an assessment of the level to which the change contrasts with the existing view or expected view of the landscape. This includes the degree of any change to the backdrop to, or outlook from a viewpoint.

The assessment considers the likely impacts of the proposal. The level of effects on a view depends on factors such as the extent of visibility, degree of obstruction of existing features, degree of contrast with the existing view, angle of view, and duration of view.

Steps undertaken to assess visual effects include:

- identify and map viewpoint locations
- undertake assessment of visual effects, comprising:
 - sensitivity of visual receivers to proposed change, based on: susceptibility of visual receivers to change, and value attached to the view (refer Table 3.4)
 - magnitude of visual effect, based on: size or scale of change; geographical extent of effects, and duration and reversibility of effects (refer Table 3.5).

An assessment is undertaken of the overall level of significance of the visual effects in relation to the existing view (refer section 3.5).

Table 3.4 Sensitivity criteria (visual)

Rating	Criteria
High	• Occupiers of residential properties, at home or going to or from, with long viewing periods, within close proximity to the proposed development. • Communities that place value upon the landscape and enjoyment of views of their setting.
Moderate	• Outdoor workers who have a key focus on their work who may also have intermittent views of the study area. • Viewers at schools, or similar, when outdoor play and recreation areas are located within close proximity but viewing periods are limited. • Occupiers of residential properties with long viewing periods, at a distance from or screened from the study area.
Low	• Road users in motor vehicles, trains or on transport routes that are passing through or adjacent to the study area and therefore have short term views; Viewers indoor at their place of work, schools or similar.
Negligible	• Viewers from locations where there is screening by vegetation or structures where only occasional screened views are available and viewing times are short; Road users in motor vehicles, trains or on transport routes that are passing through/adjacent to the study area and have partially screened views and short viewing times.

Table 3.5 Magnitude of change criteria (visual)

Rating	Criteria
High	A substantial/obvious change to the existing view due to total loss of, or change to, elements, features or characteristics of the view. Would cause a view to be permanently changed and its quality diminished. Mitigation measures are unlikely to reduce the impacts of the change.
Moderate	Discernible changes in the existing view due to partial loss of, or change to elements, features or characteristics of the view, however has potential to be partly mitigated. The change would be out of scale with the existing view, and would leave an adverse impact on the view.
Low	Minor loss or alteration to one or more key view elements, features or characteristics, or the introduction of components that may be visible but may not be uncharacteristic within the existing view. Mitigation measures have potential to be effective in neutralising adverse effects.
Negligible	Almost imperceptible or no change in the view as there is little or no loss of/or change to the elements, features or characteristics of the view. Mitigation measures have potential to be effective in neutralising adverse effects and/or improve the view.

3.5 Landscape and visual significance of impacts

The combination of sensitivity and magnitude determines the significance of the impact on the landscape character or viewpoint. Refer to Table 3.6 for the matrix used to determine the significance of impact.

Table 3.6 Significance of impact matrix

		Magnitude of change			
		High	Moderate	Low	Negligible
Sensitivity	High	High Impact	High-Moderate	Moderate	Negligible
	Moderate	High-Moderate	Moderate	Moderate-Low	Negligible
	Low	Moderate	Moderate-Low	Low	Negligible
	Negligible	Negligible	Negligible	Negligible	Negligible

3.6 Potential visual impacts from lighting

A discussion of potential visual impacts from lighting was provided for the construction and operation phases of the proposal on the night time observing conditions of Siding Spring Observatory. The high-level assessment was undertaken in a qualitative manner by examining *Dark Sky Planning Guideline: Protecting the observing conditions at Siding Spring* (Dark Sky Planning Guideline) (Department of Planning and Environment, 2016). A summary was produced of the key principles for minimising lighting impacts, which was then used to inform a discussion of potential lighting impact of the construction and operation phases of the project.

3.7 Cumulative impact assessment

A cumulative impact assessment was undertaken to assess the impact of the proposal as a result of additional changes to the landscape or visual environment in conjunction with other developments (associated with or separate to it), or actions that occurred in the past, present or are likely to occur in the foreseeable future.

3.7.1 Background and approach

The background and approach for the cumulative impact assessment has been synthesised from previously referred to reference documents, the EIS methodology provided in detail in the EIS (Part D chapter D1), and *Assessing the Cumulative Impact of Onshore Wind Energy Developments* (Scottish Natural Heritage, 2012).

Cumulative effects can be described as *the additional changes caused by a proposed development in conjunction with other similar developments or as the combined effect of a set of developments, taken together* (Scottish Natural Heritage, 2012).

The primary concern is whether or not the proposal, together with other developments in the area intensifies the landscape and/or visual impacts more so than the sum of each individual development. The emphasis remains on the main project being assessed and whether it adds to or combines with the other development to create a significant cumulative effect.

3.7.2 Study area for cumulative impact assessment

In accordance with the SEARs, relevant projects that could have a cumulative impact when considered with the proposal were identified for inclusion in the cumulative assessment. The EIS identifies seven major projects as having a cumulative impact (refer to Part D chapter D1 for more detail). Refer to section 8 for the cumulative landscape character and visual assessment.

3.7.3 Criteria definition

The following sections describe the criteria that have been used to assess the cumulative landscape and visual impact of the proposal against each individual development identified. The individual assessments were then used to produce a summary of cumulative landscape and visual impact for the proposal.

Similarity to proposal in scale and form

The similarity of the proposal to other projects identified in terms of scale and form would affect the overall cumulative impact.

For example, if several wind farms with numerous turbines were to be located within close proximity, they would gradually begin to appear as one large windfarm and may dramatically alter the landscape.

The effect would not be as great for example, if a wind farm development were located near a local road project and a motel. In the latter example, the individual developments would not read as a whole element, but rather separate discreet developments with no clear connection between them.

The following classifications have been applied to this criteria:

- **High** – Both projects are very similar in scale and form and may read as one development.
- **Moderate** – Both projects are moderately similar in scale and form.
- **Low** – Both projects are very different in terms of scale and form.
- **Negligible** – Both projects are virtually incomparable in scale and form.

Likelihood of project being implemented within a similar timescale

The effect of many projects being implemented within a similar timescale or concurrently would have a significant cumulative impact. This would create a sense of the landscape undergoing a process of rapid development. The inverse would be a scenario where development takes place one project at a time over an extended period, such that the change in landscape character would virtually go unnoticeable and not beyond what would be normally expected.

Developments that are at the pre-planning or scoping stage have not generally been considered in the assessment of cumulative effects because firm information on which to base the assessment is not available and because of uncertainty about what will actually occur. Developments with planning consent or a valid planning application have been considered as the likelihood of implementation is high.

The following classifications have been applied to this criteria:

- **High** – It is highly likely that both projects would be implemented concurrently or have overlapping construction programs.
- **Moderate** – There is a reasonable possibility that both projects may be implemented within a similar or overlapping timescale.
- **Low** – Both projects are not likely to be implemented within a similar or overlapping timescale.
- **Negligible** – There is no possibility for both projects to be implemented within a similar or overlapping timescale.

Cumulative effects on landscape character

Cumulative effects on landscape character may result from changes to the physical fabric or the character of the landscape, including values attached to it. This may result from adding new types of change, or from extending similar changes associated with the proposal.

The following classifications have been applied to these criteria:

- **High** – Both developments could have a detrimental effect on the landscape character, condition or value, which may include impacts to nationally important features. The change may cause the landscape character to be permanently changed to an extent that a different landscape character type or sub-type would be created.
- **Moderate** – Any change as a result of both developments would be unlikely to have a considerable adverse effect on the overall landscape character, condition or value, which may include state or locally important features. Key landscape characteristics of the character type would be retained, although individual elements or features of value may be affected.
- **Low** – Any change as a result of both developments would be unlikely to have a considerable effect on the landscape character, condition or value. The landscape is likely to have the capacity to accommodate the type of combined change envisaged.
- **Negligible** – Both development would be very unlikely to have an adverse effect on the landscape character, condition or value, and the landscape character would be in below average condition. Combined changes may enhance the condition or value of the existing landscape character.

Likelihood of combined visibility

The ability to view two or more developments from the same viewing location would result in a greater cumulative impact than where only one development is visible from a given location. Furthermore, being able to see two or more developments while looking in one direction would have a greater cumulative impact than if one has to turn to look in different directions to see all of the developments.

Judgements have been made about the appearance of the various proposed or approved developments without the aid of visual materials.

The following classifications have been applied to these criteria:

- **High** – Both developments would be clearly visible together in views from one direction from a given location and/or could possibly be interpreted as part of the same development.
- **Moderate** – There is a reasonable possibility of being able to see both developments by turning to look in different directions, but not while looking in the same direction.
- **Low** – It is unlikely that both developments would be visible from the same viewing location, either while looking in one direction or having to turn to look in different directions.
- **Negligible** – It is not possible for both developments to be visible from the same viewing location.

Likelihood of sequential visibility

Sequential visibility refers to the ability to view two or more developments in succession whilst moving along a linear route such as a road, track or pathway.

The following are types of sequential views that may be experienced.

Frequently sequential. Where two or more developments appear regularly and within short time lapses between instances because the observer is moving quickly or the distance between the viewpoints is short.

Occasionally sequential. Where longer time lapses between views of two or more developments occur because the observer is moving slowly and/or there are larger distances between the viewpoints.

Rarely sequential. The time lapses between views of two or more developments are so great that the developments would seem completely disconnected.

The following classifications have been applied to these criteria:

- **High** – Views of both developments would be frequently sequential.
- **Moderate** – Views of both developments would be occasionally sequential.
- **Low** – Views of both developments would be rarely sequential.
- **Negligible** – Sequential views of both developments would not be possible.

3.8 Recommended mitigation and management measures

Mitigation measures are developed specifically for the proposal and are appropriate in terms of scale, effort, expense, and applicability. Mitigation measures would include responses to either: avoid, minimise, rehabilitate, manage, or offset impacts, as described below:

- **Avoidance** – Avoid developments in sensitive or prominent landscapes, and avoid insensitive or visually intrusive designs. Prevention of adverse effects at source.
- **Reduction** – Reduction of adverse effects that cannot be eliminated by avoidance. The significance of adverse impacts is reduced. Seeks to limit the exposure of the receiver. Reduce the visual intrusiveness of the design and reduce the visibility of the proposal.
- **Remedy** – Remedy serves to improve adverse conditions by carrying out further works which seek to restore the environment e.g. increased planting of trees/shrubs to replace unavoidable loss of vegetation.
- **Offsetting** – The provision of alternative or compensatory measures where appropriate and feasible (eg offset planting).

Mitigation and management measures are considered during the proposal options assessment and concept design process and, where possible, integrated into the proposal design (refer to section 4). Additional measures are developed after the assessment in response to identified adverse impacts (refer to section 9), including measures recommended for detailed design, construction, and operation of the proposal.

Recommended mitigation and management measures respond to urban design, landscape and rehabilitation objectives as outlined in section 4.

3.9 Aboriginal cultural heritage

The potential impacts of the proposal, as identified in *ARTC Inland Narromine to Narrabri Aboriginal Cultural Heritage Assessment* (JacobsGHD, 2020a) were distributed to the Registered Aboriginal Parties in May 2020 for discussion.

Relevant to this report, Tabletop Mountain was identified by Aboriginal knowledge holders throughout the course of the cultural values assessment as having widespread contemporary cultural values including pathways throughout the landscape involving the Warrumbungles and areas further afield. These pathways link spiritual and ceremonial sites, as well as travel corridors throughout the landscape. During the assessment, knowledge holders commented on the importance of spurs and ridgelines as routes for travel and as vantage points. This has been considered in this report when assessing landscape character and visual sensitivity (refer to sections 5.3.3 and 6.1.14).

3.10 Stakeholder engagement

Stakeholders and the community were consulted to support the preparation of the EIS and to inform the development of the proposal and understanding of potential impacts. A diverse range of communication and consultation tools have been used. Visual amenity was identified as a key issue by impacted landowners and Indigenous stakeholders. Specific issues raised in relation to visual amenity included:

- visual impacts during operation, and the need to consider mitigation strategies such as tree screening.

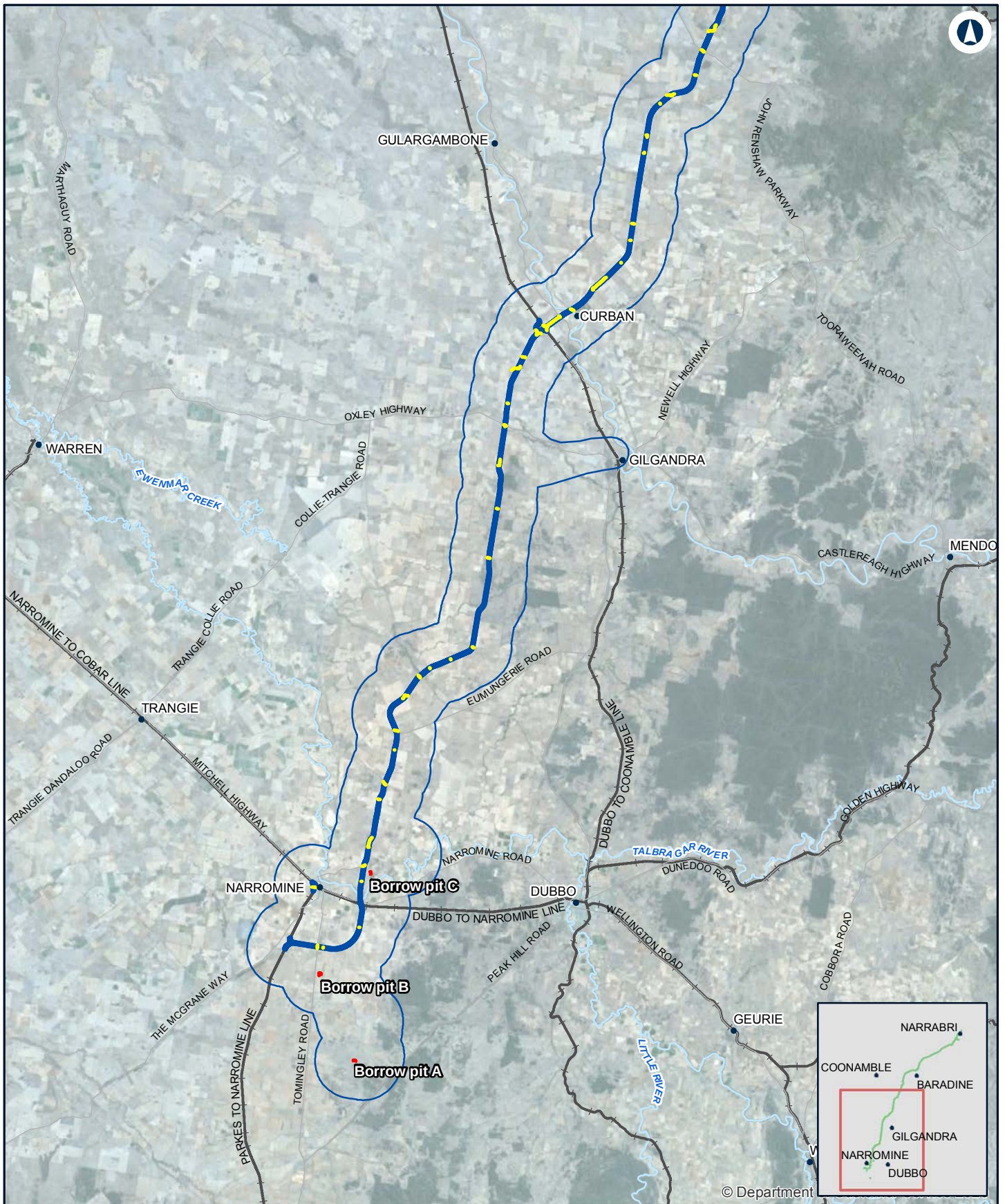
Vegetation screening of the proposal during operation has been identified in section 9.1.1 as a mitigation and management measure to address potential impacts from residential visual receivers within proximity of the proposal. The urban design and landscape plan, undertaken during detailed design, would address this issue, in consultation with relevant stakeholders and the community.

Further information on consultation undertaken for the proposal is provided in *ARTC Inland Rail Narromine to Narrabri Consultation Report* (JacobsGHD, 2020e).

3.11 Limitations and assumptions

Limitations associated with this assessment are as follows:

- Within Australia, there is no Australia-wide guidance document for the assessment of landscape and visual impacts. The industry typically refers to *Guidance for Landscape and Visual Impact Assessment, 3rd Edition* (2013) (Landscape Institute and the Institute for Environmental Management and Assessment, UK); *Environmental Impact Assessment Practice Note - Guideline for landscape character and visual impact assessment (EIA-N04), Version 2.1* (Roads and Maritime Services, 2018) specific to NSW; and *Guidance Note for Landscape and Visual Assessment* (AILA, 2018), specific to Queensland.
- The assessment aims to be objective and describe any changes factually. While potential changes resulting from the proposal are defined, the significance of these changes requires qualitative (subjective) judgements. This assessment's conclusions therefore combine objective measurement and professional interpretation. While this assessment aims to be objective, it is recognised that visual assessment can be subjective and individuals are likely to associate different visual experiences to the study area.
- The study area was visited on two occasions, both of which were in summer and during drought and intense drought conditions, with variable atmospheric conditions including dust storms and smoke from nearby bushfires which may have limited potential visibility. These conditions have been described and represented as such within this report, however may not be representative of the study area during different seasons, atmospheric and weather conditions.



NARROMINE TO NARRABRI

Study area

Figure 3.1a

0 10 20
Km

Coordinate System: GDA 1994 MGA Zone 55

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Author: JacobsGHD

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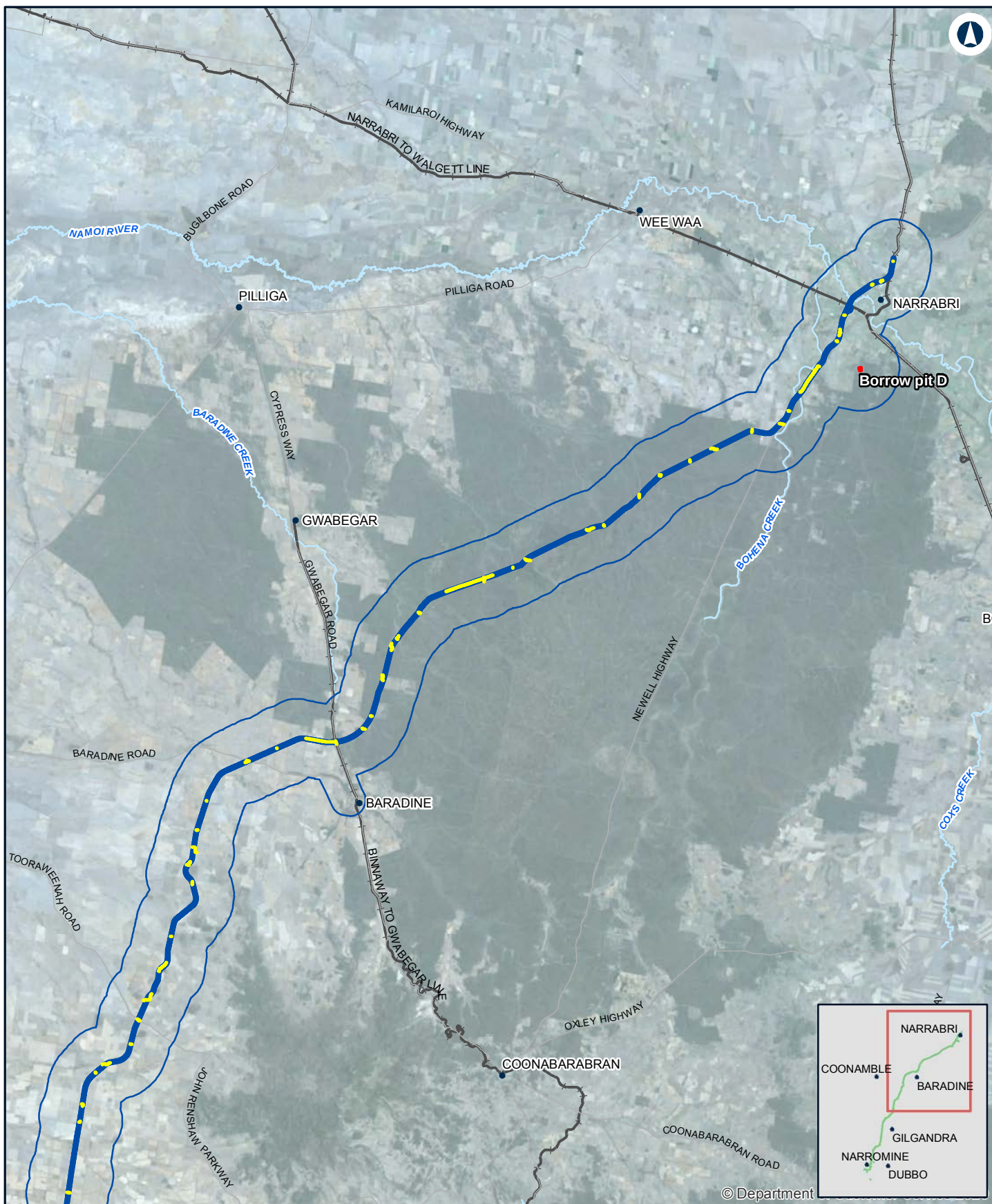
Data Sources: Basemap layers: NSWSS; Study area, project elements: GHDJACOBS

LEGEND

- Alignment
- LVIA study area
- Road realignments
- Borrow pits

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NARROMINE TO NARRABRI

Study area

Figure 3.1b

0 10 20
Km

LEGEND

- Alignment
- LVIA study area
- Road realignments
- Borrow pits

Coordinate System: GDA 1994 MGA Zone 55

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Date: 25/06/2020

Paper: A4

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Scale: 1:700,000

Data Sources: Basemap layers: NSWSS; Study area, project elements: GHDJACOBS

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4. Landscape, urban design and rehabilitation objectives

The following sections outline the landscape, urban design and rehabilitation context of the proposal, and its development through various design phases.

4.1 Program-wide

4.1.1 Inland Rail Landscape and Rehabilitation Strategy

The *Inland Rail Landscape and Rehabilitation Strategy* (ARTC, 2019a) (the Strategy) establishes program-wide governing landscape objectives and principles, and landscape and rehabilitation treatment solutions for the construction and operation of Inland Rail.

Key objectives include the following, with a number of relevant design principles under each objective within the Strategy:

- conserve and connect
- self-sustaining solutions
- integrated outcomes
- beyond delivery.

Additional objectives have been developed under the four typical landscape scenarios:

- rural landscapes
- ecologically sensitive areas
- townships
- temporary treatments.

4.1.2 Inland Rail Landscape and Rehabilitation Framework

The *Inland Rail Landscape and Rehabilitation Framework* (ARTC, 2019b) (the Framework) has been developed to establish governing landscape objectives and principles for the Inland Rail program. The Framework provides guidance for detailed design and construction, including performance outcomes for the design of landscape treatments,

The objectives of the Framework are to:

- Support the Objectives and Principles of the Landscape and Rehabilitation Strategy, with respect to 'Conserve and connect', 'Self-sustaining solutions', 'Integrated outcomes', and 'Beyond delivery'.
- Capture the landscape and rehabilitation measures in the Primary Approval Document, Conditions of Approval and operational requirements for implementation and maintenance.
- Support compliance with the relevant project Conditions of Approval (when available).
- Provide the framework for the development of completion criteria that can be applied consistently program-wide as well as be tailored to individual projects to achieve the required outcomes for reinstatement, rehabilitation and revegetation of disturbed areas, meeting statutory requirements.
- Define a list of contractual requirements for the design and implementation of landscape/rehabilitation treatments. Contractual requirements to be incorporated into project schedules, forecasts and bill of quantities.

- Ensure collaboration across multiple disciplines, such as engineering and environment (including noise, ecology, heritage, sustainability, geotechnics, etc) as well as Construction and Operations Teams, to deliver a sensitive, informed and integrated outcome.

The Strategy and the Framework have been used to inform this report.

4.2 Proposal reference design

The following has been undertaken during the reference design phase of the proposal.

4.2.1 Landscape and urban design objectives

General urban design objectives have been identified for the proposal:

- to fit sensitively within the setting and topography of each landscape typology it passes through
- to minimise impacts to cross connectivity and maximise active transport permeability for communities
- to design built form elements that fit well in their setting, are legible and minimise disturbance to existing connectivity
- to respond to the local natural and cultural context to integrate the proposal into the local setting
- to minimise landscape and visual impacts for communities
- to deliver a fully integrated resilient landscape corridor that that requires minimal maintenance.

During the route selection process these objectives were considered in conjunction with other technical, environmental and social criteria. In particular, the selection process considered proximity to residences, minimising changes to topography, co-location with existing transport corridors, avoiding key geographical features and minimising vegetation removal.

4.2.2 Borrow Pit Rehabilitation Strategy

As part of the EIS, the ARTC *Inland Rail Narromine to Narrabri Borrow Pit Rehabilitation Strategy* (JacobsGHD, 2020c) was prepared to provide a high-level rehabilitation strategy for the four borrow pit sites associated with the construction of the proposal. This included establishing baseline conditions, developing rehabilitation objectives, environmental performance standards, and concept landscape plans with indicative species mixes for re-establishing site vegetation. This strategy would be used by ARTC and their appointed contractor to develop detailed rehabilitation plans for the borrow pits in the detailed design phase.

4.3 Proposal detailed design

The following would be undertaken during the detailed design phase of the proposal. This work would respond to potential impacts identified and mitigation measures recommended in the EIS, including within section 9.1.1 of this report.

4.3.1 Urban design and landscape

During detailed design, an urban design framework and associated urban design and landscape plan would be prepared by a suitably qualified consultant in consultation with relevant stakeholders (including councils and the community). This would be context specific, and include a vision and place-specific objectives and principles to ensure the design is well integrated into its surrounding environment as far as practicable.

4.3.2 Rehabilitation strategy

Substantial areas of landscape and habitat rehabilitation would be required along the length of the proposal site. The urban design and landscape plans developed during the detailed design phase would incorporate a landscape and rehabilitation strategy. The strategy would include consideration of the following:

- rehabilitation of riparian areas disturbed during construction
- rehabilitation of temporary construction areas to agreed pre-existing conditions
- rehabilitation of temporary construction areas where existing native vegetation is adjacent and the landholder agrees
- establishment of appropriate native grass species within the rail corridor where practicable to minimise exposed surfaces
- rehabilitation of agricultural land.

The specific landscape rehabilitation recommendations would be developed in response to the following proposal requirements:

- implement low maintenance landscape
- minimise exposed surfaces
- reinstate native vegetation to match local ecological communities
- provide for fauna habitat and connectivity as far as possible
- select species to ensure biosecurity issues and adjoining landholder activities are considered
- consideration of a staged approach for agricultural land.

4.3.3 Reference documents

The urban design framework, landscape and urban design plan, and rehabilitation strategy would be prepared in accordance with relevant guidelines, policies and strategies, including:

- AS4282-1997 Control of the obtrusive effects of outdoor lighting
- *Beyond the Pavement: Urban design policy, procedures and design principles* (Roads and Maritime Services, 2014)
- *Bridge aesthetics: design guidelines to improve the appearance of bridges in NSW* (Roads and Maritime Services, 2012)
- Conditions of approval for the proposal
- Crime prevention through environmental design (CPTED) principles
- *Landscape design guideline: Design guideline to improve the quality, safety and cost effectiveness of green infrastructure in road corridors* (Roads and Maritime Services, 2018)
- *Urban Green Cover in NSW: technical guidelines* (Office of Environment and Heritage, 2015)
- *Water sensitive urban design guideline: Applying water sensitive urban design principles to NSW transport projects* (Roads and Maritime Services, 2017)
- *Inland Rail Landscape and Rehabilitation Strategy* (ARTC, 2019a)
- *Inland Rail Landscape and Rehabilitation Framework* (ARTC, 2019b)
- *Inland Rail Narromine to Narrabri Agriculture and Land Use Assessment* (JacobsGHD 2020b)

- *Inland Rail Narromine to Narrabri Borrow Pit Rehabilitation Strategy* (JacobsGHD 2020c)
- Rehabilitation requirements described in *ARTC Inland Rail Narromine to Narrabri Biodiversity Development Assessment Report* (JacobsGHD 2020d)
- Relevant EIS mitigation measures (including within this report, and as outlined in *ARTC Inland Rail Narromine to Narrabri Biodiversity Development Assessment Report* (JacobsGHD 2020d)).

5. Landscape impact assessment

5.1 Landscape baseline

5.1.1 Land use and built form

Land uses within the study area comprise predominantly of rural land, with areas of state forest in the Pilliga region. The townships of Narrabri and Narromine lie to the north and south of the study area respectively, with typical urban land uses including residential, local centre, open space, infrastructure and industrial.

Rural land in the region is centred around the production of irrigated cotton, grain crops, sheep and cattle grazing, and forestry. Cotton and grain crops occur predominantly on the fertile soils of the flat alluvial plains interspersed with grazing. Forestry is confined to an isolated area with poorer soil quality.

Although the productive rural landscapes dominate the study area, built form and infrastructure are prominent features scattered throughout. These are typically associated with rural land uses and include large-scale farm machinery such as silos, rural residential dwellings and sheds, and road and rail infrastructure.

Roads in the study area are both sealed and unsealed and include a hierarchy of highways, arterial and sub-arterial roads, local roads and dirt tracks. Highways traversing the study area include the Newell Highway, Kamilaroi Highway, Mitchell Highway, Castlereagh Highway, and the Oxley Highway.

Existing rail infrastructure includes both used and unused primarily freight lines. This includes the Parkes to Narromine Line south from Narromine; the Main Western Line through Narromine; the Dubbo to Coonamble Line crossing near Curban; the Binnaway to Gwabegar Line on the western side of the Pilliga (currently disused); the Narrabri to Walgett Line south-west of Narrabri, and the Mungindi Line (passenger service) traversing through Narrabri. The Narromine railway station is closed to passenger services.

A number of travelling stock reserves are present within the study area. These linear corridors are Crown Land, historically associated with pathways used traditionally by Aboriginal people, the movement of stock, and for emergency access. More recently, these corridors have provided valuable grazing land, recreational land, and important biodiversity conservation corridors, often providing landscape-scale connectivity. A recent government review found that regional communities have strong connections to travelling stock reserves (NSW Department of Industry, 2018).

5.1.2 Topography and hydrology

Much of the topography within the study area is relatively flat with gentle slopes and characteristic steeper uplands associated with the Warrumbungle Ranges foothills. The terrain is slightly more elevated in the area associated with the Pilliga East State Forest.

The study area is within the Murray Darling Basin, crossing a number of catchment areas including the Namoi Valley to the north and Macquarie-Castlereagh catchment to the south. Major watercourses include the Namoi River traversing Narrabri, the Macquarie River running through Narromine, and the Castlereagh River near Curban.

Due to the flatness of the terrain, flooding is common within the study area, particularly associated with the Namoi and Macquarie rivers. This includes relatively frequent flood events within the townships of Narromine and Narrabri. However, over time, flows within both river catchments have been reduced due to the construction of significant water storages upstream, as well as drought conditions.

Refer to Figure 5.1 for the topography and Figure 5.2 for the hydrology of the study area.

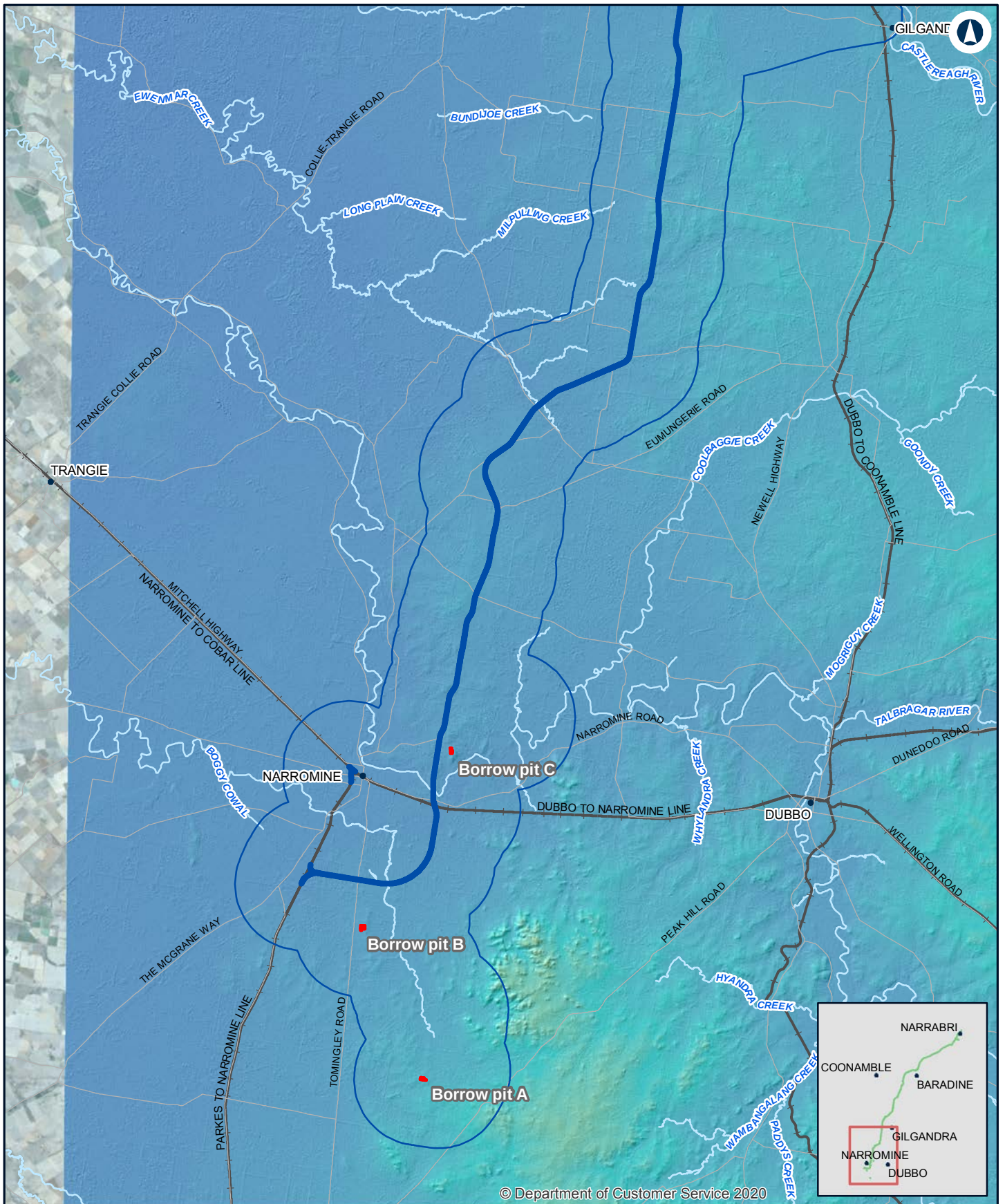
5.1.3 Vegetation

Over time, the vast majority of remnant native vegetation in the study area has been cleared for cropping and grazing, however some remnants and scattered trees are present within paddocks, along fence lines and waterways, and along roadsides. The riparian vegetation associated with waterways has a strong visual presence through the vast agricultural plains. Planted corridors of native trees along property boundaries are a relatively common feature within the rural landscape.

The Pilliga forests are a large tract of native dry sclerophyll forest in the northern portion of the study area, with dense understorey creating a strong spatial contrast to the surrounding open plains.

The climate of the region is characterised by hot summers and mild winters with great variability in rainfalls. Therefore periods of drought and flooding are common occurrences. The dense forest of the Pilliga combined with the generally dry climate is conducive to bushfires.

Refer to Figure 5.2 for the location of National Parks and State forests in proximity to the study area.



