APPENDIX

I

Landscape and Visual Impact Assessment Technical Report

CALVERT TO KAGARU ENVIRONMENTAL IMPACT STATEMENT

IR_1381

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

Inland Rail

Calvert to Kagaru

Landscape and Visual Impact Assessment Technical Report - Appendix I

Inland Rail Package 3400: Calvert to Kagaru

Landscape and Visual Impact Assessment – Appendix I

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1. Summary

This Landscape and Visual Impact Assessment (LVIA) has been prepared by Lat27 Pty Ltd on behalf of Future Freight Joint Venture (FFJV) as part of an Environmental Impact Statement (EIS) for the Calvert to Kagaru Project (the Project).

The Inland Rail Program (the Program) is a major national interstate freight route between Melbourne and Brisbane. Australian Rail Track Corporation Ltd (ARTC) proposes to construct and operate the Calvert to Kagaru (C2K) Project which extends approximately 53 km in length, connecting the existing Queensland Rail (QR) West Moreton System rail corridor with the existing Interstate Line at Kagaru.

1.1. Key elements of the Project relevant to LVIA

The elements of the Project that are relevant to the LVIA include the:

- New track: approximately 53 km of new track within a greenfield rail corridor. Where possible, the Project utilises land gazetted for a future railway corridor under the provisions of the *Transport Infrastructure Act 1994* (Qld) known as the Southern Freight Rail Corridor (SFRC).
- Tunnel: a 1,015 m tunnel traversing the Teviot Range
- Crossing loops: four crossing loops, designed to accommodate trains initially up to 1,800 m long but potentially up to 3,600 m long
- Bridges: 27 new bridge structures (rail bridges over road, rail bridges over waterways, rail bridges over waterways and roads, and road bridges over rail). The three road bridges over rail are located on Mount Forbes Road, Cunningham Highway and Undullah Road.
- Culverts: reinforced concrete pipe culverts and reinforced concrete box culverts. Scour protection measures will generally be installed around culverts to avoid erosion.
- Drainage: embankment and catch drains adjacent to the proposed alignment to divert surface runoff
- Level crossings: both passive and active including lighting
- Ancillary works: including road and public utility crossings and realignments, signalling and communications infrastructure, signage, fencing and provision of services in the corridor (excluding those undertaken as enabling works)
- Presence of the freight train: presence of double stacked trains, with a height of 6.5 m and length of 1,800 m with provision to accommodate up to 3,600 m long
- Fencing: the alignment will be fenced with standard three or four strand wire fence. Where superior fencing is required near roads or where trespass is occurring, a 1.8 m chain wire fence is proposed. Fauna fencing will be provided where required
- Cuts and embankments: approximately 18.88 km of cut, with maximum cut depths up to 42.95 m and approximately 28.32 km of fill sections, with maximum fill depths of up to 25 m
- Laydown areas: 29 laydown areas in total, located approximately every 5 km
- Construction impacts: including vegetation clearance, presence of construction equipment and stockpiles, presence of laydown areas and temporary construction lighting.

Although ARTC are applying for approval to build infrastructure to accommodate trains up to 1,800 m in length. ARTC intend to acquire the land for the future 3,600 m crossing loop extension with the initial land acquisition. The approval for the construction of future 3,600 m crossing loops will be subject to separate approval applications in the future. This assessment is based on the allowance for 1,800 m long trains, including double stacking.

1.2. The landscape of the LVIA study area

The alignment will tie into the existing QR railway line near the township of Calvert and travel in a generally south-east direction to Kagaru, where it will connect with the existing interstate line. Between these settlements, the Project traverses rural landscapes, comprising agricultural and pastoral landscapes, open woodland and the foothills of the Teviot Range. A study area for the LVIA was defined extending 10 km from the alignment. The landscape of the LVIA study area varies greatly, from low-lying alluvial plains with subtle undulations to densely forested elevated areas associated with the Teviot Range, and more distant Little Liverpool Range and Mount Walker. The Project includes a 1,015 m long tunnel through the Teviot Range to facilitate the required gradient. The study area is traversed by the Bremer River and a network of creeks including Plain Creek, Western Creek, Purga Creek and Teviot Brook that are tributaries of the Bremer and Logan rivers. There are no national parks or other nationally-protected landscapes within the LVIA study area, however the LVIA study area does encompass conservation areas which are known to attract recreational visitors including trails within the Flinders – Goolman conservation estate.

1.3. Landscape and visual impacts

The LVIA identified and assessed the impact of the Project on landscape, visual and lighting amenity through a combination of desk and field work, including GIS analysis, Visibility analysis mapping (VAM) and preparation of illustrative cross-sections and visualisations.

Ten landscape character types (LCTs) have been identified within the LVIA study area, of which eight are potentially affected by the Project with impacts of up to a High magnitude of change anticipated. The most significant landscape impact identified concerns LCT H: Forested Uplands (H5: Teviot Range) relating to the introduction of extensive cut and fill and tunnelling within the forested landscapes of the Teviot Range south of Flinders Peak.

For much of the LVIA study area there are relatively few visual receptors with the landscape comprising isolated farmsteads set on large private farms. However, there are some settlements within the potential viewshed of the Project including Calvert, Peak Crossing and Harrisville. Visual impacts are typically contained by the presence of vegetation, including along creek lines, and localised undulations in landform. Elevated and panoramic views over the alignment are also available from the Forested Uplands, particularly from walking trails around Flinders Peak. Elsewhere, there are fairly open views across the rural landscape from the network of local roads and highways, including the Cunningham Highway, Rosewood-Laidley Road and Ipswich-Boonah Road.

As part of the visual assessment, 12 representative viewpoints have been selected and assessed for both construction and operation phases of the Project. During construction, the greatest visual impact identified was up to Moderate significance, relating to four viewpoints (Viewpoint 3: Cunningham Highway looking south-east to Flinders Peak, Viewpoint 10: Washpool Road near rural properties 456-463, Viewpoint 11: Wild Pig Creek Road near rural properties 717-722 and Viewpoint 12: Undullah Road near “Brooklands” rural property).

For visual impacts during operation, three visual impacts of up to High significance were identified. These are associated with Viewpoint 1: Rosewood-Warrill View Road Looking north-east; Viewpoint 3: Cunningham Highway looking south-east to Flinders Peak and Viewpoint 5: Ipswich-Boonah Road looking north-east, near properties 276 and 288, each of which was identified to have High significance, due to the presence of railway infrastructure (bridges) as viewed from the Cunningham Highway, Rosewood-Warrill View Road and Ipswich-Boonah Road. Other visual impacts during both construction and operation are of lower significance, typically relating to views experienced by relatively small numbers of homesteads or with a lower magnitude of change to the existing view.

For all lighting impacts (including during both construction and operation phase) the greatest impact identified of up to Low significance relates to one viewpoint (Viewpoint 5: Ipswich-Boonah Road looking north-east, near properties 276 and 288).

Cumulative impacts, particularly the effects in combination with the adjoining Kagaru to Acacia Ridge and Bromelton (K2ARB) and Helidon to Calvert (H2C) Inland Rail projects have been considered. Cumulative impacts during both construction and operation are considered to be up to Medium consequence, due to the potential for localised areas (particularly Kagaru and Willowbank) to be affected by multiple projects, dependent upon project phasing. There are no identified cumulative impacts associated with night lighting.

1.4. Mitigation opportunities

The design has incorporated some mitigation measures that are considered as initial mitigation measures, and which have been considered in the impact assessment. The LVIA has also identified a range of additional mitigation measures including protection of existing vegetation, rehabilitation of disturbed vegetation, opportunities to undertake additional planting to buffer views and opportunities for urban design of key structures. These have potential to enhance the legacy of the Project and would reduce the residual impact of the Project on some landscapes and views, including key roads, highways and settlements such as Calvert.

2. Scope of Report

This LVIA has been prepared by Lat27 Pty Ltd on behalf of FFJV as part of an EIS for the Project.

The Inland Rail Program is a major national interstate freight route between Melbourne and Brisbane. ARTC proposes to construct and operate the C2K Project which extends approximately 53 km in length, connecting the existing QR West Moreton System rail corridor with the existing Interstate Line at Kagaru. The location of the Project is shown in **Figure 1: Inland Rail regional context** and **Figure 2: LVIA Study Area** is discussed in more detail below. The Project connects the adjacent projects of H2C in the northwest and K2ARB to the south-east.

The Project was declared a 'coordinated project', for which an EIS is required by the Queensland (QLD) Coordinator-General under Section 26(1)(a) of the *State Development and Public Works Organisation Act 1971* (SDPWO Act) (QLD Government, 2017). The Project is also a controlled action under the Commonwealth *Environment Protection and Biodiversity Conservation Act* 1999 (EPBC Act) and requires approval from the Commonwealth Minister administering the EPBC Act.

2.1. Project Terms of Reference

The Terms of Reference (ToR) describe the matters the proponent must address in an EIS for the Project. The following matters relating to landscape and visual amenity are described in **Table 1**, along with the relevant sections within this LVIA that address each of the requirements.

Table 1: Terms of Reference compliance table

Term of reference	Requirement	Relevant section where Term is addressed
Section: Project description. Subsection: Proposed construction and operations ToR 10.10	Describe the following information about the proposed Project: (p) landscaping and the rehabilitation of affected areas after construction and during operation	• Landscape and urban design treatments are discussed in **Section 6: Potential Impacts and Section 11: Mitigation and Residual Impact Assessment**.
Section: Land: Landscape and Visual amenity: Subsection: Existing environment ToR - 11.86	Describe and illustrate the existing landscape character and environment, including key natural landscape features, major views, view sheds and outlooks that contribute to the amenity of the area.	• The existing landscape character is described in Section 5 (particularly **Section 5.2: Landscape character baseline**) and **Section 7: Landscape Impact Assessment**. • Views, viewsheds and outlooks are described in **Section 5: Description of Existing Landscape and Visual Amenity Values** (particularly **Section 5.3: Visual assessment baseline**) and **Section 8: Visual Impact Assessment**.
Section: Land: Landscape and Visual amenity. Subsection: Impact assessment ToR - 11.87	Describe and illustrate the visual impact of the construction and operation of the Project. Include major views, view sheds, outlooks, and features contributing to the amenity of the area. Such views should be representative of public and private viewpoints, including places of residence, work, and recreation.	• The visual impact of the Project is described in **Section 8: Visual Impact Assessment** and illustrated on the associated plans and figures – including visualisations – in Appendix 1 and 2.
Section: Land: Landscape and Visual amenity. Subsection: Impact assessment ToR - 11.88	Address the findings, requirements and recommendations of South East Queensland Regional Plan 2005-2026 Implementation Guideline No 8 – Identifying and Protecting Scenic Amenity Values (2007)	• Consideration of regional scenic amenity is included in **Section 3: Legislation, policies, standards and guidelines** (particularly **Section 3.2: State and regional**) and, as required, in **Section 7: Landscape Impact Assessment**.

Term of reference	Requirement	Relevant section where Term is addressed
Section: Land: Landscape and Visual amenity. Subsection: Mitigation Measures ToR - 11.89	Describe any proposed measures to avoid, minimise or mitigate potential impacts on landscape character and visual amenity.	• Landscape and urban design treatments are discussed in **Section 11: Mitigation and Residual Impact Assessment**.

2.2. Objectives of the LVIA

The purpose of the LVIA is to:

- Identify the urban design and landscaping aspects of the Project
- Assess the impact of the Project on the urban, rural and natural fabric
- Explore the use of Crime Prevention Through Environmental Design (CPTED) principles during the design development process, including natural surveillance, lighting, walkways, signage and landscape
- Identify urban design strategies and opportunities to enhance healthy, cohesive and inclusive communities
- Assess the visual impact of the Project on:
    - Views and vistas
    - Streetscapes, key sites and buildings
    - Heritage items including Aboriginal places and environmental heritage
    - The local community
- 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.

Key objectives of the LVIA are:

- To undertake a baseline assessment describing existing environmental aspects and their values within the LVIA study area (refer to **Section 4.1: Definition of the LVIA study area** for description) with respect to landscape character and visual amenity including scenic viewpoints
- To describe the existing landscape including with reference to any values identified in planning schemes (landscape receptors) and identify those people who experience and value views of the landscape (visual receptors)
- To identify key Project risks on landscape and/or visual values during the day and consider the potential for any night time impacts
- To evaluate the significance of the impacts of the Project activities on landscape, views and visual receptors during construction and operation during day and night
- To describe any Project modifications or management techniques that can mitigate identified landscape and visual impacts
- To illustrate the visual impacts using visualisation techniques to assist members of the public in understanding potential impacts.

3. Legislation, policies, standards and guidelines

The purpose of this section is to identify and discuss the relevance of any legislative or policy level objectives and standards that exist to protect or manage the landscape and visual values in the context of the Project.

The purpose of LVIA is to assist in creating a design that is integrated into its landscape context across the entire Inland Rail Program. For this reason, it is necessary to consider policies and guidelines (particularly at the higher national, State and regional level) that may extend beyond the immediate context in which the Project is sited. As an example, consideration of urban design principles set out in both New South Wales (NSW) and QLD guidelines will ensure that a common approach is adopted to design and mitigation which fulfils the separate requirements of these jurisdictions while ensuring design consistency across borders.

Similarly, as landscape and visual impacts may cross boundaries (most obviously views between adjoining local council areas), consideration has also been given to the policies applying to adjacent jurisdictions at the local level.

Relevant guidelines that have informed the LVIA methodology are discussed in **Section 4: Methodology**.

Legislation, policies, standards and guidelines that have been considered in this LVIA are described below and, where applicable, shown on **Figure 3: Regional scenic amenity and planning designations**.

3.1. National

The national regulatory context for LVIA practice and policy is summarised in **Table 2**.

Table 2: Regulatory Context – National

Legislation, policy or guideline	Relevance to the Project
National	
AS4282-1997 Australian Standard for the Control of the obtrusive effects of outdoor lighting (1997) This standard sets out guidelines for the control of the obtrusive effects of outdoor lighting and gives recommended limits for the relevant lighting parameters to contain these effects within tolerable levels. It refers to the potential effects of lighting systems on receptors including nearby residents and users of adjacent roads. It does not apply to road lighting or lighting systems that are of a cyclic or flashing nature.	• Lighting is proposed as part of the Project (see **Section 6: Potential Impacts** for details). • AS4282-1997 is relevant to the consideration of spill lighting associated with a Project. • The standard notes that the determination of when the spill light becomes obtrusive to others is difficult since both physiological and psychological effects are involved. • It provides a common basis for assessment of developments that provide outdoor lighting. • Key aspects for consideration include the level of lighting existing in the area, the times the proposed lighting is likely to operate (with different standards applied before and after an established curfew hour – typically 11 p.m.), and the type of lighting uses. • Public lighting is excluded because it is provided to facilitate all night safety and security. • Section 2.4 states that "*people will have a range of reactions to the installation of outdoor lighting; responses may vary from positive acceptance to outright rejection. The degree of response will depend, in part on the nature of surrounding developments, past experiences, novelty of the installation, and frequency and times of operation.*" • Table 2.1 of the standard sets out recommended maximum values (lux) for the control of obtrusive light. • Illuminance reduces in proportion to the inverse of the square of the distance from the floodlight – therefore, the further away a light source is from a receptor the lower the potential illuminance.

Legislation, policy or guideline	Relevance to the Project
	• The objective of design is to ensure that direct view of the bright parts of floodlights are prevented from positions at eye height of neighbouring properties. • As all proposed lighting during construction and operation is for safety and security purposes, as described in **Section 6: Potential Impacts**, a full quantitative lighting assessment is not deemed to be required. However, the general principles of AS4282 have been used to inform the qualitative lighting assessment methodology (described in **Section 4.1: Definition of the LVIA study area**
AS4970: Protection of Trees on Development Site	• This Standard provides guidance on the principles for protecting trees on land subject to development. Where development is to occur, the Standard provides guidance on how to decide which trees are appropriate for retention, and on the means of protecting those trees during construction work. • The Standard does not apply to the establishment of new trees.
Disability (Access to Premises – Buildings) Standards 2010 (2010) This is a legislative Standard that provides a nationally applicable set of provisions that detail what must be done to provide for non-discriminatory access to public buildings for people with disability.	• The Project is mostly located in a rural area within freehold land with restricted access to the general public, limiting the applicability of the Disability (Access to Premises – Buildings) Standards. However, accessibility needs to be considered where the alignment passes through settlements and in recreational areas or adjacent to recreation trails and walkways where people may be present close to the alignment. • The objects of these Standards are: o to ensure that dignified, equitable, cost-effective and reasonably achievable access to buildings, and facilities and services within buildings, is provided for people with a disability; and o to give certainty to building certifiers, building developers and building managers that, if access to buildings is provided in accordance with these Standards, the provision of that access, to the extent covered by these Standards, will be lawful.

3.2. State and regional

The QLD State and regional regulatory context for LVIA practice and policy is summarised in **Table 3.** This comprises documents referenced in the ToR or identified as being relevant to the assessment.

Table 3: Regulatory Context – QLD State and regional

Legislation, policy or guideline	Relevance to the Project
QLD	
Road Landscape Manual (RLM) (2nd Edition, 2013) This manual aims to facilitate the understanding of, and procedures associated with, the assessment, design and management of roads as they affect the QLD landscape. It sets out principles for the design of roads to assist in their integration in their natural, cultural and urban landscape settings Appendix 2 of the manual describes the process for visual assessment required in the planning and design of QLD roads.	• The Project requires the realignment and redesign of numerous local and State-controlled roads (see **Section 6: Potential Impacts** for details) • Key principles for the design of roads outlined in the manual are integration, context sensitive design, collaboration, sustainability and liveability • Road landscape integration requires that a consistent and harmonious approach is adopted, reflecting and referencing the surrounding natural and built landscape to achieve integration • Context sensitive design solution recognises and respond to the road landscape setting to provide "*a transportation facility that fits its setting…that leads to preserving and enhancing scenic, aesthetic, historic, community and environmental resources, while improving and maintaining safety, mobility, and infrastructure conditions"* • The manual describes a range of acceptable approaches for the design of hard and soft landscape and urban design elements, including earthworks, vehicle bridges, tunnels, buffer planting etc

Legislation, policy or guideline	Relevance to the Project
	• The visual assessment methodology does not directly apply as it is intended for the assessment of Department of Transport and Main Roads projects. However, the principles have informed the Inland Rail assessment methodology (refer **Section 4.1: Definition of the LVIA study area**). • The landscape and urban design guidelines inform the design and the mitigation of impacts of the Program on the roads impacted by the Project.
Crime Prevention through Environmental Design (CPTED) (2007) The CPTED guidelines for QLD seek to promote the incorporation of CPTED principles into the planning, design and management of development in QLD. They aim to guide and encourage public and private developers to design with CPTED in mind. This guideline is a suitable framework for consideration of the Hea-2 Crime Prevention credit in the Infrastructure Sustainability (IS) Rating Scheme, although is not directly referenced.	• The Project is mostly located in a rural area within privately-owned land with restricted accessibility to the general public limiting the applicability of the CPTED guidelines. However, CPTED needs to be considered where the alignment passes through settlements and in recreational areas or adjacent to recreation trails and walkways where people may be present close to the alignment. • The guidelines describe several principles to inform design including surveillance (both direct and indirect), legibility, territoriality, ownership, management and vulnerability • The guidelines address a range of scales from planning through to detailed design and include strategies for signage, public artwork, materiality (functional and robust without being harsh). • Key relevant principles include design of the built environment to reduce or limit risk from assault by providing well-lit, active and overlooked places and pedestrian and cyclist systems and routes to important places and avoiding the creation of hidden spaces close to pedestrian/cyclist travel routes in the public realm • Elements such as landscaping, walls, fences, buildings, passages, bridges, tunnels and street furniture are to be designed to avoid hidden places close to paths or hidden corners, blind spots or bends that create places of concealment. • It is recommended to avoid, where possible, pedestrian/cyclist tunnels, bridges or other movement predictors (especially closed ones) which limit surveillance and response options
Bromelton State Development Area Development Scheme (2017) The Bromelton State Development Area (SDA) was declared in 2008 with an area of approximately 15,610 hectares (ha) and is located within the Scenic Rim Regional Council. The Bromelton SDA Development Scheme is the regulatory instrument that controls development to which it applies within the Bromelton SDA.	• The Project traverses the northern area of the Bromelton SDA at Kagaru. • Section 2.3 of the Bromelton Development Scheme states that development within the Bromelton SDA will avoid adverse impacts on environmental, cultural heritage and community values, or minimise and mitigate impacts where they can't be reasonably avoided and be located, designed and constructed in accordance with best practice principles. • Section 2.5 of the Bromelton Development Scheme outlines the SDA wide assessment criteria and includes a section on character and amenity, which states that visual impacts of development are minimised through building design, materials and landscaping when viewed from a significant publicly accessible viewpoint such as major roads. It also includes a section on landscaping that states that development provides landscaping that: o Minimises the visual impacts of the development o Incorporates at least 50 per cent local species o Is low maintenance.

Legislation, policy or guideline	Relevance to the Project
Greater Flagstone Priority Development Area Development Scheme (2011) The Greater Flagstone Priority Development Area (PDA) was declared in October 2010 and covers an area of 7,188 ha. Once developed, the Greater Flagstone PDA is anticipated to provide approximately 50,000 dwellings to house a population of up to 120,000 people. The Greater Flagstone PDA Development Scheme is the planning instrument that assists with planning, carrying out, promoting, coordinating and controlling the development of land within the Greater Flagstone PDA.	• The Project intersects a small portion of the Greater Flagstone PDA. • Section 3.3.8 Natural and cultural values identifies several significant environmental features and states that the design, siting and layout of the development: o Incorporates landscaping with endemic species that contribute to the bushland character, flora and fauna habitat, and fauna movement o Minimises adverse impacts on natural landforms and the visual amenity of the site.
QLD (regional level)	
South East Queensland Regional Plan (2017) The South East Queensland Regional Plan 2017 (SEQRP), also known as *ShapingSEQ*, is the regional plan for the south-east Queensland (SEQ) region. It was given effect on 11 August 2017. The region includes the following Local Government Areas (LGAs) through which the Project passes: Ipswich City Council (ICC), Logan City Council (LCC) and Scenic Rim Regional Council (SRRC). The plan provides a regional framework for growth management, and sets planning direction for sustainable growth, global economic competitiveness and high-quality living including by ensuring land use and infrastructure planning are integrated, valuing and protecting the natural environment including landscapes, and supporting rural communities. The plan is supported by a range of background papers.	• The entirety of the LVIA study area of the Project falls this region. The ToR require consideration of the Project against the requirements of *ShapingSEQ,* which sets out the vision and strategy for planning in the SEQ region. • The 'Prosper' and 'Connect' elements of the SEQRP supports investment in upgrades and new infrastructure, including the Inland Rail Program that "will reinforce SEQ as the apex of Australia's strategic freight network" and "allows for long-term intent for an improved passenger rail connection between Brisbane and Toowoomba." • The 'Sustain' element of the plan highlights the importance of "valuing and protecting our greatest assets – our regional landscapes and natural systems that sustain us." • Goal 4: Sustain is the most important in terms of guiding the regional context for landscape and visual amenity values stating "*Our regional landscapes contain a wide range of values, including biodiversity, rural production, natural economic resources, scenic amenity, cultural landscapes and outdoor recreation. These values contribute to SEQ being one of the most biodiverse and liveable regions in Australia.*" • Element 4: Regional landscapes seeks to protect the values of inter-urban breaks, protect and rehabilitate culturally significant plans, and protect the regional greenspace network and *"protect regional scenic amenity areas from development that would compromise their values*." • Map 5c: Regional landscape values, maps key valued landscapes in SEQ including protected areas, regionally significant greenspace, regionally significant scenic amenity and inter-urban breaks. • The Project passes through/close to areas of identified regionally significant scenic amenity as described in **Section 5.1: Regional landscape context**. These areas are subject to detailed assessment in the landscape and visual assessment; see **Section 7: Landscape Impact Assessment**. • Scenic amenity areas are "*Landscape areas identified by the SEQ regional amenity methodology as having scenic amenity value*". The stated benefits of such areas include physical and mental health and wellbeing, tourism, sense of place and community cohesion. • Element 5: Live is also relevant in terms of landscape and scenic amenity. For example, Live Element 3: Inspiration from local character requires that "*The communities of SEQ demonstrate a strong respect for their heritage, distinct context and local character*". This includes identifying and conserving local landscape, heritage and cultural assets including indigenous landscape values; working with natural topography to create development that contributes positively to the environmental and visual experience of a place;