NARROMINE TO NARRABRI

Topography

Figure 5.1a

0 5.5 11
Km

Coordinate System: GDA 1994 MGA Zone 55

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Date: 10/06/2020

Paper: A4

Author: JacobsGHD

Scale: 1:400,000

Data Sources: Basemap layers: NSWSS; SRTM DEM: USGS; Study area, project elements: GHDJACOBS

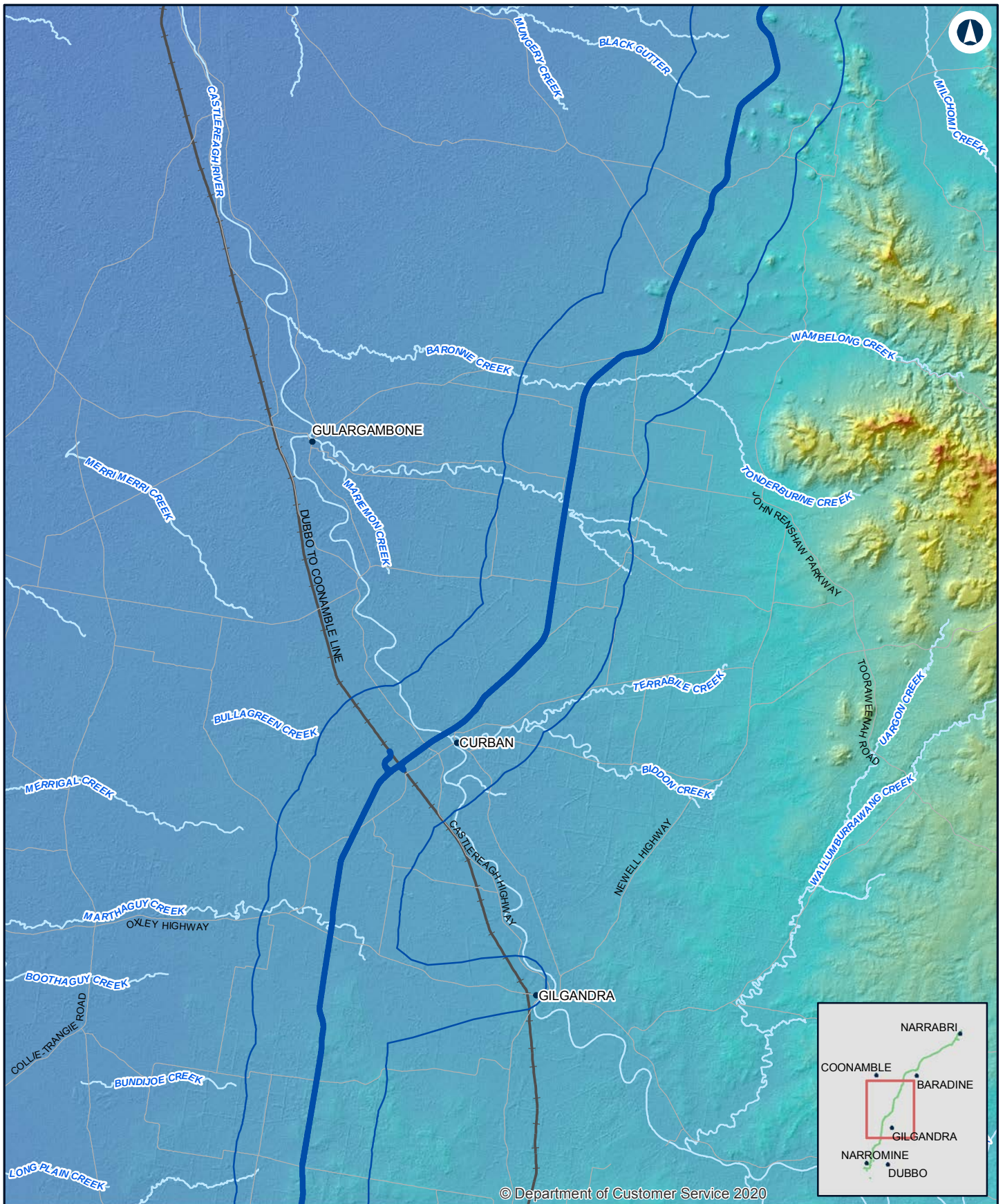
LEGEND

- Alignment
- LVIA study area
- Borrow pits
- Road
- Existing railway

Elevation
High : 1599m
Low : -49m

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NARROMINE TO NARRABRI

Topography

Figure 5.1b

0 5.5 11 Km

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Data Sources: Basemap layers: NSWSS; SRTM DEM: USGS; Study area, project elements: GHDJACOBS

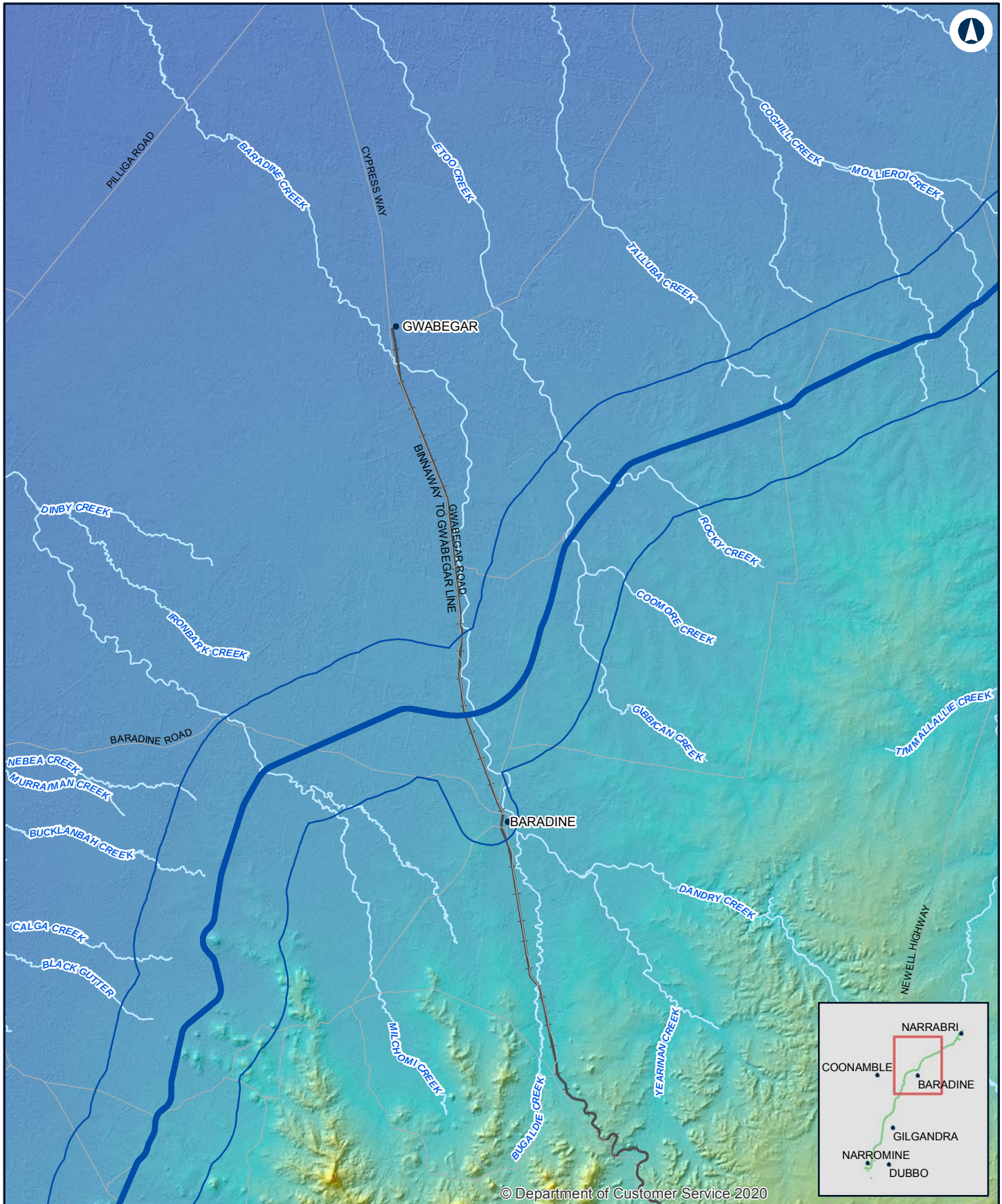
LEGEND

- Alignment
- LVIA study area
- Road
- +— Existing railway

Elevation
 High : 1599m
 Low : -49m

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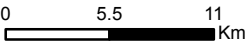


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NARROMINE TO NARRABRI

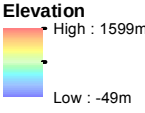
Topography

Figure 5.1c



LEGEND

- Alignment
- LVIA study area
- Road
- Existing railway



Coordinate System: GDA 1994 MGA Zone 55

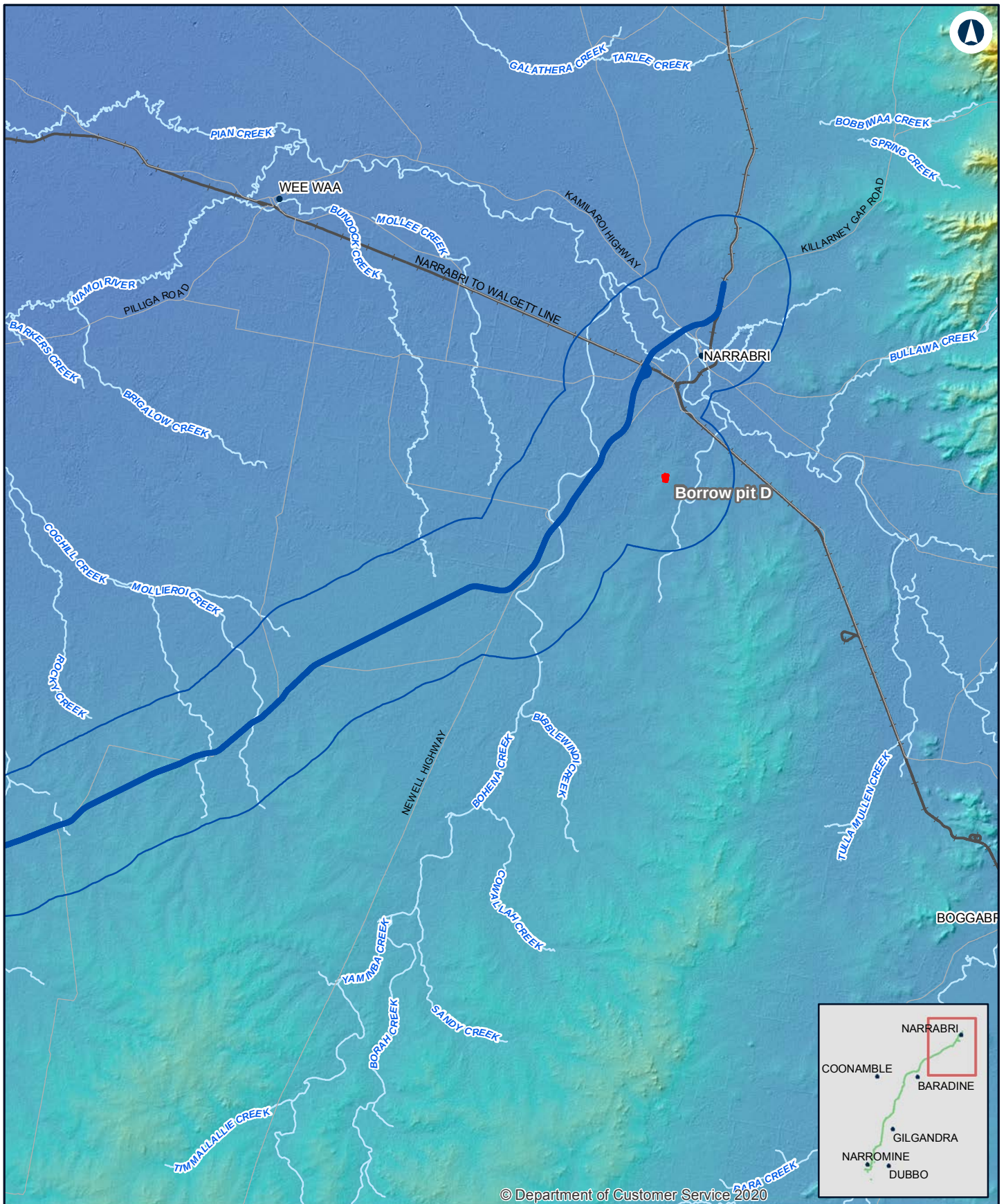
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NARROMINE TO NARRABRI

Topography

Figure 5.1d

0 5.5 11 Km

Coordinate System: GDA 1994 MGA Zone 55

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Date: 10/06/2020

Paper: A4

Author: JacobsGHD

Scale: 1:400,000

Data Sources: Basemap layers: NSWSS; SRTM DEM: USGS; Study area, project elements: GHDJACOBS

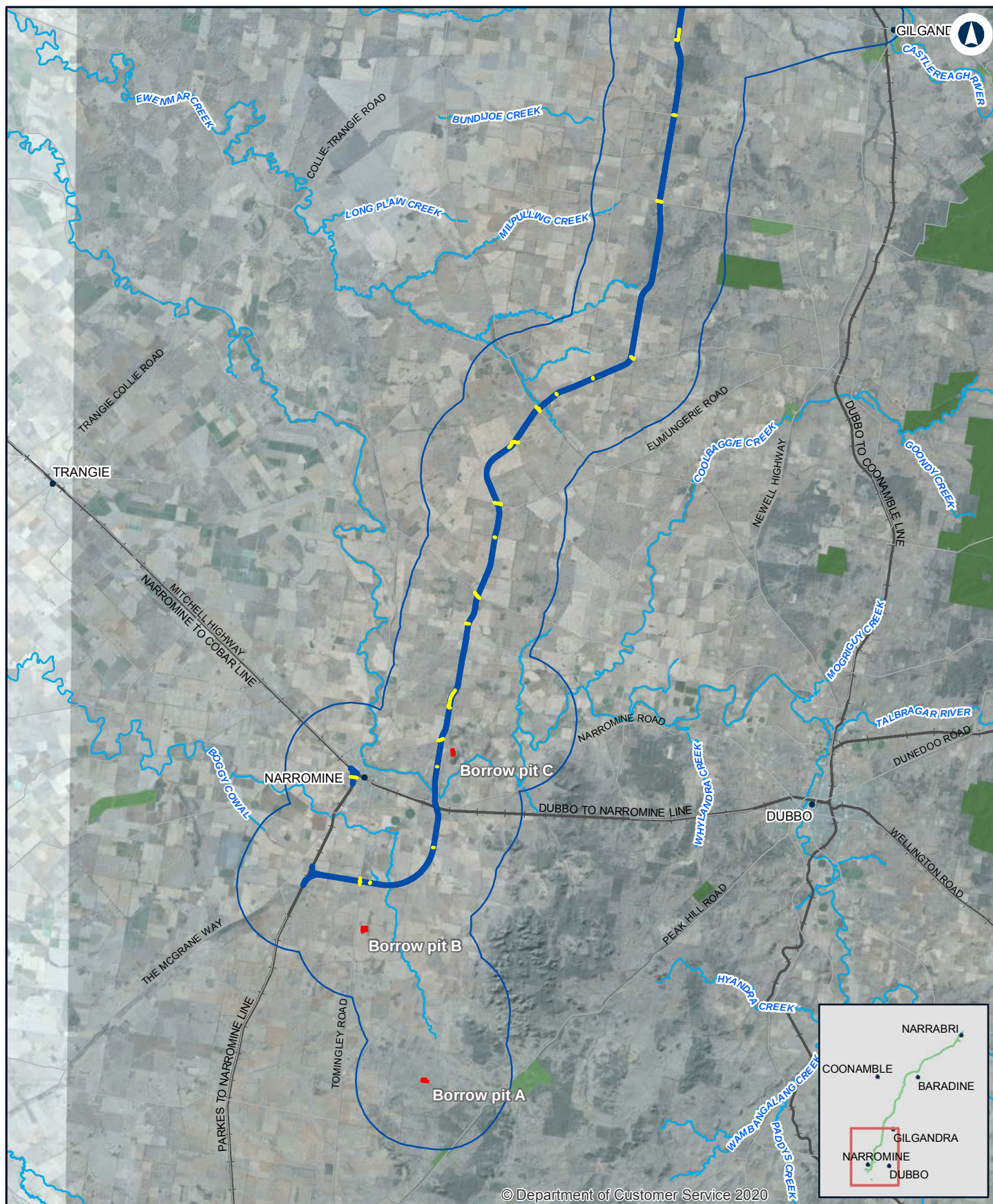
LEGEND

- Alignment
- LVIA study area
- Borrow pits
- Road
- Existing railway

Elevation
■ High : 1599m
■ Low : -49m

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NARROMINE TO NARRABRI

Hydrology and vegetation

Figure 5.2a

0 5.5 11
Km

Coordinate System: GDA 1994 MGA Zone 55

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Paper: A4

Author: JacobsGHD

Scale: 1:400,000

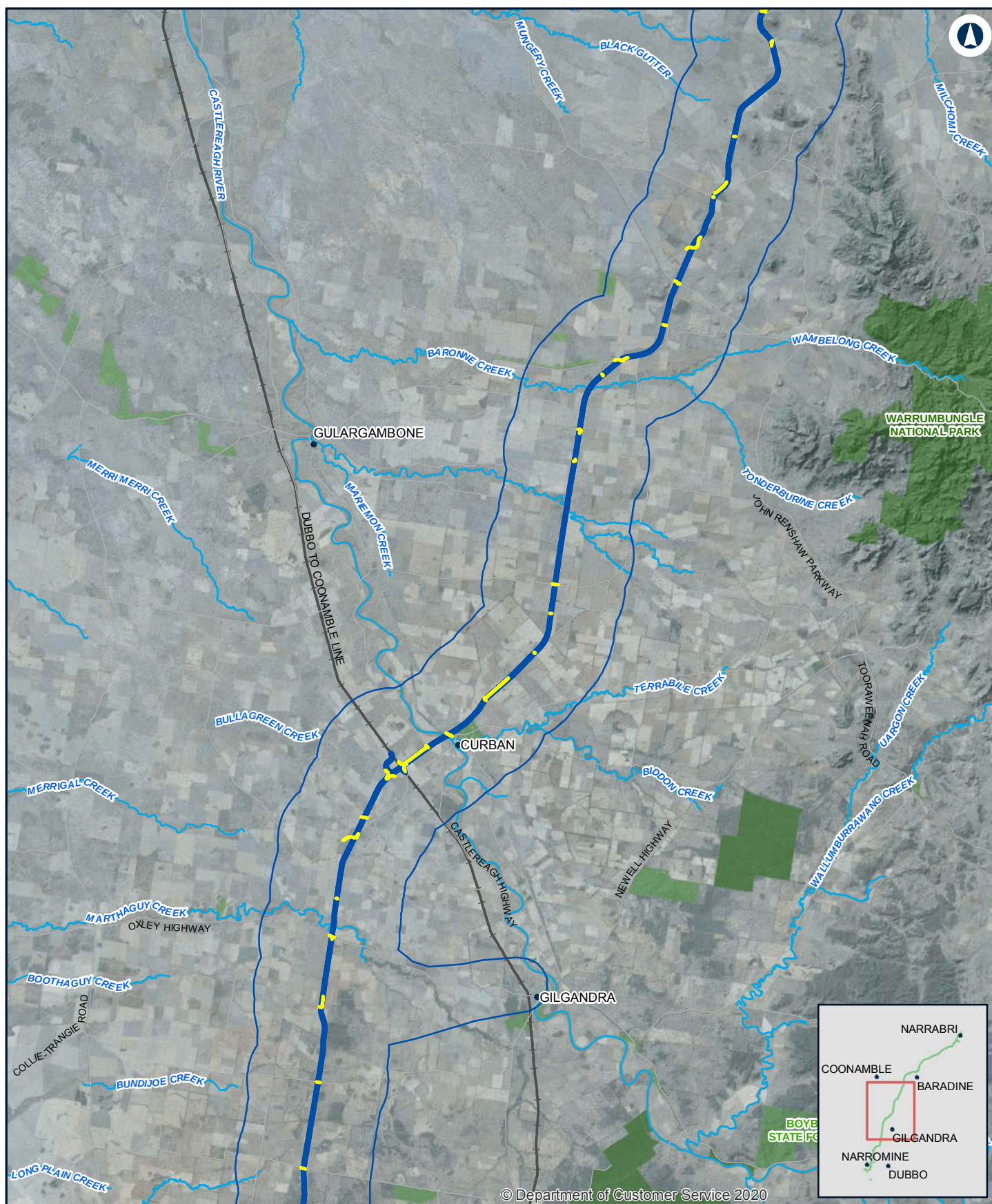
Data Sources: Basemap layers: NSWSS; Study area, project elements: GHDJACOBS

LEGEND

- Alignment
- LVIA study area
- Road realignments
- Borrow pits
- Road
- Existing railway
- Watercourse
- National park
- State forest

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NARROMINE TO NARRABRI

Hydrology and vegetation

Figure 5.2b

0 5.5 11 Km

Coordinate System: GDA 1994 MGA Zone 55

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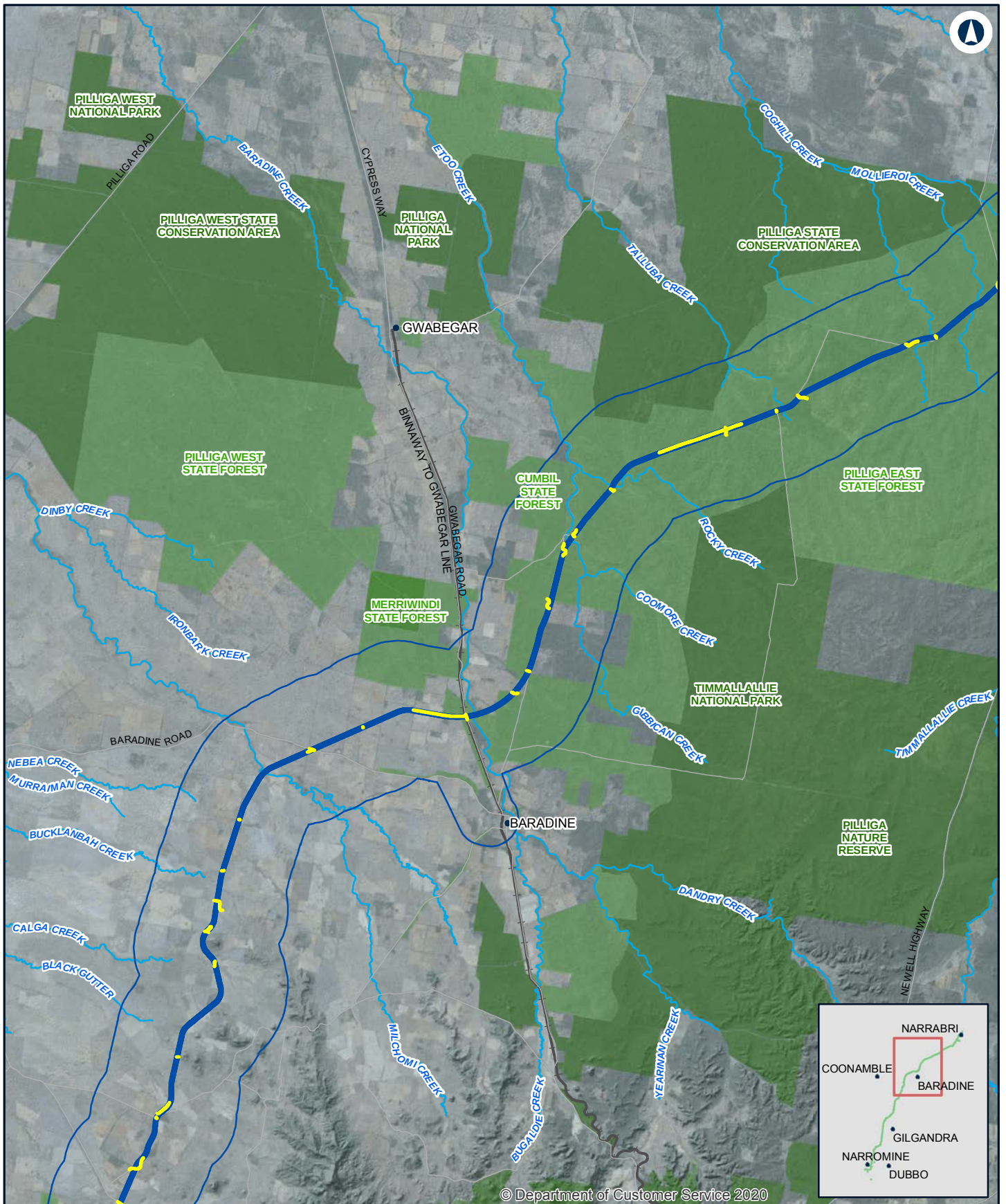
Data Sources: Basemap layers: NSWSS; Study area, project elements: GHDJACOBS

LEGEND

- Alignment
- LVIA study area
- Road realignments
- Road
- Existing railway
- Watercourse
- National park
- State forest

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NARROMINE TO NARRABRI

Hydrology and vegetation

Figure 5.2c

0 5.5 11
Km

Coordinate System: GDA 1994 MGA Zone 55

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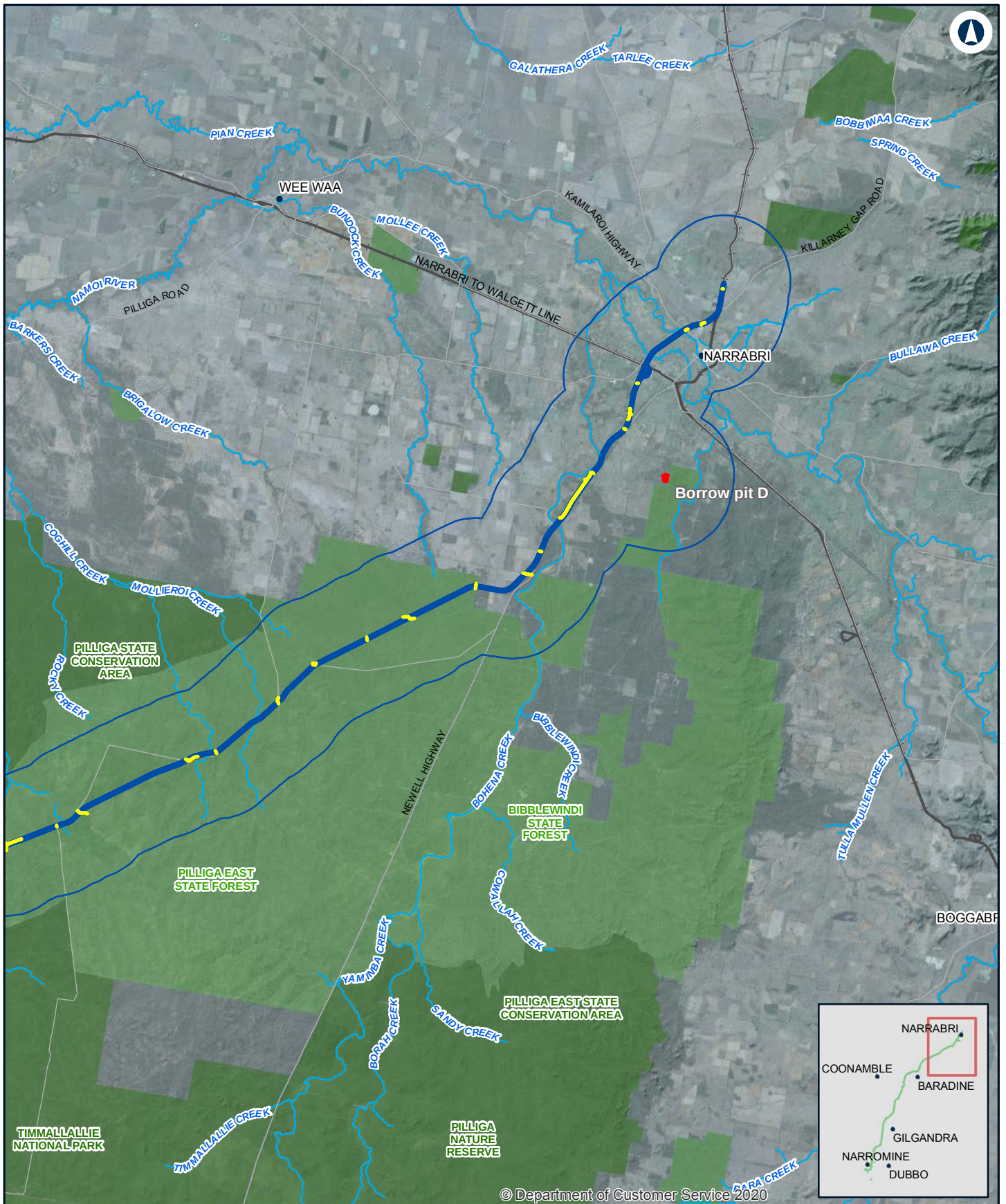
Data Sources: Basemap layers: NSWSS; Study area, project elements: GHDJACOBS

LEGEND

- Alignment
- LVIA study area
- Road realignments
- Road
- Existing railway
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NARROMINE TO NARRABRI

Hydrology and vegetation

0 5.5 11 Km

Coordinate System: GDA 1994 MGA Zone 55

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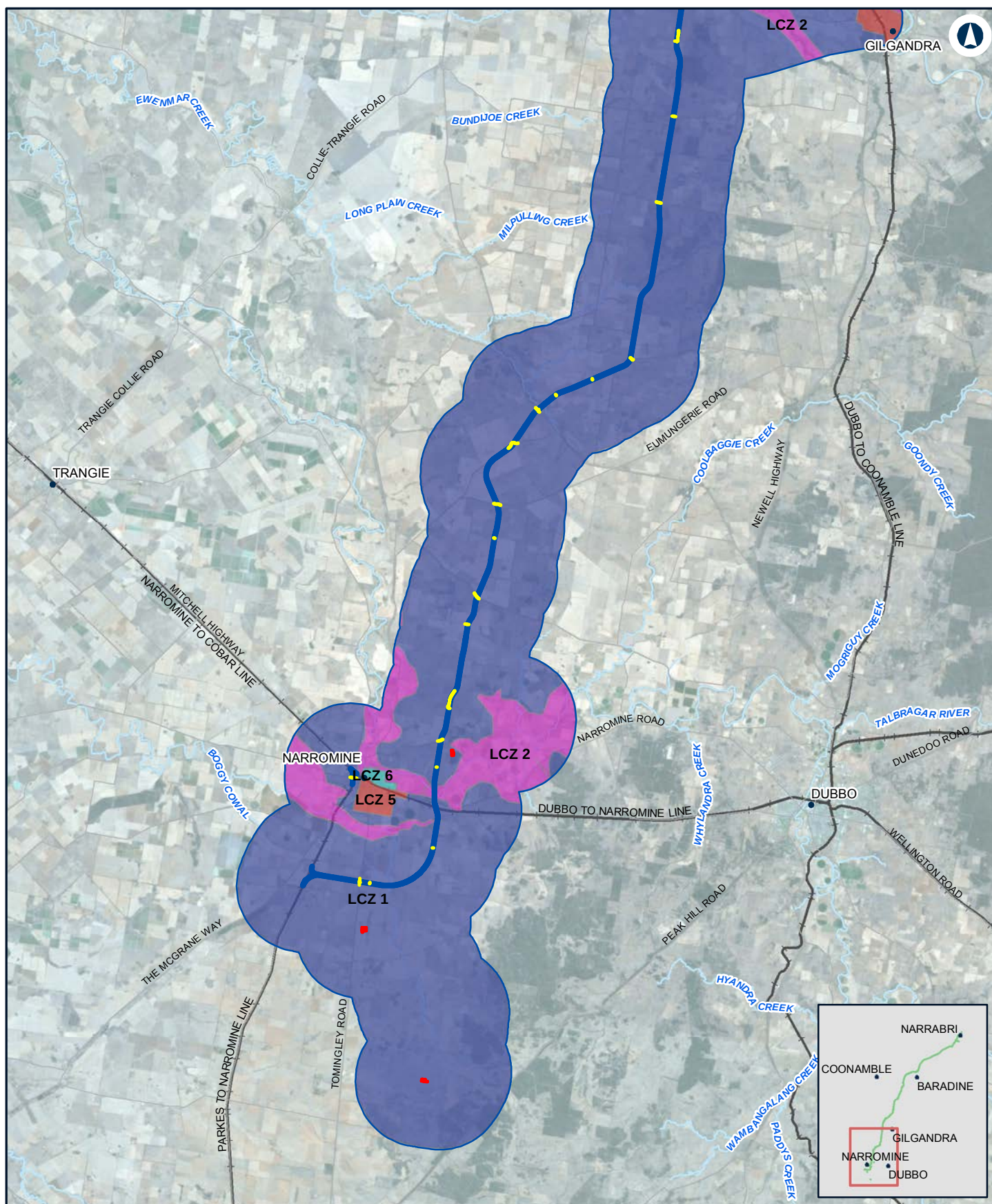
5.2 Landscape character zones

Landscape Character Zones (LCZs) have been defined within the study area based on the landscape and visual baseline assessment. The LCZs represent broadly homogenous landscape characteristics and urban patterns.

The following LCZs have been defined:

- LCZ 1: Slopes and Plains
- LCZ 2: Waterways and Floodplains
- LCZ 3: Warrumbungle Slopes and Uplands
- LCZ 4: Pilliga Forests
- LCZ 5: Township (alluvial plain)
- LCZ 6: Township (floodplain).

Refer to Figure 5.3 for the location of LCZs.



NARROMINE TO NARRABRI

Landscape character zones

Figure 5.3a

0 5.5 11 Km

Coordinate System: GDA 1994 MGA Zone 55

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LEGEND

- Alignment
- LVIA study area
- Road realignments
- Borrow pits
- Settlement
- Road
- Existing railway

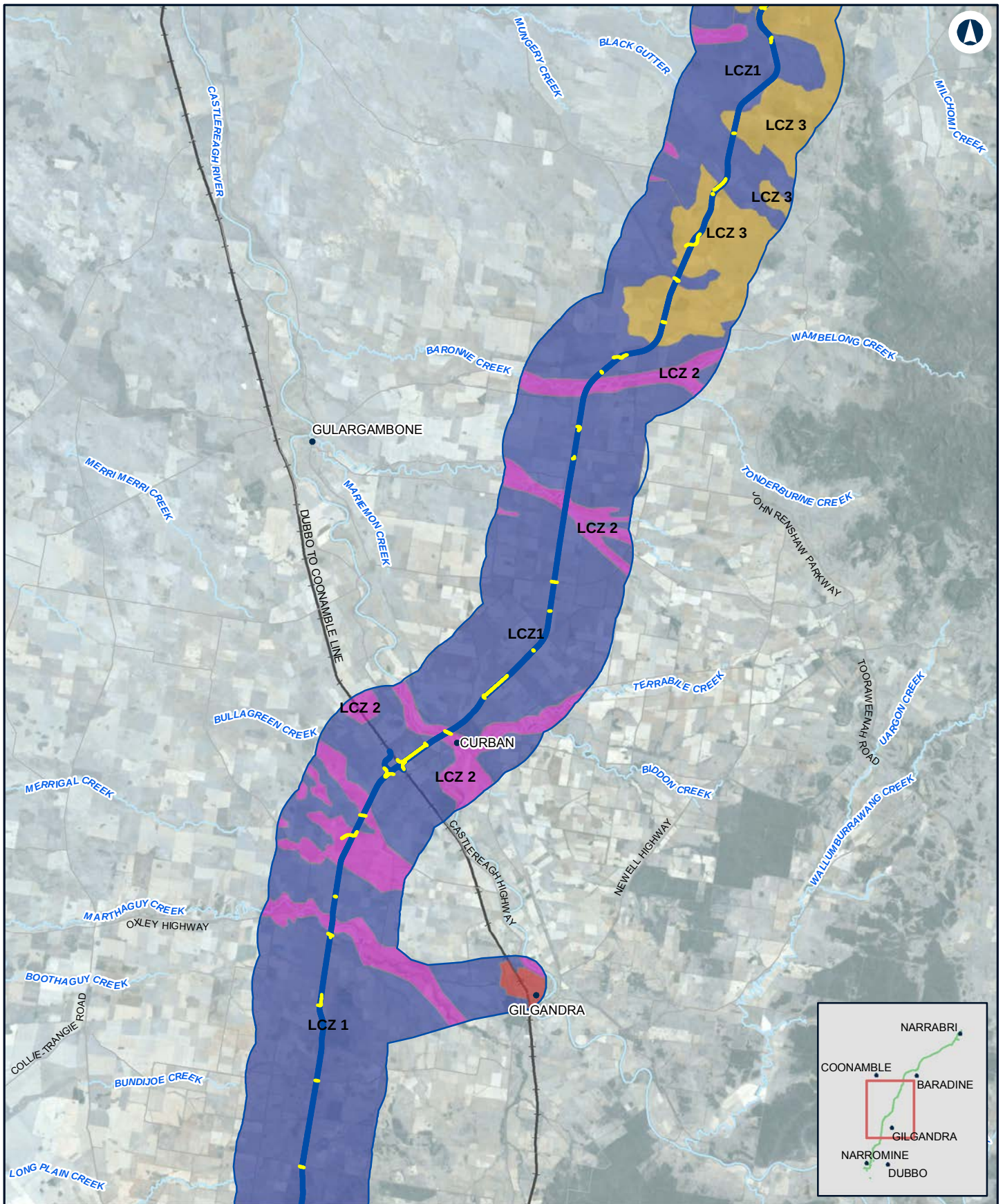
Landscape character zones

- LCZ 1 - Slopes and Plains
- LCZ 2 - Waterways and Floodplains
- LCZ 5 - Township (alluvial plain)
- LCZ 6 - Township (floodplain)

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NARROMINE TO NARRABRI

Landscape character zones

Figure 5.3b

0 5.5 11
Km

Coordinate System: GDA 1994 MGA Zone 55

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LEGEND

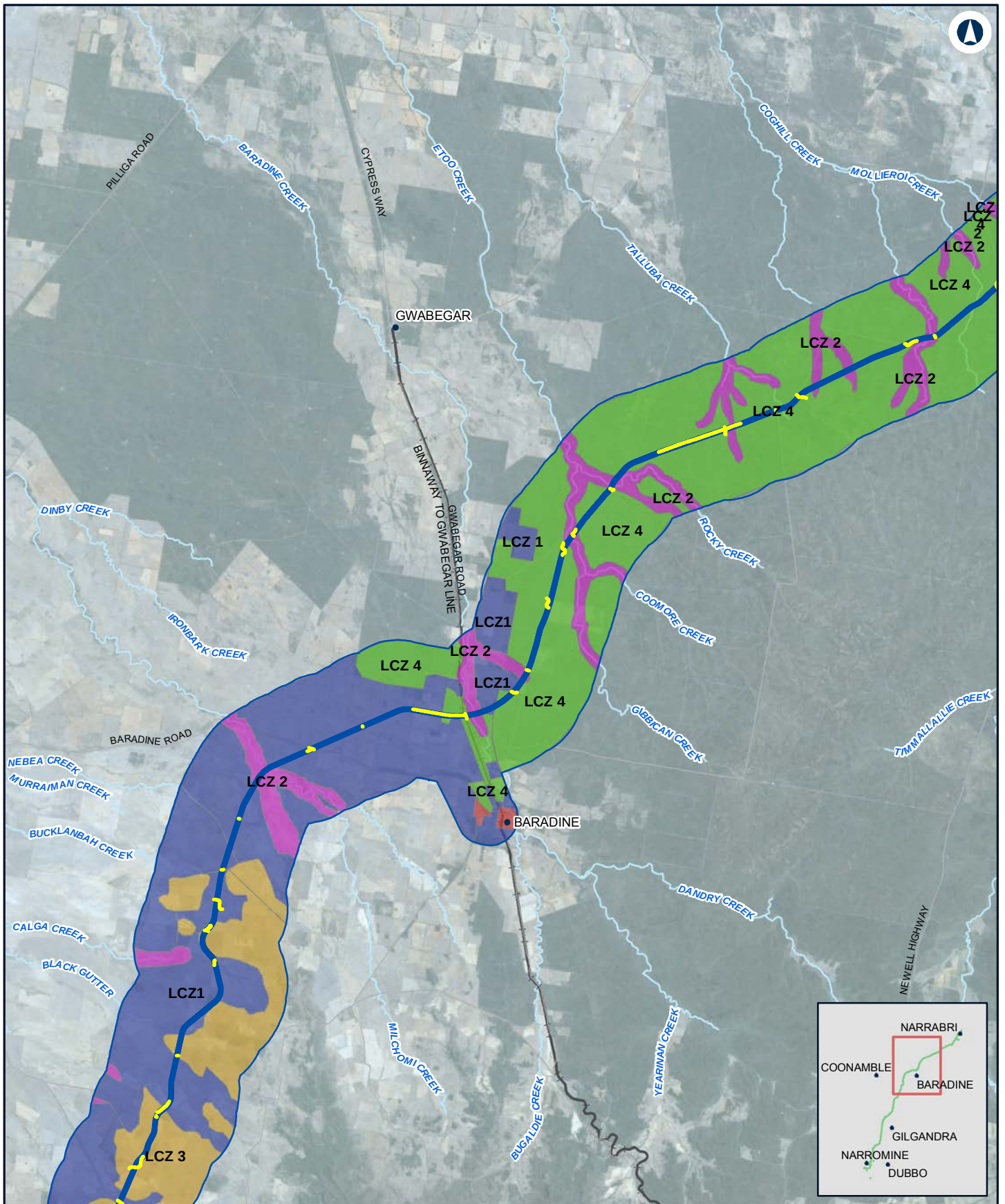
- Alignment
- LVIA study area
- Road realignments
- Settlement
- Road
- Existing railway