Legislation, policy or guideline	Relevance to the Project
	using appropriate building materials that add to a local area's character and diversity; and, working with the characteristics, traditions and values of the local community to create a distinctive local character and contributory community value. • Map 6 Live: Some great places, identifies some locations close to the Project in SEQ including Rosewood town centre (51). • The Western subregion includes Ipswich, Lockyer Valley, Scenic Rim, Somerset and Toowoomba. This subregion is characterised by features including "*a predominantly regional and rural lifestyle supported by spectacular open space, hinterland and natural landscape settings*". • The "Connect" theme seeks to enhance "*the movement of goods and services via key freight connections*". • Key regional infrastructure outcomes for Connect in this subregion are shown on Map 4b that indicates a future freight corridor (rail), the Toowoomba Second Range Crossing and support for planning and industrial growth of the Toowoomba Enterprise Hub (Charlton Wellcamp). The theme emphasizes the Western Sub-region's role as the western gateway, connecting SEQ to the rural areas and towns of Darling Downs and South Burnett, and providing critical freight connections with northern NSW and the southern states. • Key regional outcomes for "Sustain" in this subregion include the identification, protection and management of regional landscapes, particularly: (f) Flinders–Karawatha Corridor, which links Karawatha Forest, Greenbank Military Training Area, White Rock, Goolman, Mount Perry, Flinders Peak, Teviot Range, Mount Joyce, Wyaralong Dam and south to Mount Barney in the Border Ranges.
South East Queensland Regional Plan (SEQRP) Implementation Guideline No 8 Identifying and protecting scenic amenity values (2007) This guideline document was developed to assist SEQ local governments to determine a framework for the protection of regional landscape values. It was developed to support the (now superseded) Scenic Amenity policies of the QLD Regional Plan 2009–2031 but is still referenced as the *SEQ regional amenity methodology* in the current regional plan *ShapingSEQ*.	• The guidelines were informed by the SEQ 2004 Public Preference Survey. This established that 68 per cent of people consider scenic values to be the most important or second-most important values at places where the scenery is highly preferred, such as the views from lookouts over the ocean, beaches, rocky cliffs, bushland, rivers and mountains. • The guideline establishes a voluntary methodology that centres around some key concepts: o Scenic amenity which is defined as "*a measure of the relative contribution of each place in the landscape to the collective appreciation of open space as viewed from places that are important to the public*" (Department of Natural Resources, 2001). o Scenic preference which is defined as "*a rating of the community's liking for scenery of open space compared to areas occupied by built structures, measured using photographs*" (Department of Natural Resources, 2001). o Public viewing locations: publicly accessible outdoor locations such as roads, walkways, beaches, picnic areas, lookouts or viewing platforms. Significant and popular viewpoints are elevated public viewing locations where people can safely stop and rest to admire the view. o Seen landscape areas: natural or built areas such as hills, the ocean, farmlands, waterways, towns, cities or suburbs visible from one or many public viewing locations. Areas of high scenic amenity are highly preferred and seen landscape areas. o View corridors: three-dimensional spaces that connect public viewing locations with seen landscape areas. Important view corridors connect significant and popular viewpoints with areas of high scenic amenity.

Legislation, policy or guideline	Relevance to the Project
	• The regional scenic amenity values are calculated using GIS analysis which combines visual exposure (least visible to most visible) and visual preference (least preferred to most preferred) to give a value between 1 and 10. • Regional scenic amenity applies to areas with a value of 9-10 with local scenic amenity value applying to areas of 6-8. • Regionally significant and popular viewpoints need to have a scenic value of 9-10 in at least one direction with a visitation importance rating of 9 or 10. Locally significant and popular viewpoints need to have a scenic value of 6-8 in at least one direction with a visitation importance rating of 6-8. • The SEQ Scenic Amenity Methodology mapping is a useful tool for indicating regional scenic amenity values and, therefore, assists in determining relative sensitivity of landscape and visual values across the LVIA study area. It has been used to inform the sensitivity of the landscape character areas identified in this LVIA and to identify areas where views are likely to have high scenic amenity values and are, therefore, likely to be of greater sensitivity to change. • The SEQ Scenic Amenity methodology is applicable only to SEQ. While some LGAs outside of SEQ region through which the Inland Rail passes have applied the methodology and have this mapping available, it is not available for all landscapes affected by Inland Rail in QLD. Therefore, care needs to be taken in its application to the LVIA methodology and it cannot be used in isolation of other approaches. For example, while the Project is within the SEQ region and has scenic amenity mapping available, other parts of the Inland Rail Program do not have scenic amenity mapping available and alternative approaches are required to ensure consistency. • The guideline includes an assessment methodology for determining acceptable proposed development in areas of high scenic amenity. This involves taking photographs and calculating the percentage of evident built development to determine acceptability. • This simplistic empirical methodology for development assessment is only applicable to high scenic value areas (which are not consistently mapped throughout the Inland Rail Program) and is, therefore, not considered to be suitable to use for the LVIA assessment method for Inland Rail. The approach used in this LVIA is consistent with standard international (including QLD) LVIA practice and recognises the need to consider landscape and visual impacts across the study area; including impacts on areas of more local scenic amenity value to the community taking a defined qualitative approach. However, the key concepts of the guideline and the associated mapping (as discussed further in **Section 5.1: Regional landscape context**) have informed the baseline assessment and the analysist outputs as described in **Section 4: Methodology**.

The following documents that apply to NSW have also been considered and, where relevant, applied to the LVIA process for this Project to ensure consistency of approach for the landscape assessment and mitigation approach across the QLD and northern NSW sections of the Inland Rail Program. These are summarised in **Table 4**.

Table 4: Regulatory Context – NSW State and Regional

Legislation, policy or guideline	Relevance to the Project
NSW	
<u>Beyond the Pavement: RTA urban design policy, procedures and design principles (2014)</u> *Beyond the Pavement* is a high-level urban design policy that systematically incorporates urban design thinking into infrastructure projects, with a focus on delivering improved design outcomes and higher levels of community satisfaction. This Guideline is referenced in the IS Technical Manual as part of the Urb-1 Urban Design credit in the IS Rating Scheme.	• This plan is relevant to the entirety of the Inland Rail Program, as it is important to consider the broader impacts of the Project and associated infrastructure upon existing built form, communities and the natural environments the Project transects (including infrastructure associated with temporary construction such as laydown yards and construction lighting). • The key purpose of this policy is to ensure that: o Existing landscape and built environment qualities are understood and protected o Built projects contribute to the quality of the built environment in urban and rural contexts, and create a legacy for the future o The quality of life of local communities is protected or improved in terms of connections, access to facilities, proximity to noise, views, safety and sense of place. • The guidance considers *"…roads and bridges can be impressive and attractive feats of engineering which add visual interest and identity to the environment, or, if not designed well, can be visually unappealing and fail to be embraced by the community".* Relevant to the assessment of landscape and visual impacts, this report states that: • The architectural and landscape quality of transport infrastructure should be visually pleasing • Transport infrastructure should fit sensitively into its natural setting, protecting the scale and unique qualities of the places in which it is situated • Major built elements can add character and help transform areas for the better • The design quality of structures and elements contributes to how a place looks and feels and how robust and durable it is • Tunnel portals should be distinctive and elegant, address their rural or urban context • The location, scale and design of earthworks and structures should be kept in character with the existing landscapes and neither intrude into views from key sites and nearby properties, nor affect sites which may be of significant heritage or conservation value, or that have visual prominence or value • The retention of views helps define the scenic quality of a road or a journey • Views and viewpoints to heritage bridges, abutments and buildings should be maintained, as far as possible • Signage should be designed and located to minimise the visual impact on heritage buildings and ensembles, as well as structures of heritage significance, such as bridges, aboriginal heritage and culture, historic roads and the broader landscape of which these are part • Vegetation contributes to the uniqueness of a place, the 'greening' of a corridor and the overall tree cover of an area • Plantings in towns, cities and the countryside or along roads that can be considered to have heritage value, even if their heritage value has not yet been assessed and formally listed on an environmental plan or register should be preserved and respected.

Legislation, policy or guideline	Relevance to the Project
The Environmental Impact Assessment Practice Note – Guideline for Landscape Character and Visual Impact Assessment EIA–N04 (practice note EIA-N04) (RTA 2018) This practice note applies to projects which Road and Maritime Services (RMS) is seeking determination and approval to proceed. Therefore, it applies principally to road projects. It recognises the importance of landscape character and visual impact assessment to determine impacts on the character and views within a place to ensure a good urban design outcome.	• This document applies to NSW, however is worthy of consideration in the QLD context given the cross-border nature of the Inland Rail Program. • The purpose of this practice note is to: o Inform the development of the preferred route and concept design to avoid and minimise impacts up front. o Inform RMS, other agencies and the community about what avoidance, management and mitigation strategies would be implemented. • The note differentiates between the assessment of impact on an area's built, natural and cultural character or sense of place and the assessment of impacts on views. • The impact assessment process is based upon assessment of sensitivity to change and magnitude (scale, character, distance) of the proposal on an area or view. • A range of attributes for the assessment of landscape character are described and the guidance requires desk and field-based study to break the LVIA study area down into character zones. • The visual assessment methodology includes defining the extent of visibility, identifying key viewpoints and their sensitivity in order to assess visual impacts. • Guidelines are given for refining the concept through siting and mitigation using the RMS suite of urban design guideline documents.
Bridge Aesthetics: Design guidelines to improve the appearance of bridges in NSW (RMS, 2012) The purpose of this document is to help design teams produce bridges of aesthetic value.	• This document is relevant to the assessment of the design of bridge structures in NSW. Although this document applies to NSW and the *Road Landscape Manual* (2013) described above takes precedence within QLD, it is also worthy of consideration in the QLD context given the cross-border nature of the Inland Rail Program. This report states that: - (i) Bridge design should consider the visual impact of proposed infrastructure on the local context and be contextually appropriate. - (ii) Bridges along the route should be designed to create a visually consistent design language, that assists in placemaking and wayfinding.
NSW Sustainable Design Guidelines Version 3.0 (TfNSW, 2013) These guidelines are a key tool in helping to realise sustainable project outcomes and seek to deliver sustainable development practices by embedding sustainability initiatives into the planning, design, construction, operations and maintenance of transport infrastructure projects.	• The guidelines apply in NSW and incorporate the following key aims: o Minimising impacts on the environment, whether through transport operations, infrastructure delivery or maintenance. o Procuring, delivering and promoting sustainable transport options that achieve value for money and reduced life cycle costs. o Developing, expanding and managing the transport network that is sustainable and climate resilient. • The guidelines outline several sustainability initiatives (14 compulsory requirements and 2 sub requirements) that project teams are required to implement at each project delivery stage. • While these guidelines apply to NSW, they are worthy of consideration in the QLD context given the cross-border nature of the Inland Rail Program.

Legislation, policy or guideline	Relevance to the Project
Crime prevention and the assessment of development applications (DUAC, 2001). These guidelines are intended to assist councils identify crime risk and minimise opportunities for crime through the appropriate assessment of development proposals. This guideline provides a framework for the Hea-2 Crime Prevention credit in the IS Rating Scheme.	• This document applies to NSW, however is worthy of consideration in the QLD context given the cross-border nature of the Inland Rail Program. • The Project is mostly located in a rural area within privately-owned land with limited public accessibility limiting the applicability of the CPTED guidelines. However, CPTED needs to be considered where the alignment passes through settlements, near recreational areas or adjacent to recreation trails and walkways where people may be present close to the alignment. • The guidelines describe several basic CPTED principles to assess development applications including surveillance (both direct and indirect), access control, territorial reinforcement and space management. These principles apply to both construction and operation project phases.