Landscape character zones

- LCZ 1 - Slopes and Plains
- LCZ 2 - Waterways and Floodplains
- LCZ 3 - Warrumbungle Slopes and Uplands
- LCZ 5 - Township (alluvial plain)

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NARROMINE TO NARRABRI

Landscape character zones

Figure 5.3c

0 5.5 11 Km

Coordinate System: GDA 1994 MGA Zone 55

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LEGEND

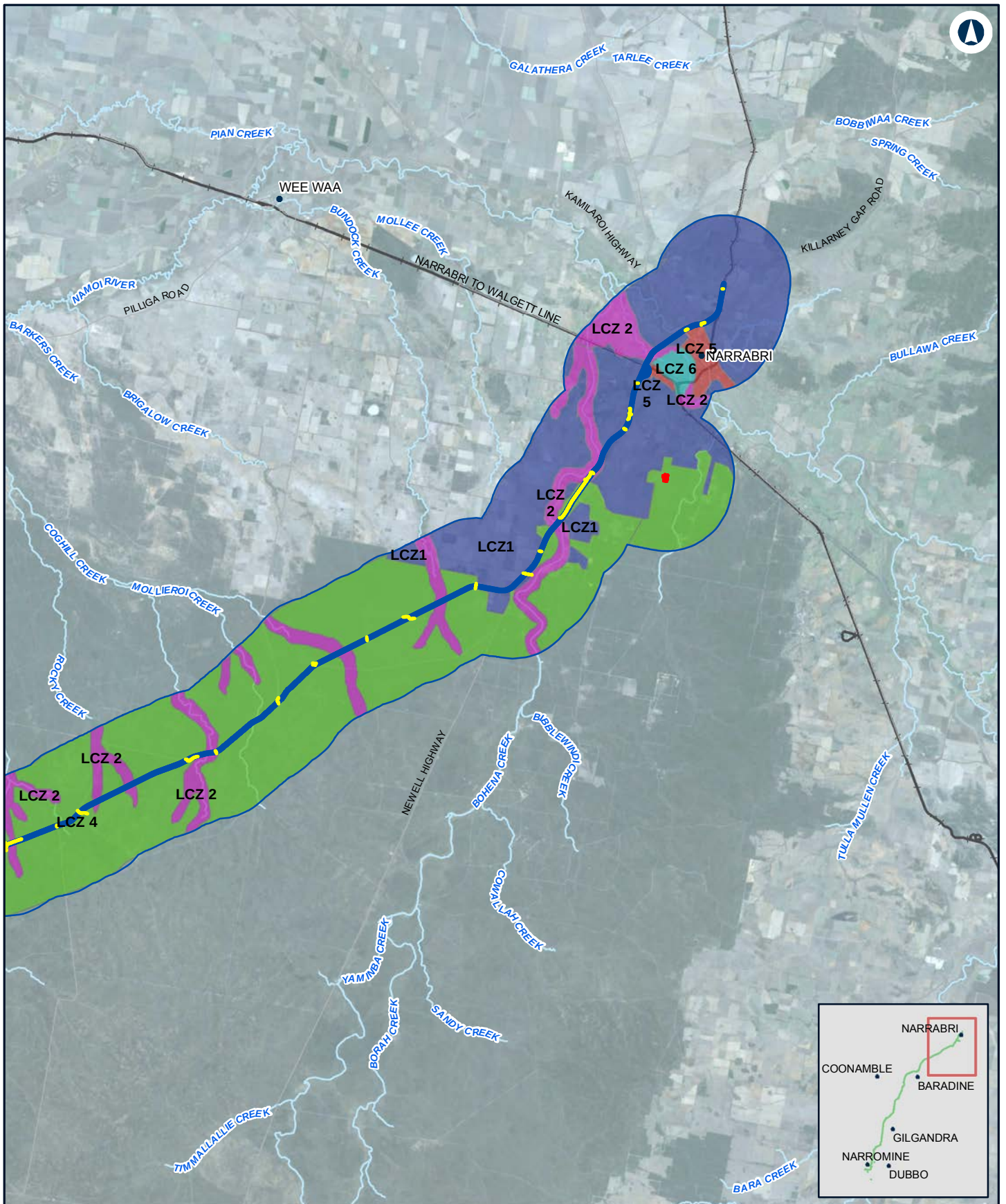
- Alignment
- LVIA study area
- Road realignments
- Settlement
- Existing railway

Landscape character zones

- LCZ 1 - Slopes and Plains
- LCZ 2 - Waterways and Floodplains
- LCZ 3 - Warrumbungle Slopes and Uplands
- LCZ 4 - Pilliga Forests
- LCZ 5 - Township (alluvial plain)

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NARROMINE TO NARRABRI

Landscape character zones

Figure 5.3d

0 5.5 11
Km

Coordinate System: GDA 1994 MGA Zone 55

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Data Sources: Basemap layers: NSWSS; Study area, project elements: GHDJACOBS

LEGEND

- Alignment
- LVIA study area
- Road realignments
- Borrow pits
- Settlement
- Road
- Existing railway

Landscape character zones

- LCZ 1 - Slopes and Plains
- LCZ 2 - Waterways and Floodplains
- LCZ 4 - Pilliga Forests
- LCZ 5 - Township (alluvial plain)
- LCZ 6 - Township (floodplain)

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5.3 Landscape character impact assessment

This section includes a description of landscape character and assessment of impacts to the landscape character from the proposal.

5.3.1 LCZ 1: Slopes and Plains

LCZ 1: Slopes and Plains



Photo 5.1 LCZ 1 characteristics along Cobboco Road, Burroway



Photo 5.2 LCZ 1 characteristics along Eumungerie Road, Narromine



Photo 5.3 Rail line and infrastructure within LCZ 1

LCZ 1: Slopes and Plains

Location of LCZ 1	LCZ 1 is located throughout the study area, including predominantly rural land north of the Pilliga surrounding Narrabri, to the south between Baradine and Narromine, and areas to the south of Narromine.
Key characteristics of LCZ 1	LCZ 1 includes both long gentle slopes, low rounded hills and alluvial plains. These are found at elevation ranging from 170 to 300 metres. The local relief ranges from one to 30 metres. To the south of Narromine, LCZ 1 also includes limited areas up to elevations of 340 metres. Land use is predominantly privately owned irrigated and non-irrigated cropping / grazing land, forming a vast expanse of open, flat agricultural mosaic punctuated by scattered and linear trees. This mosaic is large scale and dynamic, with colours and vegetation types transitioning through the seasons in response to farming practices and climate. The road and rail network traverses this mosaic. Roads comprise of both sealed and unsealed roads of varying hierarchies, with verges including pasture grasses and, at times, linear dense rows of mature native trees. The existing rail lines are at-grade surrounded by low pasture grasses. The road network is generally very linear across the flat landscape. Paddock boundaries are defined by post and wire fencing, with vegetation type often changing between fields. Tree cover includes mature native Eucalypt species, some of which may include remnant trees, scattered throughout paddocks. Dense linear boundary plantings along fence lines are common characteristic features. Built form includes large-scale farm machinery and infrastructure such as silos and sheds, and rural residential dwellings located in isolated clusters scattered throughout the expansive plains, typically amongst some mature vegetation. This LCZ also includes a number of other land uses on the outer edges of Narrabri, including an agricultural education facility and a publicly accessible viewing area.
Anticipated change to landscape character	Anticipated changes to LCZ 1 include a new rail corridor traversing through large portions of the character zone. This linear corridor would require a clear corridor to be maintained, which would require the permanent removal of existing vegetation in some locations (a greater area is proposed to be cleared during construction, however this would likely be re-established). The rail line is predominantly at-grade, aside from various bridges. Where required, proposed cut and fill batters would be much steeper than existing slopes within this LCZ. In some locations, the rail line follows alongside existing linear road corridors, and at other time, it traverses through rural land or along linear property boundary lines or fence lines. When alongside existing roads or linear tree rows, the rail corridor is more often sited at a distance to allow for the potential retention of the existing linear vegetation corridor. New rail bridges within LCZ 1 would be located at creek and river crossings. The Narrabri Creek / Namoi River bridge traverses across a portion of LCZ 1. Multiple new level crossings at public and private road intersections are proposed. Road realignments would also be required at various locations along the rail corridor. In some instances, these would be curvilinear and someone at odd with the existing road network character. Borrow pits are proposed within LCZ 1, to the north and south of Narromine. These would require a change to the landform associated with extraction of material, as well as the removal of vegetation. A rehabilitation strategy has been prepared for these borrow pit sites for their remediation to a similar landscape character as existing.

LCZ 1: Slopes and Plains

Sensitivity to change	The sensitivity of change for LCZ 1 is considered to be Low . The landscape character elements such as topography, rural land, linear mature tree corridor and scattered remnant vegetation making a positive contribution to the landscape character of the area. However, the type of change proposed would be unlikely to have an adverse effect on the landscape character, condition or value. The landscape is likely to have the capacity to accommodate the anticipated change.
Magnitude of change	The magnitude of change for LCZ 1 is considered to be Low due to there being a minor loss of vegetation along the proposed rail corridor and the introduction of new components such as rail bridges, although these are not uncharacteristic within the existing landscape. The rail corridor is situated to minimise linear tree removal, is generally at-grade, and the road and rail corridors are features within the existing landscape character. Proposed batter slopes would be contrary to the existing landscape characteristics, however are relatively minor overall, with potential to be mitigated through detailed design. The borrow pits would be in contrast to the existing landscape, however the introduction of these would be a minor alteration to the LCZ1 and the rehabilitation strategy would see the landscape character of these areas remediated similar to the existing.
Significance of impact	The significance of impact for LCZ 1 is therefore considered to be Low .

5.3.2 LCZ 2: Waterways and Floodplains

LCZ 2: Waterways and Floodplains



Photo 5.4 National Park Highway bridge across the Castlereagh River



Photo 5.5 Castlereagh River characteristics

Location of LCZ 2	LCZ 2 is located along the main drainage channels within the study area, traversing across most landscape character zones. LCZ 2 includes the Macquarie, Castlereagh, and Namoi rivers and associated creeks and tributaries.
Key characteristics of LCZ 2	LCZ 2 is found across a range of elevations within the study area, and generally has a local relief of between five and 15 metres. The waterway characteristics vary from permanent stream flow to dry creeks, typically with a sand bed. Vegetation also varies according to location, but typically comprises of woodland with species including River Red Gum (<i>Eucalyptus camaldulensis</i>), Brimble Box (<i>Eucalyptus populnea</i>), as well as White Cypress Pine (<i>Callitris glaucophylla</i>). LCZ 2 includes the land uses of primary production and forestry. Existing infrastructure typically includes road and rail bridge crossings. Cultural uses are limited as this LCZ occurs primarily within private property and state forest. LCZ 2 forms a dense, often winding tree-lined corridor through an otherwise cleared agricultural mosaic. LCZ 2 creates spatial definition within the rural landscape, creating contrast and often acting as a visual backdrop to the horizon.

LCZ 2: Waterways and Floodplains

Anticipated change to landscape character	Anticipated changes to LCZ 2 include a new rail corridor through short sections of this character zone, where the rail line crosses creeks, rivers or floodplain. The rail corridor would require a clear corridor to be maintained, which would require the permanent removal of existing vegetation (a greater area is likely to be cleared during construction, however this would likely be re-established). Proposed rail bridges would occur at locations including but not limited to the following: Narrabri Creek / Namoi River bridge, two bridges at Bohena Creek at separate locations, Mitchell Highway/Macquarie River bridge, Emogandy Creek bridge, Kickabil Creek and Kickabil Road bridge, Marthaguy Creek bridge, Castlereagh River bridge, and the Baradine Creek bridge, among others. These bridges would vary in length, however would be concrete in material.
Sensitivity to change	The sensitivity to change for LCZ 2 is considered to be Moderate due to the landscape character elements such as the waterways and vegetation making a good contribution to the landscape character of the area. Any change from the proposal would be unlikely to have a significant adverse effect on the landscape character, with road and rail crossing being a typical feature within this landscape.
Magnitude of change	The magnitude of change is LCZ 2 is considered to be Low as although the rail corridor would result in the permanent removal of vegetation at river and creek crossings, these would occur for short sections within the LCZ, with the overall majority of vegetation retained. The proposed rail bridges would not be uncharacteristic within the existing landscape character.
Significance of impact	The significance of impact for LCZ 2 is therefore considered to be Moderate-Low.

5.3.3 LCZ 3: Warrumbungle Slopes and Uplands

LCZ 3: Warrumbungle Slopes and Uplands



Photo 5.6 LCZ 3 characteristics along Goorianawa Road, Barwon



Photo 5.7 LCZ 3 characteristics along Weenya Road, Tonderburine



Photo 5.8 Table Top Mountain, viewed from Vatua Lane, Barwon

Location of LCZ 3	LCZ 3 is located on the western edge of the Warrumbungle Ranges, between National Park Road / Box Ridge Road intersection and Munns Road.
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LCZ 3: Warrumbungle Slopes and Uplands

Key characteristics of LCZ 3	LCZ 3 is situated on elevations ranging between 300 and 450 metres within the study area, with a local relief of between 50 to 250 metres. Topography is characterised by stony ridges and isolated elevations with steeper slopes associated with the Warrumbungle Tops ecosystem, rising above flatter terrain. Geology includes sandstone, conglomerates, shale, and basaltic volcanic rock. Soils are thin, sandy, with low nutrient content. Native vegetation to the flatter slopes includes patches of Green Mallee (<i>Eucalyptus viridis</i>) and White Mallee (<i>Eucalyptus Dumosa</i>), with clumps of acacia species amongst Red Ironbark (<i>Eucalyptus sideroxylon</i>). However, this area of LCZ 3 has been largely cleared for farming land. The steeper slopes typically contain woodland consisting of White Box (<i>Eucalyptus albens</i>), Narrow-leaved Ironbark (<i>Eucalyptus crebra</i>), White Cypress Pine (<i>Callitris glaucophylla</i>), and acacia species. Landscape features include Mount Tenandra, Looking Glass Mountain, Table Top Mountain, and Black Hollow. Land use associated with LCZ 3 within the study area are predominantly primary production, with existing infrastructure confined predominantly to gravel roads, rural residences and farming related structures such as sheds and silos. The rocky topographic elevations within LCZ 3 provide visual interest in this portion of the study area, contrasting with the slopes and plains dominating much of the proposal site. These formations are predominantly vegetated to the upper and lower slopes. Roadways are situated to the lowest elevations, winding through valleys creating a visually interesting journey amongst characteristic landscape features.
Anticipated change to landscape character	Anticipated changes to LCZ 3 include a new linear rail corridor, requiring a clear corridor to be maintained, which would require the permanent removal of existing vegetation in some locations (a greater area is likely to be cleared during construction, however this would likely be re-established). This section of corridor would cross through LCZ 3 in various locations, winding around the base of key topographic features including Mount Tenandra and Table Top Mountain. Minor vegetation clearing would occur, as well as some cut and fill batters. Some road realignments are also proposed.
Sensitivity to change	The sensitivity to change for LCZ 3 is considered Moderate, as the landscape character elements are in good condition and include locally important topographical features, including Aboriginal cultural value associated with Table Top Mountain (JacobsGHD, 2020a). Any change caused by the proposal would be unlikely to have a substantial adverse effect, as the rail corridor would be generally at-grade, to lower elevations within the LCZ, and would weave between the key topographical features. Through the design process, the alignment has changed to avoid impacts to Table Top Mountain (JacobsGHD, 2020a).
Magnitude of change	The magnitude of change for LCZ 3 is considered to be Low due to the introduction of the new rail corridor, which although it would be a discernible change within the landscape character, its siting would be similar in nature to existing pattern of roads within the LCZ. The cut and fill batters would be somewhat in contrast with the existing landform, particularly on the western side of Table Top Mountain. However, this has potential to be mitigated through detailed design.
Significance of impact	The significance of impact for LCZ 3 is considered to be Moderate-Low.

5.3.4 LCZ 4: Pilliga Forests

LCZ 4: Pilliga Forests



Photo 5.9 LCZ 4 characteristics along Cumbil Road, Kenebri



Photo 5.10 LCZ 4 characteristics along Gwabegar Road, Baradine



Photo 5.11 Unused Binnaway to Gwabegar rail line within LCZ 4

LCZ 4: Pilliga Forests



Photo 5.12 Gas pipeline easement within LCZ 4

Location of LCZ 4

LCZ 4 is located across an extensive area to the north of the study area between Gwabegar Road near the township of Baradine and the intersection of Bohena Creek and the Newell Highway, south of Narrabri.

Key characteristics of LCZ 4

LCZ 4 is situated on elevations ranging between 240 and 300 metres, with a local relief of between five to ten metres. Slopes are long and gentle, broken by 'sand monkeys' (abandoned sandy stream channels), patches of heavy grey clay and incised stream channels, with some rock outcrops.

Vegetation is comprised of a continuous covering of open forest with dense subcanopy, with species including white cypress pine, Bimble box, Pilliga box, Blakey's red gum and narrow-leaved ironbark, among others. The forest is of a medium height and largely characterised by the proportion of cypress pines which form a dense vertical screen and blue-green colour, punctuated by dark trunks, as shown above.

Ephemeral wetlands comprising shallow ponds are also characteristic within LCZ 4 and the broader Pilliga forests.

The vegetation and soils in this area have experienced relatively few significant changes over time due to cultural influences.

Land uses within LCZ 4 includes primarily state forests associated with the Pilliga East, Euligal, Cumbil, Baradine, Merriwindi, and Coomore state forests. A portion of national park / nature reserve use is also present within LCZ 4 associated with the Pilliga State Conservation Area. The state forests are used for the commercial production of cypress pine and ironbark.

The state forests are publically accessible along dirt roads. Within the study area, no formal cultural facilities are present, however the Salt Caves Picnic Area is located nearby within the Timmallallie National Park.

There is minimal evidence of buildings within LCZ 4. Infrastructure corridors include roads, a rail line, and gas pipeline. Roads include sealed and unsealed roads with cleared verges to the forest edge, and no fencing. The rail line is currently unused, with the easement following Cumbil Road separated by a forested buffer of about 20 metres. The Santos gas pipeline and easement are located in the northern portion of LCZ 4. All infrastructure easements are cleared of forest vegetation, creating a highly defined spatial linear pattern through the forest, however are only visible from within the easement itself due to the density of vegetation.

LCZ 4: Pilliga Forests

Anticipated change to landscape character

The anticipated change to LCZ 4 would include a new rail corridor with multiple level crossings through large sections of the LCZ. This corridor would require a clear corridor to be maintained, which would require the permanent removal of existing vegetation (a greater area is likely to be cleared during construction, however would likely be re-established). The new rail corridor would be situated adjacent to existing roads, including Cumbil Road and the Pilliga Forest Way, as well as traversing through areas of open forest. When situated adjacent to existing roads, the rail line generally shares the clearing already established by the road, however this would be substantially wider to accommodate the clear corridor width required. However, where the rail line is situated adjacent to the Newell highway, some vegetation may be retained between the rail corridor and the highway.

Where the rail line is situated through open forest, a new linear clearing within the forest would be created and permanently maintained.

The Pilliga Forest Way would also require realignment to accommodate the proposal, for a distance of 6.7 kilometres. This realignment would be parallel with the rail line.

A borrow pit is proposed to be located to the south of Narrabri, on the north-western edge of Jacks Creek State Forest. This would require vegetation removal and changes to landform associated with material extraction. A rehabilitation strategy has been prepared for this borrow pit site for remediation to a similar landscape character as existing.

Sensitivity to change

The sensitivity to change for LCZ 4 is considered to be **Moderate**, as the landscape character elements are in good condition, with recognised landscape and cultural values associated with the forests. However, any anticipated changes from the proposal would be unlikely to have a substantial adverse effect on the landscape character.

Magnitude of change

The magnitude of change for LCZ 4 is considered to be **Moderate**, as the proposal would a discernible change to the landscape character associated with the removal of a linear corridor of existing established vegetation through a large section of the LCZ. This change would be in contrast with the existing local pattern, however would not be uncharacteristic within the existing landscape due to the presence of existing linear infrastructure corridors. The borrow pit would be in contrast to the existing landscape, however the introduction of this element would be a minor alteration to the LCZ4 and the rehabilitation strategy would see the landscape character of this area remediated similar to the existing.

Significance of impact

The significance of impact for LCZ 4 is therefore **Moderate**.

5.3.5 LCZ 5: Township (alluvial plain)

LCZ 5: Township (alluvial plain)



Photo 5.13 LCZ 5 characteristics in along Dandaloo Street, Narromine



Photo 5.14 LCZ 5 characteristics along Maitland Street, Narrabri



Photo 5.15 LCZ 5 parkland adjacent to Narrabri Creek

LCZ 5: Township (alluvial plain)

Location of LCZ 5	LCZ 5 is located on the alluvial plain within the townships of Narromine and Narrabri, in the southern and northern portions of the townships respectively.
Key characteristics of LCZ 5	LCZ 5 is situated on flat to gently sloping alluvial terrain on elevations of around 240 metres at Narromine and around 210 metres at Narrabri. LCZ 5 sits just above the floodplain of the adjoining Macquarie River in Narromine and Namoi River in Narrabri. Narrabri Creek and associated urban parkland is within LCZ 5 in Narrabri. The primary land use for LCZ 5 is typical urban development associated with regional towns. This includes a main street characterised by two storey buildings with retail or commercial use to the ground level, often with a number of heritage feature buildings. Beyond this is a residential area with single storey detached dwellings punctuated by community facilities such as churches, schools, parks and recreational facilities. Within Narrabri, the Narrabri Creek and associated waterside parkland is located within LCZ 5. The urban pattern typically forms a grid aligned with the nearby waterway, with key transport corridors radiating from the town centre or traversing through. The local train station is located near the town centre. Roundabouts are common street features, and on-street parking is typical. The outer edges of town are characterised by lower density residential development, with larger scale community facilities such as the showground and cemetery. In Narrabri, light and general industry is also located in this area, with built form typically including large scale sheds. Vegetation includes street trees, lawn and garden beds within urban parklands, and private residential gardens.
Anticipated change to landscape character	Anticipated changes to LCZ 5 would be limited to the northern areas of Narrabri, and the western edge of Narromine. There would be a new rail connection to the Narrabri to Walgett Line on the western edge of the LCZ, and a new rail corridor adjacent to the Newell Highway. The Narromine West connection rail tie-in would occur on the western edge of the LCZ on the outer edge of Narromine.
Sensitivity to change	The sensitivity to change for this LCZ is considered to be Low , due to the new rail corridor elements being on the edge of the LCZ adjacent to existing light industrial areas. The anticipated change is unlikely to have an adverse effect on the landscape character, condition or value in this part of the LCZ.
Magnitude of change	The magnitude of change for LCZ 5 is considered to be Low , as the introduction of the rail corridor on the edge of the LCZ would not be uncharacteristic within the existing landscape, where existing rail corridors are already present.
Significance of impact	The significance of impact is therefore considered to be Low .

5.3.6 LCZ 6: Township (floodplain)

LCZ 6: Township (floodplain)



Photo 5.16 Residential development and rail line within LCZ 6 in Narrabri



Photo 5.17 Residence on Namoi River floodplain with LCZ 6, Narrabri

Location of LCZ 6

LCZ 6 is located on the low lying floodplains within the townships of Narromine and Narrabri, in the northern portion and southern portion of the townships respectively, associated with the Macquarie and Namoi rivers.

Key characteristics of LCZ 6

LCZ 6 is situated on flat terrain with depressed vegetated channels associated with the adjacent water courses. LCZ 6 occurs on elevations of around 230 metres at Narromine and 210 metres at Narrabri.

The floodplain nature of this landscape character zone somewhat constrains development in certain areas, therefore parkland and low density / rural residential development are common land uses. Where industrial and urban residential development occurs, the landform has either been modified to accommodate this, or the built form itself is elevated above the floodplain.

The urban setting is perhaps more informal in comparison to LCZ 5, particularly in Narrabri, with fewer formal boundaries such as fences, kerbs and gutters, and lack of built form consistency, with areas of development interspersed with paddocks. Development is typically lower density with larger lot sizes. The urban pattern includes the formal urban grid as well as less formal development patterns informed by the natural waterway alignment. Roads are both sealed and unsealed.

LCZ 6: Township (floodplain)

Vegetation is varied, including urban plantings typical of LCZ 5 as well as riparian vegetation both along waterways, interspersed within parkland areas, roadways and scattered irregularly through open paddocks.

The spatial characteristics are defined by the low elevation and relief, lower density built form and riparian vegetation, creating a sense of dispersion and openness.

Within Narromine, this LCZ appears to be undergoing growth, with new low density residential development outside of the township grid.

Anticipated change to landscape character

Anticipated changes to LCZ 6 would be limited to the north-western area of Narrabri. The proposed Narrabri Creek / Namoi River bridge would traverse adjacent to the western edge of this LCZ.

Sensitivity to change

The sensitivity to change is considered to be **Low** as the landscape character elements are not particularly distinctive local features, the proposal is unlikely to have an adverse effect on the landscape character, and the proposal location is not within the LCZ but adjacent to the edge of it.

Magnitude of change

The magnitude of change is for LCZ 6 is considered to be **Negligible**, as there would be an almost imperceptible change in the landscape character.

Significance of impact

The significance of impact for LCZ 6 is considered **Negligible**.

5.3.7 Patterns of change

The following section outlines notable changes taking place within the study area.

Pilliga forests

The Pilliga forests are undergoing land use classification and management change due to the recognised ecological value of the forests and associated biodiversity conservation value. The area is gradually transitioning from state forest to conservation area, involving the inclusion of more of the state forest area into existing national parks. Management objectives will therefore focus on the conservation of biodiversity and heritage within these reclassified areas.

Landscape, ecological and cultural values associated with the Pilliga forests are increasingly being recognised and appreciated, which may attract more people to this area in future for recreation.

Tourism

Tourism is a growing industry in the region particularly around the Warrumbungles and Siding Springs Observatory, and along the Newell Highway. Expansion would result in more accommodation and other travel related services, as well as an increase in visitation and facilities such as walking tracks and picnic areas in places such as the Pilliga forests. With this may come an increased recognition and appreciation of local characteristics, natural landscapes, and the journey experienced whilst travelling between destinations.

Climate change

As previously mentioned, the current climate is diverse with hot summers, mild winters and high rainfall variability leading to periods of drought and flooding. The Pilliga is also prone to bushfires. Climate change impacts typically include more extreme temperature variations and more extreme weather events. This is likely to have an effect on the vegetation and land use in this region, particularly considering the dominance of rural land uses.

Nearby proposed projects

Various projects are proposed for development within proximity to the proposal. Refer to section 8 cumulative impacts for details. These projects indicate planned growth and change in the region.

5.4 Summary of landscape character impacts

The following Table 5.1 provides a summary of landscape character impacts for the proposal.

Table 5.1 Summary of landscape character impacts

Landscape Character Zone (LCZ)	Description	Sensitivity to change	Magnitude of change	Significance of impact
LCZ 1	Slopes and Plains	Low	Low	Low
LCZ 2	Waterways and Floodplains	Moderate	Low	Moderate-Low
LCZ 3	Warrumbungle Slopes and Uplands	Moderate	Low	Moderate-Low
LCZ 4	Pilliga Forests	Moderate	Moderate	Moderate
LCZ 5	Township (alluvial plain)	Low	Low	Low
LCZ 6	Township (floodplain)	Low	Negligible	Negligible

6. Visual impact assessment

The assessment of visual impacts is divided into two sections. Section 6.1 identifies and describes visual impacts along the rail and road infrastructure during construction and operation. Section 6.2 identifies and describes visual impacts near the borrow pits and the associated access tracks.

6.1 Rail and road infrastructure

The following section provides an overview of the existing visual characteristics within the study area, including identification of key visual elements and a discussion of ZTV analysis undertaken. Potential sensitive receivers for the proposal are also identified.

6.1.1 Visual baseline

Key visual characteristics

The study area includes a variety of landscape character zones as identified in section 5.2, each with different visual characteristics.

Within LCZ 1 Slopes and Plains, long views are experienced across the flat open agricultural land, often framed or terminated by linear native roadside vegetation, vegetation along fence lines, or associated with creek and river corridors. Roadways are generally linear, emphasising the flatness of the topography. The colour palette would change through the seasons as crops transition, creating a mosaic landscape. In some locations, distant views can be achieved to regional ranges when atmospheric conditions are clear.

Within LCZ 2 Waterways and Floodplains, and LCZ 6 Townships (floodplains), views are experienced from lower elevations, along floodplains and waterways which are more enclosed by gentle rises beyond the floodplain, or riparian vegetation.

Within LCZ 3 Warrumbungle Slopes and Uplands, geological rises create visually prominent features, and the more winding road journey emphasises their presence as roads wind between them at lower elevations. Views towards more distant rises are common, creating a sense of enclosure.

Within LCZ 4 Pilliga Forests, the density and type of vegetation creates linear vertical walls which direct views along linear road clearings, and screen any views beyond this. The vegetation is a dark blue and green in colour, and the vegetation type, particularly the cypress pine, is a visually distinctive characteristic to this area.

Within LCZ 5 Townships (alluvial), views are generally defined by the presence of urban built form and street trees along the characteristic grid of streets. Key visual features are typically include historical built form and feature landscape planting to the main town centre.

Key viewing locations

Due to the generally flat topography and relatively sparse population within the study area, key viewing locations are limited. However, notable views or viewing locations include the following:

- Salt Caves Picnic Area lookout within Timmallallie National Park
- Narrabri Lookout, Narrabri
- Main streets within Narrabri and Narromine townships
- At the transition between LCZ 1 and LCZ 3 near Black Hollow / Mount Tenandra / Baradine.

Zone of Theoretical Visibility analysis

A ZTV analysis was undertaken for the rail alignment using the approach and parameters outlined in section 3.2.2. The resulting ZTV mapping is shown in Figure 6.1. This generally shows the extent of theoretical visibility within the study area, with areas of theoretical visibility generally constrained by topography and vegetation.

In addition to the limitations identified in section 3.2.2, this ZTV analysis was undertaken for the top of rail alignment only, therefore is not representative of potential visibility of the double-stacked trains, which although would be a temporary visual change, would have a greater visibility than the rail line itself.

Sensitive visual receivers

The sensitivity of visual receivers is dependent on the occupation or activity of people experiencing the view, the extent to which their attention or interest is on the view, and the value attached to the view. Occupiers of residential properties generally have a higher sensitivity, as they are likely to experience views for longer than those passing through the area such as road users. Visual receivers at locations where the community places higher value on the view, such as tourist lookouts, also have a higher sensitivity.

Sensitive visual receivers within the study area include the following:

Residents

- rural residential dwellings on rural land within the proposal viewshed
- residential areas to the outer edges of Narromine and Narrabri

Visitors to recreational areas

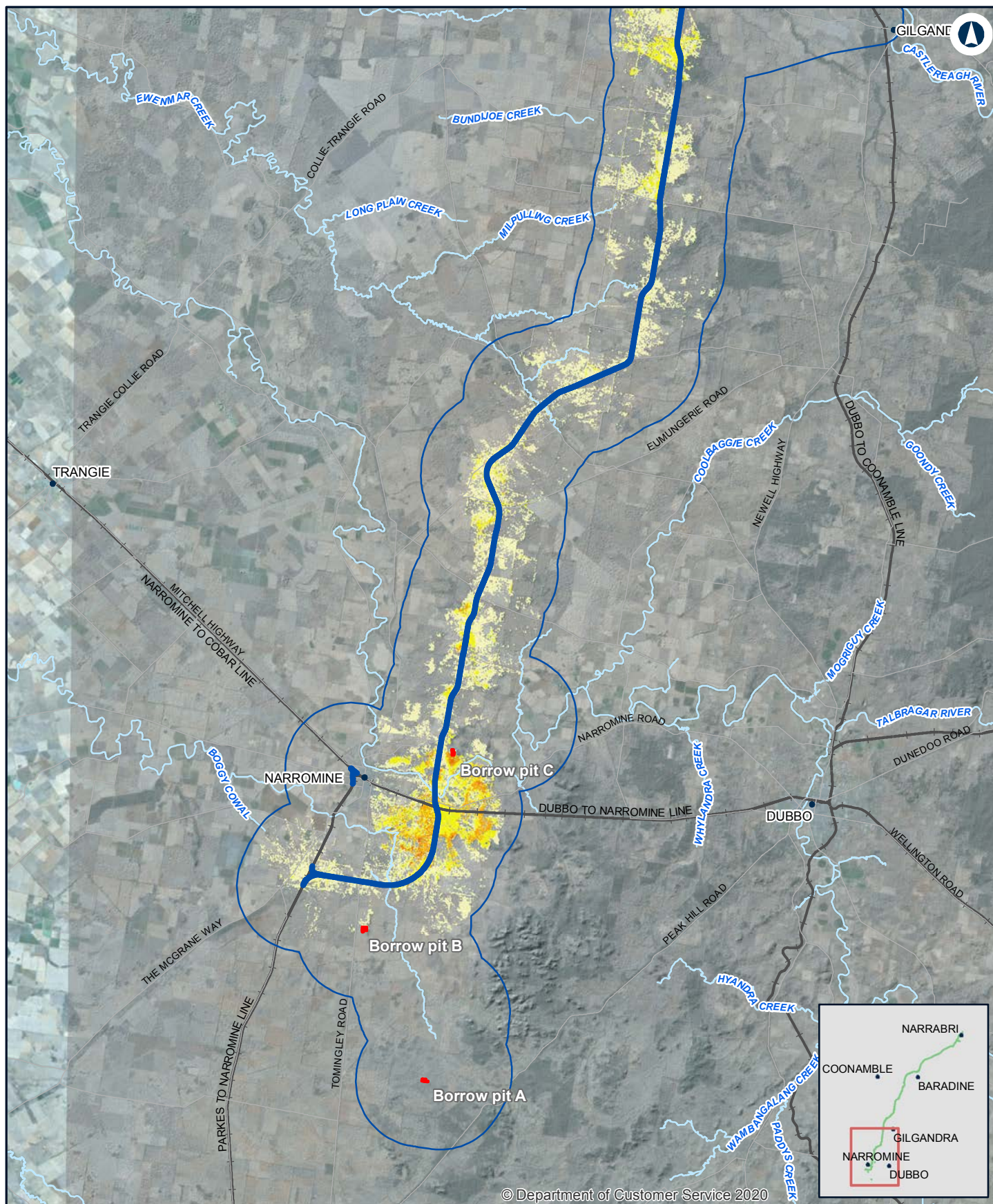
- Salt Caves Picnic Area
- Narrabri Lookout
- Narrabri Speedway

Workers

- rural and industrial workers within areas on the eastern and western sides of Narromine and Narrabri, and within rural land
- outdoor workers at the University of Sydney Plant Breeding Institute, Narrabri

Road users

- main roads including the Mitchell Highway, Newell Highway, Kamilaroi Highway, Castlereagh Highway, and Oxley Highway
- secondary roads such as Eumungerie Road, Tomingley Road, National Park Road, and Pilliga Forest Way
- local roads.



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NARROMINE TO NARRABRI

Zone of theoretical visibility - rail line

Figure 6. 1a

0 5.5 11 Km

Coordinate System: GDA 1994 MGA Zone 55

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Date: 10/06/2020

Paper: A4

Author: JacobsGHD

Scale: 1:400,000

Data Sources: Basemap layers: NSWSS; SRTM Hillshade: USGS; Study area, project elements: GHDJACOBS

LEGEND

- Alignment
- LVIA study area
- Borrow pits
- Road
- Existing railway

VALUE

- Not visible
- Less visible
-
-
- More visible

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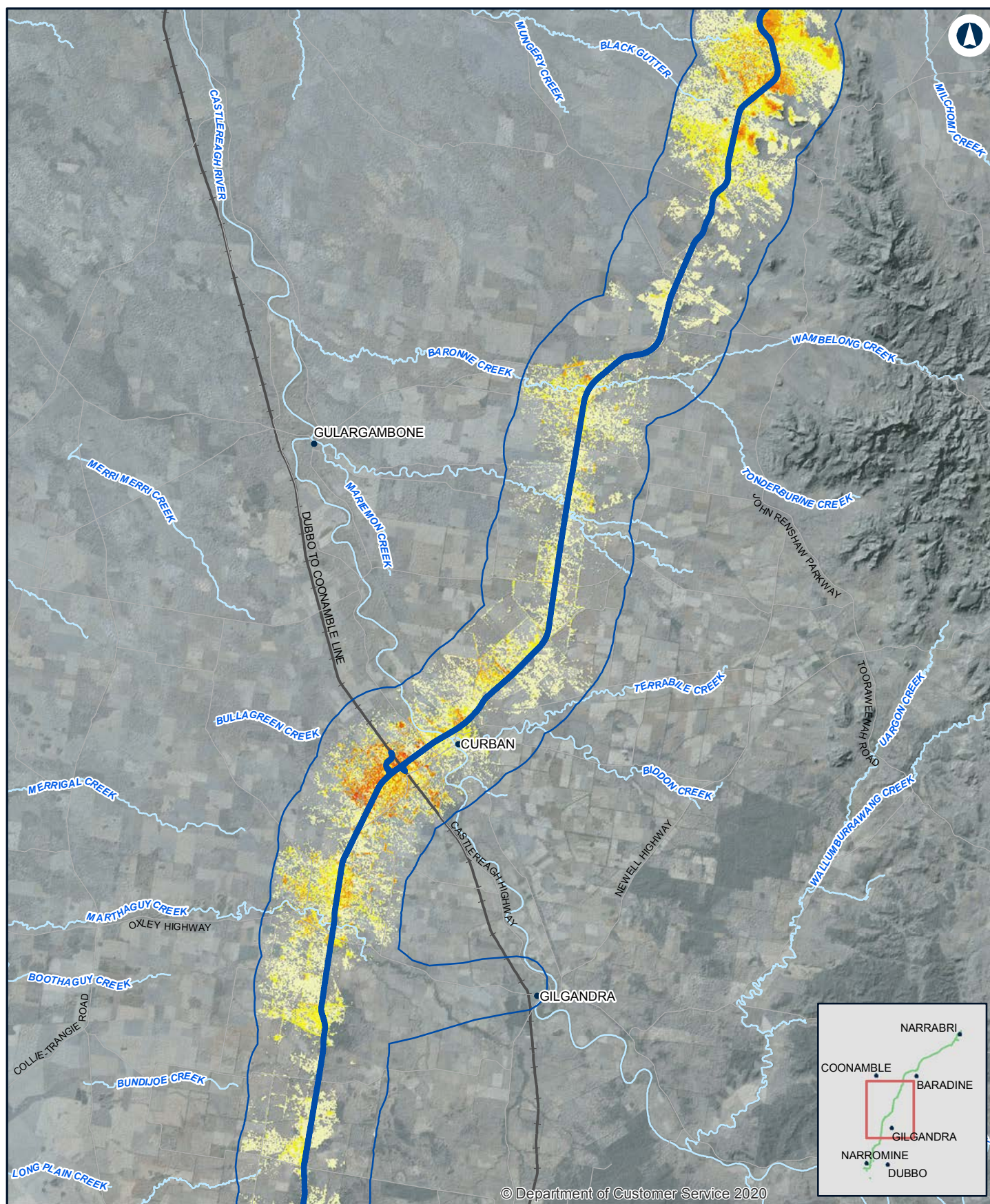
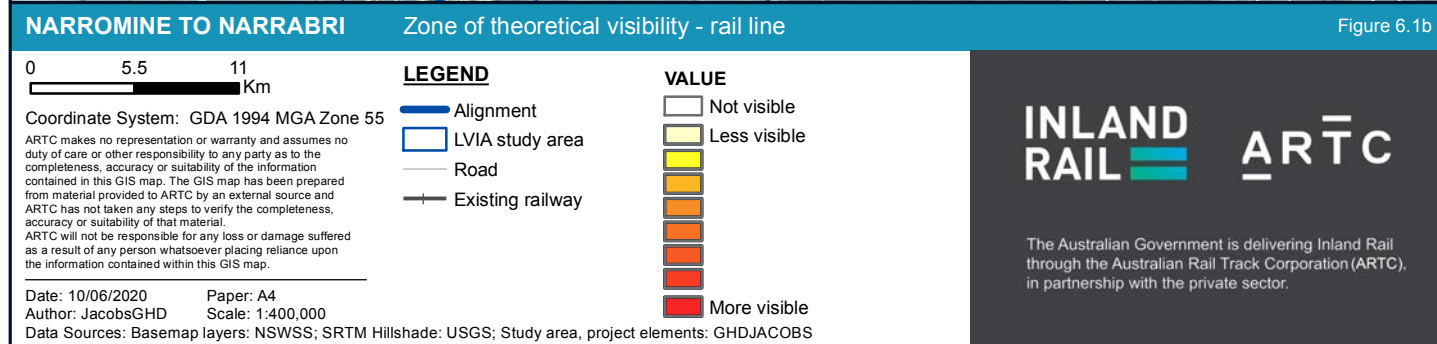
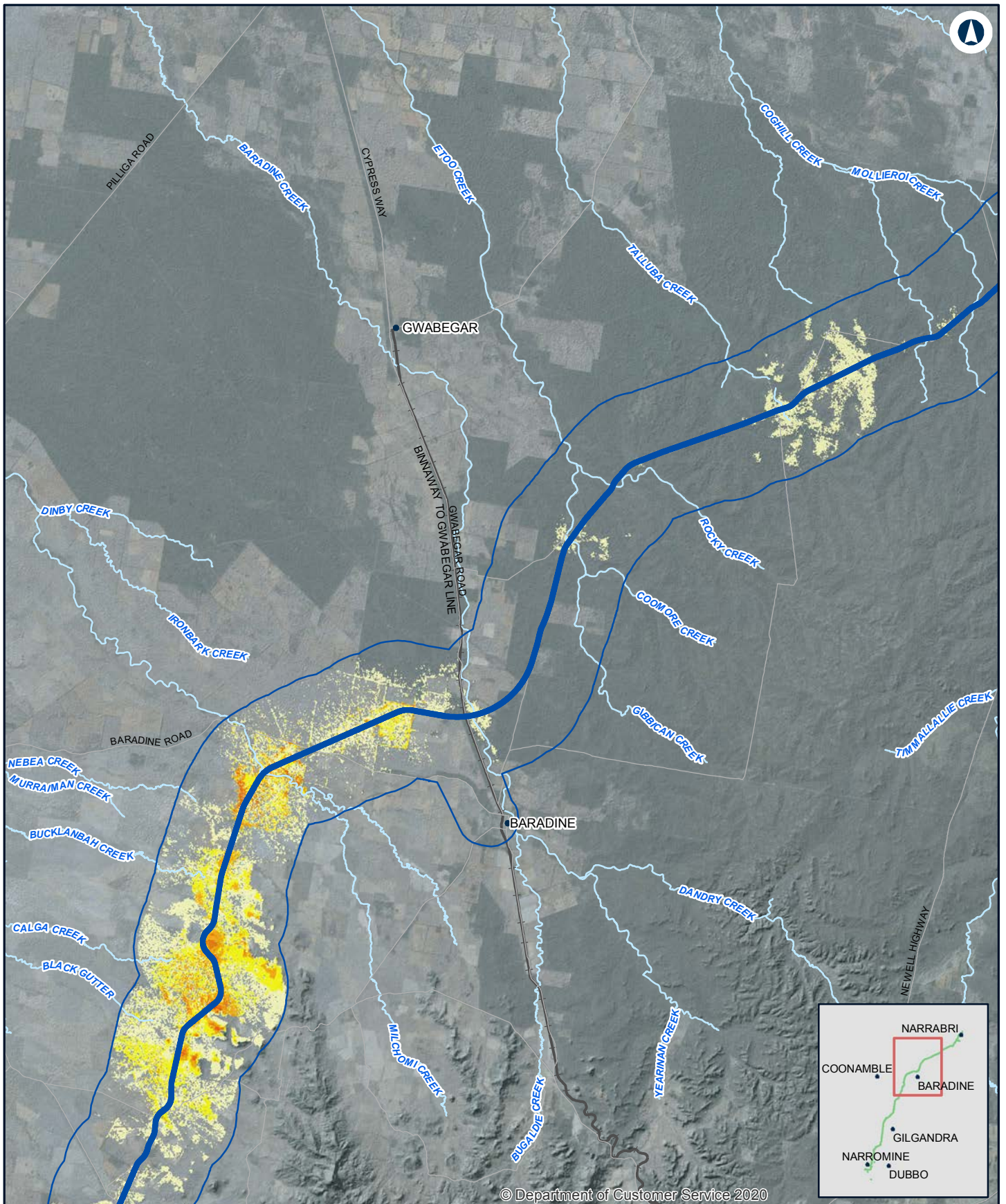


Figure 6.1b





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NARROMINE TO NARRABRI

Zone of theoretical visibility - rail line

Figure 6.1c

0 5.5 11 Km

Coordinate System: GDA 1994 MGA Zone 55

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Date: 10/06/2020 Paper: A4
Author: JacobsGHD Scale: 1:400,000

Data Sources: Basemap layers: NSWSS; SRTM Hillshade: USGS; Study area, project elements: GHDJACOBS

LEGEND

- Alignment
- LVIA study area
- Road
- Existing railway

VALUE

- Not visible
- Less visible
-
- More visible

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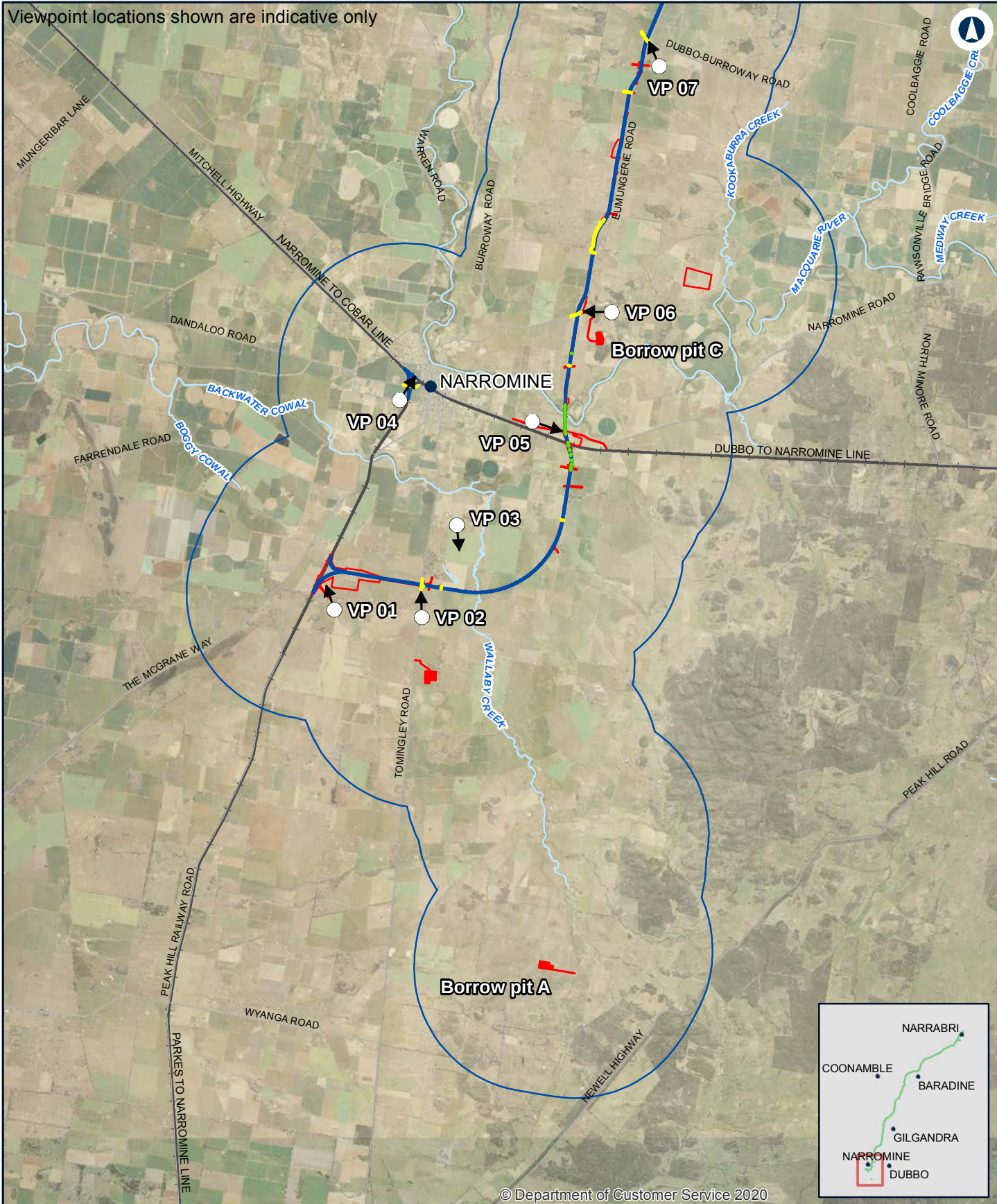
6.1.2 Visual impact assessment

The following sections 6.1.3 to 6.1.25 assesses the visual impact of the proposal from 23 viewpoint (VP) locations. Viewpoint locations were selected to represent a range of visual receivers and visual impacts within the study area. The assessment is based on the proposal during construction and operation. Refer to Table 6.1 and Figure 6.2 for viewpoint locations.

Photomontages have been provided for VP05, VP18, VP19, VP21 and VP22, to represent the proposed view from these viewpoint locations (refer to Appendix A).

Table 6.1 Viewpoint locations – rail and road infrastructure

Viewpoint	Location	Sensitive receiver
VP01	Narwonah Road, Narromine	Local road users and nearby residents
VP02	Tomingley Road, Narromine	Arterial road users
VP03	Villeneuve Drive, Narromine	Nearby residents
VP04	Old Backwater Road, Narromine	Nearby residents and road users
VP05	Mitchell Highway, Narromine	Highway road users
VP06	Eumungerie Road, Narromine	Arterial road users
VP07	Eumungerie Road / Dubbo-Burroway Road, Burroway	Arterial road users
VP08	Oxley Highway / Marthaguy Creek, Gilgandra	Highway road users
VP09	National Park Road, Curban	Sub-arterial road users and Curban settlement
VP10	National Park Road / Castlereagh River, Curban	Sub-arterial road users
VP11	Gumin Gumin Road, Mount Tenandra	Arterial road users
VP12	Munns Road, Baradine	Local road users
VP13	Baradine Road, Baradine	Arterial road users
VP14	Gwabegar Road, Baradine	Arterial road users
VP15	Pilliga Forest Way / Country Line Road, The Pilliga	Sub-arterial road users
VP16	Salt Caves Lookout, Timmallallie National Park, The Pilliga	Visitors to the Salt Caves Picnic Area
VP17	Pilliga Forest Way / Twenty Foot Road, The Pilliga	Sub-arterial road users
VP18	Newell Highway, Narrabri	Highway road users
VP19	Yarrie Lake Road, Narrabri	Sub-arterial road users, nearby workers and residents
VP20	Genanagie Street, Narrabri	Nearby residents and local road users
VP21	The Island Road, Narrabri	Local road users and nearby residents
VP22	Kamilaroi Highway, Narrabri	Highway road users and nearby residents
VP23	Lookout, Narrabri	Visitors to the lookout



NARROMINE TO NARRABRI

Viewpoint locations

Figure 6.2a

0 2.5 5
Km

Coordinate System: GDA 1994 MGA Zone 55

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Date: 25/06/2020

Paper: A4

Author: JacobsGHD

Scale: 1:210,000

Data Sources: Basemap layers: NSWSS; Study area, project elements: GHDJACOBS

LEGEND

- Alignment
- The proposal site
- LVIA study area
- Road realignments
- Road
- Existing railway
- Watercourse
- Viewpoints
- Bridges
- Borrow pits

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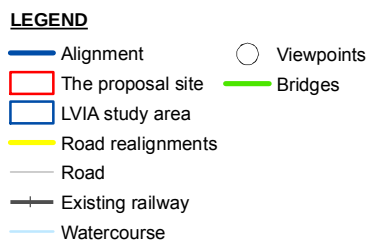
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Viewpoint locations

Figure 6.2b



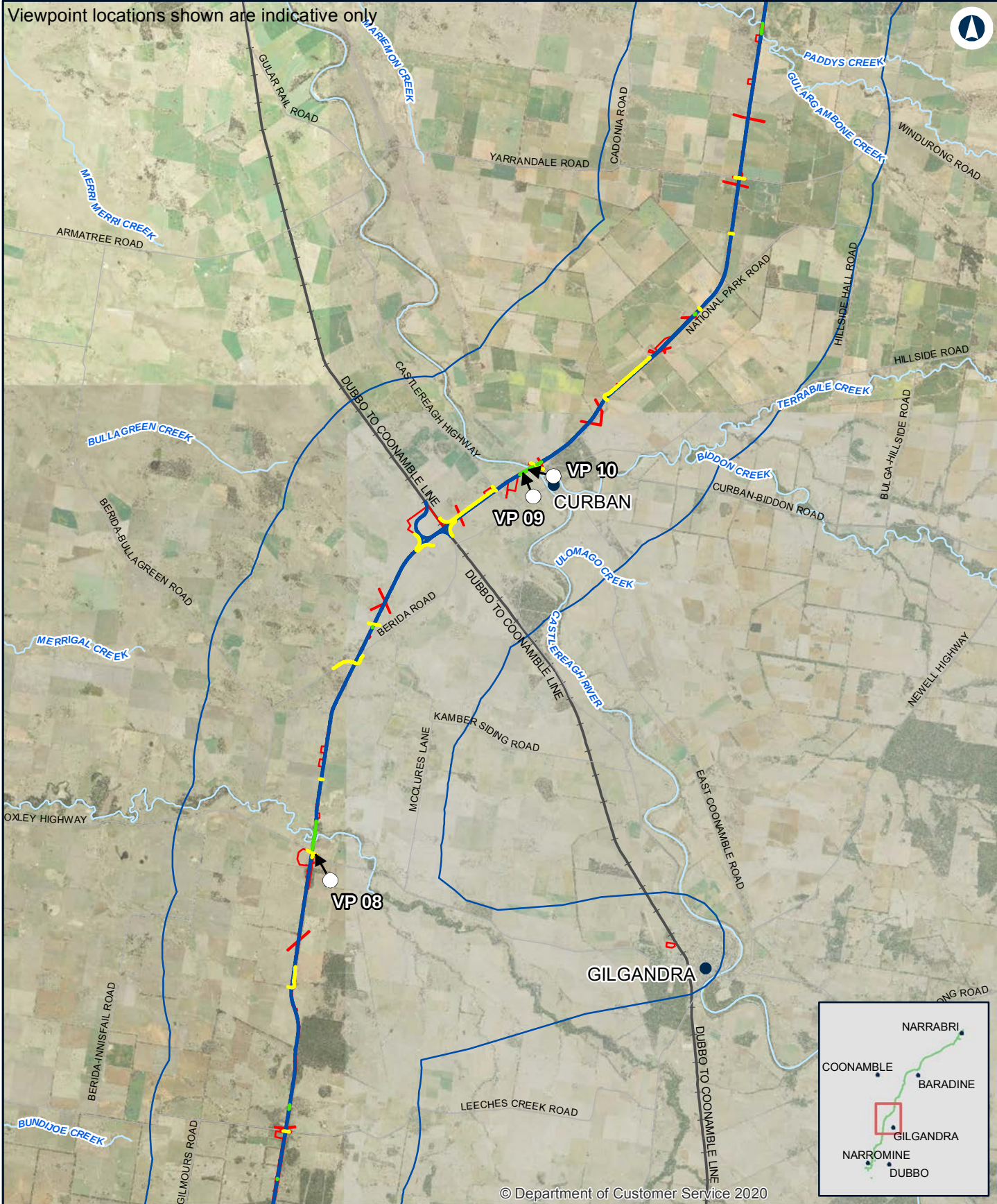
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Data Sources: Basemap layers: NSWSS: Study area, project elements: GHDJACOBS

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NARROMINE TO NARRABRI

Viewpoint locations

Figure 6.2c

0 2.5 5
Km

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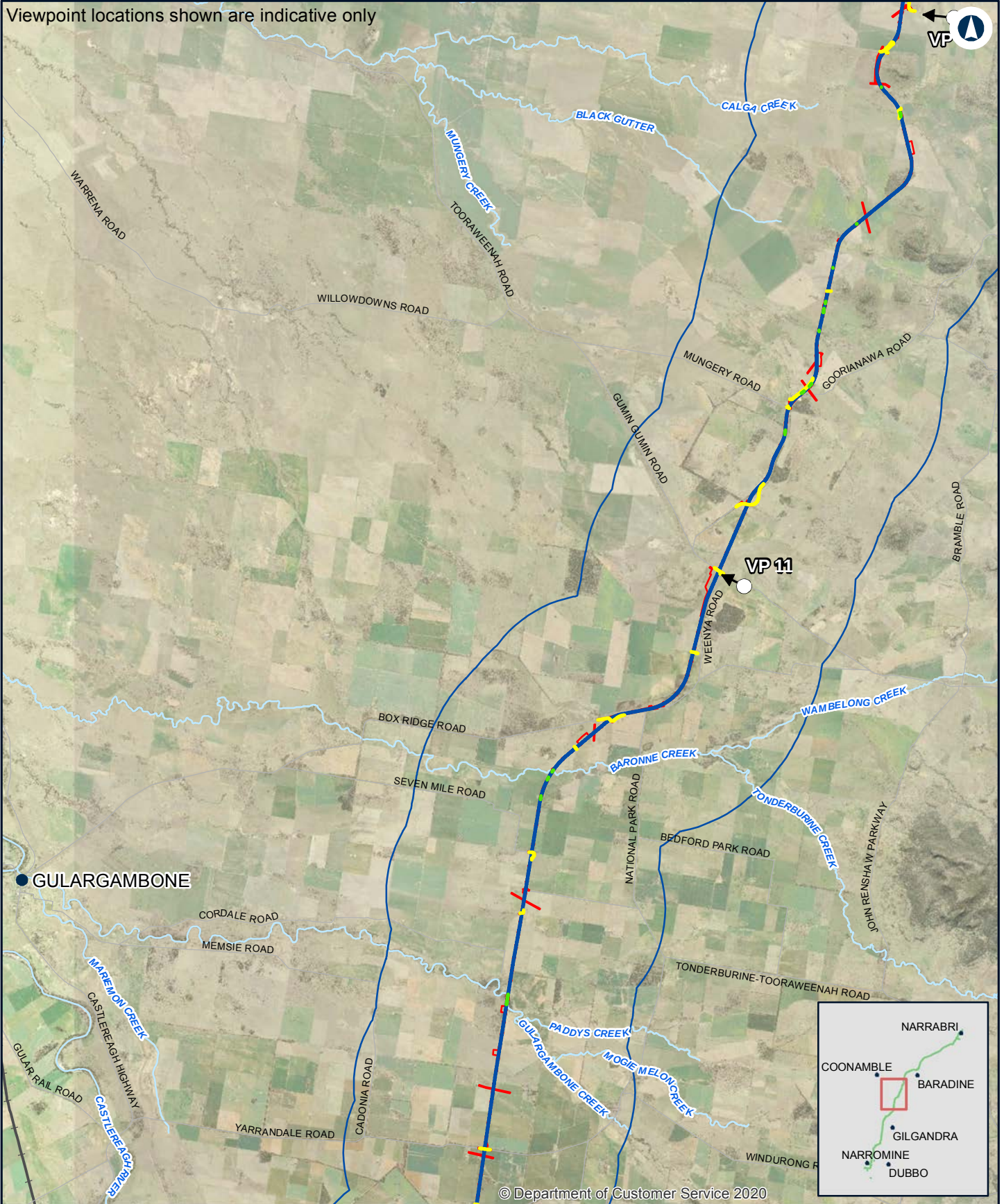
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Data Sources: Basemap layers: NSWSS; Study area, project elements: GHDJACOBS

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NARROMINE TO NARRABRI

Viewpoint locations

Figure 6.2d

0 2.5 5
Km

Coordinate System: GDA 1994 MGA Zone 55

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Date: 25/06/2020

Paper: A4

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Data Sources: Basemap layers: NSWSS; Study area, project elements: GHDJACOBS

LEGEND

- Alignment
- The proposal site
- LVIA study area
- Road realignments
- Road
- Existing railway
- Watercourse
- Bridges
- Viewpoints

INLAND RAIL **ARTC**

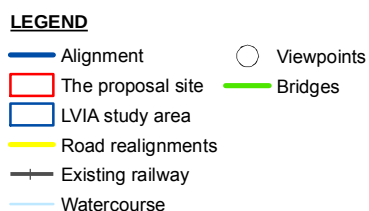
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Viewpoint locations

Figure 6.2e

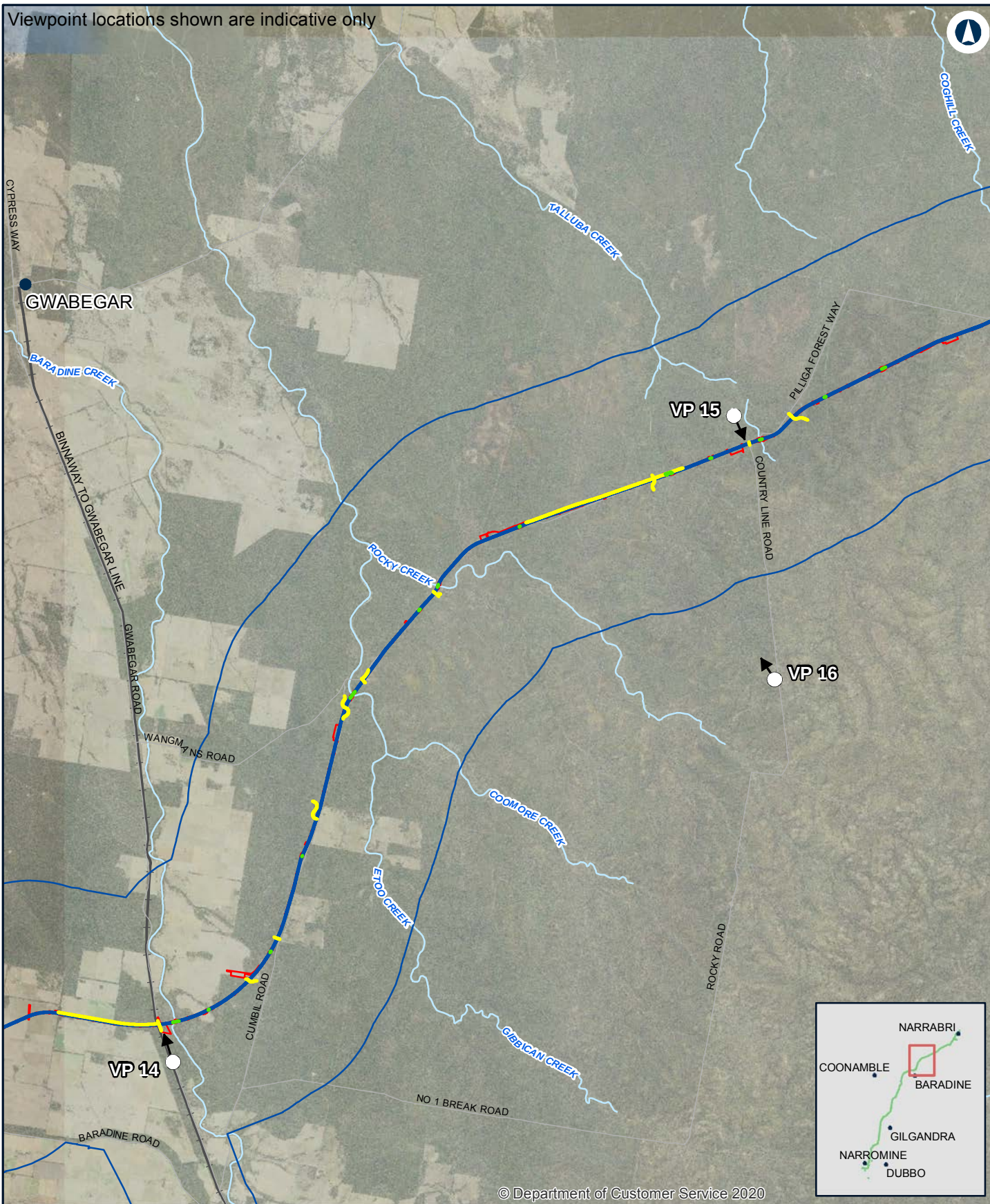


Date: 25/06/2020 Paper: A4
Author: JacobsGHD Scale: 1:210,000
Data Sources: Basemap layers: NSWSS; Study area, project elements: GHDJACOBS

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NARROMINE TO NARRABRI

Viewpoint locations

Figure 6.2f

0 2.5 5
Km

Coordinate System: GDA 1994 MGA Zone 55

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Data Sources: Basemap layers: NSWSS; Study area, project elements: GHDJACOBS

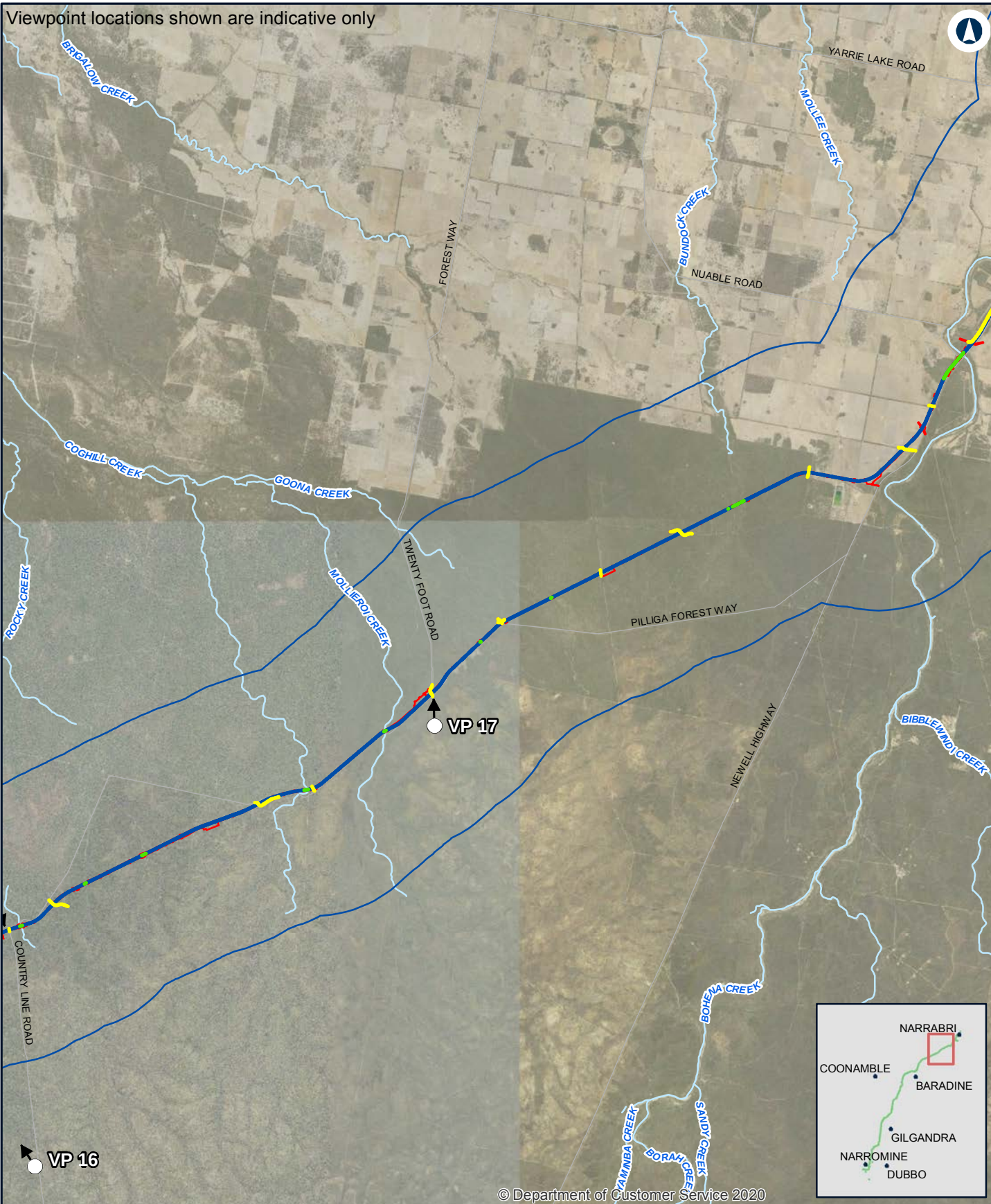
LEGEND

- Alignment
- The proposal site
- LVIA study area
- Road realignments
- Existing railway
- Watercourse
- Viewpoints
- Bridges

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NARROMINE TO NARRABRI

Viewpoint locations

Figure 6.2g

0 2.5 5
Km

Coordinate System: GDA 1994 MGA Zone 55

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Data Sources: Basemap layers: NSWSS; Study area, project elements: GHDJACOBS

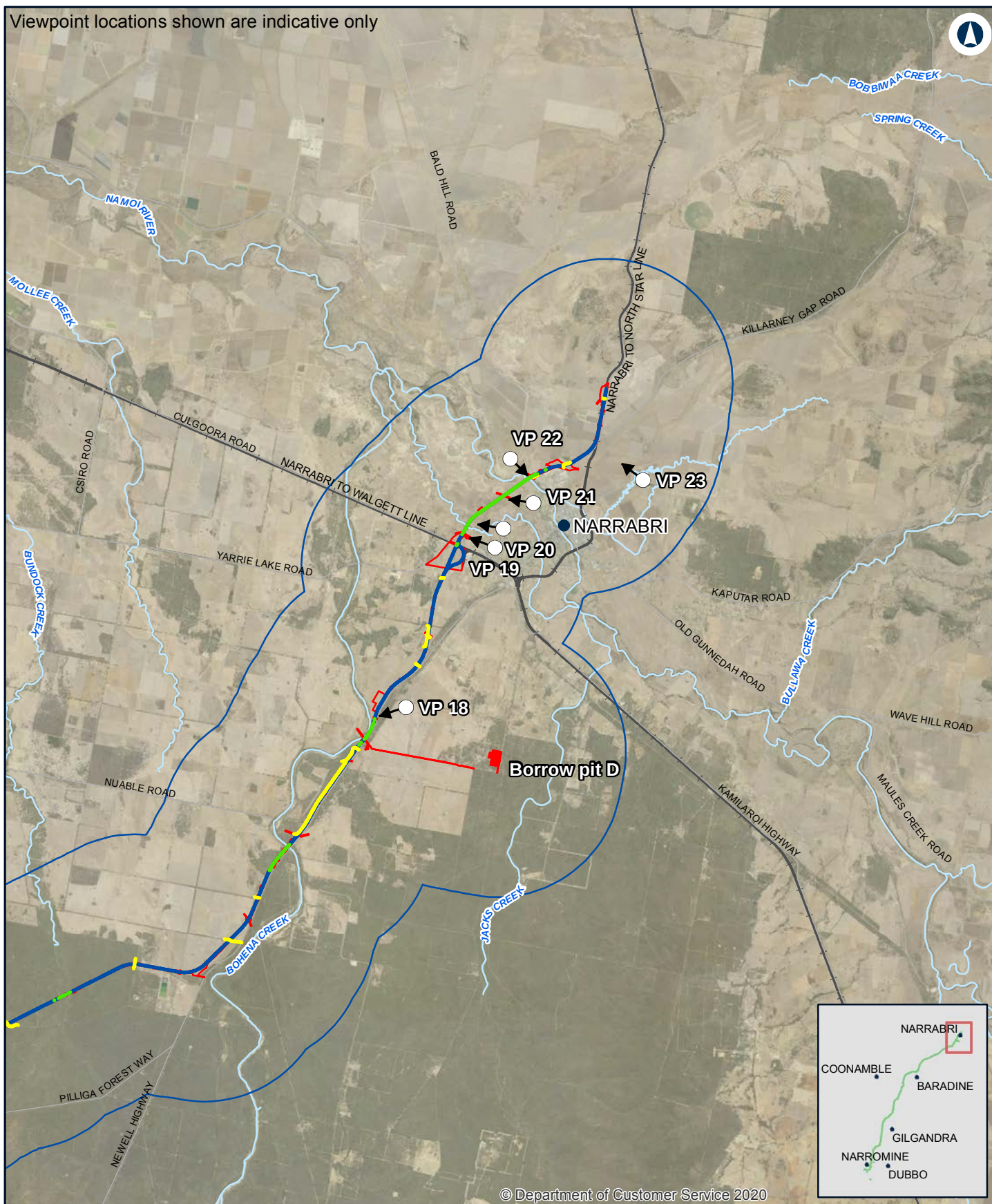
LEGEND

- Alignment
- The proposal site
- LVIA study area
- Road realignments
- Road
- Watercourse
- Bridges
- Viewpoints

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NARROMINE TO NARRABRI

Viewpoint locations

Figure 6.2h

0 2.5 5
Km

Coordinate System: GDA 1994 MGA Zone 55

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Date: 25/06/2020

Paper: A4

Author: JacobsGHD

Scale: 1:210,000

Data Sources: Basemap layers: NSWSS; Study area, project elements: GHDJACOBS

LEGEND

- Alignment
- The proposal site
- LVIA study area
- Road realignments
- Road
- Existing railway
- Watercourse
- Viewpoints
- Bridges
- Borrow pits

INLAND RAIL **ARTC**

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6.1.3 Viewpoint 01: Narwonah Road, Narromine



Criteria	Comments
Location / view direction	VP01 is located on the southern side of Narwonah Road, about one kilometre from the proposed rail line, looking north-west.
Visual receivers	Narwonah Road is a local road within a rural landscape setting. A number of residences are located on the southern side of the road in the vicinity of VP01. This view is representative of views experienced by local road users and nearby residences.
Description of existing view	VP01 comprises of Narwonah Road to the foreground and rural land behind. Scattered intermittent foreground trees feature both within the road verge and paddocks behind. The flat expansive alluvial plains stretches across the view in the background, with ploughed fields alongside those with pasture grass. A layering of native trees forms a distant continuous backdrop. To the left of the view, a large storage shed is present at the Narwonah railway station adjacent to the existing Parkes-Narromine freight line. This rail line is just discernible, extending across the view from the shed towards the right. Power poles and fencing also feature within the view.
Anticipated change to view	During construction, a construction compound would be located to the right, beyond the extent of this view. The construction area extends towards the viewpoint. This would result in some likely storage and construction activities, however this would occur behind some existing foreground vegetation. Construction activities associated with the construction of the proposed new rail line would be visible including machinery and site fencing. During operation, the proposed new rail line would just be discernible within the view to the front of the existing rail line, extending across the view extent, behind foreground vegetation. During operation, double stacked freight trains up to 6.5 metres in height associated with the new rail line would be visible at various times, moving across the view. The rail line would be slightly elevated above the existing surface. Proposed new fencing to either side of the rail corridor may also be discernible. Some tree removal within the middle ground of the view would be seen.
Sensitivity to change	Moderate as residents to the south of Narwonah Road are at a distance to the proposal and the proposal would be partially screened from the view. Residences are also set back from the road. Local road users would have short term transient views, with a low sensitivity to change.
Magnitude of change	The magnitude of change during construction is considered moderate as the construction activity and compound would be discernible changes in the existing view, although these would be temporary and for the duration of the construction period only. The magnitude of change during operation is considered low as the proposed trains using the new line will be a regular noticeable new change to the view, however not uncharacteristic within the existing view due to the existing rail line.
Significance of impact	The significance of impact during construction is therefore Moderate. The significance of impact during operation is therefore Moderate-Low.