3.3. Local

The Project passes through the LGAs of ICC, SRRC (which comprises the former Boonah Shire Council and Beaudesert Shire Council) and LCC. The provisions of the following planning schemes apply:

- City of Ipswich Planning Scheme (2006)
- Scenic Rim Regional Council Planning Scheme (2020)
- Logan Planning Scheme (2015).

The LVIA study area, beyond the Project disturbance footprint (as described in **Section 4: Methodology**), also includes part of the Lockyer Valley. Therefore, the following planning schemes have also been considered due to the potential for cross-border visual impacts:

- Lockyer Valley Regional Council planning scheme:
    - Laidley Shire Planning Scheme (2003)
    - Draft Lockyer Valley Planning Scheme[1].

These planning schemes recognise and protect areas valued for their landscape and/or scenic qualities, arising from nature conservation or rural characteristics. The key policies at the local level are summarised in **Table 5**.

In accordance with Schedule 6, Part 5, Section 26 (2) of the Planning Regulation 2017, development for the construction of transport infrastructure, where the infrastructure is government supported transport infrastructure cannot be made assessable development under the relevant local categorising instruments (i.e. planning schemes). Consequently, the provisions of these planning schemes do not apply to the Project. Notwithstanding this, the zoning intent for these areas as determined by the planning schemes have been taken into consideration when determining impacts of the Project on landscape and visual amenity in the area.

[1]A draft planning scheme was prepared for the Lockyer Valley Regional Council LGA to set out consistent development requirements across the entire LGA. As a result of feedback during public consultation and the adoption of the Planning Act 2016 a new draft planning scheme will be developed.

Table 5: Regulatory Context –Local Government Planning Schemes

Legislation, policy or guideline	Relevance to the Project
Local level	
<u>Ipswich Planning Scheme 2006</u> The Project alignment passes through the Ipswich City Planning Scheme area. The consolidated Ipswich Planning Scheme covers the entire LGA. The scheme divides the area into zones, with character places overlays and development constraints overlays with associated codes. Implementation guidelines are also included for specific topics.	• The alignment predominantly traverses land zoned as rural, comprising Rural A (RA: Rural Agricultural) and Rural B (Rural Pastoral) with the exception of Regional Business and Industry Investigation" (RBIA01 Ebenezer/Willowbank) located area around Paynes Road. • The wider LVIA study area includes Rural D (RD: Rural Conservation), Rural E (E: Special Land Management) and Conservation (CONRV). • Rosewood and Harrisville are zoned as Township Character Housing (TCH). Peak Crossing and Calvert are zoned Township Residential (TR). • The Planning Scheme includes some provisions with respect to landscape and visual amenity: • Section 1.7 Township Areas Strategy requires that uses are generally (2) (a) located outside…the scenic frame surrounding the townships and significant view corridors; and located and designed to (b)… avoid significant adverse effects on—(i) the maintenance of townscape quality; (ii) landmark features, main approach routes, gateways and edges; (iii) the character of the towns; and (iv) places of cultural significance or streetscape value (inclusive of their setting and overall character). • Part 3.1 Desired Environmental Outcomes includes provision that: 3(a) the values of significant natural features, including the principal conservation areas are not compromised; (b) adverse effects on the natural environment are minimised or prevented with respect to the loss of natural vegetation and associated habitat, soil degradation, …and the like; and (m) rural areas are conserved and protected from incompatible uses such as urban residential. • Part 10.6 Overall Outcomes for Rural Areas includes provisions for amenity and rural landscape as follows: (j) there is a high standard of amenity in rural areas and uses in these areas are compatible with the overall rural setting (k) uses and works are designed and located in a manner which is appropriate and compatible with: (i) the extensive view corridors to rivers, hillsides, prominent ridgelines and peaks. (ii) the maintenance of the rural landscape quality, including existing building style. (o) Cultural Significance and Streetscape Value: Uses and works are designed and located in a manner which is appropriate and compatible with identified places of cultural significance or streetscape value. • There are no specific scenic amenity overlays or view corridors noted in the plan, although regionally significant amenity areas identified through *ShapingSEQ* apply.
<u>Scenic Rim Planning Scheme (2020)</u>	• The Project alignment passes through the northern part of the Draft Scenic Rim planning area, which covers the entire SRRC LGA. • The alignment predominantly traverses land zoned as "Rural", in the draft Scenic Rim Planning Scheme zone maps. The alignment traverses a small area zoned as "Recreation & Open Space" (approx. Ch 43400 – 44400) near Wild Pig Creek Road and land zoned as "Special Purpose" within the Bromelton SDA Precinct (approx. Ch 51500 – 5450). • The Planning Scheme includes some provisions with respect to landscape and visual amenity: o Section 3.3 Strategic Vision states that development in the region has (2) maintained rural production as the foundation of the region's economy, whilst having protected the region's natural assets and rural amenity; (3) protected and enhanced the natural beauty, environment, natural resources and rural landscapes; and (4)

Legislation, policy or guideline	Relevance to the Project
	retained and strengthened the heritage character and community pride experienced in towns and villages through carefully managed development. o Clear visions for the region's towns are also stated, while the other rural villages dispersed within the Rural Areas of the region including Aratula, Harrisville, Mount Alford, Peak Crossing, Roadvale and Tamborine, have retained a strong rural character with the history of these villages conserved for the community and visitors to respect and appreciate. • The rail alignment crosses land identified as "Rural Areas" on Strategic Framework Map SFM-01. Section 3.4.1 sets out the strategic intent for rural areas. o Rural areas are to retain their distinctive and attractive rural and natural landscape qualities including, but not limited to: (1) expanses of productive rural farmland; (2) forested mountain ranges contributing to the region's iconic scenic backdrop; (3) waterways and dams set amongst a varying landscape from forested, steep upper reaches to open floodplain; and (4) scenic viewing experiences within forested hills and valley settings. • Section 3.4.2 includes the following strategic outcomes for rural areas: o (2) Non-rural activities are located and designed to preserve the landscape character and scenic amenity of Rural Areas, which include (but are not limited to) the following rural and natural qualities: (a) expanses of productive rural farmland; (b) forested mountain ranges contributing to the region's iconic scenic backdrop; (c) waterways and dams set amongst a varying landscape from forested, steep upper reaches to open floodplains; and (d) scenic viewing experiences within forested hills and valley settings. o (8) The level of amenity expected in a Rural Zone (excluding precincts) is predominantly representative of a traditional rural environment. • The rail alignment crosses land identified as "Bromelton SDA" on Strategic Framework Map SFM-01. Section 3.4.1 sets out the strategic intent for this area. - The Bromelton SDA is identified as an area that will develop into an industrial area of regional, State and national significance, primarily intent on accommodating logistic operations and rail-dependent industries. • There are two small areas identified as "Townships" on Strategic Framework Map SFM-01 with the LVIA study area. Section 3.4.1 sets out the strategic intent for townships. - Townships will remain in their current settlement pattern, with residential scale uses, to preserve their distinctive character that is interconnected with the region's rural history. Townships continue to facilitate a flexible mixed-use environment comprising low density residential, small scale commercial and low impact industrial uses that services the residents of Townships and their immediate rural areas. Development is designed to preserve and complement the streetscape and historic character, and the existing settlement pattern of Townships. • Section 3.4.2 includes the following strategic outcomes for township areas: o (2) Development is of a low rise and low intensity, and complements the existing streetscape, rural character and settlement pattern of the Township. Development also maintains and complements the Township's existing character through the retention of historic and traditional buildings, and the use of design elements found in traditional buildings such as similar roof form, materials, scale and setbacks.

Legislation, policy or guideline	Relevance to the Project
	• The Strategic Framework Map SFM-01 area also includes in the eastern extent of the LVIA study area small areas identified as “Acreage Areas”, “Investigation Areas” and “Urban Areas”, however due to the distance of these from the alignment they are not discussed in detail. • Although there are no specific scenic amenity overlays or view corridors for the LVIA study area noted in the plan, the regionally significant amenity areas identified through *ShapingSEQ* apply.
Draft Lockyer Valley Regional Council Planning Scheme Lockyer Valley Regional Council is in the process of producing a Draft Lockyer Valley Planning Scheme. Until its adoption, the planning schemes currently in force and effective across the Lockyer Valley Regional Council area are those of the former Gatton and Laidley Shires which were in place when these shires were amalgamated to form the Lockyer Valley Regional Council on 15 March 2008.	• There are no specific landscape or scenic amenity overlay maps or associated codes. • As a result of feedback during public consultation period and the passage of the *Planning Act 2016* by the QLD Parliament, Council has determined to review the content of draft planning scheme and prepare an amended planning scheme document and amended mapping. • The draft Lockyer Valley Planning Scheme is still under review by the State government.
Laidley Shire Planning Scheme (2003) The scheme divides the area into zones with associated codes.	• The Project alignment and disturbance footprint mostly crosses land zoned “Rural Landscape” and “Rural Agricultural Land”, however it also intersects land zoned as “Urban Residential”, “Open Space and Reserves”, “Community Purpose”, “Business”, “Industrial”, “Rural Residential”, “Residential Expansion” and “Rural Uplands”, in the Laidley Shire Planning Scheme zoning maps. • Section 3.1 discusses desired environmental outcomes for the Laidley Shire, making specific reference to the following desired outcome under the heading of ‘Environment’: (a) The areas of high scenic amenity, remnant vegetation, wetlands, fauna habitats and wildlife corridors and regionally significant open space in the Shire are protected. (d) Places of historical and indigenous cultural heritage and social significance are protected, maintained and enhanced. • Section 6.2.5 Specific Outcomes for the Rural Uplands Area states that “*the scenic values of the natural landscape are protected from development, or the effects of development, that may significantly reduce the scenic value, amenity and rural character.”* • Section 6.5.2 Specific Outcomes for the Business and Village Area states that “*the heritage character and amenity of the business and village areas is retained”.* • Section 6.7.2 Overall Outcomes for the Areas of Natural and Environmental Significance Overlay Code states that *“buildings and/or facilities do not compromise the Shire’s natural environment or scenic amenity”.* • Section 6.8.2 Overall Outcomes for the Places/Areas of Cultural Heritage Significance Overly Code seeks the protection of *indigenous and non-indigenous cultural heritage areas.* Specific Outcomes include: o 2. Any development complements the existing streetscape and character of a locality and assists with integration into the public streetscape. • Section 6.9.2. Overall Outcomes for the Development Constraints Code states that the provision of public infrastructure, such as… railways…are safe and efficient, and the potential impacts on the community and the environment are minimised.

Legislation, policy or guideline	Relevance to the Project
	• Specific Outcomes for Existing and Proposed Rail Corridor: o 7. Landscaping and built form support the function of the corridor and enhance the local amenity along the existing rail corridor. • Section 6.19.3 Specific Outcomes and Acceptable Solutions for the Filling and Excavation Code: o 1. Filling and excavation activities do not detrimentally impact upon surrounding amenity, and the stability of adjoining land is compatible with such activities.

4. Methodology

The LVIA methodology has been developed with reference to guidelines and techniques used in Australia and internationally, including:

- Australian Institute of Landscape Architects (AILA) QLD (2018) Guidance Note for Landscape and Visual Assessment (GNLVA)
- Environmental Impact Assessment Practice Note – Guideline for Landscape Character and Visual Impact Assessment EIA–N04 (practice note EIA-N04) (RTA 2018)
- The Landscape Institute and the Institute of Environmental Management and Assessment (2013) Guidelines for Landscape and Visual Impact Assessment, Third Edition (GLVIA3), Routledge
- The Landscape Institute and the Institute of Environmental Management and Assessment (2002) Guidelines for Landscape and Visual Impact Assessment, Second Edition (GLVIA2), Spon Press
- South East Queensland Regional Plan (SEQRP) Implementation Guideline No 8 Identifying and protecting scenic amenity values, QLD Government (2007)
- Landscape Institute (2018) Technical Guidance Note: Photography and Photomontage in Landscape and Visual Impact Assessment, Public Consultation Draft 2018-06-01
- Landscape Institute (2011) Landscape Institute Advice Note 01/09: Use of photography and photomontage in landscape and visual assessment
- Topic Paper 6: Techniques and Criteria for Judging Capacity and Sensitivity Scottish Natural Heritage and The Countryside Agency (2006)
- Australian Standard 4282 – Control of Obtrusive Effects of Outdoor Lighting (1997)
- The Institution of Lighting Engineers UK (2005) Guidance Notes for Reduction of Obstructive Lighting.