6.1.4 Viewpoint 02: Tomingley Road, Narromine



Criteria	Comments
Location / view direction	VP02 is located on the western side of Tomingley Road, about 45 metres north of the intersection with Pinedean Road. VP02 is looking north. This viewpoint is situated on the location where the proposed rail line would cross Tomingley Road as a level crossing. However, as the character of the road is relatively consistent, this viewpoint is representative only.
Visual receivers	This viewpoint represents views experienced by road users. Tomingley Road is an arterial road connecting Narromine to the north with the Newell Highway to the south.
Description of existing view	The view comprises of Tomingley Road to the centre of the view, characterised by one traffic lane in each direction, with asphalt surface, gravel verge and swale. Dense native vegetation is present to both sides of the road, including a combination of tall mature eucalypts, clumps of smaller trees and large shrubs. Navigational markers and a road sign also feature within the view. Some gaps in vegetation allow filtered views to the rural land beyond.
Anticipated change to view	During construction, Tomingley Road and Pinedean Road would be designated construction routes, therefore construction vehicles associated with the works would be seen travelling through this location. Construction activities associated with the construction of the proposed new rail line would be visible including machinery, site fencing, and vegetation removal. During operation, the proposed new rail line would appear within the view as it crosses Tomingley Road as a level crossing. This would appear as rail tracks at the same level as the road, with road line marking, signage, warning lights and boom gates. Some existing vegetation would require removal to accommodate the cleared rail corridor to be permanently maintained. Additional vegetation would be cleared along the roadway, including all foreground trees to the right of the view and trees close to the roadway along the left of the view.
Sensitivity to change	Low, as motorists are passing through this area, with short-term viewing durations and generally limited interest in surrounding views.
Magnitude of change	During construction, the magnitude of change is considered to be moderate as the change would result in the loss of established vegetation from within the view and the construction activities would be out of scale with, and create an adverse impact on the existing view. However, construction activities would be temporary and for the duration of the construction period only. During operation, the magnitude of change is considered moderate as the change would result in the loss of trees to the foreground to either side of the road. The proposed level crossing and associated infrastructure would be a new feature in the view. Although the changes would be obvious, the tree removal could be partially mitigated with potential future planting.
Significance of impact	The significance of impact during construction and operation is therefore Moderate-Low.

6.1.5 Viewpoint 03: Villeneuve Drive, Narromine



Criteria	Comments
Location / view direction	VP03 is located on the southern side of Villeneuve Drive, about 2.6 kilometres from the proposed rail line, looking south.
Visual receivers	Villeneuve Drive is a local road within a large lot residential area close to Narromine. This viewpoint is representative of views from nearby residences.
Description of existing view	The foreground of this view comprises of large lot residential land associated with houses situated along Villeneuve Drive. This consists of low grasses with intermittent shrubs and trees. Beyond the property fence lies flat expansive rural land on alluvial plains. Along the horizon, a layering of trees forms a continuous backdrop to the view, associated with plantings along fence lines, near a distant residence, and vegetation along drainage lines including Wallaby Creek. To the left of the view, distant low granite hills can be seen rising above the tree line. To the right, a tank is present associated with a residence.
Anticipated change to view	During construction, construction activities are not likely to be visible from this location. During operation, the proposed new rail line and associated trains would be located to the background of the view, however this would not be visible from this location. The proposed double stacked freight trains would be seen at various times, appearing to the left of the view where a clearing is present towards the rail line. The height of the trains would appear at a lower height than the tree canopy.
Sensitivity to change	Moderate , as receivers are residents at home with long viewing periods and outdoor living areas typically to the back of their properties. However, viewers are at a distance and partially screened from the project.
Magnitude of change	During construction, the magnitude of change is considered negligible as the construction activities are unlikely to be visible due to the distance from the proposal. During operation, the magnitude of change is considered negligible due to the distance and almost imperceptible change to the existing characteristics of the view.
Significance of impact	Significance of impact during construction and operation is therefore Negligible .

6.1.6 Viewpoint 04: Old Backwater Road, Narromine



Criteria	Comments
Location / view direction	VP04 is located on the southern side of Old Backwater Road, about 500 metres from the proposed rail line associated with the Narromine West connection. VP04 is looking north-east. A number of residences are present along the southern side of the road in this location.
Visual receivers	Old Backwater Road is a sub-arterial road within rural land on the western edge of Narromine. This viewpoint is representative of views from nearby residences, and road users.
Description of existing view	VP04 comprises of flat rural grazing land to the foreground beyond the road corridor. A roadside tree can be seen to the right. To the background, built form infrastructure associated with the existing rail lines to the edge of Narromine is present, including a white dome building, and tall mesh tower. A number of silos can also be seen to the right in the background. Canopy vegetation surrounding these elements forms a consistent green backdrop to the view.
Anticipated change to view	During construction , activities associated with the construction of the rail line would be visible from this location, including the presence of vehicles and machinery. During operation , the proposed new rail line and associated trains would be located to the middle ground of the view, on the far side of the paddock to the front of all built form and vegetation. It would extend across the extent of the view. The rail line itself may be just discernible, however is proposed at about the same level as the existing ground. There are two existing rail lines in this location. New fencing is proposed to either side of the rail corridor, which would be visible. The freight trains would be seen at various times, travelling across the view, however these trains are not likely to be double-stacked. The height of the trains would appear at a lower height than the tree canopy.
Sensitivity to change	Moderate , as residents would experience this view when entering and leaving their properties. Viewers are at a distance and partially screened from the project due to length of driveways and the presence of street trees.
Magnitude of change	During construction , the magnitude of change is considered moderate . However, these would be temporary and for the duration of the construction period only. During operation , the magnitude of change is considered low as the proposed change would likely be only visible when proposed trains are using the new rail line.
Significance of impact	The significance of impact during construction is therefore Moderate . The significance of impact during operation is therefore Moderate-Low .

6.1.7 Viewpoint 05: Mitchell Highway, Narromine



Criteria	Comments
Location / view direction	VP05 is located on the northern side of the Mitchell Highway, about 140 metres from the proposal. VP05 is looking east towards the proposed combined rail line bridge over the Mitchell Highway and southern abutment of the Macquarie River bridge.
Visual receivers	The Mitchell Highway is the primary road connecting Narromine and Dubbo. VP05 is representative of road users travelling east.
Description of existing view	VP05 is a view along the highway which features in the centre of the view, comprising of one lane in each direction with grassy verges. Mature native canopy trees are present to either side of the road, typically with solid trunks and grey bark. These are situated within a wide road corridor. To the right of the view, filtered views to paddocks and distant trees can be seen beyond the road corridor.
Anticipated change to view	During construction, a construction compound would be situated behind the proposed rail bridge anticipated within this view, and to the right of the highway. Construction activities associated with the bridge would include the presence of large machinery in this location undertaking construction activities, as well as tree removal. The Mitchell Highway west of this location is also a designated construction access route. During operation, the proposed rail line bridge over the Mitchell Highway would appear to the centre of the view, extending across the roadway. To the right, a batter and bridge abutment would be located partially behind foreground trees and shrubs. From the abutment, the concrete rail bridge would extend over the roadway and continue, elevated, to the left towards the Macquarie River, partially screened by foreground trees. The bridge would be elevated on vertical structural piers. Within the view, a number of trees would be removed to accommodate the rail corridor and construction works, to the front and behind the bridge. Double stacked freight trains would be seen on the bridge at various times each day. Refer to Appendix A for photomontage.
Sensitivity to change	Low , as road users experiencing this view are passing through the area, with short-term viewing durations and generally limited interest in surrounding views as they are passing through the area.
Magnitude of change	During construction, the magnitude of change is considered moderate as the construction of the bridge and batter would be discernible changes to the view and would be out of scale with the existing view. However, construction activities would be temporary and for the duration of the construction period only. During operation, the magnitude of change is considered moderate as the new road bridge and associated elements would be new built form features extending across the view, however not out of scale due to the present of canopy vegetation. The anticipated tree removal would occur across a large portion of the view, however has potential to be partially mitigated over time along the road corridor with new planting. Tree removal would also be partly mitigated visually by the presence of retained foreground and background trees.
Significance of impact	The significance of impact during construction and operation is therefore Moderate-Low .

6.1.8 Viewpoint 06: Eumungerie Road, Narromine



Criteria	Comments
Location / view direction	VP06 is located on the south-eastern side of Eumungerie Road near Euromedah Road, about 160 metres from the proposed rail line. VP06 is looking in a south-west direction towards the proposed level crossing of the rail line with Eumungerie Road.
Visual receivers	Eumungerie Road is an arterial road north of Narromine. This view is representative of views experienced by road users travelling south-west.
Description of existing view	VP06 is a view across the rural landscape north of Narromine associated with LCZ 1 Slopes and Plains. Eumungerie Road appears to the left of the view, curving around a bend before straightening out towards the background of the view. Some scattered native foreground vegetation is present within the roadside and adjoining paddocks, beyond which distant filtered views can be achieved across flat agricultural fields towards low hills in the distance. To the left along the roadside, dense planting is present along the road edge.
Anticipated change to view	During construction, a construction compound would be located within the rural land to the right of this view, between the proposed rail line and Eumungerie Road. This would include storage area for materials and construction activities associated with the proposal. Due to the absence of roadside vegetation in this location, this compound would be visible from the roadway. Eumungerie Road is also a designated construction access route for the proposal. The construction of the rail line would result in the removal of the dense roadside vegetation to the left of this view. During operation, the proposed level crossing of the rail line with Eumungerie Road would appear to the foreground, crossing over the roadway in the location of the tallest eucalypt tree. In this location, the rail tracks, road line marking, signage, warning lights and boom gates would appear at the crossing. The rail tracks would continue across the extent of the view to the right within the existing rural land. The tracks would be at a similar level to the existing land. All dense vegetation along the left of the roadway would be removed, as well as the tall eucalypts, and all foreground vegetation within the rural land to the right. Rail corridor fencing would be present to either side of the rail corridor. Double stacked trains would be visible at various times.
Sensitivity to change	Low , as road users experiencing this view are passing through the area, with short-term viewing durations and generally limited interest in surrounding views as they are passing through the area.
Magnitude of change	During construction, the magnitude of change is considered moderate as the anticipated changes would be discernible and out of character with the existing view. However, construction activities would be temporary and for the duration of the construction period only. During operation, the magnitude of change is considered moderate as the anticipated changes would be discernible, particularly when trains are visible, and out of character within the existing open rural view.
Significance of impact	The significance of impact during construction and operation is therefore Moderate-Low .

6.1.9 Viewpoint 07: Eumungerie Road / Dubbo-Burroway Road, Burroway



Criteria	Comments
Location / view direction	VP07 is located on the south-western side of the intersection of Eumungerie Road and Dubbo-Burroway Road. This viewpoint is about 60 metres from the proposed rail line. VP07 is looking north-west towards the proposed level crossing of the rail line and Dubbo-Burroway Road.
Visual receivers	Eumungerie Road is an arterial road north of Narromine. This view is representative of views experienced by road users travelling north.
Description of existing view	VP07 is a view across the intersection. To the right, Eumungerie Road can be seen with dense roadside vegetation. Dubbo-Burroway Road extends across the foreground of the view, with road signage and road markers. The dense vegetation wraps around the corner beyond the intersection, with white timber fencing indicating the corners of fencing. Vegetation is set back from the intersection, with grass to the foreground. Filtered views can be seen to the rural land beyond the tree row.
Anticipated change to view	During construction, there would be no construction compounds present in this location. During construction, vegetation clearing and construction activities associated with the rail line and level crossing would be seen within this view. Eumungerie Road is a designated construction route for the proposal. During operation, the level crossing would appear to the left, with rail tracks crossing over Dubbo-Burroway Road at-grade, with associated line marking, warning lights, signage, and boom gates. The rail tracks would extend across the view to the right and to the front of the white corner fencing. Existing trees to the centre of the view would be removed to allow for the rail corridor clearing. Roadside vegetation along Eumungerie Road would be retained. The rail line would disappear from view behind these trees to the right. All foreground vegetation to the left of Dubbo-Burroway Road would be removed to accommodate the rail corridor. Double stacked freight trains would appear at various times on the rail line.
Sensitivity to change	Low , as road users experiencing this view are passing through the area, with short-term viewing durations and generally limited interest in surrounding views as they are passing through the area.
Magnitude of change	During construction, the magnitude of change is considered moderate due to the vegetation removal and presence of construction activities being discernible changes and uncharacteristic within the existing view. However, construction activities would be temporary and for the duration of the construction period only. During operation, the magnitude of change is considered moderate due to the extent of vegetation removal across the view, which cannot be replaced in future. The level crossing and presence of trains would also be a new feature within the view.
Significance of impact	The significance of impact during construction and operation is therefore Moderate-Low .

6.1.10 Viewpoint 08: Oxley Highway / Marthaguy Creek, Gilgandra



Criteria	Comments
Location / view direction	VP08 is located on the southern side of the Oxley Highway, about 110 metres from the proposed rail line. VP08 is looking north-west towards the proposed level crossing on the Oxley Highway and southern abutment of the Marthaguy Creek bridge.
Visual receivers	The Oxley Highway is a primary highway connecting Gilgandra to Warren. VP08 is representative of views experienced by road users.
Description of existing view	VP08 is a view along the Oxley Highway and right towards the Marthaguy Creek riparian corridor. The highway appears in the view, with one lane in each direction, wide grassy verges and rural fencing. Nancarrow Road is a gravel roadway appearing to the left of the view. Some scattered native roadside vegetation can be seen along with roadside, primarily in the middle ground, with a large gap in this location revealing open views towards the creek. Rural land is present on either side of the highway. The sky appears a dusty brown due to the environmental conditions at the time of the site inspection.
Anticipated change to view	During construction, a construction compound is proposed to the left of this view within the rural land beyond Nancarrow Road. This would include storage areas for materials and construction activities associated with the proposal. Due to limited roadside vegetation, the compound would be visible from this location. The Oxley Highway and Nancarrow Road are also designated construction access routes. Construction activities including vegetation removal, and associated with the construction of the rail line and the Marthaguy Creek bridge, would be visible in this view. During operation, the proposed new level crossing of the Oxley Highway would appear just beyond the Nancarrow Road intersection. The rail tracks would cross over the road at-grade, and associated line marking, signage, warning lights and boom gates would be present visible. To the right of the level crossing, the rail line would rise in elevation on a landform batter, to a bridge. This would extend across the view to the right, over the floodplain towards the creek, which it would begin to cross on the far right of the view. Vegetation removal would include all roadside vegetation within the view, as well as scattered vegetation within the paddock to the left. Riparian vegetation would also be removed to accommodate the rail corridor clearing, to the far right of the view. Double stacked freight train would appear at various times on the rail line. Fencing would be visible to the rail corridor within the floodplain.
Sensitivity to change	Low , as road users experiencing this view are passing through the area, with short-term viewing durations and generally limited interest in surrounding views.
Magnitude of change	During construction, the magnitude of change is considered moderate due to the construction activities, construction compound and vegetation removal being uncharacteristic in the existing view. However, construction activities would be temporary and for the duration of the construction period only. During operation, the magnitude of change is considered moderate due to the scale and extent of new rail infrastructure which would be uncharacteristic within the existing view.
Significance of impact	The significance of impact during construction and operation is therefore Moderate-Low .

6.1.11 Viewpoint 09: National Park Road, Curban



Criteria	Comments
Location / view direction	VP09 is located on the northern side of National Park Road in Curban, about one kilometre from the proposed Castlereagh River bridge. VP09 is looking in a north-west direction towards the proposal.
Visual receivers	National Park Road is a sub-arterial road traversing through Curban in this location. This view is representative of road users and viewers from the nearby small township of Curban, which includes community facilities and a small number of residences.
Description of existing view	VP09 is an open view across the agricultural floodplain adjacent to the Castlereagh River. The view is dominated by the field of pasture beyond the wire boundary fence in the foreground. On the horizon, the native riparian vegetation associate with the Castlereagh River corridor can be seen extending across the view. The view is generally flat and expansive, defined by a distant layering of vegetation. The sky appears dusty due to the climate conditions on the day of the site inspection.
Anticipated change to view	During construction, a construction compound would be present to the left of the southern bridge abutment within the view, between the rail line and the viewpoint. This would be visible, yet at a distance from the viewer. The movement of vehicles and construction activities associated with the construction of the proposal would be visible from this location. During operation, the proposed rail line would extend across the view. This would be visible primarily at the southern abutment where the rail line elevates from the existing level to the Castlereagh River bridge, to the centre left of the view. The bridge would continue to the right until it crosses the river to the centre right of the view. Some tree removal would be required in this location, however this may be visually mitigated by surrounding vegetation. Double stacked freight trains would appear at various times on the rail line and bridge. Fencing would be discernible to the rail corridor edge.
Sensitivity to change	Moderate as viewers from or visiting the Curban settlement may experience this view frequently and with long viewing durations, however at a distance from the proposal.
Magnitude of change	During construction, the magnitude of change is considered moderate as the construction compound and construction activities would be discernible changes and uncharacteristic within the existing view. However, these changes would be temporary and for the duration of the construction period only. During operation, the magnitude of change is considered low due to the new rail infrastructure extending across the view, however this would be minor in scale within the view and horizontal in nature, similar in character to the existing view composition.
Significance of impact	The significance of impact during construction is therefore Moderate. The significance of impact during operation is therefore Moderate-Low.

6.1.12 Viewpoint 10: National Park Road / Castlereagh River, Curban



Criteria	Comments
Location / view direction	VP10 is located on National Park Road in Curban, about 700 metres from the northern abutment of the Castlereagh River bridge, looking across Terrabile Creek. This view is looking north-west, and across a section of travelling stock reserve land adjacent to the Castlereagh River.
Visual receivers	This viewpoint is representative of views experienced by road users on National Park Road travelling north-west.
Description of existing view	VP10 comprises of foreground of pasture grass to the southern bank of Terrabile Creek. The wire fence in the foreground forms the boundary to National Park Road. Mature eucalypt trees can be seen extending across the view within the dry creek bed of Terrabile Creek. Limited filtered views can be achieved to the background, with visibility to the northern grassy bank of Terrabile Creek and the riparian vegetation along the Castlereagh River in the distance. The National Park Road bridge barrier appears to the right of view. East Coonamble Road can just be seen through vegetation on the far side of the bridge.
Anticipated change to view	During construction, no construction compounds would be visible from this location, however, National Park Road and East Coonamble Road are designated construction access routes for the proposal. The construction activities associated with the rail line and the new bridge over Castlereagh River in the background are not likely to be visible through the mature vegetation. During operation, the proposed new bridge over the floodplain and Castlereagh River would be situated largely behind riparian vegetation within the foreground of this view. Some minor movements may be discernible from this location when trains are passing through, however this would likely be the only visual change.
Sensitivity to change	Low , as road users experiencing this view are passing through the area, with short-term viewing durations and generally limited interest in surrounding views as they are passing through the area at speed.
Magnitude of change	During construction and operation , the magnitude of change is considered negligible due to the presence of dense intervening vegetation screening views to the proposal.
Significance of impact	The significance of impact during construction and operation is therefore Negligible .

6.1.13 Viewpoint 11: Gumin Gumin Road, Mount Tenandra



Criteria	Comments
Location / view direction	VP11 is located on Gumin Gumin Road, about 50 metres from a proposed level crossing of the rail line and Gumin Gumin Road. This view is looking north-west.
Visual receivers	Gumin Gumin Road is an arterial road traversing through Mount Tenandra. This viewpoint is representative of road users travelling west.
Description of existing view	VP11 is an open view which comprises of Gumin Gumin Road to the centre of the view, with wide grassy road corridor and gravel roadway. To the left, Mount Tenandra is present within rural land. To the right, flat rural grazing land is present. Scattered native trees appear to the background of the view and upon Mount Tenandra.
Anticipated change to view	During construction, a construction compound would be present to the left of this view, between a private residence on the edge of Mount Tenandra and the proposed rail line. This is just outside of the range of this view. Construction activities including vegetation removal associated with the new rail line and level crossing would be visible in the immediate foreground of this view. During operation, the proposed level crossing would appear within the immediate foreground of the view. This would include new rail tracks at the same level as the existing grade, extending across the view. Signage would be seen at the crossing location. Fencing would be present to either side of the rail corridor with the adjoining rural land. The roadside trees to the left of the road would be removed to accommodate the proposal. Double stacked freight trains would appear at various times on the rail line and bridge.
Sensitivity to change	Low , as road users experiencing this view are passing through the area, with short-term viewing durations and generally limited interest in surrounding views as they are passing through the area at speed.
Magnitude of change	During construction, the magnitude of change is considered moderate as the construction activities associated with the new rail line and level crossing would be uncharacteristic within the existing view. However, construction activities would be temporary and for the duration of the construction period only. During operation, the magnitude of change is considered moderate as the level crossing and rail line would be new discernible elements in the existing view, although they would be predominantly at ground level and within the existing view composition, with limited tree removal.
Significance of impact	The significance of impact during construction and operation is therefore Moderate-Low .

6.1.14 Viewpoint 12: Munns Road, Baradine



Criteria	Comments
Location / view direction	VP12 is located on the southern side of Munns Road, looking west, about two kilometres from the proposed rail line.
Visual receivers	Munns Road is a local road through rural areas between Coonamble and Baradine. This viewpoint is representative of views experienced by road users on Munns Road travelling west at this location.
Description of existing view	VP12 is a view comprising of the gravel road and grassy verge of Munns Road to the centre. Private rural land is present to either side, including a residence and farm buildings to the left amongst scattered trees. Findlays Road can be seen to the right. The geological formation of Table Top Mountain can just be seen to the far left. This formation is within LCZ 3 Warrumbungle Slopes and Uplands, and has Aboriginal cultural value associated with travel corridors through the landscape (JacobsGHD, 2020a). In the distance, vegetation can be seen on the horizon.
Anticipated change to view	During construction, a construction compound is present which may be visible to the far right of this view beyond the tree line. Munns Road is also a designated construction access route for the proposal, therefore vehicles would be using this road during construction. Construction activities may be visible in the distance. During operation, the proposed new railway line would be largely situated behind existing foreground and intervening vegetation, as it's located behind Table Top Mountain, the residence to the left, and distant trees on the horizon to the right. The rail line itself would therefore not be visible. However, train may be seen to the far right of the view beyond the extent of existing trees, at various times.
Sensitivity to change	Low , as road users experiencing this view are passing through the area, with short-term viewing durations and generally limited interest in surrounding views.
Magnitude of change	During construction, the magnitude of change is considered low as Munns Road would see increased construction traffic, however this would be during the duration of the construction period. During operation, the magnitude of change is considered negligible due to the intervening vegetation and distance.
Significance of impact	The significance of impact during construction is therefore Low. The significance of impact during operation is therefore Negligible.

6.1.15 Viewpoint 13: Baradine Road, Baradine



Criteria	Comments
Location / view direction	VP13 is located on the southern side of Baradine Road, about 220 metres from the proposed rail line. VP13 is looking east towards the proposed level crossing of the rail line with Baradine Road.
Visual receivers	Baradine Road is an arterial road connecting Baradine to Coonamble to the west. This viewpoint is representative of road users travelling east.
Description of existing view	VP13 comprises of Baradine Road to the centre of the view, with a dense corridor of native roadside vegetation to either side, including eucalypts, casuarinas and cypress pines. This vegetation creates a visual barrier and sense of enclosure to the view. A cleared gravel verge and swale are present adjacent to the asphalt road surface. Infrastructure is limited to roadside markers seen in the distance. To the roadside, vegetation is slightly less dense, revealing filtered views to the rural land beyond.
Anticipated change to view	During construction, a construction compound is proposed within the rural land to the right, which would be visible within the view. This may include views of storage areas for materials and construction activities associated with the proposal. Baradine Road is also a designated construction access route. Construction activities including the removal of roadside vegetation associated with the construction of the new rail line and level crossing would be visible in this view. During operation, the proposed new railway line would appear to the centre of the view, crossing over Baradine Road at-grade. New road line-marking, signage, warning lights and boom gates would be seen associated with this crossing. The majority of roadside vegetation to the left and right foreground would be removed to accommodate the construction of the proposal. This would open up views particularly to the right, towards rural land and the proposed rail line as it traverses through the paddock. Double stacked freight trains would appear at various times on the rail line. Fencing would be visible to the edge of the rail corridor.
Sensitivity to change	Low , as road users experiencing this view are passing through the area, with short-term viewing durations and generally limited interest in surrounding views as they are passing through the area at speed.
Magnitude of change	During construction, the magnitude of change is considered moderate due to the presence of the construction compound, construction activities and vegetation removal associated with the level crossing and new rail line. However, these would be temporary and for the duration of the construction period only. During operation, the magnitude of change is considered moderate due to the extent of vegetation removal that would change the composition of the view. However, this change could be partially mitigated over time with new planting.
Significance of impact	Significance of impact during construction and operation is therefore Moderate-Low .

6.1.16 Viewpoint 14: Gwabegar Road, Baradine



Criteria	Comments
Location / view direction	VP14 is located on the western side of Gwabegar Road, about 160 metres from the proposal. This view is looking north towards the proposed level crossing of the rail line with Gwabegar Road.
Visual receivers	Gwabegar Road is an arterial road connecting Baradine to Gwabegar to the north. In this location, the road traverses the western edge of the Pilliga forests (Baradine State Forest). This viewpoint is representative of road users.
Description of existing view	VP14 comprises of Gwabegar Road to the centre of the view, with dense roadside vegetation to either side. A cleared gravel verge and swale is present to either side of the road. Vegetation is typical of the Pilliga forests, largely consisting of cypress pines and taller eucalypts, characterised by blue-green foliage and dense mid-storey vegetation. Dappled shadows appear across the road surface and verge.
Anticipated change to view	During construction, a construction compound is proposed adjacent to the rail corridor, which would be visible within this view to the right. Visible elements may include storage areas, construction machinery and activities associated with the proposal. Gwabegar Road is also a designated construction access route for the proposal. Construction activities including the removal of roadside vegetation associated with the construction of the new rail line and level crossing would be visible in this view. During operation, the proposed level crossing of the rail line would appear across the road corridor at the same grade as existing road, in the middle ground of the view. Signage, road line marking, signage, warning lights and boom gates would be visible. Vegetation removal would include much of the existing roadside vegetation to the right, and all vegetation to the left within this view due to the extent of the construction area, revealing an open clearing to the rail line and a nearby access track to the right. Double stacked freight trains would appear at various times on the rail line. Rail corridor fencing would be visible alongside the rail corridor.
Sensitivity to change	Low , as road users experiencing this view are passing through the area, with short-term viewing durations and generally limited interest in surrounding views, as they are passing through the area at speed.
Magnitude of change	During construction, the magnitude of change is considered to be high due to the large extent of vegetation likely to be removed and the presence of the construction compound and activities. However, construction activities would be temporary and for the duration of the construction period only. During operation, the magnitude of change is considered high due to the large extent of vegetation likely to be removal within the view. However, this has potential to be mitigated with planting in future.
Significance of impact	The significance of impact during construction and operation is therefore Moderate .

6.1.17 Viewpoint 15: Pilliga Forest Way / Country Line Road, The Pilliga



Criteria	Comments
Location / view direction	VP15 is located at the junction of Pilliga Forest Way and Country Line Road, looking south-east towards the proposed level crossing of the rail line with Country Line Road. VP15 is about 50 metres from the proposal.
Visual receivers	Country Line Road is a sub-arterial access road to the Salt Caves Picnic Area, a popular visitor location within the Timmallallie National Park. This viewpoint is representative of road users, some of which may include visitors to the national park.
Description of existing view	VP15 comprises of Country Line Road to the centre of the view, with Pilliga forest vegetation to either side. The gravel road ascends towards a hill away from the intersection. A clearing is present in the foreground, beyond which the dense forest appears, casting shadows across the road. Signage and road markers are present to the foreground. Vegetation is typical of the Pilliga forests, comprising of a medium dense open forest with cypress pines and eucalypts.
Anticipated change to view	During construction, there would be a compound located about 350 metres to the right of this view, however this would not be seen from this location. Pilliga Forest Way is a designated construction access route for the proposal. Construction activities including the removal of vegetation associated with the construction of the new rail line and level crossing would be visible in this view. During operation, the proposed new railway line would appear to cross over Country Line Road just beyond the forest threshold towards the rise in the roadway, at a similar level to the existing ground. However, to the left of the view, the rail line would increase in elevation towards a nearby bridge, on batter slopes. The railway tracks would be visible crossing the roadway at the level crossing, together with associated signage. Double stacked freight trains would be seen on the rail line at various times. A thin row of trees may be retained along Pilliga Forest Way to the right and left of the view. However, filtered views would be achieved through these trees to the rail corridor behind, which is proposed to be cleared of the existing dense vegetation. Vegetation would also be removed to either side of Country Line Road, opening up views along the road corridor to the centre.
Sensitivity to change	Low , as road users experiencing this view are passing through the area, with short-term viewing durations and generally limited interest in surrounding views.
Magnitude of change	During construction, the magnitude of change is considered moderate due to the presence of construction compound and activities including vegetation removal being uncharacteristic within the existing view. However, construction activities would be temporary and for the duration of the construction period only. During operation, the magnitude of change is considered low due to the loss of vegetation, and introduction of the new rail line and level crossing, however the retention of some foreground vegetation would somewhat mitigate the change, and the new elements would not be in contrast to other transport related features within the view, such as roads and signage.
Significance of impact	The significance of impact during construction is therefore Moderate-Low. The significance of impact during operation is therefore Low.

6.1.18 Viewpoint 16: Salt Caves Lookout, Timmallallie National Park, The Pilliga



Criteria	Comments
Location / view direction	VP16 is located on the upper level of the lookout tower within the Salt Caves Picnic Area, Timmallallie National Park. This elevated view is about nine kilometres from the proposed rail alignment and looking north-west. This location is outside of the LVA study area, however has been included due to its role as a tourist destination and place for visitors to enjoy expansive views of the surrounding landscape.
Visual receivers	This viewpoint is representative of what visitors to the lookout at the Salt Caves Picnic Area within Timmallallie National Park would experience.
Description of existing view	VP16 comprises of Pilliga forest vegetation, appearing dark brown-green in colour with varying densities of foliage highlighted by black and green tree trunks. Sandy red soil can be seen through this vegetation to the foreground. The horizon line is a horizontal linear expanse with slight undulations, losing definition at the point where it meets the sky. Wellyard Road, a gravel road providing access to the picnic area, can be seen to the lower left foreground.
Anticipated change to view	During construction, a construction compound would be situated within the distance of this view, which would create a large area of cleared vegetation. However, it is unlikely this would be noticeable within this view due to the distance from the viewer, and layering of canopy vegetation. During operation, the proposed new railway line would traverse across the extent of this view in the distance, generally at the same grade as the existing ground, however, with one bridge over a watercourse. Vegetation would be permanently removed within the rail corridor. However, it is unlikely that the proposal would create a noticeable change to this view due to the distance from the viewer, and layering of canopy vegetation.
Sensitivity to change	High , as this is a formal lookout within a national park where visitors are specifically interested in experiencing distant views of the surrounding landscape.
Magnitude of change	During construction and operation , the magnitude of change is considered negligible as the proposal is unlikely to change this view.
Significance of impact	The significance of impact during construction and operation is therefore Negligible .

6.1.19 Viewpoint 17: Pilliga Forest Way / Twenty Foot Road, The Pilliga



Criteria	Comments
Location / view direction	VP17 is located at the intersection of Pilliga Forest Way and Twenty Foot Road, about 50 metres from the proposed rail line. This view is looking north towards the proposed level crossing of the rail line with Twenty Foot Road.
Visual receivers	Pilliga Forest Way and Twenty Foot Road are sub-arterial roads within the Pilliga forests (Pilliga East State Forest). This viewpoint is representative of road users.
Description of existing view	VP17 comprises of Twenty Foot Road to the centre of the view, a red gravel road joining Pilliga Forest Way at an intersection. Pilliga forest vegetation is present to either side of the road corridor, casting shadows across the roadway. Vegetation consists of medium-height open forest with a dense sub-canopy of cypress pine and canopy of eucalypts. The road is informal, with infrastructure limited to road edge markers and signage.
Anticipated change to view	During construction, a construction compound is proposed about 230 metres to the left of this viewpoint, however this would not be seen within the view. Pilliga Forest Way is a designated construction access route. Construction activities including the removal of vegetation associated with the construction of the new rail line, level crossing and realignment of Twenty Foot Road would be visible in this view. During operation, Twenty Foot Road is proposed to be realigned in this location, therefore the new roadway and proposed level crossing of the new roadway would appear to the far left of the existing view. The rail line would be seen at a similar level to the existing ground level, with warning signs at the level crossing location. Double stacked freight trains would be seen using the rail line at various times. Vegetation removed would be seen across the majority of the left side of the existing roadway, to accommodate the new rail corridor and roadway. However, some distant vegetation would be seen behind. It is assumed that the existing roadway would be retained as per the existing view, however this could be revegetated in future.
Sensitivity to change	Low , as road users experiencing this view are passing through the area, with short-term viewing durations and generally limited interest in surrounding views.
Magnitude of change	During construction, the magnitude of change is considered moderate due to the extent of vegetation removal and construction activities being discernible changes in the landscape. However, construction activities would be temporary and for the duration of the construction period only. During operation, the magnitude of change is considered moderate due to the extent of vegetation removal and new level crossing within the view. However, with potential for some visual mitigation of the existing roadway.
Significance of impact	The significance of impact during construction and operation is therefore Moderate-Low .

6.1.20 Viewpoint 18: Newell Highway, Narrabri



Criteria	Comments
Location / view direction	VP18 is located on the eastern side of the Newell Highway, about 80 metres from the proposed rail line. The view is looking south-west towards the northern approach to the proposed Bohena Creek bridge. The wide vegetated road reserve in this location is associated with a travelling stock reserve alongside the Newell Highway.
Visual receivers	The Newell Highway is a north-south primary road connecting Narrabri to Coonabarabran through the Pilliga forests. This viewpoint is representative of road users travelling south.
Description of existing view	VP18 is a view through a gap in roadside vegetation along the Newell Highway. A number of informal trees are present to the foreground, with rural land, a residence and associated buildings behind. Dense continuous vegetation forms a backdrop to the view, situated along Bohena Creek. The Newell Highway is present in the foreground.
Anticipated change to view	During construction, no construction compounds would be visible from this location, however, the Newell Highway is a designated construction access route for the proposal. A construction compound is located nearby, about 430 metres to the right of this viewing location. It is unlikely this would be seen from the highway due to dense existing vegetation. Construction activities including the removal of vegetation associated with the construction of the new rail line would be visible in this view. During operation, the proposed rail line would be situated parallel to the Newell Highway on the northern side. Within this view, this would be seen extending across the view, elevated on a landform slope as the rail line approaches the bridge further left out of the range of this view. The landform and rail line would be situated behind the existing roadside vegetation to the right and left, and in the approximate location of the centrally located trees, which would be removed. The landform would be relatively high, screening all built form behind. However, some vegetation would be seen above it, associated with Bohena Creek corridor behind. Double stacked freight trains would appear on the elevated rail line at various times. Refer to Appendix A for photomontage of the proposed view.
Sensitivity to change	Low , as road users experiencing this view are passing through the area, with short-term viewing durations and generally limited interest in surrounding views.
Magnitude of change	During construction, the magnitude of change is considered moderate due to the presence of construction activities and vegetation removal being discernible elements and uncharacteristic within the existing view. However, construction activities would be temporary and for the duration of the construction period only. During operation, the magnitude of change is considered moderate as the new landform and rail line would be a new feature within the view of substantial scale. This change would not substantially change the views overall composition, however, views to the floodplain and built form would be entirely removed, and the depth of the view would no longer remain.
Significance of impact	The significance of impact during construction and operation is therefore Moderate-Low .

6.1.21 Viewpoint 19: Yarrie Lake Road, Narrabri



Criteria	Comments
Location / view direction	VP19 is located on the southern side of Yarrie Lake Road, about 350 metres from the proposed rail line bridge over Yarrie Lake Road, and southern portion of the proposed Narrabri Creek / Namoi River bridge. VP19 is looking north-west.
Visual receivers	Yarrie Lake Road is a sub-arterial road within a rural and industrial area of Narromine. This viewpoint is representative of local road users, nearby workers and residents.
Description of existing view	VP19 is an open and expansive view over the flat plain. The view is comprised of Yarrie Lake Road to the centre of the view, with a wide verge to the left and overhead power lines to the right. A driveway to an industrial property can be seen to the left. Two rural residence houses and associated buildings can be seen to the right, one close to the road and the other, close to the Namoi River. To the far right, dense riparian vegetation associated with the river can be seen. Vegetation continues across the view forming a continuous backdrop, associated with existing vegetation within rural land.
Anticipated change to view	During construction, a construction compound is proposed to the left of Yarrie Lake Road, behind the proposed rail alignment and bridge. It is unlikely this would be visible within the view, aside from possible tall construction machinery and built form above the bridge level, in an isolated portion of the view. Yarrie Lake Road is a designated construction access road for the proposal. Construction activities including the removal of vegetation would be visible. During operation, the proposed rail line would appear to cross Yarrie Lake Road in the about location of the red car. The rail line would be elevated above the roadway, and extend across the floodplain to the right towards the Namoi River, behind the existing residential properties. The elongated bridge would have associated structural concrete piers at various intervals, raising it above the ground plain, which would be seen within the view. Double stacked trains would be seen on the bridge at various times. Some vegetation along Yarrie Lake Road to the foreground of the bridge would likely be removed to accommodate construction works. Refer to Appendix A for photomontage of the proposed view.
Sensitivity to change	Moderate , as residents would experience this view when entering and leaving their properties, however at a distance from the proposal. Outdoor workers would have intermittent views of the study area, and therefore would have a moderate sensitivity to change. Road users experiencing this view are passing through the area, with short-term viewing durations and generally limited interest in surrounding views, and would have a low sensitivity to change.
Magnitude of change	During construction, the magnitude of change is considered moderate as the construction activities would be a discernible change within the existing view. However, construction activities would be temporary and for the duration of the construction period only. During operation, the magnitude of change is considered low as the bridge would be a new feature within the view, however appearing at a relatively small scale. The composition and overall character of the view would not be substantially impacted by the change. Any tree removal to the foreground could be mitigated by future planting along the roadway.
Significance of impact	The significance of impact during construction is therefore Moderate . The significance of impact during operation is therefore Moderate-Low .

6.1.22 Viewpoint 20: Genanagie Street, Narrabri



Criteria	Comments
Location / view direction	VP20 is located on Genanagie Street, about 950 metres from the proposed Narrabri Creek / Namoi River bridge. This view is looking west.
Visual receivers	Genanagie Street is a local road in a rural area alongside the riparian bank of the Namoi River. This viewpoint is representative of nearby residences and local road users.
Description of existing view	VP20 comprises of Genanagie Street to the foreground, open flat pasture land to the centre of the view, and riparian canopy vegetation forming a backdrop, associated with the Namoi River. Some built form can be seen to the left amongst vegetation, which is associated with the industrial area on the edge of Narrabri. To the right, a power pole is just out of view, which is adjacent to a private property access way.
Anticipated change to view	During construction, a construction compound is proposed alongside the proposed rail bridge, however this would not be visible from this location. The construction of the bridge would also be screened by the existing riparian vegetation. During operation, the proposed new bridge would be situated behind multiple layers of existing riparian vegetation within the view, and vegetation within rural land beyond the Namoi River. Although it is proposed to be elevated above the floodplain, the bridge would not be visible from this location, due to the presence of intervening vegetation and the distance from the viewpoint. It would be unlikely any passing freight trains using the bridge would be visible.
Sensitivity to change	Moderate , as road users are likely to be primarily nearby residents going to or from home, who would experience this view frequently, although with short-term viewing durations. Viewers are at a distance and somewhat screened from the study area.
Magnitude of change	During construction and operation , the magnitude of change is considered negligible as there would be no change to the existing view due to the presence of intervening vegetation and distance.
Significance of impact	The significance of impact during construction and operation is therefore Negligible .

6.1.23 Viewpoint 21: The Island Road, Narrabri



Criteria	Comments
Location / view direction	VP21 is located on the southern side of The Island Road at the threshold between a residential and rural area, about one kilometre from the proposed Narrabri Creek / Namoi River bridge over the floodplain. VP21 is looking west towards the proposal.
Visual receivers	The Island Road is a local road connecting Narrabri to the west, between Namoi River and Narrabri Creek. This viewpoint is representative of local road users and nearby residents.
Description of existing view	VP21 comprises of The Island Road, an asphalt road with grassy verge, swale, and overhead power lines. To the centre, a clump of roadside vegetation can be seen in the middle ground where the road crosses a drainage line. Flat rural land is present beyond the road corridor fencing, consisting of pasture grasses, water from recent rainfall, and individual canopy trees. Built form associated with residences and farming uses can be seen in the distance amongst eucalypt trees. To the right, the driveway of a residence built at elevation above the floodplain can be seen. This is the extent of suburban residential development associated with the Narrabri township. A riparian vegetation corridor associated with Narrabri Creek forms the distant backdrop to the view.
Anticipated change to view	During construction, there would be no construction compounds visible within this view. However, The Island Road is a designated construction access road for the proposal, therefore construction vehicles would be seen travelling along the roadway, and construction activities would be seen along the proposed rail alignment associated with bridge construction works. During operation, the proposed new rail bridge would appear to the right of the existing road and roadside vegetation, extending across the floodplain behind all foreground vegetation and built form, and to the front of the distant riparian corridor. The proposed height of the bridge would be just below the height of background riparian trees. The bridge would be elevated on vertical structural piers. To the left of the road, the rail bridge would be largely screened by intervening vegetation and built form. Double stacked freight trains would be seen on the rail bridge at various times. These would appear above the distant horizon line. Refer to Appendix A for a photomontage of the proposed view.
Sensitivity to change	Moderate , as this view represents road users and nearby residents at home, or going to or from, who would experience this view frequently. Viewing durations would vary from short-term when travelling on the road, and longer term when viewing at home. However, the proposal is at a distance and somewhat screened from viewers.
Magnitude of change	During construction, the magnitude of change is considered low as the construction activities associated with the bridge would be at a distance and would be a minor alteration to the view. Construction activities would be temporary and for the duration of the construction period only. During operation, the magnitude of change is considered low as the bridge would be a new feature within the view, however at a relatively small scale. The composition and overall character of the view would not be substantially impacted by this change.
Significance of impact	The significance of impact during construction and operation is therefore Moderate-Low .

6.1.24 Viewpoint 22: Kamilaroi Highway, Narrabri



Criteria	Comments
Location / view direction	VP22 is located on the southern side of the Kamilaroi Highway. This viewpoint is about 180 metres from the proposed rail line bridge over the Kamilaroi Highway, and Narrabri Creek / Namoi River bridge. VP22 is looking south-east.
Visual receivers	The Kamilaroi Highway is a primary road connecting Narrabri to the west. This viewpoint is representative of road users and a nearby residence.
Description of existing view	VP22 is a view along the Kamilaroi Highway, a sealed single carriage road with wide grassy verges, overhead power lines and irregular roadside tree planting. A residence is located to the left side of the road corridor just out of view, with industrial properties amongst dense screening vegetation to either side of the road. Riparian vegetation associated with Narrabri Creek forms a dense green buffer to the background on the right side of the road corridor. Grassy land is present to the foreground beyond roadside fencing, associated with a grazing easement to the right, and the Narrabri Speedway to the left.
Anticipated change to view	During construction, there would be no construction compounds visible within this view. However, the Kamilaroi Highway is a designated construction access road for the proposal. Construction vehicles would be seen travelling along the roadway, and construction activities associated with the bridge works would be visible across the extent of this view. During operation, the proposed new rail bridge would be situated at the approximate location as the existing truck on the highway, extending across the view and elevated above the road. The concrete bridge would descend in elevation from the right of the view as it crosses Narrabri Creek, to the left towards the speedway. The bridge would be elevated on vertical structural piers. The majority of the bridge would be visible within this view. A number of foreground trees along the highway are likely to be removed to accommodate construction works, as well as riparian vegetation to accommodate the rail corridor, and trees along the industrial property interface to the left of the view in the location of a proposed road realignment. Double stacked freight trains would be seen on the rail bridge at various times. Refer to Appendix A for photomontage of the proposed view.
Sensitivity to change	Moderate , as road users are likely to be primarily people travelling to or from Narrabri with short-term viewing durations. This location is somewhat of an entry point to Narrabri, however near an industrial area. The nearby residents would experience this view frequently when going to and from home.
Magnitude of change	During construction , the magnitude of change is considered moderate due to the presence of the construction activities associated with the bridge being discernible and uncharacteristic within the existing view, however this would be a temporary change during the construction period only. During operation , the magnitude of change is considered moderate as a new built form element would feature across the horizontal extent of this view. Although much of the background vegetation would remain, the overall character of the view would change. The change would be permanent, however, has potential to be partially mitigated.
Significance of impact	The significance of impact during construction and operation is therefore Moderate .

6.1.25 Viewpoint 23: Lookout, Narrabri



Criteria	Comments
Location / view direction	VP23 is located at the Lookout off Stoney Creek Road, north-east of Narrabri about 2.4 kilometres from the proposed rail line. VP23 is looking north-west.
Visual receivers	This viewpoint is situated at the top of a pronounced geological formation within a flat rural landscape, the land of which is within the travelling stock reserve network. Public vehicular access is provided from Stoney Creek Road to an informal viewing area at the summit. Amenities are limited to a circuit road and some picnic tables. This viewpoint is representative of visitors to the lookout.
Description of existing view	VP23 is an expansive view over the landscape on the outer edge of Narrabri. Low shrubs are present to the foreground, which define the edge of the clearing associated with the lookout area. To the centre of the view, a residence located on Stoltenbergs Road can be seen amongst canopy vegetation. Beyond this, fields of cropland and pasture are present, with scattered trees along the dusty horizon. Industrial sheds appear to the left of view, located on the outer edge of Narrabri along the Newell Highway. Far distant trees to the right on the horizon are associated with minor geographic elevations west of the Newell Highway above the riparian floodplain.
Anticipated change to view	During construction, there would be no construction compounds visible within this view. However, the Newell Highway is a designated construction access road for the proposal. Construction vehicles would be seen travelling along the roadway, and construction activities associated with the rail line may be seen within this view. During operation, the proposed new rail line would be situated on the far side of the Newell Highway, within the background of the view, extending from the location of the sheds to the left, across the extent of view to the right. The rail lines would not be visible from this location. However, the trains using the line would be visible due to the open nature of the landscape, and the height and length of proposed trains.
Sensitivity to change	Moderate , as visitors to this location would have a specific interest in experiencing views to the broader landscape, over potentially long viewing periods. However, the existing views experienced are not protected nor particularly scenic.
Magnitude of change	During construction, the magnitude of change is considered negligible due to the intervening distance. During operation, the magnitude of change is considered negligible as the proposal would only be visible when trains are in operation and is at a distance from the viewpoint.
Significance of impact	The significance of impact during construction and operation is therefore Negligible .

6.2 Borrow pits and access tracks

6.2.1 Landscape and visual context

Four borrow pit sites are proposed to support the construction of the proposal. These would include borrow pits and associated access tracks. The following section provides an overview of the visual context of the borrow pit sites.

Borrow pit A

Borrow pit A is situated about 22 kilometres south of Narromine, within a rural landscape setting. The topography is gently undulating, with a number of minor drainage lines present. Vegetation is primarily non-irrigated grazing land, with linear native trees present along roadside corridors, within drainage lines, and to higher elevations of the landform. Local roads are typically gravel and gentle undulating in nature in response to the landform.

Borrow pit A is located within private rural land, on a higher topographic elevation which is partially vegetated. The nearest road is Tantitha Road to the east, a gravel road from which a number of residences are situated to either side.

Sensitive visual receivers would include local road users of Tantitha Road, and potentially a number of nearby residents on Tantitha Road.

Borrow pit B

Borrow pit B is situated about 10 kilometres south of Narromine, within relatively flat rural land. Vegetation includes a mosaic of cropping and grazing fields, with linear native trees along road corridors, and upon elevated rises within the landscape. Nearby roads include Tomingley Road, a sealed north-south arterial road, and local gravel roads including Haberworth Lane, and Pinedean Road.

Borrow pit B is located within private rural land, on a slightly elevated site that has been subject to previous excavation activity which has resulted in changes to the natural landform and vegetation removal. A number of rural residences are located nearby. Dense existing vegetation on the north and eastern side of the borrow pit shields view to the borrow pit site from location beyond, such as Pinedean Road. Linear vegetation along Tomingley Road contributes to shielding some views from the road, however some gaps in vegetation are present.

Sensitive visual receivers would therefore include road users on Tomingley Road, experiencing intermittent views through gaps in roadside vegetation, and possibly a small number of residences when entering and leaving their properties at Tomingley Road.

Borrow pit C

Borrow pit C is situated about six kilometres north-east of Narromine on private rural land. The topography is flat to gently undulating, with small vegetated rises amongst cleared grazing land. The Macquarie River is located nearby to the south. Nearby roads include Eumungerie Road to the north-east, a sealed arterial road, as well as the local unsealed roads Euromedah Road and Macquarie View Road. Dense native vegetation is present on higher landform elevation, to either side of Euromedah Road, and isolated patches within cleared paddocks.

Borrow pit C is located to the north-western side of a densely vegetated landform elevation on private property. A number of rural residences are present nearby. Due to the presence of intervening vegetation, only a number of residents to the west of the site may experience views to the borrow pit. Sensitive visual receivers would include road users of Eumungerie Road and Mountain View Road travelling east, and nearby residents to the west.

Borrow pit D

Borrow pit D is located about five kilometres east of the Newell Highway and seven kilometres south of Narrabri, on private rural land. The topography is flat to gently undulating, with slopes generally to the east towards Jacks Creek, and the west towards Bohena Creek, away from a small ridgeline. Jacks Creek State Forest is located to the east of the property, a large lot residential area to the north, and rural land to the south and west. The Newell Highway and adjacent travelling stock reserve borders the property to the west. Dense native vegetation is present within the state forest. The rural land comprises large cleared grazing areas with tree rows along property boundary lines, together with large areas of dense vegetation forming a connection to the state forest.

Borrow pit D is located on the eastern-most part of the property, on the boundary with the state forest, and on a gentle ridgeline. Aerial imagery indicates the borrow pit site is relatively densely vegetated, however project consultants (not the authors of this assessment) who visited the site in October 2019 identified recent clearing that had occurred to up to 90 per cent of the borrow pit site and beyond. At the time of the site visit, the clearing extended beyond the borrow pit site to the north, south and west between around 100 to 400 metres, with vegetation buffers retained on all sides including a 20 metre buffer along the eastern boundary with the state forest.

An access track is proposed to connect the borrow pit with the Newell Highway to the west. A number of rural residences are situated nearby, to the north-west and south-west of the borrow pit site. Nearby roads include the Newell Highway, Tomlinson Lane, Gun Club Road, and Perimeter Road. Sensitive visual receivers may include road users and nearby residents.

6.2.2 Visual impact assessment

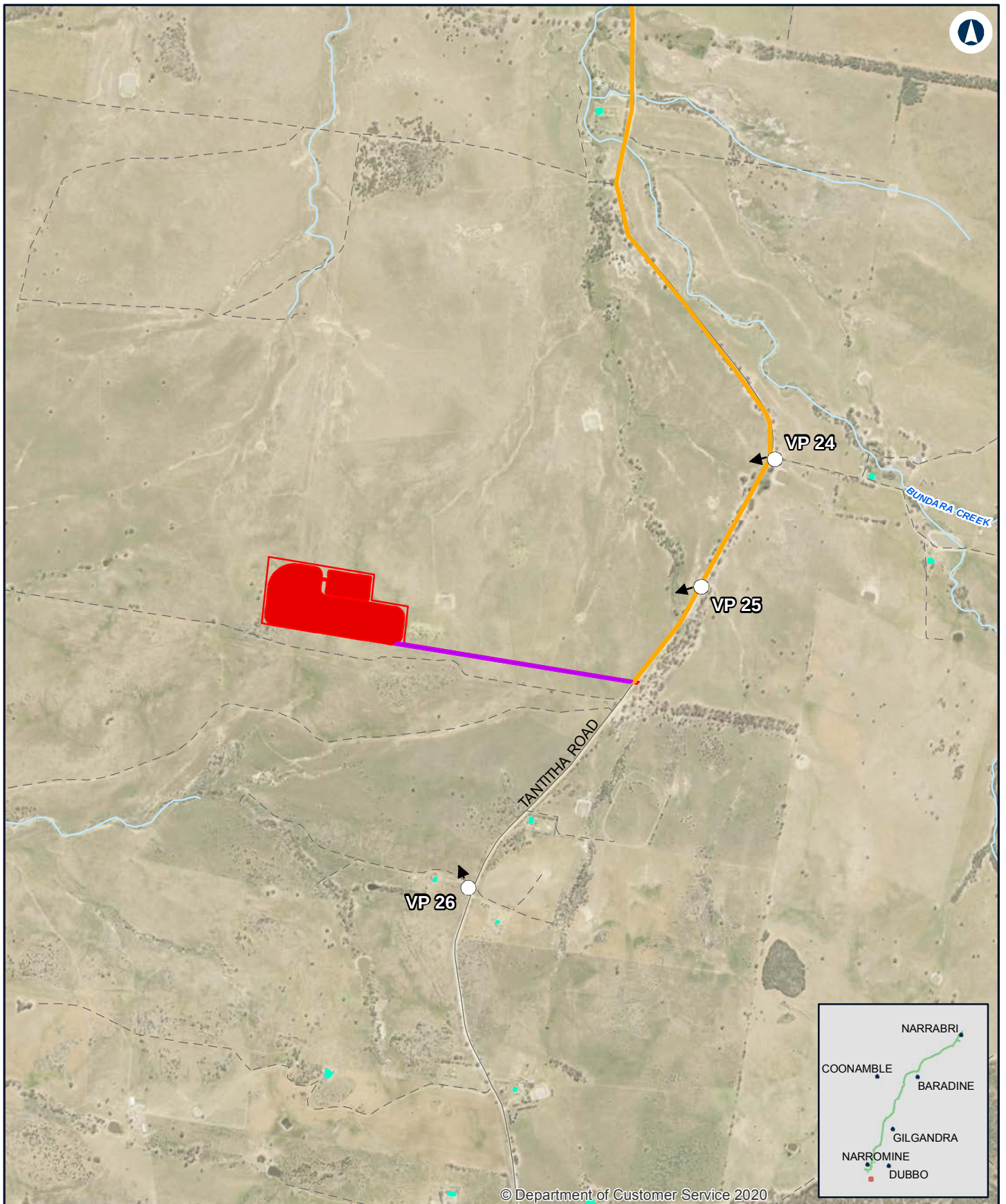
The following section 6.2.3 to 6.2.12 assesses the visual impact of the borrow pits A, B and C, from nine viewpoint locations. A discussion of potential visual impacts has been provided for borrow pit D in section 6.2.12 as a site visit was unable to be undertaken. Refer to Table 6.2 and Figure 6.3, Figure 6.4, and Figure 6.5, for viewpoint locations.

This assessment discusses the proposed borrow pits and access roads in construction, post-extraction, and rehabilitation phases. The assessment rating are based on the post-extraction and post-rehabilitation phase only. Photomontages have been provided for VP25, VP28, and VP31 to represent the proposed view from viewpoint locations (refer to Appendix A).

Table 6.2 Viewpoint locations – borrow pits and access tracks

Viewpoint	Location	Sensitive receiver	Proposal component
VP24	Tantitha Road (north)	Local road users and nearby residents	borrow pit A
VP25	Tantitha Road (central)	Local road users	borrow pit A
VP26	Tantitha Road (south)	Local road users and nearby residents	borrow pit A
VP27	Tomingley Road (north)	Arterial road users	borrow pit B
VP28	Tomingley Road (central)	Arterial road users, nearby residents and outdoor farm workers	borrow pit B
VP29	Tomingley Road (south)	Arterial road users and nearby residents	borrow pit B

Viewpoint	Location	Sensitive receiver	Proposal component
VP30	Eumungerie Road (west)	Arterial road users and nearby residents	borrow pit C
VP31	Eumungerie Road (east)	Arterial road users	borrow pit C
VP32	Macquarie View Road	Local road users and nearby residents	borrow pit C



NARROMINE TO NARRABRI

Viewpoint location (borrow pit A)

Figure 6.3

0 0.25 0.5
Km

Coordinate System: GDA 1994 MGA Zone 55

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Date: 24/06/2020

Paper: A4

Author: JacobsGHD

Scale: 1:20,000

Data Sources: Basemap layers: NSWSS; Study area, project elements: GHDJACOBS

LEGEND

- The proposal site
- Viewpoints
- Residential dwelling
- Borrow pit
- New access road
- Access road on public road
- Road
- Watercourse

INLAND RAIL **ARTC**

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6.2.3 Viewpoint 24: Tantitha Road (north)



Criteria	Comments
Location / view direction	VP24 is located on Tantitha Road about 1.5 kilometres from borrow pit A. VP24 is looking south-west.
Visual receivers	This viewpoint is situated in the location where a residential driveway meets Tantitha Road. This local road is south of Narromine within a rural setting. VP24 is representative of local road users and nearby residents entering and leaving their property.
Description of existing view	VP24 is a rural view across dry rural grazing land. The view comprises of Tantitha Road traversing across the view, intersecting with the gravel driveway of the private property to the foreground. Clumps of vegetation within the roadside corridor and adjacent rural property can be seen to the left. Across the centre of the view, a linear row of trees are present, associated with a natural drainage line. The land increases in elevation towards the back of the view, where some distant trees can be seen scattered across the horizon.
Anticipated change to view	Construction: during construction, the presence of extraction machinery, stockpiles, and storage areas may be visible on the horizon to the background centre of the view in the location of the borrow pit. Tantitha Road is a designated borrow pit access road, therefore construction vehicles may be visible on this road, and entering and leaving the borrow pit site to the left, although largely screened by foreground vegetation. Post-extraction: after extraction of the borrow pit has occurred, a row of trees along the horizon would be removed from the view, situated in the centre of the view on the highest landform. Some minor changes to the landform may be just discernible, including the removal of existing pasture grass to the upper portion of this landform. Post-rehabilitation: the <i>Borrow Pit Rehabilitation Strategy</i> (JacobsGHD, 2020c) proposes to revegetate disturbed areas of the borrow pit site and access track with similar vegetation cover and species as the existing conditions. The extraction area is not proposed to be re-filled, however objectives for the final landform are for maximum 1:4 slopes to tie-in to the existing landform. Concept rehabilitation plans have been developed which outline the proposed landform and planting areas.
Sensitivity to change	Moderate , as nearby residents would experience this view frequently when entering and leaving their property, however they are at a distance from and somewhat screened from the proposal. Local road users would experience short-term view durations while passing through the area.
Magnitude of change	Post-extraction , the magnitude of change is considered low as the anticipated change would be minor and small in scale within the view. Post-rehabilitation , the magnitude of change is considered negligible as the revegetation would be effective in neutralising the minor changes associated with the borrow pit.
Significance of impact	The significance of impact post-extraction is therefore Moderate-Low . The significance of impact post-rehabilitation is therefore Negligible .

6.2.4 Viewpoint 25: Tantitha Road (central)

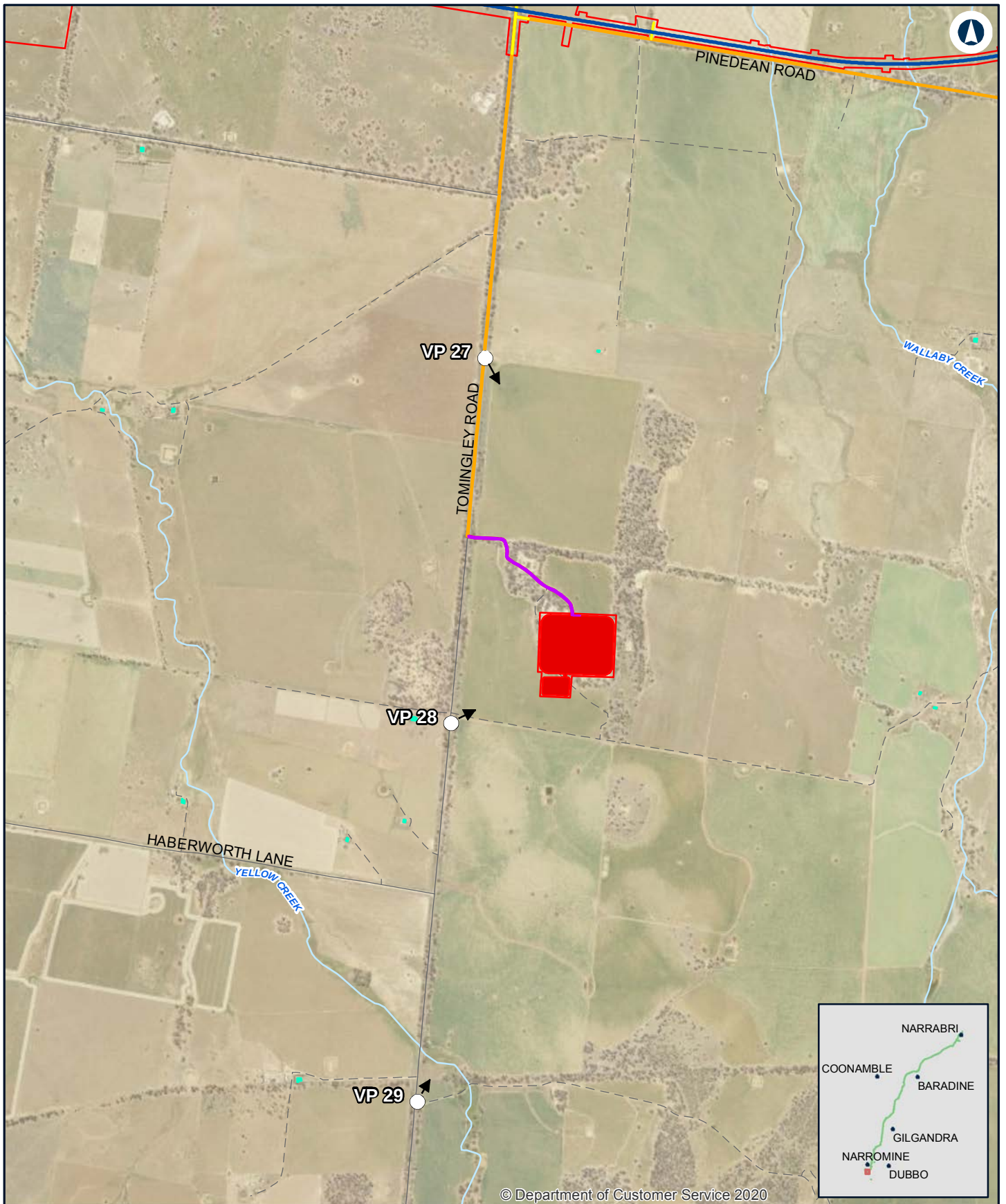


Criteria	Comments
Location / view Direction	VP25 is located on Tantitha Road about 1.1 kilometres from borrow pit A. VP25 is looking south-west.
Visual receivers	This viewpoint is situated along a stretch of Tantitha Road, a local road south of Narromine within a rural setting. In this location, there is an opening in intervening roadside / riparian vegetation, revealing views to the borrow pit site. This viewpoint is representative of local road users travelling south.
Description of existing view	VP25 is an open view across the dry rural landscape. To the foreground, a number of trees are present within the adjacent rural property within a natural drainage line, beyond the roadside wire fence. To the left, the road can be seen curving around to the right in the background, lined with dense vegetation. The landform increases in elevation towards the centre of the view where it reaches a high point in the location where a cluster of trees are present.
Anticipated change to view	Construction: during construction, the presence of extraction machinery, stockpiles, and storage areas may be visible in the location of the proposed tree removal mentioned above. Tantitha Road is a designated borrow pit access road, therefore construction vehicles may be visible on this road, and entering and leaving the borrow pit to the left. Post-extraction: after extraction of the borrow pit has occurred, a row of trees along the horizon would be removed located to the right of the dense cluster on the horizon, and to the left of the foreground tree to the centre right of the view. Some minor changes to the landform may be just discernible, including the removal of existing pasture grass to this location. Refer to Appendix A for photomontage of the proposed view. Post-rehabilitation: the <i>Borrow Pit Rehabilitation Strategy</i> (JacobsGHD, 2020c) proposes to revegetate disturbed areas of the borrow pit site and access track with similar vegetation cover and species as the existing conditions. The extraction area is not proposed to be re-filled, however objectives for the final landform are for maximum 1:4 slopes to tie-in to the existing landform. Concept rehabilitation plans have been developed which outline the proposed landform and planting areas.
Sensitivity to change	Low , as road users experiencing this view are passing through the area, with short-term viewing durations and generally limited interest in surrounding views.
Magnitude of change	Post-extraction , the magnitude of change is considered low as the anticipated change would be minor and small in scale within the view. Post-rehabilitation , the magnitude of change is considered Negligible as the revegetation would be effective in neutralising the minor changes associated with the borrow pit.
Significance of impact	The significance of impact post-extraction is therefore Low . The significance of impact post-rehabilitation is therefore Negligible .

6.2.5 Viewpoint 26: Tantitha Road (south)



Criteria	Comments
Location / view direction	VP26 is located on Tantitha Road about 970 metres from borrow pit A. VP26 is looking north-west.
Visual receivers	This viewpoint is situated in the location where two residential driveways meet Tantitha Road. This local road is south of Narromine within a rural setting. This viewpoint is representative of local road users and nearby residents.
Description of existing view	VP26 is a view from an elevated location, across a residential driveway to rural grazing land beyond. A row of eucalypts are present to the foreground along the driveway behind the property fence. To the right, a structure can be seen amongst vegetation. To the background, the landscape is gently undulating, largely cleared, with isolated patches of vegetation amongst pasture grass.
Anticipated change to view	Construction: during construction, a portion of the active borrow pit site may be partially visible on the horizon, which could include the presence of extraction machinery, stockpiles, and storage areas. Construction vehicles may also be seen along the horizon during this time. Post-extraction: after extraction of the borrow pit has occurred, a small amount of vegetation may be removed from the view in the location to the right of the row of driveway trees, on the horizon line. However, this would likely occur behind a number of existing trees, therefore may not be noticeable. No changes in landform would likely be visible as this would occur on the far side of the hill. Post-rehabilitation: the <i>Borrow Pit Rehabilitation Strategy</i> (JacobsGHD, 2020c) proposes to revegetate disturbed areas of the borrow pit site and access track with similar vegetation cover and species as the existing conditions. The extraction area is not proposed to be re-filled, however objectives for the final landform are for maximum 1:4 slopes to tie-in to the existing landform. Concept rehabilitation plans have been developed which outline the proposed landform and planting areas.
Sensitivity to change	Moderate as the nearby residents may experience a similar view from home with long viewing durations, or when travelling to and from home. However, viewers would be at a distance from the proposal. Road users experiencing this view would be passing through the area, with short-term viewing durations.
Magnitude of change	Post-extraction and post-rehabilitation , the magnitude of change is considered negligible as the anticipated change would be very minor.
Significance of impact	The significance of impact post-extraction and post-rehabilitation is therefore Negligible .



NARROMINE TO NARRABRI

Viewpoint location (borrow pit B)

Figure 6.4

0 0.4 0.8
Km

Coordinate System: GDA 1994 MGA Zone 55

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Date: 24/06/2020

Paper: A4

Author: JacobsGHD

Scale: 1:30,000

Data Sources: Basemap layers: NSWSS; Study area, project elements: GHDJACOBS

LEGEND

- Alignment
- The proposal site
- Road realignments
- Viewpoints
- Residential dwelling
- Road
- Watercourse
- Borrow pit
- New access road
- Access road on public road

INLAND RAIL **ARTC**

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6.2.6 Viewpoint 27: Tomingley Road (north)



Criteria	Comments
Location / view direction	VP27 is located on Tomingley Road, about 1.5 kilometres from borrow pit B. VP27 is looking south-east.
Visual receivers	Tomingley Road is an arterial road south of Narromine. VP27 is representative of views experienced by road users travelling south.
Description of existing view	VP27 is a view across cultivated rural land. Tomingley Road can be seen to the right, with large road verge extending across the left of the view. Beyond the roadside fence, a cultivated paddock can be seen, behind which dense vegetation forms a consistent backdrop to the view horizon. A cluster of darker green vegetation can be seen to the right along the roadside corridor.
Anticipated change to view	Construction: during construction, an existing private road would be used as a construction access route. Therefore, filtered views may occur to a portion of this road, where the movement of construction vehicles may be seen. Within the view, this would be located to the right of the view behind darker green vegetation close to the road. Post-extraction: the borrow pit site is situated to the centre of the view, behind existing vegetation. Although some vegetation is proposed to be removed, this would occur behind intervening vegetation, therefore would not be seen from this location. It is not anticipated that any change would occur to this view. Post-rehabilitation: the <i>Borrow Pit Rehabilitation Strategy</i> (JacobsGHD, 2020c) proposes to revegetate disturbed areas of the borrow pit site and access track with similar vegetation cover and species as the existing conditions. The extraction area is not proposed to be re-filled, however objectives for the final landform are for maximum 1:4 slopes to tie-in to the existing landform. Concept rehabilitation plans have been developed which outline the proposed landform and planting areas.
Sensitivity to change	Low , as road users experiencing this view are passing through the area, with short-term viewing durations and generally limited interest in surrounding views.
Magnitude of change	Post-extraction and post-rehabilitation , the magnitude of change is considered negligible due to no anticipated change to the view.
Significance of impact	The significance of impact post-extraction and post-rehabilitation is therefore Negligible .

6.2.7 Viewpoint 28: Tomingley Road (central)

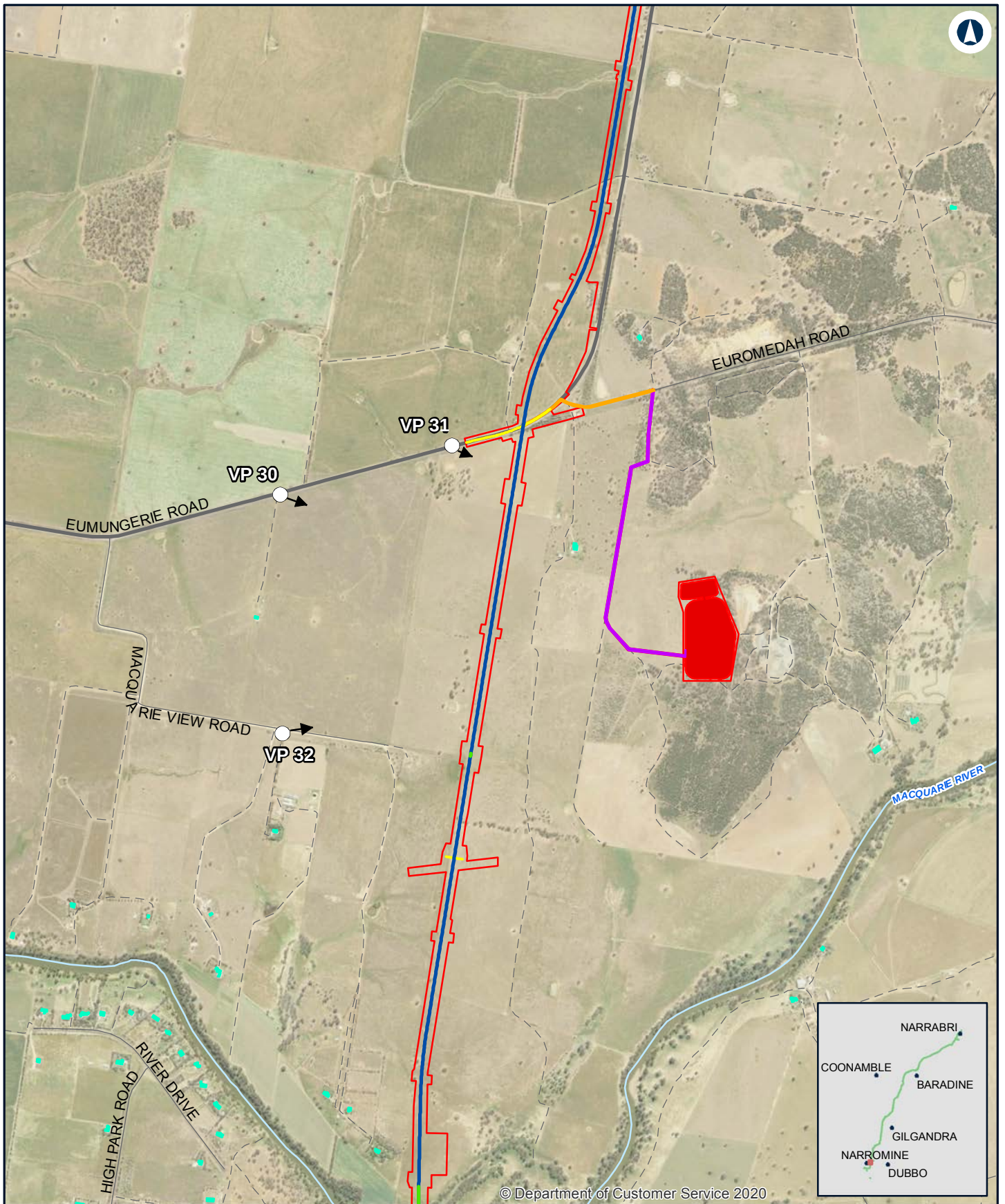


Criteria	Comments
Location / view direction	VP28 is located on Tomingley Road, about 550 metres from borrow pit B. A residence and driveway are located to the west and east of this viewpoint. VP28 is looking north-east.
Visual receivers	Tomingley Road is an arterial road south of Narromine. VP28 is representative of views experienced by road users travelling north, nearby residents, and outdoor farm workers.
Description of existing view	VP28 is a view looking from the edge of the road, through an opening in roadside vegetation to dry rural land beyond. The roadside verge appears in the foreground, with grass and mature native trees along the fence line. A gravel road and gate are present to the centre of the view, providing access to rural land and a residence about three kilometres to the east. Dry rural land is present to the middle ground, beyond which clumps of vegetation are present along the top of a gentle rise. An overhead power line follows the fence line between the paddocks.
Anticipated change to view	Construction: during construction, the vehicular access route to the borrow pit would be situated mostly behind existing trees present on the horizon. However, at the borrow pit site, the presence of extraction machinery, stockpiles, and storage areas would likely be visible, as well as construction vehicles. Post-extraction: the borrow pit site is situated on top of the vegetated rise on the horizon within the view. The borrow pit would extend across about one third of the view. On the horizon across this extent, all existing vegetation would be removed. Some minor changes in topography would also be noticeable associated with the borrow pit post-extraction landform, as the rise would be slightly flatter along the top. Refer to Appendix A for photomontage of the proposed view. Post-rehabilitation: the <i>Borrow Pit Rehabilitation Strategy</i> (JacobsGHD, 2020c) proposes to revegetate disturbed areas of the borrow pit site and access track with similar vegetation cover and species as the existing conditions. The extraction area is not proposed to be re-filled, however objectives for the final landform are for maximum 1:4 slopes to tie-in to the existing landform. Concept rehabilitation plans have been developed which outline the proposed landform and planting areas.
Sensitivity to change	Moderate as the nearby residents may experience a similar view when travelling to and from home. However, viewers would be at a distance from the proposal. Outdoor workers would have intermittent view as their focus would be on their work. Road users experiencing this view would be passing through the area, with a short-term viewing duration.
Magnitude of change	Post-extraction , the magnitude of change is considered Moderate as the tree removal at the borrow pit site is located on the horizon, therefore is visually obvious, changing the character of the view. However, this change has potential to be partly mitigated. Post-rehabilitation , the magnitude of change is considered low as the proposed vegetation would establish to replace the removed trees and would potentially neutralise the changes to the vegetation within the view. The magnitude of change would decrease over time as the vegetation established.
Significance of impact	The significance of impact post-extraction is therefore Moderate . The significance of impact post-rehabilitation is therefore Moderate-Low .