As described in the GNLVA (AILA, 2018):

> *"Landscape and Visual Assessment (LVA) is an essential tool of reconciling development with landscape and scenic values and promoting better outcomes for our communities."*

4.1. Definition of the LVIA study area

For the purposes of the assessment, the LVIA study area has been defined as the area that has potential to influence landscape and/or visual values and receptors (refer to **Figure 2: LVIA Study Area**). This is based on:

- The horizontal and vertical alignment for the Project
- VAM, which establishes the theoretical viewshed of the Project based on landform
- Assumptions regarding the likely extent of visibility of Projects of this nature, based on experience of previous similar projects in Australia such as the LVIA for the SFRC (AECOM 2008). It is considered unlikely that any visual receptors located beyond the boundary of the 10 km LVIA study area will be able to obtain views of the Project. However it is noted that the Project connects to the adjacent H2C and K2ARB Inland Rail projects, considered further in Section 10: Cumulative Impacts
- Refinement during the field survey stage.

4.2. Desktop assessment

A desktop analysis of existing landscape character and visual amenity for the LVIA study area was undertaken to inform this LVIA. The desktop analysis comprised assessment of the underlying topography, land cover and landscape values. Information sources that have been identified and reviewed through the desktop analysis include:

- Relevant planning schemes, policies and guidelines from local councils and the State Government (see Section 3: Legislation, policies, standards and guidelines)
- Publicly available information on recreation spaces and public visitor areas
- Traffic count data
- Digital aerial photography (imagery obtained 2018 from Google Earth)

- Cadastral data (showing roads, property boundaries and built areas)
- QLD bioregion data Interim Biogeographic Regionalisation for Australia (IBRA) Environmental Resources Information Network (ERIN)
- Shuttle Radar Topography Mission (SRTM) (DEM1S) data - landform and topography
- EPBC Act protected matters search tool
- Department of Natural Resources, Mines and Energy (DNRME) - watercourses and drainage features
- Department of Environment and Science (DES) - matters of State environmental significance
- Other GIS information available online
- SFRC Landscape and Visual Impact Assessment prepared by AECOM (2008).

4.3. Visibility Analysis Mapping study

The VAM (sometimes also known as a 'Zone of Theoretical Visibility' (ZTV) study) comprises a digitally mapped representation of the area within which a proposed development may have an influence or effect upon views and visual amenity. It is used as a desktop tool to inform the visual assessment, including selecting representative viewpoints for more detailed assessment through field survey.

ESRI ArcGIS 10.5.1 software has been used to model the VAM. The viewshed analysis tool in ArcGIS was used to identify the cells in the Digital Elevation Model (DEM) that are potentially visible from the observation features. These cells are selected mapped points along the rail alignment at approximately 500 m intervals and their known elevations. Cells in the DEM that are in the theoretical visible line of sight of each part of the rail line are given the value of 1 (potentially visible). Cells that are not in the line of sight of each observation feature, due to being obscured by intervening landform, are given the value of 0 (not visible). The DEM was derived from a combined DEM lidar survey (resampled to a raster size of 20 m) within 5 km of the Project and SRTM data (DEM1s) beyond this distance (at 30 m resampled back to 20 m).

The calculation of the VAM does not take into account any built development, which can locally reduce the availability of receptors views. However, based on field observations, it is considered that because built development within the LVIA study area is generally minimal, it would be unlikely to meaningfully affect the extent of the identified visible zone. VAMs also do not account for vegetation which can significantly affect visibility locally and over large forested areas (such as State forests).

An additional VAM was produced during the assessment period indicating the height of the double stacked train (i.e. to a height of 6.5 m above the rail alignment).

Further analysis was undertaken to compare the VAM of permanent infrastructure with the VAM of the double stacked train. This assisted in determining the extent to which the operational rolling stock may affect visibility of the Project. Preparation of a VAM comparing the difference between operational infrastructure and the rolling stock assisted further.

Collectively the VAM outputs were used with other desktop information (such as cadastral information indicating the likely presence of visual receptors) to assist in identifying view sheds and potential major views and outlooks for further analysis in the field. This approach was used to meet the requirements of the ToRs by assessing the visual impact of the construction and operation of the Project on major views, view sheds, outlooks, and features contributing to the amenity of the area as described in **Section 2.1: Project Terms of Reference**.

4.4. Field survey

Two field visits to assess the LVIA study area were carried out from 23 to 24 and 30 to 31 August 2018. These were undertaken by a landscape planner with extensive experience in LVIA accompanied by a landscape architect skilled in landscape photography.

The purpose of the field assessment was to ground truth the findings of the desktop assessment and to assess landscape character and visual amenity, including identifying sensitive viewpoints requiring further assessment. Photographs were taken to:

- Portray landscape character
- Inform the viewpoint assessment from representative viewpoints
- Provide base images to produce visualisations.

The field visit focused on aspects of the landscape with potential to be of the greatest sensitivity to the Project and to understand the Project infrastructure that is most likely to affect landscape character and visual amenity values.

4.5. Stakeholder and community consultation inputs

Community perception of Inland Rail is an important consideration in assessing the landscape and visual impact of the Project. Therefore, a stakeholder and community engagement process has been developed for the Project. Relevant feedback from preliminary consultation activities undertaken by others (including as part of the Social Impact Assessment) has informed the landscape and visual amenity assessment, where appropriate. Issues raised during consultation that have informed the landscape and visual assessment process include:

- Comments about the desirability of providing planting along embankments to screen the alignment
- Concerns about impacts upon the 'amenity' of towns and freehold properties
- Concerns about impacts upon visitors' enjoyment of tourist facilities and local businesses.

This includes, for example, selection of particular viewpoints for the visual assessment and informing the sensitivity of identified landscape and visual values.

In later Project phases, visualisations have been developed to inform the landscape and visual amenity assessment and communicate the impacts of the Project to stakeholders. Feedback from stakeholders and the community on these visualisations has, where appropriate, informed the assessment. The visualisation process is described further in **Section 4.8: Landscape impact assessment methodology**.

4.6. Identification of potential Project impacts

This component of the LVIA includes describing infrastructure that is likely to be associated with the Project, such as the presence of embankments, bridges, cuttings, fencing and level crossings as well as the movement of freight trains through the landscape.

The potential for impacts of different types across a range of Project phases, scales and timeframes are considered, including:

- Temporary (short-term) and permanent (long-term)
- Reversible and irreversible
- Beneficial, neutral and adverse
- Daytime and night-time (lighting)
- Construction and operation
- Cumulative.

These potential impacts are further discussed in **Section 6: Potential Impacts**.

4.7. LVIA methodology overview

The LVIA methodology is a significance assessment as described in the EIS' Chapter 4: Assessment Methodology. The significance assessment method has been applied to environmental values that will be impacted by the Project where impacts cannot be quantified. Unlike some other technical disciplines there are no established, measurable thresholds of significance for defining either landscape or visual impacts, although there are some standards associated with lighting. The purpose of the LVIA process is to determine the level of significance of impacts on the landscape and visual resource, during day and night, during both construction and operation phases of the Project.

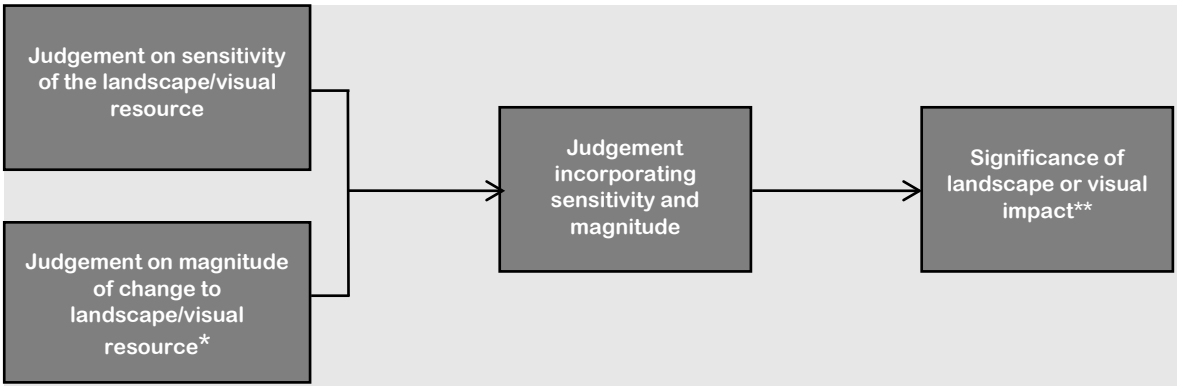
The significance of a potential impact is assessed in terms of the sensitivity (or vulnerability) of the environmental value, and the magnitude of the potential impact. The LVIA significance methodology is, therefore, determined by considering the sensitivity of the landscape or visual receptor and the magnitude of change to the receptor anticipated as a result of the Project.

It is noted that the LVIA methodology has defined its own thresholds for sensitivity and magnitude that are different to the criteria in Chapter 4: Assessment Methodology of the EIS and follow criteria and principles more widely-used for the assessment of landscape and visual impacts. This is because many landscape values, including views, are rarely listed on statutory State, national or international registers. Assessment at the LGA level of landscape and visual values is also not always available and is frequently inconsistent. Therefore, establishing common criteria specific to landscape and visual values is more likely to result in a fair assessment of values and sensitivity. Similarly, magnitude criteria need to be defined that recognise the range of factors relevant to LVIA, for example the number of people experiencing a change in view and the intensity of the change.

The significance assessment matrix has also been streamlined to remove 'major' for sensitivity and magnitude established in Chapter 4: Assessment Methodology of the EIS since these thresholds are difficult to translate to landscape and visual values. For example, 'major sensitivity' elements are not anticipated to be present since there are no 'entirely intact' landscapes within the LVIA study as all have been influenced by human activities. Similarly, 'major magnitude' is unlikely because any Project impacts on landscape or visual values would be reversible, with sufficient time and budget.

Although related, landscape, visual and lighting impacts are considered separately for clarity. This process is illustrated in **Plate 1** and described in further detail in **Section 4.8: Landscape impact assessment methodology**, **Section 4.9: Visual impact assessment methodology** and **Section 4.10: Lighting impact assessment methodology**.

Plate 1: Landscape and Visual Impact Assessment Process



* There is no standard methodology for the quantification of the magnitude of effects; however, it is generally based on the scale or degree of change to the landscape or visual resource, the nature of the effect and its duration.

** Overall landscape or visual impact is determined by combining the sensitivity of the landscape or visual resource with the magnitude of change. Professional judgement is used to determine the overall significance of impact based on these two elements.

While the values placed on views and landscapes may be culturally influenced, the GNLVA (AILA, 2018) states the following general principles have been consistently found in scenic preference studies and community consultation:

- Water and natural elements are preferred over urban scenes
- Mountains and hills are preferred over flat land
- Views are preferred which include both mid-ground elements (with some detail discernible) and a background
- Views with skyline features and views which include focal points are preferred
- Views dominated by, or with a high proportion of attractive features (such as mountains) are considered to be more attractive, and hence more important to retain, than those with only a minor or distant proportion of such elements
- Panoramic views with a number of such distinctive elements are more attractive and worthy of protection than narrow view corridors or a line of sight to a single element
- Diversity is generally preferred over uniformity, and heritage over modernity, but these need to be balanced with preferences for consistency and coherence of built form, which are also valued
- Viewpoints (including residences and public places) may have primary views in one direction (e.g. to an attractive or distinctive feature) and secondary views in other directions. The distinction may be related to desirability of views (e.g. river views), viewing distance, or to the orientation of viewpoints (e.g. lookouts)
- Discordant elements which contrast markedly with their otherwise-attractive settings are often regarded as having a detrimental impact on amenity. This depends on the viewing distance and proportion of view affected, and overall design
- Views from accessible public spaces (streets, lookouts, parks etc.) are valued more than views available only from private residences.