6.2.8 Viewpoint 29: Tomingley Road (south)



Criteria	Comments
Location / view direction	VP29 is located on Tomingley Road, about 2.4 kilometres from borrow pit B. A rural residential driveway is present at this location, with the residence located over two kilometres to the east of Tomingley Road. VP29 is looking north-east.
Visual receivers	Tomingley Road is an arterial road south of Narromine. VP29 is representative of views experienced by road users travelling north, and nearby residents when entering and leaving their property.
Description of existing view	VP29 is a view looking along the road corridor and across the flat rural land beyond. To the foreground, low vegetation is present within the roadside verge, this transitions to dense canopy trees towards the centre of the view. Beyond the road corridor, a few trees are present nearby a farm dam. Dry pasture land is present to the middle ground on either side to the road. Canopy vegetation is present along the horizon line.
Anticipated change to view	Construction: during construction, the construction access route would not be visible from this location. However, the presence of extraction machinery, stockpiles, and storage areas may be visible at the borrow pit site. Post-extraction: the borrow pit site is situated to the centre of the view on the horizon line, to the left of the small clump of trees beyond the roadside corridor. In this location, the canopy trees along the horizon would be removed. It is not likely that any changes to the landform would be noticeable from this location. Post-rehabilitation: the <i>Borrow Pit Rehabilitation Strategy</i> (JacobsGHD, 2020c) proposes to revegetate disturbed areas of the borrow pit site and access track with similar vegetation cover and species as the existing conditions. The extraction area is not proposed to be re-filled, however objectives for the final landform are for maximum 1:4 slopes to tie-in to the existing landform. Concept rehabilitation plans have been developed which outline the proposed landform and planting areas.
Sensitivity to change	Low , as the nearby residents may only experience this view when entering and leaving their properties near the road, at a distance from the proposal. Road users experiencing this view would be passing through the area, with a short-term viewing duration.
Magnitude of change	Post-extraction , the magnitude of change is considered Low as the change would be visible due to its location on the horizon, however only across a small extent of the view, with potential to be mitigated. Post-rehabilitation , the magnitude of change is considered negligible as the revegetation would be effective in neutralising the minor changes associated with the borrow pit.
Significance of impact	The significance of impact post-extraction is therefore Low . The significance of impact post-rehabilitation is therefore Negligible .



NARROMINE TO NARRABRI

Viewpoint location (borrow pit C)

Figure 6.5

0 0.35 0.7
Km

Coordinate System: GDA 1994 MGA Zone 55

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Date: 24/06/2020

Paper: A4

Author: JacobsGHD

Scale: 1:25,000

Data Sources: Basemap layers: NSWSS; Study area, project elements: GHDJACOBS

LEGEND

- Alignment
- The proposal site
- Road realignments
- Bridges
- Residential dwelling
- Road
- Watercourse
- Borrow pit
- New access road
- Access road on public road
- Viewpoints

INLAND RAIL **ARTC**

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6.2.9 Viewpoint 30: Eumungerie Road (west)



Criteria	Comments
Location / view direction	VP30 is located on Eumungerie Road, about two kilometres from borrow pit C. A rural residential driveway is present at this location, with the residence located about 500 metres to the south of Eumungerie Road. VP30 is looking south-east.
Visual receivers	Eumungerie Road an arterial road north of Narromine. VP30 is representative of views experienced by road users travelling north-east, and nearby residents when entering and leaving their property. Eumungerie Road gradually descends through an open landscape, therefore a similar view would be experienced along an extent of the road corridor.
Description of existing view	VP30 is a view from the road to the gently undulating rural land beyond. The foreground largely comprises of dry grasses. To the centre of the view, some native trees are present to the middle ground and along the left side of the road. The landform rises slightly to the right, and a small vegetated hill can be seen on the horizon. Built form associated with a residence can just be seen to the left of the hill, amongst trees.
Anticipated change to view	Construction: during construction, a portion of the construction access route to the borrow pit would be seen close to the borrow pit itself, on the far side of the residence. The presence of extraction machinery, stockpiles, and storage areas may be visible at the borrow pit site. Associated with the rail line, a construction compound is proposed to the left of the roadway in the distance. Construction activities may be seen along the rail corridor. Eumungerie Road is also a designated construction route for the proposal. Post-extraction: the borrow pit site is situated on the small vegetated hill to the right. The borrow pit would extend from the residence to about two thirds across the hill. Vegetation would be removed from the upper portion of the hill, and potentially from part of the horizon. Changes to the landform would not likely be noticeable from this location. In addition to the borrow pit, the rail line would traverse across the view, between the residence and the middle ground vegetation. This is not likely to be noticeable within this view, however, double stacked freight trains would be seen moving across the view at various times. Post-rehabilitation: the <i>Borrow Pit Rehabilitation Strategy</i> (JacobsGHD, 2020c) proposes to revegetate disturbed areas of the borrow pit site and access track with similar vegetation cover and species as the existing conditions. The extraction area is not proposed to be re-filled, however objectives for the final landform are for maximum 1:4 slopes to tie-in to the existing landform. Concept rehabilitation plans have been developed which outline the proposed landform and planting areas.
Sensitivity to change	Moderate as the nearby residents would experience this view when travelling to and from home, and a similar view from near the home due to the limited amount of vegetation. However, viewers would be at a distance from the proposal. Road users experiencing this view would be passing through the area, with a short-term viewing duration.
Magnitude of change	Post-extraction , the magnitude of change is considered Low due to the minor loss of vegetation to the distant hill, across a small extent of the view. This change has potential to be mitigated. Post-rehabilitation , the magnitude of change is considered Negligible as the revegetation would be effective in neutralising the minor changes associated with the borrow pit.
Significance of impact	The significance of impact post-extraction is therefore Moderate-Low . The significance of impact post-rehabilitation is therefore Negligible .

6.2.10 Viewpoint 31: Eumungerie Road (east)

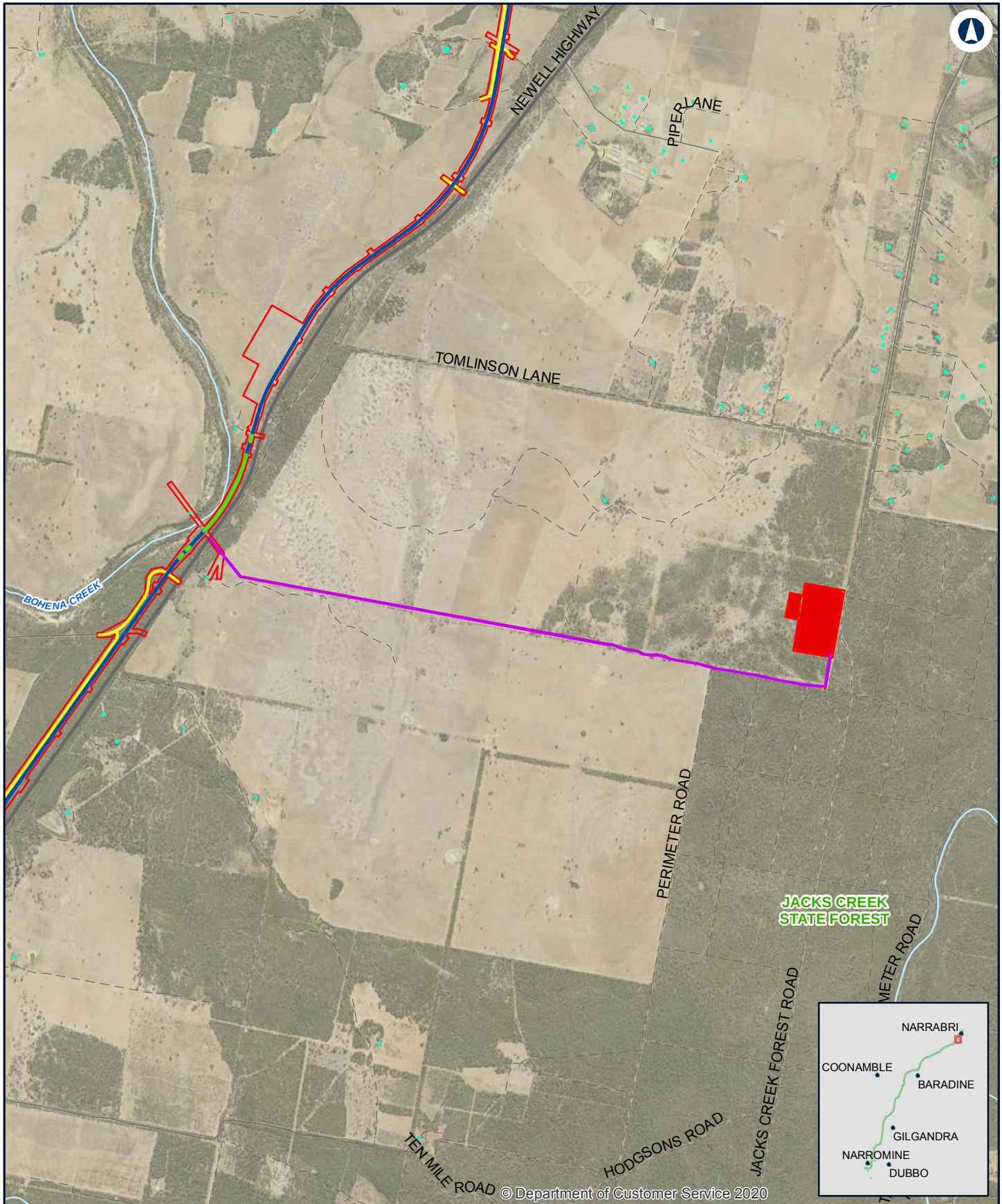


Criteria	Comments
Location / view direction	VP31 is located on Eumungerie Road, about 1.3 kilometres from borrow pit C. VP31 is looking south-east.
Visual receivers	Eumungerie Road an arterial road north of Narromine. VP31 is representative of views experienced by road users travelling north-east.
Description of existing view	VP31 is a view from the road corridor to rural land beyond. The road pavement and grassy verge appear to the foreground. A clump of native trees can be seen in the adjacent bare paddock to the right. Dense vegetation is present to the middle ground on the horizon beyond the clearing, to the flatter area to the left and the small hill to the centre of the view. A residence and shed can be seen amongst tree in front of the hill.
Anticipated change to view	Construction: during construction, vehicles using the access road to the borrow pit would be seen moving across the view between Eumungerie Road to the borrow pit, behind the residence. At the borrow pit site, the presence of extraction machinery, stockpiles and storage areas may be visible. In addition, construction activities associated with the rail line would be visible along the rail corridor. Eumungerie Road is also a designated construction route for the proposal. Post-extraction: the borrow pit site is situated on the small vegetated hill to the centre of the view, behind the residence. The site would extend across the majority of the hill within the view. Vegetation would be removed from the front face of the hill, with trees remaining on the horizon line. Any changes proposed to the landform would not be obvious from this location. Refer to Appendix A for photomontage of the proposed view of the borrow pit. In addition to the borrow pit, the proposed rail line would be seen across the view within the clearing. This would be slightly elevated above the existing ground, on fill. Double stacked freight trains would appear on the rail line at various times. Post-rehabilitation: the <i>Borrow Pit Rehabilitation Strategy</i> (JacobsGHD, 2020c) proposes to revegetate disturbed areas of the borrow pit site and access track with similar vegetation cover and species as the existing conditions. The extraction area is not proposed to be re-filled, however objectives for the final landform are for maximum 1:4 slopes to tie-in to the existing landform. Concept rehabilitation plans have been developed which outline the proposed landform and planting areas.
Sensitivity to change	Low , as road users experiencing this view would be passing through the area, with a short-term viewing duration.
Magnitude of change	Post-extraction , the magnitude of change is considered Low as the anticipated changes relating to the borrow pit would be minor and across a small extent of the view, with potential to be mitigated. Post-rehabilitation , the magnitude of change is considered Negligible as the revegetation would be effective in neutralising the minor changes associated with the borrow pit.
Significance of impact	The significance of impact post-extraction is therefore Low . The significance of impact post-rehabilitation is therefore Negligible .

6.2.11 Viewpoint 32: Macquarie View Road



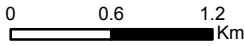
Criteria	Comments
Location / view direction	VP32 is located on Macquarie View Road, about 1.95 kilometres from borrow pit C. VP32 is situated at the driveway access to the private property, and looking north-east.
Visual receivers	Macquarie View Road is a local road on rural land to the north-east of Narromine. VP32 is representative of road users and nearby residents in this location.
Description of existing view	VP32 is a relatively open view along the road corridor and across the gently undulating rural landscape. Macquarie View Road is present to the centre of the view, with dry grassy paddocks to either side. A small vegetated hill can be seen to the centre of the view. Only a small amount of foreground vegetation is present along the road corridor.
Anticipated change to view	Construction: during construction, vehicles using the access road to the borrow pits are not likely to be seen from this location. At the borrow pit site, the presence of extraction machinery, stockpiles and storage areas may be visible. In addition, construction activities associated with the rail line would be visible along the rail corridor. Post-extraction: the borrow pit site is situated on the vegetated hill to the centre of the view, extending across the left half of the hill. Some vegetation would be removed from the upper hill face in this location, as well as potentially a portion on the horizon line. Any changes proposed to the landform would not be obvious from this location. In addition, the rail line would extent across this view, slightly elevated on fill, beyond the extent of Macquarie View Road. The rail line may be just discernible from this location. Double stacked freight train would be seen traversing across the view at various times. Post-rehabilitation: the <i>Borrow Pit Rehabilitation Strategy</i> (JacobsGHD, 2020c) proposes to revegetate disturbed areas of the borrow pit site and access track with similar vegetation cover and species as the existing conditions. The extraction area is not proposed to be re-filled, however objectives for the final landform are for maximum 1:4 slopes to tie-in to the existing landform. Concept rehabilitation plans have been developed which outline the proposed landform and planting areas.
Sensitivity to change	Moderate as nearby residents would experience this view when travelling to and from home, and a similar view from home due to the limited amount of vegetation present. However, viewers would be at a distance from the proposal. Road users experiencing this view would be passing through the area, with a short-term viewing duration.
Magnitude of change	Post-extraction , the magnitude of change is considered Low due to the relatively minor anticipated changes across a relatively small extent of the view, with potential to be mitigated. Post-rehabilitation , the magnitude of change is considered Negligible as the revegetation would be effective in neutralising the minor changes associated with the borrow pit.
Significance of impact	The significance of impact post-extraction is therefore Moderate-Low . The significance of impact post-rehabilitation is therefore Negligible .



NARROMINE TO NARRABRI

Landscape context plan (borrow pit D)

Figure 6.6



Coordinate System: GDA 1994 MGA Zone 55

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Date: 24/06/2020 Paper: A4
 Author: JacobsGHD Scale: 1:45,000
 Data Sources: Basemap layers: NSWSS; Study area, project elements: GHDJACOBS

LEGEND

- Alignment
- The proposal site
- Road realignments
- Bridges
- Residential dwelling
- Road
- Existing railway
- Watercourse
- Borrow pit
- New access road



The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

6.2.12 Borrow pit D

Borrow pit D has been assessed at a desktop level only due to site inspection constraints.



Figure 6.7 Images of borrow pit D

Criteria	Comments
Anticipated change	Construction: the borrow pit access track is proposed to connect the borrow pit with the Newell Highway, through vegetated and cleared rural land to the west. During construction, vehicles will use this track to and from the borrow pit. Post-extraction: the borrow pit is proposed on the western side of a gentle rise within an area of a rural property already largely cleared of vegetation. Changes would occur to the existing landform as a result of the extraction of fill material. Post-rehabilitation: the <i>Borrow Pit Rehabilitation Strategy</i> (JacobsGHD, 2020c) proposes to revegetate disturbed areas of the borrow pit site and access track with similar vegetation cover and species as the existing conditions. The extraction area is not proposed to be re-filled, however objectives for the final landform are for a maximum 1:4 slopes to tie-in to the existing landform. Concept rehabilitation plans have been developed which outline the proposed landform and planting areas.
Visual receivers	Views of the borrow pit from nearby residences to the north-west and south-west are not likely to be achieved due to the presence of relatively dense intervening vegetation retained beyond the recent clearing at the borrow pit site. Three to four residences however may experience views of the borrow pit access track in use during construction. There is not likely to be visibility of the borrow pit site from the Newell Highway to the west, due to the dense stands of roadside vegetation along the highway. However, if views were possible, the distance between the site and the highway would result in a visual change that is barely discernible.
Sensitivity to change	Negligible as there are not likely to be any visual receivers post-extraction.
Magnitude of change	Post-extraction and post-rehabilitation, the magnitude of change is considered to be Negligible as there is not likely to be any change to views.
Significance of impact	The post-extraction and post-rehabilitation significance of impact is expected to be Negligible.

6.3 Overview of construction impacts

The following section provides an overview of construction impacts throughout the study area.

6.3.1 General corridor wide

The corridor wide construction impacts would include views to the establishment of compounds, storage areas, delivery and storage of construction materials, installation of temporary site fencing, vegetation clearing and removal, bulk earthworks, construction of the rail infrastructure and road infrastructure where realignment is required, and relocation of utilities. Sensitive receivers would include surrounding residences, adjacent road users, users of the state forests and other publically accessible open spaces.

6.3.2 Narromine

The construction impacts around Narromine would include increased traffic and machinery associated with the construction works on existing roads in and around the town. The construction of the Macquarie River bridge would possibly be visible from users of Mitchell Highway, users of the Macquarie River and potentially nearby residences.

A multi-function compound would be located at Narromine South where the proposal would connect with the Parkes to Narromine section of Inland Rail. There are currently two locations for temporary workforce accommodation, with the Narromine South multi-function compound being one and another location to the north-east of Narromine. The multi-function compound would be potentially visible from surrounding residences, users of the Mitchell Highway, and Webbs Siding Road. The compound would also result in increased traffic associated with the temporary workforce on surrounding roads.

Borrow pits A and B would be required to provide fill for the proposal south of the Macquarie River. Borrow pit C would be required to provide fill for the proposal north of the Macquarie River. Refer to section 6.2 viewpoints 24 to 32 for visual assessments for these borrow pit sites.

6.3.3 Curban/Gilgandra

A multi-function compound would be located at Curban where the proposal would connect with the Dubbo to Coonamble Line. This compound would be potentially visible from surrounding farming residences, users of Curban Park, and users of Castlereagh Highway and National Park Road.

During the construction period, temporary workforce accommodation would be required. This would be located on the north-western edge of Gilgandra on Federation Street and would be potentially visible from adjacent residences, users of Gilgandra Park, users of Federation Street, Marshall Street, Hercules Place, Stockings Crescent, Barden Street, Bencubbin Street, and Eureka Street. The temporary workforce accommodation would also result in increased traffic associated with the temporary workforce on surrounding roads.

6.3.4 Baradine

During the construction period, temporary workforce accommodation would be required. This would be located on the western edge of Baradine on Lachlan Street and would be potentially visible from adjacent residences, users of Baradine Park, users of O'Neills Lane, Lachlan Street, and Jesse Williams Road. The temporary workforce accommodation would also result in increased traffic associated with the temporary workforce on surrounding roads.

6.3.5 Pilliga Forests

The construction of the rail corridor and road realignment through the Pilliga East State Forest, Euligal State Forest, and Cumbil State Forest would require the clearing of vegetation and multiple construction compounds. Sensitive receivers would include users of the state forests, including drivers along Old Mill Road, Schatz Road, Pilliga Forest Way, Sparrow Road, Twenty Foot Road, Country Line Road, Cumbil Road, and Mistletoe Road.

6.3.6 Narrabri

The construction impacts around Narrabri would include increased traffic and machinery associated with the construction works on existing roads in and around the town. The Narrabri West multi-function compound would be located where the proposal connects with the Narrabri to Walgett Line. The compound would include temporary workforce accommodation and would be potentially visible from surrounding residences, Culgoora Road and Yarrie Lake Road. The construction of the Narrabri Creek / Namoi River bridge would be visible from adjacent residences and residences on the edge of the town.

Borrow pit D would be required to provide the fill to the northern parts of Pilliga East State Forest. Refer to section 6.2.12 for potential visual impacts.

6.4 Overview of operational impacts

Corridor wide operational impacts would result from the permanent loss of vegetation, the introduction of a new rail corridor and associated infrastructure, which would typically be new visual features within a rural landscape setting. Areas of greatest visual impact would be adjacent to proposed elevated bridges where the built form would be elevated above the viewer in a landscape where road and rail, where present, typically sits along the ground plain. Viewers in these locations would include road users, nearby residents and workers, for example viewers nearby viewpoint locations VP05, VP19 and VP22. Within densely vegetated areas of the Pilliga Forests, road users would experience visual impacts associated with the proposed vegetation removal, which may appear greater in magnitude to other locations due to the character and density of the existing vegetation. Rural residences within proximity of the proposal may experience visual impacts from their home or surrounds, however, the focus of this assessment is from publicly accessible locations only. Any visual impacts from these locations would likely be associated with vegetation removal, and/or new rail infrastructure within an otherwise rural landscape setting.

6.5 Summary of visual impacts

The following Table 6.3 provides a summary of visual impacts for the proposal during both construction and operation.

Table 6.3 Summary of visual impacts – rail and road infrastructure

Viewpoint	Location	Sensitivity to change	Magnitude of change	Significance of impact
VP01	Narwonah Road, Narromine	Moderate	Construction: Moderate Operation: Low	Construction: Moderate Operation: Moderate-Low
VP02	Tomingley Road, Narromine	Low	Construction and operation: Moderate	Construction and operation: Moderate-Low
VP03	Villeneuve Drive, Narromine	Moderate	Construction and operation: Negligible	Construction and operation: Negligible
VP04	Old Backwater Road, Narromine	Moderate	Construction: Moderate Operation: Low	Construction: Moderate Operation: Moderate-Low
VP05	Mitchell Highway, Narromine	Low	Construction and operation: Moderate	Construction and operation: Moderate-Low
VP06	Eumungerie Road, Narromine	Low	Construction and operation: Moderate	Construction and operation: Moderate-Low
VP07	Eumungerie Road / Dubbo-Burroway Road	Low	Construction and operation: Moderate	Construction and operation: Moderate-Low
VP08	Oxley Highway / Marthaguy Creek	Low	Construction and operation: Moderate	Construction and operation: Moderate-Low
VP09	National Park Road, Curban	Moderate	Construction: Moderate Operation: Low	Construction: Moderate Operation: Moderate-Low
VP10	National Park Road / Castlereagh River, Curban	Low	Construction and operation: Negligible	Construction and operation: Negligible
VP11	Gumin Gumin Road, Mount Tenandra	Low	Construction and operation: Moderate	Construction and operation: Moderate-Low
VP12	Munns Road, Baradine	Low	Construction: Low Operation: Negligible	Construction: Low Operation: Negligible
VP13	Baradine Road, Baradine	Low	Construction and operation: Moderate	Construction and operation: Moderate-Low

Viewpoint	Location	Sensitivity to change	Magnitude of change	Significance of impact
VP14	Gwabegar Road, Baradine	Low	Construction and operation: High	Construction and operation: Moderate
VP15	Pilliga Forest Way / Country Line Road	Low	Construction: Moderate Operation: Low	Construction: Moderate-Low Operation: Low
VP16	Salt Caves Lookout, Timmallallie National Park	High	Construction and operation: Negligible	Construction and operation: Negligible
VP17	Pilliga Forest Way / Twenty Foot Road	Low	Construction and operation: Moderate	Construction and operation: Moderate-Low
VP18	Newell Highway, Narrabri	Low	Construction and operation: Moderate	Construction and operation: Moderate-Low
VP19	Yarrie Lake Road, Narrabri	Moderate	Construction: moderate Operation: Low	Construction: Moderate Operation: Moderate-Low
VP20	Genanagie Street, Narrabri	Moderate	Construction and operation: Negligible	Construction and operation: Negligible
VP21	The Island Road, Narrabri	Moderate	Construction and operation: Low	Construction and operation: Moderate-Low
VP22	Kamilaroi Highway, Narrabri	Moderate	Construction and operation: Moderate	Construction and operation: Moderate
VP23	Lookout, Narrabri	Moderate	Construction and operation: Negligible	Construction and operation: Negligible

The following Table 6.4 provides a summary of visual impacts of borrow pits post-extraction.

Table 6.4 Summary of visual impacts – borrow pits and access tracks

Viewpoint	Location	Sensitivity to change	Magnitude of change	Significance of impact
VP24	Tantitha Road (north)	Moderate	Low	Moderate-Low
VP25	Tantitha Road (central)	Low	Low	Low
VP26	Tantitha Road (south)	Moderate	Negligible	Negligible
VP27	Tomingley Road (north)	Low	Negligible	Negligible
VP28	Tomingley Road (central)	Moderate	Moderate	Moderate
VP29	Tomingley Road (south)	Low	Low	Low
VP30	Eumungerie Road (west)	Moderate	Low	Moderate-Low
VP31	Eumungerie Road (east)	Low	Low	Low

Viewpoint	Location	Sensitivity to change	Magnitude of change	Significance of impact
VP32	Macquarie View Road	Moderate	Low	Moderate-Low
N/A	Borrow pit D (general)	Negligible	Negligible	Negligible

The following Table 6.5 provides a summary of visual impacts of borrow pits post-rehabilitation.

Table 6.5 Summary of visual impacts – borrow pits and access tracks

Viewpoint	Location	Sensitivity to change	Magnitude of change	Significance of impact
VP24	Tantitha Road (north)	Moderate	Negligible	Negligible
VP25	Tantitha Road (central)	Low	Negligible	Negligible
VP26	Tantitha Road (south)	Moderate	Negligible	Negligible
VP27	Tomingley Road (north)	Low	Negligible	Negligible
VP28	Tomingley Road (central)	Moderate	Low	Moderate-Low
VP29	Tomingley Road (south)	Low	Negligible	Negligible
VP30	Eumungerie Road (west)	Moderate	Negligible	Negligible
VP31	Eumungerie Road (east)	Low	Negligible	Negligible
VP32	Macquarie View Road	Moderate	Negligible	Negligible
N/A	Borrow pit D (general)	Negligible	Negligible	Negligible

7. Potential visual impacts from lighting

The following sections describe the potential lighting impact of the proposal with respect to the relevant guidelines under consideration, during construction and operation.

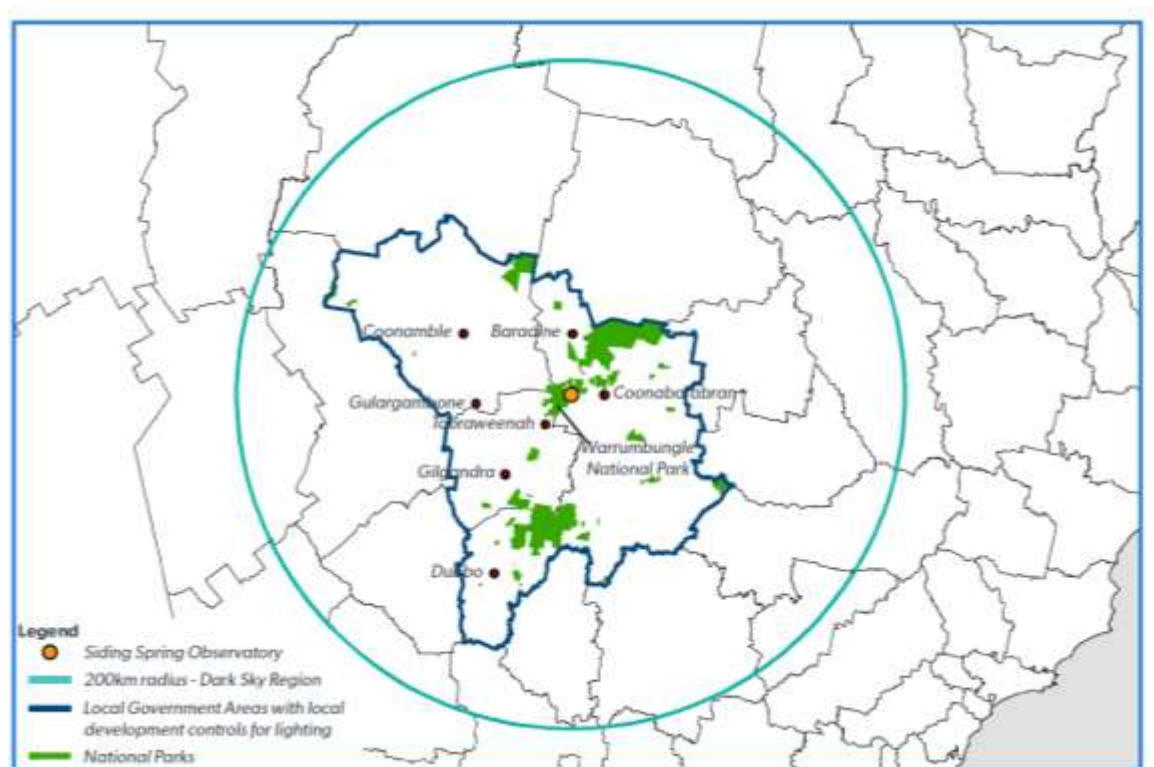
7.1 Relevant guidelines

The relevant guideline for lighting impacts of the proposal is the *Dark Sky Planning Guideline: Protecting the observing conditions at Siding Spring* (Dark Sky Planning Guideline) (Department of Planning and Environment, 2016). These guidelines were developed to protect the night time observing conditions of Australia's most important visible-light observatory at Siding Spring, NSW.

Within the guidelines, circumstances under which the guidelines apply include the following:

- Under State Environmental Planning Policy (Infrastructure) 2007 consultation with the Observatory Director is required for specified development that will contribute to artificial skyglow, on land within 200 kilometres of the Siding Spring Observatory. This aims to ensure that activities also apply best practice lighting.

The area that is applicable to the guidelines is shown in Figure 7.1. The proposal lies about 30 kilometres west of Siding Spring Observatory (about halfway between Coonamble and Coonabarabran). For this reason, it is well within the designated area for consideration of night time lighting impacts to the observatory.



Source: Department of Planning and Environment, 2016.

Figure 7.1 The application of local controls for lighting in the Dark Sky Region

The management of light is important because the telescopes at Siding Spring Observatory require clear dark nights to operate effectively. Advice needs to be obtained from the Observatory Director where a development has the potential to impact the observing conditions at Siding Spring for large projects such as SSI, critical infrastructure or designated development within the Dark Sky Region.

7.2 Principles of lighting impact minimisation

The following sections describe some basic principles for the minimisation of night time lighting impacts to the Dark Sky Region as summarised from the Dark Sky Planning Guideline.

7.2.1 Mitigating effect of distance

The distance between the light source and the telescopes at the Observatory is the most critical factor in determining the level of artificial skyglow. There are three different lighting areas within the Dark Sky Region with differing permissible lighting schemes for dwellings. This gives an idea of the level of control over lighting which may be required.

- A. 0 -12 kilometres from the Observatory – where a maximum of four shielded outside lights of no more than 900 lumens each is appropriate;
- B. 12 -18 kilometres from the Observatory – where a maximum of four shielded outside lights of no more than 1800 lumens each is appropriate; and
- C. Greater than 18 kilometres from the Observatory – where a variety of light controls apply, relevant to the type of development and the potential impact on the Observatory.

As the location of the proposal is about 30 kilometres from the Siding Spring Observatory, it is recommended that advice be sought from the Observatory Director for specific lighting controls.

7.2.2 Colour temperature

The major difference between the types of bulbs is the distribution in light wavelength. This accounts for the different colour of light from each type, whether it is a warm orange or cooler blue or white light. Lighting fixtures can also either have a narrow or broad spectrum. Generally, lights with a narrow spectrum can be filtered by telescopes without blocking out all other light, so are therefore preferred over broad spectrum varieties. Figure 7.2 shows a list of bulb types in order of preference.

Bulb type	Colour temperature	Colour appearance	Best lighting
Full spectrum fluorescent	5000K	Cool	Least preferred ↓ Most preferred
Cool white fluorescent	4100K	Intermediate	
Metal halide	4000K	Intermediate	
Soft white fluorescent	3500K	Intermediate	
Warm white fluorescent, tungsten halogen	3000K	Warm	
Standard incandescent	2700K	Warm	
High pressure sodium	2200K	Warm orange/peach	

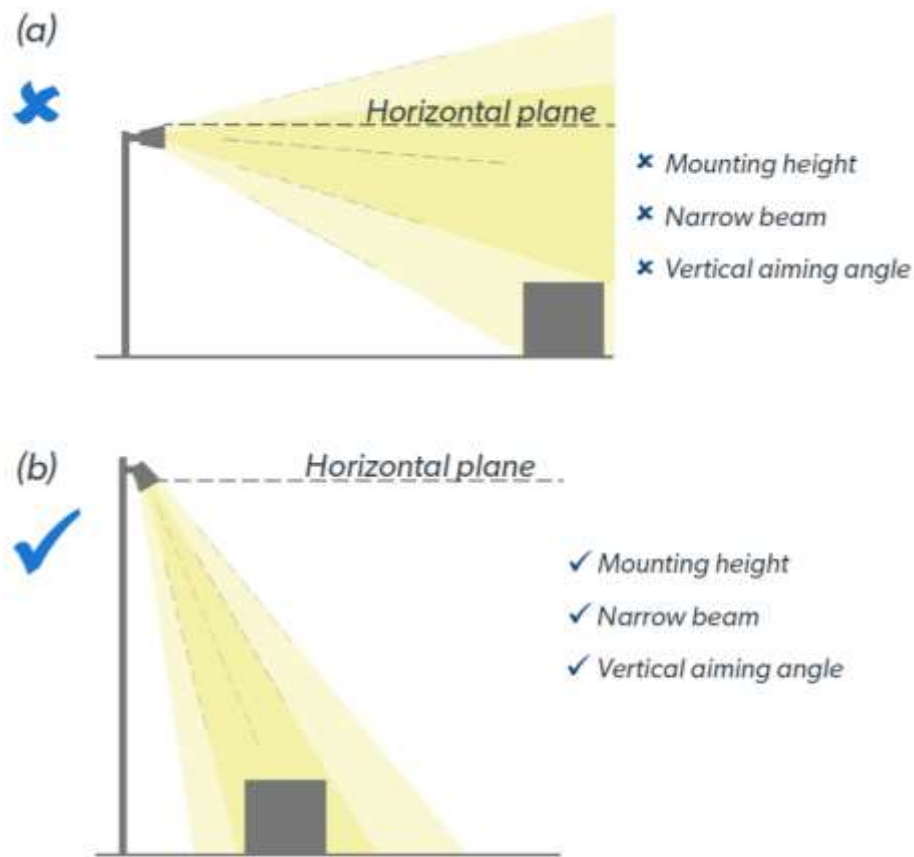
Note: With LEDs, any colour temperature can be produced, but warm colours are preferred.

Source: Department of Planning and Environment, 2016.

Figure 7.2 Common bulb types and associated colour temperature

7.2.3 Direction of light

When light shines below the horizontal plane of the fitting there is a dramatic reduction in the level of light pollution as compared with light shining above the horizontal plane. The design of light fixtures can significantly reduce lighting impacts to the observatory by taking this into consideration. Figure 7.3 illustrates this effect.

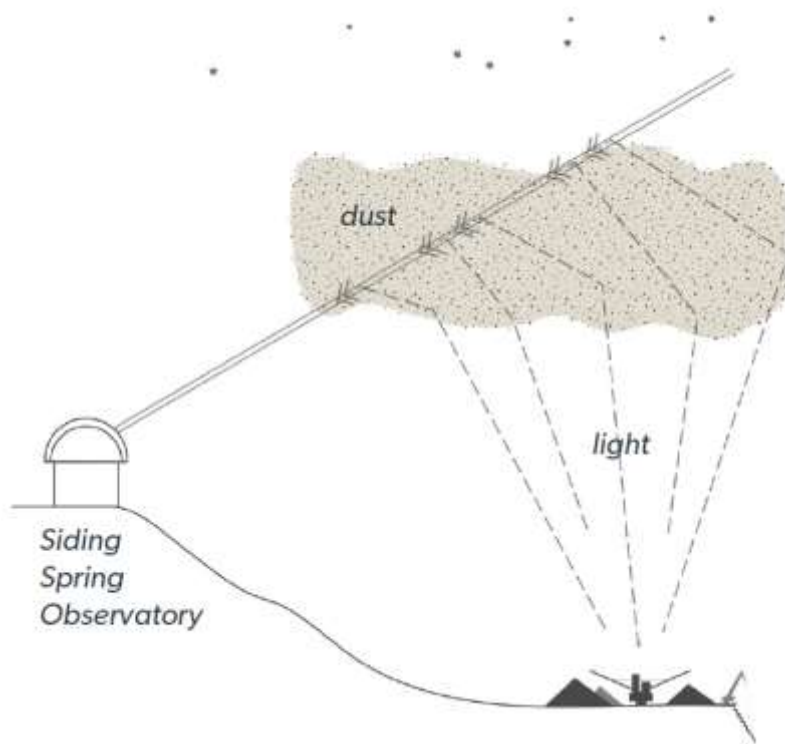


Source: Department of Planning and Environment, 2016.