4.8. Landscape impact assessment methodology

The landscape assessment is based upon an analysis of landscape character, including those landscape features that contribute to the amenity of the area; particularly any landscape values identified in legislation or planning documents during the desktop phase or through community and stakeholder consultation.

Landscape character assessment is a tool for identifying what makes one place different from another. It identifies what makes a place distinctive, without necessarily assigning a value to it. This approach has been used to establish the existing character of the landscape to provide a framework for measuring the impact of the Project on landscape character. Landscape character types (LCTs) have been defined and, where necessary, these have been further subdivided into geographically distinct landscape character areas (LCAs). The general character of the landscape and the identified LCTs are described in **Section 5.1: Regional landscape context** and **Section 5.2: Landscape character**.

4.8.1 Landscape sensitivity

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 and values. Therefore, assessment of sensitivity is based on the scale and location of the Project and how this relates to the landscape characteristics of the LVIA study area. For example, undulating forested landscapes may be sensitive to removal of vegetation and creation of cuttings. Sensitivity to change also considers landscape values protected by legislation or policies (such as National Parks or locally-valued landscapes protected in a local planning scheme).

Levels of sensitivity vary according to the type of development and the nature of the landscape. Key aspects that have been considered when identifying the level of sensitivity associated with each LCT include:

- The landscape's inherent values (e.g. perceptual qualities, cultural importance, and any specific values that may apply, such as landscape planning designations, as described in **Section 3: Legislation, policies, standards and guidelines**)

- The landscape's ability to absorb changes associated with the Project (e.g. the extent to which the Project may fit or be absorbed into the landform, land use, pattern, scale or texture of the existing landscape).

A guide to these are shown in **Table 6**.

Table 6: Defining landscape sensitivity

Sensitivity of landscape	Attributes of landscape sensitivity categories
High	A landscape protected by national designation (such as a National Park) and/ or widely acknowledged for its quality and value; a landscape with distinctive character and low capacity to accommodate the type of change envisaged.
Moderate	A moderately valued landscape, perhaps a regionally important landscape and/or protected by regional/State designation, or where its character, land use, pattern and scale may have some capacity to accommodate a degree of the type of change envisaged.
Low	A landscape valued to a limited extent, perhaps a locally important landscape or where its character, land use, pattern and scale is likely to have the capacity to accommodate the type of change envisaged.
Negligible	A landscape which is not valued for its scenic quality or where its character, existing land use, pattern and scale are tolerant of the type of change envisaged, and the landscape has capacity to accommodate change.

4.8.2 Magnitude of change to landscape amenity

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

Magnitude of change is described as Negligible (barely perceptible change), Low (noticeable change), Moderate (considerable change) or High (dominant change), as illustrated in **Table 7**.The descriptions of magnitude and sensitivity are illustrative as there is no defined boundary between levels of impacts.

Table 7: Defining magnitude of change to landscape character

Magnitude of change to landscape	Typical examples
High	Dominant change: A clearly evident and frequent/continuous change in landscape characteristics affecting an extensive area, which is likely to fundamentally change the character of the landscape.
Moderate	Considerable change: A considerable change in landscape characteristics, frequent or continuous and over a wide area or a clearly evident change, but over a restricted area.
Low	Noticeable change: A noticeable change in landscape characteristics over a wide area or a considerable change over a restricted area but will not fundamentally change the character of the landscape.
Negligible	Barely perceptible change: An imperceptible, barely or rarely perceptible change in landscape characteristics.

4.8.3 Significance of landscape impact

An evaluation of overall potential effects on landscape character is based on the sensitivity of the existing landscape to change and the magnitude of change that is likely to occur. No prescribed methods for assessment of significance of landscape impacts exist; therefore, professional judgement and experience are applied to identify the level of significance. Each landscape receptor is assessed on its own merits, as factors unique to each circumstance need to be considered. However, there are general principles which can be used as a guide to this process that provide transparency about how judgements have been made as described in in **Section 4.7: LVIA methodology overview**. The overall significance of change to landscape amenity is determined by using **Table 8: Determining level of effect on landscape values**.

Table 8: Determining level of effect on landscape values

Level of effect		Magnitude of change to landscape amenity			
		High (Dominant change)	**Moderate (Considerable change)**	**Low (Noticeable change)**	**Negligible (Barely perceptible change)**
Sensitivity of landscape	**High**	Major	High	Moderate	Low
	Moderate	High	Moderate	Low	Low
	Low	Moderate	Low	Negligible	Negligible
	Negligible	Low	Low	Negligible	Negligible

In instances where there is no magnitude of change and no potential impacts on landscape character are anticipated, a judgement of no impact is recorded.

Classification of significance of impact is considered as described in **Table 9**.

Table 9: Significance classifications

Significance	Description
Major	Arises when an impact will potentially cause irreversible or widespread harm to an environmental value that is irreplaceable because of its uniqueness or rarity. Avoidance through appropriate design responses is the only effective mitigation.
High	Occurs when the proposed activities are likely to exacerbate threatening processes affecting the intrinsic characteristics and structural elements of the environmental value. While replacement of unavoidable losses is possible, avoidance through appropriate design responses is preferred to preserve its intactness or conservation status.
Moderate	Results in degradation of the environmental value due to the scale of the impact or its susceptibility to further change even though it may be reasonably resilient to change. The abundance of the environmental value ensures it is adequately represented in the region, and that replacement, if required, is achievable.
Low	Occurs where an environmental value is of local importance and temporary or transient changes will not adversely affect its viability provided standard environmental management controls are implemented.
Negligible	Does not result in any noticeable change and hence the proposed activities will have negligible effect on environmental values. This typically occurs where the activities are located in already disturbed areas.

4.9. Visual impact assessment methodology

4.9.1 Identification and description of visual receptor audiences and viewpoints

The visual assessment is based upon an analysis of views and viewsheds; particularly any major views or outlooks identified in legislation or planning documents during the desktop phase or through stakeholder and community consultation.

Visual receptor audiences are assessed and described in terms of the views which can be obtained from selected representative viewpoints within the LVIA study area. The specific viewpoints used for the assessment have been selected based upon outputs from the VAM study and field survey (as described in **Section 4.3: Visibility Analysis Mapping study** and **Section 4.4: Field survey** respectively). Consistent with typical landscape and visual assessment practice, viewpoints on private properties have not been visited or assessed. Where appropriate, publicly accessible locations nearby have been selected to represent private views.

Potential representative visual audiences and receptors have been identified based on a range of parameters including:

- Proximity of the receptor: the most affected visual receptors are typically anticipated to be located within a 5 km radius of the Project unless located at an elevated vantage point (therefore the LVIA study area extends to 10 km from the Project)
- Type of visual receptor/visual receptor audience, for example:
    - A permanent resident of a dwelling or homestead
    - Drivers or passengers of vehicles passing through the LVIA study area
    - Members of the public accessing marked recreational areas (for example in national parks, State forests, cycle ways, footpaths and public parks and sportsgrounds)
    - An industrial or commercial worker (excluding those employed as part of the Project).

These visual receptor audiences and representative viewpoints are discussed further in **Section 5.3: Visual assessment baseline** and **Section 8: Visual Impact Assessment**.

4.9.2 Visual sensitivity

The sensitivity of each viewpoint and the visual receptor audiences which it represents, is considered to be dependent upon the:

- Importance of the view, its existing scenic qualities and the presence of other existing man-made elements in the view
- Type of the visual receptor audience and their likely interest in the view (e.g. residents, visitors to important/valued landscapes or visitors to non-designated areas, motorists)
- Volume of visual receptors and the duration of time that receptors spend experiencing the view.

The GLVIA (2002) states '*changes affecting large numbers of people are generally more significant than those affecting a relatively small group of users.*' Similarly, GLVIA (2013) states the visual receptors most susceptible to change include '*… residents at home…people, whether residents or visitors who are engaged in outdoor recreation, including use of public rights of way whose attention or interest is likely to be focused on the landscape and on particular views; …communities where views contribute to the landscape setting enjoyed by residents in the area*'. This guidance is reflected in the method used to assess the sensitivity of the viewpoints to the Project. For example, views from a regionally important location where viewers' interest is specifically focussed on the landscape (such as views from a scenic viewpoint in a National Park) have been judged as having a high sensitivity to change as have large numbers of residential viewers. In contrast, passing transient views from cars are typically judged to have lower sensitivity.

Levels of sensitivity, shown in **Table 10**, vary according to the type of development and the visual receptor audience.

Table 10: Defining visual sensitivity

Sensitivity of viewpoint	Attributes of visual sensitivity categories
High	Large numbers of viewers or those with proprietary interest and prolonged viewing opportunities such as residents and users of attractive and/or well-used recreational facilities. Views from a regionally important location whose interest is specifically focussed on the landscape, for example a national park.
Moderate	Medium numbers of residents (e.g. rural communities and townships) and moderate numbers of visitors with an interest in their environment e.g. visitors to State forests, including bush walkers, horse riders, trail bikers. Larger numbers of travellers with an interest in their surroundings, for example, local designated scenic routes.
Low	Small numbers of visitors with a passing interest in their surroundings or transient views e.g. those travelling along principal roads. Viewers whose interest is not specifically focussed on the landscape, for example, workers, commuters, truck drivers.
Negligible	Very occasional numbers of viewers with a passing interest in their surroundings, for example, those travelling along minor roads and views from the air.

4.9.3 Magnitude of change to visual amenity from representative viewpoints

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 change also depends on the loss, change or addition of any feature in the field of view of the receptor; or any change to the backdrop to, or outlook from, a viewpoint. The level of effects on a view depend on the extent of visibility, degree of obstruction of existing features, degree of contrast with the existing view, angle of view, duration of view and distance from the Project.

Magnitude of change is described as Negligible (barely perceptible change), Low (noticeable change), Moderate (considerable change) or High (dominant change), as illustrated in **Table 11**. Full descriptions on the magnitude of change from each representative viewpoint are discussed further in **Section 8: Visual Impact Assessment**.

Table 11: Defining magnitude of change to visual amenity

Magnitude of Change	Typical examples
High	Dominant change: Major changes in view at close distances, affecting a substantial part of the view, continuously visible for a long duration, or obstructing a substantial part or important elements of view. Generally, short distances (typically < 250 m) to the nearest Project infrastructure element.
Moderate	Considerable change: Clearly perceptible changes in views at intermediate distances, resulting in either a distinct new element in a significant part of the view, or a more wide-ranging, less concentrated change across a wider area. Generally, short to medium views (typically 250 m – 1 km) to the nearest Project infrastructure.
Low	Noticeable change: Minor changes in views at long distances or visible for a short duration, and/or are expected to blend in with the existing view to a moderate extent. Generally, medium to long distance views (typically 1 km – 2.5 km) to the nearest Project infrastructure.
Negligible	Barely perceptible change: Change which is barely visible at a very long distance or visible for a very short duration, and/or is expected to blend with the existing view. Distant views (generally > 2.5 km) to the nearest Project infrastructure.

4.9.4 Significance of visual impact

Impacts on the visual resource have been described by representative views in the LVIA study area. Impacts can be short term (i.e. those occurring during installation/construction of a development) or long term (i.e. those lasting for the life time of the Project). In addition, they can be wide spread (i.e. taking up a large proportional change in the view) or localised.

The evaluation of overall potential impacts on visual amenity is based on the sensitivity of existing views to change and the magnitude of change that is likely to occur. No prescribed methods for assessment of significance of impacts on visual amenity exist; therefore, professional judgement and experience are applied in order to identify the level of significance. Each viewpoint is assessed on its own merits, as factors unique to each circumstance need to be considered. However, the general principles outlined in **Section 4.7: LVIA methodology overview** and this section provide transparency about how judgements have been made. The overall significance of change to landscape amenity is determined by using **Table 12**.

Table 12: Determining level of effect on visual values

Level of effect		Magnitude of change to visual amenity			
		High (Dominant change)	**Moderate (Considerable change)**	**Low (Noticeable change)**	**Negligible (Barely perceptible change)**
Sensitivity of views	**High**	Major	High	Moderate	Low
	Moderate	High	Moderate	Low	Low
	Low	Moderate	Low	Negligible	Negligible
	Negligible	Low	Low	Negligible	Negligible

In instances where there is no magnitude of change and no potential impacts on visual amenity are anticipated, a judgement of no impact is recorded.

Classification of significance of impact is considered as described in **Table 9**.

4.9.5 Preparation of visualisations

Visualisations are artist's illustrations that aim to represent an observer's view of a proposed development. For the purposes of this assessment, visualisations have been prepared to represent the potential visual impact of the presence of the Project from a selection of the representative viewpoints identified. Visualisations have been used to:

- Assist with community and stakeholder consultation through providing an artist's impression of features of the Project that affect key views identified in the assessment
- Illustrate the visual impact assessment to assist in the interpretation of the findings
- Validate the assessment of magnitude of change
- Inform the development of mitigation measures by identifying opportunities for Project modifications, including landscape and urban design proposals (such as screen planting or alternative materials), to help integrate the Project into its visual and landscape setting.

Visualisations have not been prepared for all viewpoints. Visualisations have been selected on the basis of those illustrating key infrastructure elements likely to be of interest to the community and/or the most sensitive viewpoints, such as from regionally-significant scenic lookouts.

The methodology for the visualisation production has been based on State and international guidance including the GNLVA (AILA, 2018), GLVIA (LI, 2013) and *Landscape Institute Advice Note 01/09: Use of photography and photomontage in landscape and visual assessment* (LI, 2011). Consideration has also been given to the Landscape Institute Technical Guidance Note: Photography and Photomontage in Landscape and Visual Impact Assessment, Public Consultation Draft 2018-06-01 (LI 2018).

The visualisations have been generated using the following sequential method:

- Step 1: Select and prepare candidate field imagery for photomontage base (field panorama preferred viewpoint):
    - Select preferred field photo location as part of representative LVIA condition.
    - Choose a sequence set of field photos from this location representing 75° horizontal field of view (H-FOV) (generally 2-3 overlapping images).
    - Create combined panorama from raw imagery and crop to 75°.
    - Note GPS location of chosen panorama camera position.

- Step 2: Assemble 3D design model on terrain model for each viewpoint
    - Import georeferenced 2 km x 2 km meshed terrain model Triangular Irregular Network (TIN) to SketchUp as base for Project design visualisation.
    - Drape georeferenced high resolution ortho aerial photography Enhanced Compression Wavelet (ECW via AutoCAD) onto TIN Mesh.
    - Create surface meshes from 3D Civil design geometry strings and insert into terrain model (12D Exports to DWG – Then inserted into SKP with geo-reference).
    - Add Structural Design Geometry of bridges and other design structures. (Export from Revit as IFC and inserted).
    - Cross check master assembly of geometries against contemporaneous general arrangement plans, sections and other details documents.
    - Cross check to ensure civil geometry closely matches terrain model (especially batters / earthworks).

- Step 3: Camera match field panorama in 3D design model
    - Create camera frame in 3D model with 75° H-FOV.
    - Locate approximate camera position in model based on GPS coordinates and Field Notes, set bearing and set camera height to photographer's eye height. Generally positional accuracy at this stage is +/- 5 m.
    - Create positional massing of existing site features (buildings, power poles, isolated trees, fencing and others) that are identifiable on both aerial and site photography.
    - Fine-tune camera position by superimposing field panorama and 3D model viewport. Positional iterations at this stage aim to locate 3D camera within 1 m of actual field position.

- Step 4: Site detail and entourage
    - Create or import site furniture or design detail, materials, planting, texture necessary or having significant visual impact or effect on visual character of the scene.
    - Create and insert suitable distribution of entourage and vehicles. Generally, this means illustrating a track use condition showing close proximity of typical representative double-stacked freight traffic.

- Step 5: 3D Rendering and photomontage creation.
    - Render 3D model at suitably high resolution for desired production outputs. For this LVIA reporting this is 7500 x 2500 pixels.
    - Composite rendered image with field panorama image using Adobe Photoshop.
    - Postprocessing and repair to existing site features. Remove and demolished site features (such as poles, trees and buildings) and make good any ground features to be altered permanently during construction.
    - Mask parts of rendered image that can be better represented by parts of field image (generally terrain).
    - Introduce new elements to the view including any proposed mitigation measures such as vegetation.

Every reasonable effort has been made to ensure the images are representative and have not been manipulated to downplay the extent of impact.

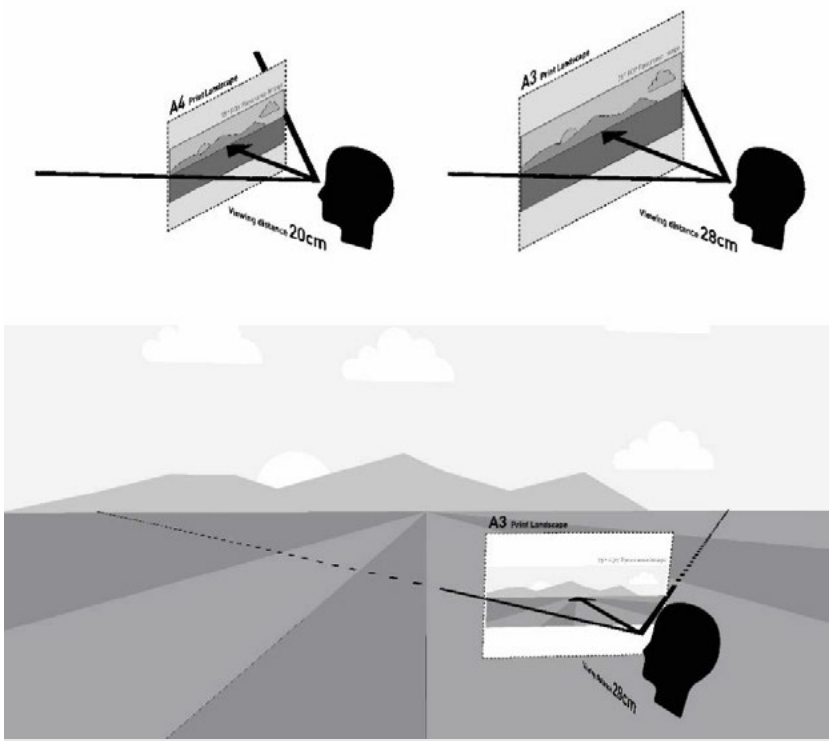
To ensure the photomontages consistently present a view which is representative of the human eye, the field assessment photographs were taken at around average human viewing height (typically considered to be 1.5 m). The photos were taken using a Canon EOS 6D Mark II body with a Sigma 50 mm f/1.4 DG JSM lens. The Canon EOS 6D is a full sensor lens. Using a 50 mm lens it has an equivalent Field of View as a Standard Single Lens Reflex (SLR) using 35 mm film and 50 mm focal length, which is the standard (albeit technologically outdated) recommendation for obtaining photographs that are representative of the human field of vision (40°).

Photo stitching software and Adobe Photoshop were used to piece together the adjoining images to produce a field of vision of approximately 75° that is considered representative of the human field of view. Although the parameters of human vision when stationary is often quoted as falling to between 45-60° (SNH, 2006), humans generally move their eyes, heads and bodies as necessary to experience a view. Therefore, a wider field of view has been used for the photomontages with 75° insets of key portions of the viewfield, which is in line with good practice.

Photomontages and visualisations should be viewed at the correct 'viewing distance'. Very simply, if the hard copy of the photomontage is held too close to the eye, the elements in the scene will appear too big; if it is held too far away, the elements will appear too small; and there is only one distance at which the photograph will match the real scene (the correct viewing distance).

The visualisations have been illustrated on A4 landscape pages, although could be printed at A3. The recommended viewing distance for each photomontage is determined by the image size and field of view and is represented in **Plate 2**.

Plate 2: Recommended viewing distance for photomontages and visualisations



4.10. Lighting impact assessment methodology

The lighting assessment is based upon an analysis of representative views identified through the visual assessment. Lighting impacts are considered during both construction and operation phases of the Project.

Construction will typically be undertaken during the following primary Project construction hours:

- Monday to Friday 6.30 am to 6.00 pm
- Saturday 6.30 am to 1.00 pm
- No work Sundays and public holidays.

Track possessions, when the construction contractor has control over an operating railway, will proceed on a 7 day/24-hour period. Track possession of QR assets will generally be allocated over weekend periods, with extended track possession occurring over holiday periods.

Works outside of primary Project construction hours may occur throughout the duration of the construction program and will involve:

- Delivery of concrete, steel, and other construction materials delivered to site by heavy vehicles
- Movements of heavy plant and materials
- Spoil haulage
- Tunnelling activities
- Arrival and departure of construction staff during shift change-overs
- Roadworks to arterial roads
- Traffic control crews, including large truck mounted crash attenuator vehicles, medium rigid vehicles, and lighting towers
- Incident response including tow-trucks for light, medium, and heavy vehicles.

Extended working hours would be considered permissible where there are no nearby sensitive receptors or impacts to receivers can be appropriately managed. Any changes to working hours would be supported by assessing impacts to sensitive receptors.

Lighting for construction activities will comprise night time lighting of compounds and works areas only as well as works within existing QR corridor areas and/or traffic management associated with road diversion schemes. Permanent lighting associated with the Project will also be minimal comprising only the train headlight, tunnel portal lighting, emergency lighting of tunnels adjacent to the egress walkway, substation lighting and safety lighting associated with features such as level crossings. Therefore, light spill during the construction and operational phase has been assessed through a high-level qualitative assessment.

As there is no prescribed assessment method for assessing the impacts of lighting on visual amenity, guidance and terminology has been taken from Australian Standard 4282 – *Control of Obtrusive Effects of Outdoor Lighting* (1997) and *Guidance Notes for Reduction of Obstructive Lighting* (2005) prepared by The Institution of Lighting Engineers UK. This information has then been combined with the standard method of assessment for impacts on visual amenity. Visual receptor audiences are assumed to be the same as those identified in the visual impact assessment process. The assessment is qualitative only.

4.10.1 Judgement of visual sensitivity to lighting

The sensitivity of each representative viewpoint to changes in after-dark lighting conditions due to the Project has been based upon elements illustrated in **Table 13** including:

- The proximity of the viewpoint to the greatest lighting source that is associated with the Project
- The public and private accessibility of the representative viewpoint location and the likely number of viewers who will visit the viewpoint.

Full descriptions on the judgements of visual sensitivity to lighting from each representative viewpoint are discussed in **Section 9: Lighting Impact**.

Table 13: Defining viewpoint sensitivity to lighting

Sensitivity of viewpoint	Attributes of viewpoint sensitivity to lighting categories
High	Easily accessible at night with large numbers of viewers or those with proprietary interest and prolonged viewing opportunities located at very close distances (typically less than 200 m) to the light source.
Moderate	Relatively accessible at night with medium numbers of viewers and close to the site or easily accessible with propriety interest but located some distance (typically up to 500 m) from the light source.
Low	Typically, location not accessed at night, with small numbers of visitors with a passing interest in their surroundings e.g. those travelling along principal roads or greater numbers of viewers but located at considerable distance from the light source (typically less than 1 km).
Negligible	Rarely accessed at night. Rural locations with very occasional numbers of viewers with a passing interest in their surroundings e.g. those travelling along minor roads and views from the air or located at greater than 1 km from the light source.

4.10.2 Magnitude of change to lighting from representative viewpoints

The magnitude of change to views and visual amenity due to lighting depends on the nature, scale and duration of the change to lighting that is expected to occur. The magnitude of change also considers any change to the backdrop of, or outlook from, the representative viewpoint. The assessment assumes a worst-case scenario without mitigation. The level of effect on a view depends on the extent of visibility, degree of obstruction of existing features, degree of contrast with the existing view and angle of view.