Figure 7.3 Application of mounting height and vertical aiming to control light spill

7.2.4 Dust minimisation

Dust in the atmosphere has the effect of scattering light, such that it contributes to sky glow, or the background illumination of the night sky from artificial sources of light. The minimisation of dust would assist in reduction of lighting impacts to the Dark Sky Region. Figure 7.4 illustrates this effect.



Source: Department of Planning and Environment, 2016.

Figure 7.4 Scattering of artificial light by dust in the atmosphere

7.2.5 Lighting principles

Good lighting design demonstrates adoption of the following principles:

1. Eliminate upward spill light
2. Direct light downwards, not upwards
3. Use shielded fittings
4. Avoid 'over' lighting
5. Switch lights off when not required
6. Use energy efficient bulbs
7. Use asymmetric beams, where floodlights are used
8. Ensure lights are not directed towards reflective surfaces
9. Use warm white colours.

Further information can be found in the Dark Sky Planning Guideline.

7.3 Construction

Construction of the proposal would typically be undertaken during daylight hours except where there is a specific need to undertake discrete night works.

The construction of the proposal involves the installation of temporary workforce accommodation for the construction workforce at the following locations:

- within the Narromine South multi-function compound
- Narromine North
- Gilgandra
- Baradine
- within the Narrabri West multi-function compound.

Other construction infrastructure would include a number of smaller compounds of various sizes located along the proposal site, concrete batching plants, laydown areas, welding yards, a concrete pre-cast facility, and installation of water bores for water supply points.

Discrete night works, compounds and temporary workforce accommodation sites would be the main source of light as they will require night lighting for the safety and security of the workforce. Such lighting should be managed in general accordance with the requirements in Australian Standard AS 4282-1997 *Control of the Obtrusive Effects of Outdoor Lighting* and the good lighting design principles documented in Dark Sky Planning Guideline to minimise lighting impacts.

Construction activity along the proposal site, including borrow pits, may potentially give rise to the generation of dust. The generation of dust may give rise to lighting impacts due to the increased potential for light to be reflected by particles in the atmosphere and contribute to skyglow. The generation of dust should be managed so as it does not contribute to skyglow.

Overall, light pollution during construction activities is not expected to be significant as night-time work would be minimal. Lighting at compounds and temporary workforce accommodation sites would be managed in accordance with relevant guidelines. For these reasons, there is limited potential to impact the Dark Sky Region centred upon the Siding Spring Observatory

Consultation with the Siding Spring Observatory is recommended during detailed design to identify any additional measures which may be required.

7.4 Operation

During operation of the proposal, it is expected that the contributors to lighting impacts would be the trains and warning lights associated with active level crossings.

As the trains are freight trains, the only source of night time lighting is likely to be a single light source or closely grouped lights at the front of the train pointing forward. This is not expected to result in a significant impact to the Dark Sky Region given the relatively limited output and temporary nature of the lights. The distance from the rail line to the Siding Spring Observatory is also expected to mitigate any lighting impacts to a substantial degree. The proposed frequency of trains during night time conditions is yet to be determined.

Warning lights at active level crossings would generate minimal light and is not expected to result in a significant impact to the Dark Sky Region.

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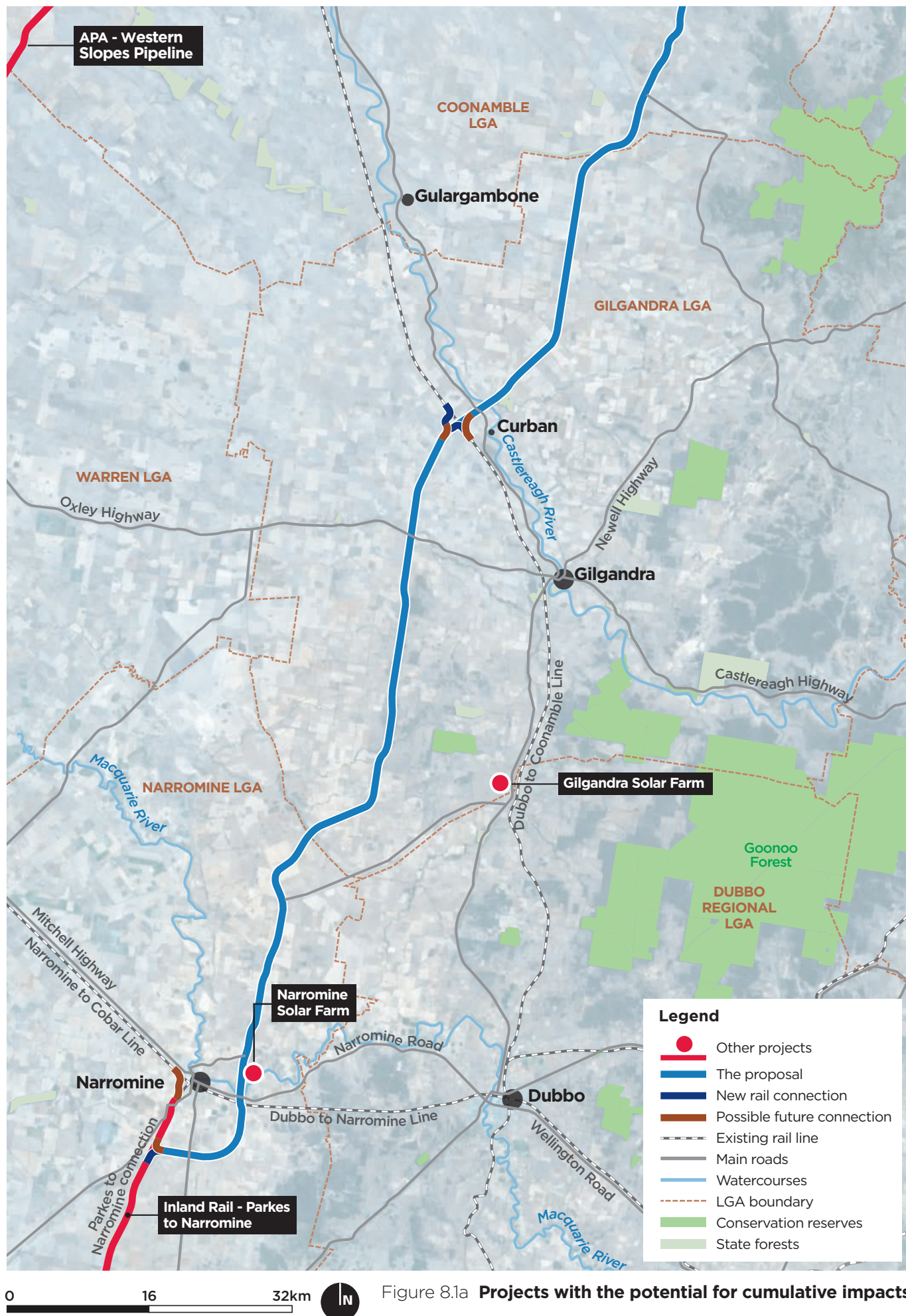
8. Cumulative impact assessment

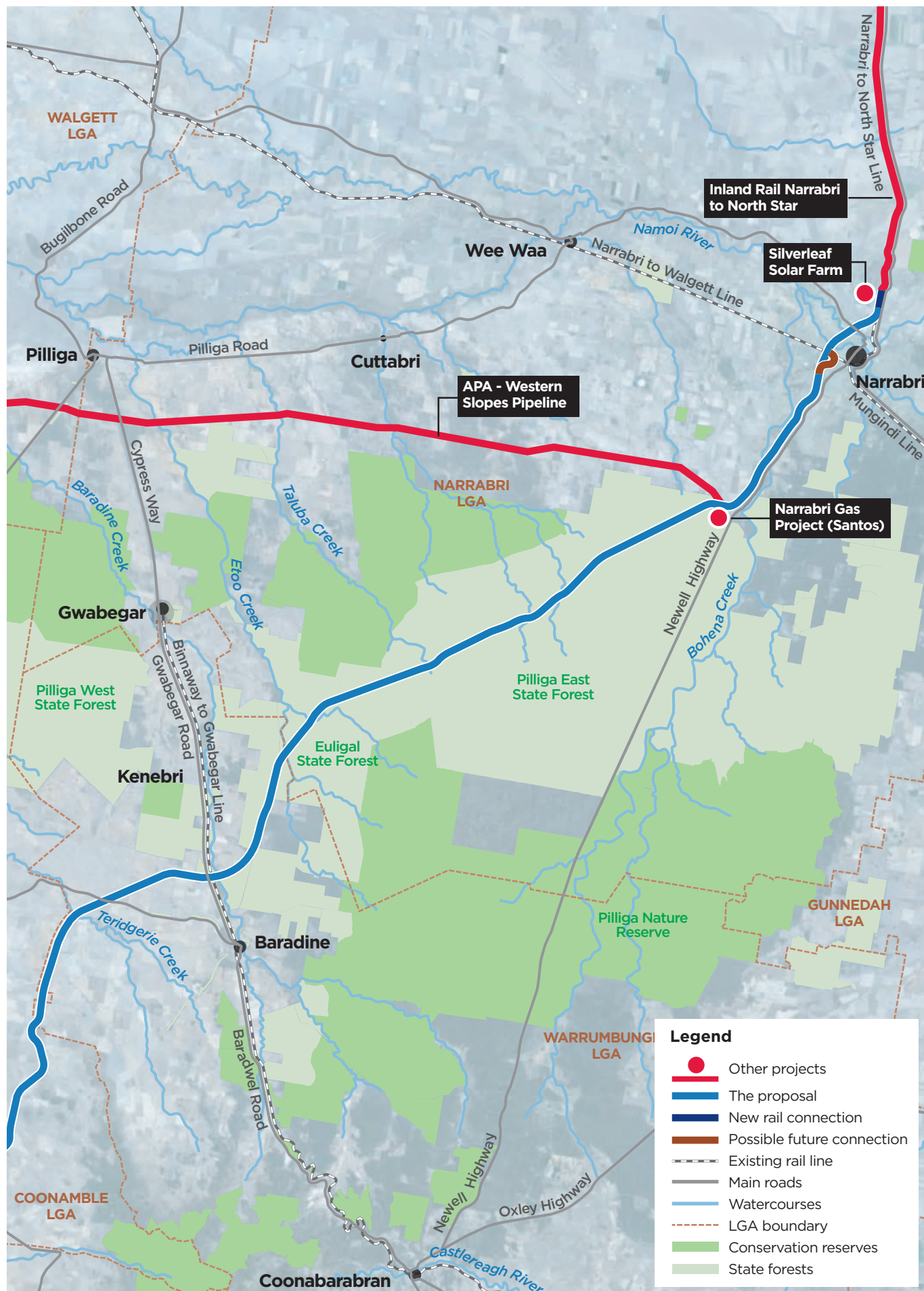
8.1 Overview

For an EIS, cumulative impacts can be defined as the successive, incremental, and combined effect of multiple impacts, which may in themselves be minor, but could become significant when considered together. The methodology and projects considered for the cumulative impact assessment are provided in detail in the EIS (Part D chapter D1). The study area for the cumulative visual assessment included projects potentially within the same view or landscape. Seven major projects were identified as having a cumulative impact and sufficient information to undertake a cumulative impact assessment. These include:

- APA - Western Slopes Pipeline
- Inland Rail – Narrabri to North Star
- Inland Rail – Parkes to Narromine
- Narrabri Gas Project
- Silverleaf Solar Farm, Narrabri
- Gilgandra Solar Farm
- Narromine Solar Farm.

The location of these projects in relation to the proposal are shown on Figure 8.1.





0 16 32km



Figure 8.1b Projects with the potential for cumulative impacts

8.2 Assessment of projects

The following section assesses the cumulative landscape and visual impacts of the proposal against each development project identified. Refer to Table 8.1 to Table 8.7.

Table 8.1 APA Western Slopes Pipeline

Criteria	Comments	Rating
Similarity to the proposal in scale and form	The western slopes pipeline is similar in scale but it is primarily a buried pipeline that would mostly be concealed from view.	Moderate
Likelihood of project being implemented within a similar timeframe	As the proposal would be implemented between 2021 and 2025 (if approved soon) and the western slopes pipeline would be constructed from mid-2022, it is highly likely that both projects would have concurrent or overlapping construction programs.	High
Cumulative effects on landscape character	Changes associated with the western slopes pipeline would occur within LCZ 1. Changes from both developments would be similar in type, and combined, are not likely to have a considerable effect on the landscape character, condition or value.	Low
Likelihood of combined visibility	The western slopes pipeline would cross the proposal site about 20 km south of Narrabri. However accessibility by the general public to view both projects would be limited at the crossing point.	Low
Likelihood of sequential visibility	Sequential visibility is not possible given the configuration of major roads such as Newell Highway, Castlereagh Highway and Kamilaroi Highway.	Negligible
Overall rating	The overall rating is low due to the differences in appearance of both projects, low likelihood of the visibility of both projects, either combined or sequentially, and low level combined changes to the landscape character.	Low

Table 8.2 Inland Rail – Narrabri to North Star

Criteria	Comments	Rating
Similarity to the proposal in scale and form	The project is very similar in scale and form.	High
Likelihood of project being implemented within a similar timeframe	As the proposal would be implemented between 2021 and 2025 (if approved soon) and the Narrabri to North Star project would be constructed from late- 2020 to 2024, it is highly likely that both projects would have concurrent or overlapping construction programs.	High
Cumulative effects on landscape character	Changes associated with the Narrabri to North Star project would occur within LCZ 1 associated with an existing rail corridor. Changes from both developments would be similar in type, and combined, are not likely to have a considerable effect on the landscape character, condition or value.	Low

Criteria	Comments	Rating
Likelihood of combined visibility	Both developments would be clearly visible together in views from one direction and would be possibly be interpreted as part of the same development.	High
Likelihood of sequential visibility	There would be only one location, where both projects connect, where there would be a sequential view of both projects. The occurrence of sequential views is therefore rare considering the geographic extent of both projects.	Low
Overall rating	The overall rating is high-moderate due to the high rating of 3 out of 5 criteria.	High-Moderate

Table 8.3 Inland Rail - Parkes to Narramine

Criteria	Comments	Rating
Similarity to the proposal in scale and form	The project is very similar in scale and form.	High
Likelihood of project being implemented within a similar timeframe	As the proposal would be implemented between 2021 and 2025 (if approved soon) and the Parkes to Narramine project has begun construction, with a completion scheduled for June 2020, it is not likely that both projects would have concurrent or overlapping construction programs.	Low
Cumulative effects on landscape character	Changes associated with the Parkes to Narramine project would occur within LCZ 1 associated with an existing rail corridor. Changes from both developments would be similar in type, and combined, are not likely to have a considerable effect on the landscape character, condition or value.	Low
Likelihood of combined visibility	Both developments would be clearly visible together in views from one direction and would be possibly be interpreted as part of the same development.	High
Likelihood of sequential visibility	There would be only one location, where both projects connect, where there would be a sequential view of both projects. The occurrence of sequential views is therefore rare considering the geographic extent of both projects.	Low
Overall rating	Given the even split between high and low ratings, the overall rating is Moderate.	Moderate

Table 8.4 Narrabri Gas Project (Santos)

Criteria	Comments	Rating
Similarity to the proposal in scale and form	The Narrabri Gas project is different in scale and form to the proposal and is not likely to draw a connection between the two developments.	Low
Likelihood of project being implemented within a similar timeframe	As the proposal would be implemented between 2021 and 2025 (if approved soon) and the Narrabri Gas Project is likely to be implemented between mid-2020 to 2021, it is likely that both projects would have limited concurrent or overlapping construction programs.	Moderate
Cumulative effects on landscape character	Changes associated with the Narrabri Gas project would occur within LCZ 1, LCZ 2 and LCZ 4. Regionally important features may be affected, however combined changes from both developments would not likely to have a considerable effect on the landscape character and key landscape characteristics would be retained.	Moderate
Likelihood of combined visibility	The Narrabri Gas project is located adjacent to the proposal at locations to the south of Narrabri. There would be potentially be some limited areas where gas wells and / or the Leewood facility maybe visible in similar view with the proposal.	Moderate
Likelihood of sequential visibility	There may be some location, where both projects are within close proximity, where there may be a sequential view of both projects. The occurrence of sequential views is therefore potentially limited due to local vegetation considering the geographic extent of the proposal and the sequential views however this is limited to within the footprint of the Narrabri Gas project.	Moderate
Overall rating	Given the low ratings for all criteria, the overall rating is low.	Moderate

Table 8.5 Silverleaf Solar Farm

Criteria	Comments	Rating
Similarity to the proposal in scale and form	The Silverleaf Solar Farm is vastly different in scale and form to the proposal and is not likely to draw a connection between the two developments.	Low
Likelihood of project being implemented within a similar timeframe	As the proposal would be implemented between 2021 and 2025 (if approved soon) and the Silverleaf Solar Farm is likely to be implemented between mid-2020 to mid- 2021, it is not likely that both projects would have concurrent or overlapping construction programs.	Low
Cumulative effects on landscape character	Changes associated with the Silverleaf Solar Farm would occur within LCZ 1. Changes from both developments would be of a different type, however, combined changes are not likely to have a considerable effect on the landscape character, condition or value.	Low

Criteria	Comments	Rating
Likelihood of combined visibility	It is possible that both developments would be visible together in views west from Newell highway, at the northern extent of the proposal.	High
Likelihood of sequential visibility	There would be only be very limited locations, where both projects are within close proximity, where there would be a sequential view of both projects. The occurrence of sequential views is therefore rare considering the geographic extent of the proposal and the sequential views confined to one location.	Low
Overall rating	The overall rating is low as the majority of ratings have been assessed as low.	Low

Table 8.6 Narromine Solar Farm

Criteria	Comments	Rating
Similarity to the proposal in scale and form	The Narromine Solar Farm is vastly different in scale and form to the proposal and is not likely to draw a connection between the two developments.	Low
Likelihood of project being implemented within a similar timeframe	As the proposal would be implemented between 2021 and 2025 (if approved soon) and the Narromine Solar Farm is expected to commence in August 2020, it is not likely that both projects would have concurrent or overlapping construction programs.	Low
Cumulative effects on landscape character	Changes associated with the Narromine Solar Farm would occur within LCZ 1. Changes from both developments would be of a different type, however combined changes are not likely to have a considerable effect on the landscape character, condition or value.	Low
Likelihood of combined visibility	It is possible but unlikely that both developments would be visible together in views north from Mitchell Highway.	Low
Likelihood of sequential visibility	There would be only one location, where both projects are within close proximity, where there may be a sequential view of both projects. The occurrence of sequential views is therefore rare considering the geographic extent of the proposal and the sequential views confined to one location.	Low
Overall rating	The overall rating is low as all of ratings have been assessed as low.	Low

Table 8.7 Gilgandra Solar Farm

Criteria	Comments	Rating
Similarity to the proposal in scale and form	The Gilgandra Solar Farm is vastly different in scale and form to the proposal and is not likely to draw a connection between the two developments.	Low
Likelihood of project being implemented within a similar timeframe	As the proposal would be implemented between 2021 and 2025 (if approved soon) and the Gilgandra Solar Farm is due to commence construction in mid to late 2020, it is not likely that both projects would have concurrent or overlapping construction programs.	Low
Cumulative effects on landscape character	Changes associated with the Gilgandra Solar Farm would occur beyond the LVA study area. Changes from both developments would be of a different type, however, combined changes are very unlikely to have an adverse effect on the landscape character, condition or value.	Negligible
Likelihood of combined visibility	It is not possible that both developments would be visible together in views west from Newell Highway.	Negligible
Likelihood of sequential visibility	As it is not possible for both developments to be viewed sequentially within a short space of time, the likelihood of sequential visibility is negligible.	Negligible
Overall rating	As ratings range between low to negligible, the overall rating is low to negligible.	Low-Negligible

8.3 Summary of cumulative impacts

A summary of cumulative impacts is provided in Table 8.8 below.

Table 8.8 Summary of cumulative impacts

Development	Overall Rating
APA Western Slopes Pipeline	Low
Inland Rail – Narrabri to North Star	High-Moderate
Inland Rail – Parkes to Narromine	Moderate
Narrabri Gas Project (Santos)	Moderate
Silverleaf Solar Farm	Low
Narromine Solar Farm	Low
Gilgandra Solar Farm	Low-Negligible

The major source of cumulative impacts would be the connection points to the other sections of Inland Rail, namely Narrabri to North Star, which is assessed as high-moderate, and Parkes to Narromine, which is assessed as moderate. In essence however, they are different stages of the same project and once the different stages have been completed they are not likely to be viewed as separate developments. Over time, the cumulative impact of the separate stages of Inland Rail are expected to diminish for this reason. There is expected to be moderate cumulative impacts with the Narrabri Gas Project, however this would potentially reduce depending on final well placement, and mitigation and landscape plans for both projects.

9. Recommended mitigation and management measures

9.1 Recommended mitigation measures

9.1.1 Detailed design

Table 9.1 provides recommended mitigation measures for detailed design in response to potential landscape character and visual impacts identified in the assessment.

Table 9.1 LVA recommended mitigation measures for detailed design

Potential impacts	Recommended measures to avoid, mitigate or minimise impacts
Potential landscape character and visual impacts	Detailed design and construction planning would seek to minimise the construction and operation footprints and avoid impacts on mature native vegetation as far as reasonably practicable. An urban design and landscape plan would be prepared to provide a consistent approach to project design and landscape. Detailed design would be undertaken in accordance with the urban design objectives developed for the design, and the urban design and landscape framework and plan. The urban design and landscape plan would include: • vegetation screening in strategic locations to visually mitigate impacts from new structures and rail operations, including around bridges and locations where the proposal would be visible from sensitive receiver locations such as within close proximity to residences, where the presence of screening does not impact safe rail operations • appropriate species that respond to the existing landscape character setting and environmental conditions • design guidelines to minimise the visual impacts of bridges, with consideration of the existing landscape and visual context and with regard to <i>Bridge aesthetics: design guidelines to improve the appearance of bridges in NSW</i> (Roads and Maritime Services, 2012).
Batter slopes in contrast with the existing landform	Batter slopes would be integrated into the surrounding landscape, as far as practicable. Appropriate slope stabilisation would be integrated into batter design to ensure successful rehabilitation and stabilisation.
Light spill	Temporary and any permanent lighting would be designed and sited to comply with: • <i>AS 4282-1997 Control of the Obtrusive Effects of Outdoor Lighting</i> • <i>Dark Sky Planning Guideline: Protecting the observing conditions at Siding Spring</i> (Department of Planning and Environment, 2016).
Landscape character and visual impacts associated with borrow pits	The borrow pits would be rehabilitated in accordance with the <i>ARTC Inland Rail Narromine to Narrabri Borrow Pit Rehabilitation Strategy</i> (JacobsGHD, 2020c).

9.1.2 Construction impacts

Table 9.2 identifies the potential impacts that are likely to the landscape character and visual amenity during construction of the proposal and recommends measures to avoid, mitigate or minimise impacts.

Table 9.2 LVA recommended mitigation measures during construction

Potential impacts	Recommended measures to avoid, mitigate or minimise impacts
Visual impacts of construction compounds	Construction compounds would be located, as far as practicable, within cleared areas and away from sensitive receiver locations. Compounds would be designed and oriented to minimise visual impacts. This would include located areas of low visual amenity away from sensitive receiver locations, and erecting boundary screening around compounds where appropriate.
Protection of trees	Trees to be retained would be protected prior to the commencement of construction in accordance with <i>AS497-2009 Protection of trees on development sites</i> .
Landscape character and visual impacts	Rehabilitation of disturbed areas would be undertaken progressively in accordance with the rehabilitation strategy (refer to section 4.3.2) to be undertaken during detailed design, and individual property agreements (where relevant).
Light spill	Lighting of work areas, compounds, and work sites would be oriented to minimise glare and light spill impact on any adjacent visual receivers.
Visual impacts from construction activities (temporary workforce accommodation)	The temporary workforce accommodation plan would include requirements for the design and visual screening of facilities to minimise the potential for visual impacts, particularly where facilities are visible from sensitive receiver locations.

9.1.3 Operation impacts

Table 9.3 identifies recommended measures to avoid, mitigate or minimise landscape character and visual impacts during operation.

Table 9.3 LVA recommended mitigation measures during operation

Potential impacts	Recommended measures to avoid, mitigate or minimise impacts
Landscape character and visual impacts	Vegetation provided in accordance with the rehabilitation strategy and urban design and landscape plan would be subject to ongoing monitoring and maintenance in accordance with ARTC's standard operating procedures.

10. Conclusion

Australian Rail Track Corporation Ltd (ARTC) is seeking approval to construct and operate the Narromine to Narrabri section of Inland Rail ('the proposal'). This report has been undertaken to determine the potential landscape and visual impacts of the proposal.

The proposal site is located between Narromine and Narrabri in Central West NSW. The proposed rail line traverses through rural and forested areas and across major watercourses including the Macquarie, Castlereagh, and Namoi rivers. The topography is generally flat to gently undulating, with some isolated geographical formations associated with the Warrumbungles.

Six landscape character units were identified within the study area, including:

- LCZ 1 Slopes and Plains
- LCZ 2 Waterways and Floodplains
- LCZ 3 Warrumbungles Slopes and Uplands
- LCZ 4 Pilliga Forests
- LCZ 5 Township (alluvial plain)
- LCZ 6 Township (floodplain).

Of these, the proposal was found to have a moderate significance of impact on LCZ 4, a moderate to low significance of impacts on LCZ 2 and LCZ 3, a low significance of impact on LCZ 1 and LCZ 5, and a negligible significance of impact on LCZ 6. Impacts to landscape character include vegetation removal, new built form infrastructure, and minor changes to landform. Impacts to landscape character were not found to be significant due to the rail line being predominantly at-grade, the siting of the rail alignment to avoid earthworks and tree removal particularly in rural area, and the presence of linear transport infrastructure within the existing context. The highest impact was due to the magnitude of proposed change associated with vegetation clearing within a dense forested environment, combined with local values in this area.

Visual characteristics within the study area include long views across flat open rural land, more enclosed views from within floodplains, and views along linear easements screened by dense vegetation within the Pilliga forests. Key visual features include geological rises associated with LCZ 3, the visually dynamic agricultural mosaic, and landscape and built form features within townships. Key viewing locations were identified as the Salt Caves Picnic Area lookout, the lookout to the outskirts of Narrabri, streets within the centre of townships, and the LCZ 3 area.

A visual assessment was provided for twenty three viewpoint locations associated with the rail and road infrastructure. Sensitive receivers were identified as residents on the outer edges of townships and within rural land, road users, workers, and visitors to recreational areas. Due to the predominantly rural context and assessment undertaken from publically accessible locations only, viewpoints were largely located where the proposal would cross a variety of roads, as well as locations to the outer edge of townships near residences, and two public recreation locations. Of the viewpoints assessed, the most substantial impacts were found to be moderate from VP14 and VP22, due to the proposed extent of vegetation removal (VP14) and the combined sensitivity of receiver and magnitude of change associated with the proposed rail bridge (VP22). Impact to views from the two recreational areas assessed were found to be negligible.

Visual assessments were also undertaken for the proposed borrow pits. Three of the borrow pit sites were visited during a site inspection, and a total of nine viewpoint assessments were provided from locations in the surrounding area. A desktop assessment was undertaken for the fourth borrow pit site. Of the viewpoints assessed, the most significant impacts were found to be moderate from VP 28 (borrow pit B) due to the residential viewer type and extent of changes to the view on the horizon.

A general discussion has been provided regarding impacts from construction, and assessments have also been provided from viewpoint locations. The most significant visual impacts are anticipated to be from sensitive receiver locations within the viewshed of construction compounds, proposed bridges, and temporary workforce accommodation sites.

Potential visual impacts from lighting during operation were reviewed, with no significant impact to the Dark Sky Region. During construction, potential visual impacts from lighting are expected to be limited, and managed in accordance with *AS 4282-1997 Control of the Obtrusive Effects of Outdoor Lighting*, principles provided within the *Dark Sky Planning Guideline: Protecting the observing conditions at Siding Spring* (Department of Planning and Environment, 2016), and through consultation with Siding Spring Observatory.

A cumulative impact assessment has been undertaken for the proposal. This assessment considers seven major development projects near the proposal. It was found that the most significant cumulative impacts would be associated with connection points to other section of Inland Rail. However, as they are different stages of the same project undertaken at different times, the cumulative impact is expected to diminish.

Mitigation and management measures have been provided for the proposal during detailed design, construction, and operation.

11. References

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Appendices

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TECHNICAL REPORT

12

Landscape and visual assessment

Appendix A Photomontages

NARROMINE TO NARRABRI ENVIRONMENTAL IMPACT STATEMENT



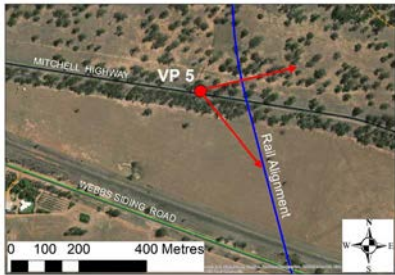
EXISTING VIEW



PROPOSED VIEW



KEY PLAN



View Direction: 70° - 150°
Horizontal Field Of View: 80°
Camera Height: 1.7 m
Camera Type: NIKON D850
Lens Size: 50 mm
Photograph Time & Date: 3:11 pm,
21st November 2018

Location: Mitchell Highway, Narromine
New South Wales
Coordinates: 622074, 6431224
(GDA 1994 MGA Zone 55)
Viewpoint Elevation: 243.8 m
Date of Photomontage: 6th March 2020
Issue: v02

Inland Rail, Narromine to Narrabri (N2N)
ARTC

Viewpoint Location 5
Jacobs 

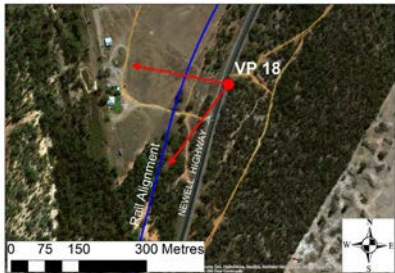
EXISTING VIEW



PROPOSED VIEW



KEY PLAN



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Horizontal Field Of View: 80°
Camera Height: 1.7 m
Camera Type: NIKON D850
Lens Size: 50 mm
Photograph Time & Date: 10:55 am,
21st November 2018

Location: Newell Highway, Narrabri
New South Wales
Coordinates: 760052, 6634086
(GDA 1994 MGA Zone 55)
Viewpoint Elevation: 228.8 m
Date of Photomontage: 6th March 2020
Issue: v02

Inland Rail, Narromine to Narrabri (N2N)
ARTC
Viewpoint Location 18
Jacobs 

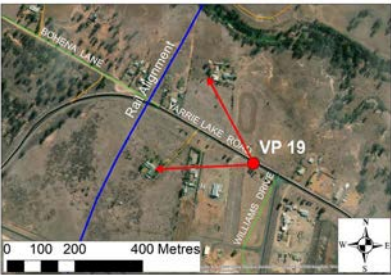
EXISTING VIEW



PROPOSED VIEW



KEY PLAN



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Camera Type: NIKON D850
Lens Size: 50 mm
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23rd November 2018

Location: Yarrie Lake Road, Narrabri
New South Wales
Coordinates: 763776, 6641263
(GDA 1994 MGA Zone 55)
Viewpoint Elevation: 214.45 m
Date of Photomontage: 6th March 2020
Issue: v02

Inland Rail, Narromine to Narrabri (N2N)
ARTC

Viewpoint Location 19

Jacobs 

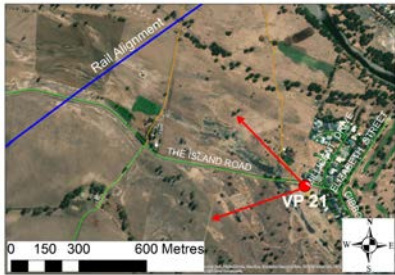
EXISTING VIEW



PROPOSED VIEW



KEY PLAN



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23rd November 2018

Location: The Island Road, Narrabri
New South Wales
Coordinates: 766306, 6642678
(GDA 1994 MGA Zone 55)
Viewpoint Elevation: 211.84 m
Date of Photomontage: 6th March 2020
Issue: v02

Inland Rail, Narromine to Narrabri (N2N)
ARTC
Viewpoint Location 21
Jacobs 

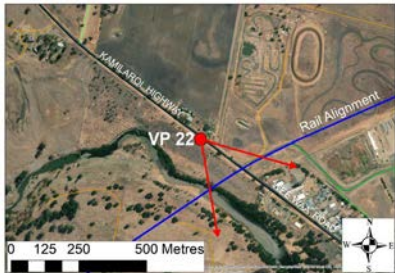
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PROPOSED VIEW



KEY PLAN



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23rd November 2018

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Issue: v02

Inland Rail, Narromine to Narrabri (N2N)
ARTC
Viewpoint Location 22
Jacobs 

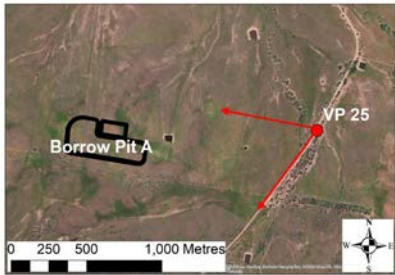
EXISTING VIEW



PROPOSED VIEW - POST
EXTRACTION



KEY PLAN



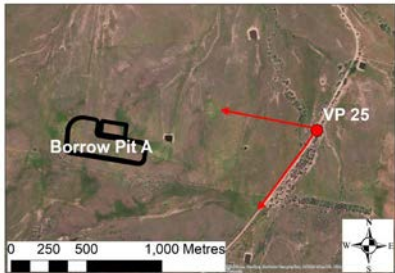
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Camera Type: Cannon EOS 6D
Lens Type: 50 mm
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10th December 2019

Location: Tantitha Road, Tomingley
New South Wales
Coordinates: 622810, 6409973
(GDA 1994 MGA Zone 55)
Viewpoint Elevation: 327.10 m
Date of Photomontage: 28th February 2020
Issue: v02

Inland Rail, Narromine to Narrabri (N2N)
ARTC
Viewpoint Location 25 : Borrow Pit A



PROPOSED VIEW - POST
EXTRACTION, SHOWING
EXTENT OF BORROW
PIT



KEY PLAN

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Lens Type: 50 mm
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10th December 2019

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New South Wales
Coordinates: 622810, 6409973
(GDA 1994 MGA Zone 55)
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Issue: v02

Inland Rail, Narromine to Narrabri (N2N)
ARTC
Viewpoint Location 25 : Borrow Pit A
Jacobs 

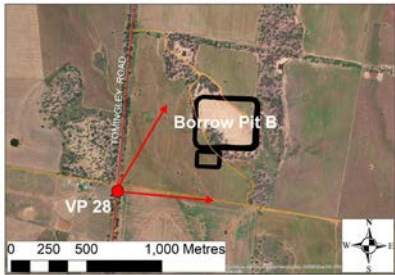
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PROPOSED VIEW - POST
EXTRACTION



KEY PLAN

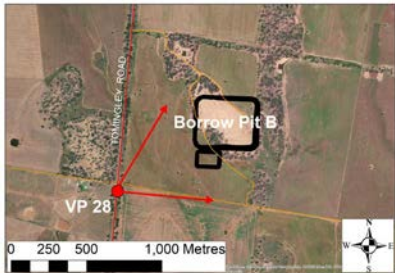


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Camera Type: Cannon EOS 6D
Lens Type: 50 mm
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10th December 2019

Location: Tomingley Road, Narromine
New South Wales
Coordinates: 616061, 6421034
(GDA 1994 MGA Zone 55)
Viewpoint Elevation: 256.6m
Date of Photomontage: 28th February 2020
Issue: v02

Inland Rail, Narromine to Narrabri (N2N)
ARTC
Viewpoint Location 28 : Borrow Pit B
Jacobs 

PROPOSED VIEW - POST
EXTRACTION, SHOWING
EXTENT OF BORROW
PIT



KEY PLAN

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Horizontal Field Of View: 80°
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Lens Type: 50 mm
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10th December 2019

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New South Wales
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(GDA 1994 MGA Zone 55)
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Issue: v02

Inland Rail, Narromine to Narrabri (N2N)
ARTC
Viewpoint Location 28 : Borrow Pit B
Jacobs 

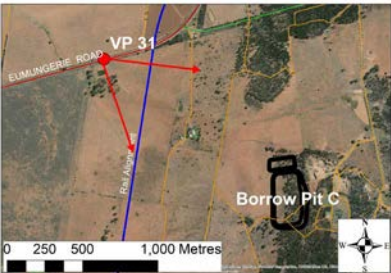
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PROPOSED VIEW - POST
EXTRACTION



KEY PLAN

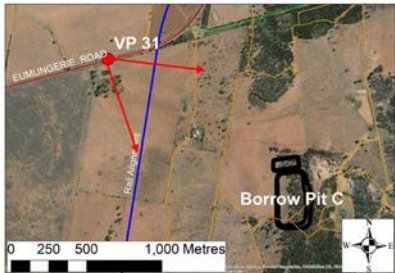


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10th December 2019

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Viewpoint Elevation: 262.1m
Date of Photomontage: 28th February 2020
Issue: v02

Inland Rail, Narromine to Narrabri (N2N)
ARTC
Viewpoint Location 31 : Borrow Pit C
Jacobs 

PROPOSED VIEW - POST
EXTRACTION, SHOWING
EXTENT OF BORROW
PIT



KEY PLAN

View Direction: 78° - 158°
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10th December 2019

Location: Eumungerie Road, Burroway
New South Wales
Coordinates: 617629, 6435933
(GDA 1994 MGA Zone 55)
Viewpoint Elevation: 262.1m
Date of Photomontage: 28th February 2020
Issue: v02

Inland Rail, Narromine to Narrabri (N2N)
ARTC
Viewpoint Location 31 : Borrow Pit C
Jacobs 

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