To enable the judgement of the magnitude of changes in lighting, **Table 14** considers the existing condition against the potential condition. These conditions include intrinsically dark, predominantly dark, predominantly lit, or brightly lit landscapes as a measure of change in visual conditions:

- Intrinsically dark– inherently remote rural landscapes with minimal artificial lighting other than that which is localised lighting of a dwelling. Typically, no street lighting and no industrial lighting.
- Predominantly dark – commonly rural residential landscapes where dwellings are still largely isolated from one another, creating a relatively dark atmosphere with intermittent sources of lighting (such as street lighting). Industrial lighting may occur in predominantly dark landscapes; however lengthy distances between these sites and residential dwellings result in minimal lighting spill onto private property.
- Predominantly lit – commonly small towns with standard elements of lighting such as street lighting and lighting from residential dwellings, commercial businesses and some industrial lighting
- Brightly lit – town/city centres or large-scale industrial landscapes with high levels of lighting.

The outcome of this judgement will result in either a high, moderate, low or negligible change to lighting conditions from the representative viewpoint. Full descriptions on the magnitude of change from each representative viewpoint are discussed in **Section 9: Lighting Impact**.

Table 14: Defining magnitude of change to lighting amenity

Magnitude of change	Typical examples
High	Dominant change: Occurs when an intrinsically dark landscape becomes brightly lit.
Moderate	Considerable change: Occurs when an intrinsically dark landscape becomes predominantly lit or a predominantly dark landscape becomes brightly lit.
Low	Noticeable change: Occurs when an intrinsically dark landscape become predominantly dark, a predominantly dark landscape becomes predominantly lit or a predominantly lit landscape becomes brightly lit.
Negligible	Barely perceptible change: Occurs when a landscape experiences negligible changes from the existing lighting conditions to the proposed lighting conditions.

4.10.3 Significance of lighting impact

This evaluation considers sensitivity of each representative night time viewpoint and the magnitude of change that is likely to occur. The general principles outlined in this section provide transparency about how judgements have been made. The overall significance of change to lighting amenity and individual viewpoints is determined by using **Table 15**.

Table 15: Determining level of effect on lighting values

Level of effect		Magnitude of change to lighting amenity			
		High (Dominant change)	**Moderate (Considerable change)**	**Low (Noticeable change)**	**Negligible (Barely perceptible change)**
Sensitivity of viewpoint to lighting	**High**	Major	High	Moderate	Low
	Moderate	High	Moderate	Low	Low
	Low	Moderate	Low	Negligible	Negligible
	Negligible	Low	Low	Negligible	Negligible

In instances where there is no magnitude of change and no potential impacts on lighting amenity are anticipated, a judgement of no impact is recorded.

Classification of significance of impact is considered as described in **Table 9: Significance** .

4.11. Mitigation and Residual Impact Assessment

Mitigation describes measures that can be implemented to avoid or reduce potential impacts to as low as reasonably practicable, based on the hierarchy of avoid, minimise, manage and offset. The aim of mitigation identified in the LVIA is to protect identified landscape and visual values. Measures may be implemented through Project design, construction methods, operating and/or maintenance procedures.

Some measures to avoid, mitigate and manage potential impacts form part of ARTC's standard environmental management procedures and, therefore, constitute the base case prior to the implementation of the identified mitigation measures.

Additional mitigation and management measures proposed as a result of the findings of this LVIA may be incorporated into the Project to further reduce identified impacts. These comprise a range of generic measures that are applicable to components across the Project as well as identification of measures that are specific to an infrastructure component or particular location. The mitigation measures are described in **Section 11: Mitigation and residual impact assessment**.

Residual impacts relate to any changes in the overall level of effect for potential impacts post the implementation of mitigation. This potentially includes measures that avoid an impact occurring or reduce the magnitude of change. The residual impact assessment is determined using the same process as for the landscape, visual and lighting assessment methodology described above. The residual impact assessment is presented in **Section 11: Mitigation and residual impact assessment**.

5. Description of Existing Landscape and Visual Amenity Values

5.1. Regional landscape context

The LVIA study area is located southwest of Ipswich City and includes areas within Ipswich City, Logan City and the Scenic Rim LGAs. A small part of the LVIA study area falls within the Lockyer Valley LGA, however the proposed alignment does not pass through this area. The eastern part of the LVIA study area falls within the Scenic Rim, a popular tourist destination recognised for its scenic beauty and includes the upland ranges of Flinders Peak, juxtaposed against the western part of the LVIA study area which comprises cleared pasture and arable floodplains with isolated rural settlements. The Project and its wider landscape context are illustrated in **Figure 1: Inland Rail regional context**.

5.1.1 Settlement and infrastructure

The Project traverses a broad range of landscapes, from isolated rural settlements, open woodland, pastoral and agricultural landscapes to the undulating and vegetated foothills of the Teviot Range. Extensive areas within the LVIA study area have been cleared for agricultural purposes and for the development of residential communities.

The nearest major town is Rosewood, situated 17 km west of Ipswich. The Rosewood State Suburb, relating to the township and surrounding area, is the most populous at 2,835 people (ABS, 2016). The rural settlements of Grandchester, Calvert, Harrisville and Peak Crossing are also within the LVIA study area and have populations (for State suburbs) of 501, 310, 427 and 972 respectively (ABS, 2016). Other rural residential developments within the LVIA study area include Deebing Heights, Yamanto, Thagoona and Willowbank; typically views from these rural residential areas are limited due to either their distance from the alignment or separation from the alignment by dense remnant vegetation that will not be affected by the Project.

The Bromelton SDA and Flagstone PDA are both located in the far eastern extent of the LVIA study area. The Project passes the northern part of the Bromelton SDA, through land identified within the ‘Rural Precinct’ of the Bromelton SDA Development Scheme, which is to provide for low impact rural and agricultural activities. The future development of Flagstone PDA is situated north of the proposed alignment and is estimated to provide approximately 50,000 new dwellings over the next 30 to 40 years. Proposed residential communities within these areas lie close to the alignment, with the proposed town centre and future residential neighbourhoods of the Flinders precinct situated approximately 500 m from the Project. It is noted that the current structure plan includes a 50 m wide biodiversity corridor along Woollaman Creek, district recreation and sports parks and outdoor recreation uses along this boundary which will provide a visual buffer.

The key roads within the LVIA study area are the Ipswich-Boonah Road (Route 93) and Cunningham Highway (Route 15) with Annual Average Daily Traffic (AADT) counts of 6,449 and 5,675 respectively. Other routes include the Rosewood-Laidley Road, Warrill View-Peak Crossing and Rosewood-Warrill View Road with 2,591, 1,419 and 1,041 vehicle movements a day, respectively. Some of these routes form part of scenic drives, as discussed further in **Section 5.3: Visual assessment baseline**. Other routes through the LVIA study area but located at greater distance from the alignment include the Mount Lindesay Highway, Centenary Highway, Beaudesert-Boonah Road, Ipswich-Rosewood Road and Warwick Road.

The Ipswich to Rosewood line is an existing operational passenger rail line located within the northern part of the LVIA study area. The line continues westwards to Laidley and beyond, and forms part of the twice weekly ‘Westlander’ service between Brisbane to Charleville, as well as supporting freight services (Australian Rail Maps, 2018).

The former rail line known as the Fassifern Branch of the Dugandan railway line once linked Boonah to Ipswich through part of the LVIA study area. The railway line is considered to be QLD's first branch railway and was progressively opened from 1882 to 1887 and closed in June 1964. Evidence of the railway can be seen in the form of tracks, embankments and cuts at various locations, especially at Peak Crossing and Harrisville, which retains a station building (QLD Historical Atlas, 2018).

Other major infrastructure in the LVIA study area include the Ebenezer and Park Ridge Industrial Development Areas, the Powerlink high voltage transmission line and Santos Moonie-Brisbane high pressure oil pipeline. There are also high voltage transmission towers, local powerlines and agricultural buildings present in parts of the LVIA study area.

5.1.2 Geology, landform and hydrology

Geology mapping was obtained from the Australian 1:250 000 Geological Series. The geology underlying the LVIA study area is largely volcanic in origin with large areas of sedimentary deposits, and is characterised by flat to gently undulating lowlands, through to ranges on metamorphic, sedimentary and igneous rocks. Accordingly, landform across the LVIA study area varies greatly and is characterised by craggy volcanic peaks rising above the scenic, cultivated landscapes of the fertile Fassifern Valley.

As illustrated on **Figure 4: Landform context and hydrological context**, the most notable landscape feature within the LVIA study area is the Teviot Range, located in the east, which includes a number of local peaks including Mount Blaine, Mount Goolman, Mount Wilbraham, Mount Joyce and Ivory's Knob. The most distinctive of these is Flinders Peak, which reaches 679 m above Australian Height Datum (AHD) at the summit. To the south of the Teviot Range lies the Dugandan Range, which includes Mount Juberra, Mount Crumpet and Mount Moy.

The Little Liverpool Range forms a distinctive landform element in the west of the LVIA study area near Grandchester. This includes Mount Grandchester at 390 m AHD. Another smaller outlying elevated area of land extends into the centre of the LVIA study area around Mount Walker (just beyond the LVIA study area).

The LVIA study area falls within the Bremer and Logan River Catchments. The Teviot Range drains into the Bremer River Basin (sub-basin of the Brisbane River Basin) to the west and into the Logan River Basin (sub-basin of Logan-Albert River basin) to the east. Several waterways intersect the alignment and flow throughout the LVIA study area, including (from west to east) Western Creek, the Bremer River, Mount Walker Creek, Purga Creek, Sandy Creek, Wild Pig Creek and Teviot Brook, a major tributary of the Logan River that also supplies water to Wyaralong Dam. It is noted that the alignment follows Purga Creek and Wild Pig Creek for some distance.

5.1.3 Soils, vegetation and land use

Existing land uses within and adjacent to the LVIA study area are shown on **Figure 5: Land use context** and is largely characterised by rural activities on a variety of allotment sizes, which typically range between 1 ha and 20 ha.

The Teviot Range is characterised by densely-vegetated mountainous areas (including Flinders Peak and Mount Perry Conservation Park) with rural land uses and agriculture in low-lying areas with more fertile soils.

To the west of the Teviot Range, the Fassifern Valley is renowned for its fertile and productive agricultural landscapes and rugged volcanic peaks. The most productive soils are the black alluvial clays, typically found on flat, slightly sloping and undulating land along watercourses in low-lying flood prone areas, which support irrigated agricultural production. Agricultural production has also developed on small areas of Brigalow scrub soils and has extended into some other marginal soils. These productive landscapes are surrounded by dryland cropping and cattle grazing, predominantly beef cattle, on the less-productive foothills.

A diverse range of other land uses are found in the LVIA study area, including residential development, industry, rural residential and more localised specialist land uses including the Rosewood wastewater centre, Jeebropilly and Ebenezer coal mines, Ipswich Motorsport Precinct (including Willowbank Raceway), Warrill Park lawn cemetery, RAAF Base Amberley, Santrev poultry (fertilised egg) farm, Gibb Brothers farming operations, Purga Quarry and Ivory's Rock Convention and Events facility.

Native remnant vegetation within the LVIA study area has been extensively cleared on low lying fertile floodplains and comprises small remnant patches of open woodlands, swamps, tree belts associated with the edge of local and State-controlled roads and scattered riparian vegetation along waterways. Steep, undulating areas surrounding local peaks are typically densely vegetated with mature eucalypt forest due to the difficulty accessing these areas.

Low lying alluvial river and creek flats are dominated by sparse remnant patches of open forest woodlands comprised of Forest Red Gum (*Eucalyptus tereticornis*), Grey Box (*E. moluccana*), Bimble Box (*E. populnea*) and Red Ironbark (*E. crebra*). Vegetated wetlands and swampy areas are dominated by dense low-lying forests of Swamp Tea-tree (*Melaleuca irbyana*), sedges and rushes (*Cyperus spp., Schoenoplectus spp*. and *Eleocharis spp*.). Waterways and riverine wetlands intersecting the alignment are typically lined by Forest Red Gum (*Eucalyptus tereticornis*) and Paperbark (*Melaleuca spp.*) fringing woodland.

Undulating landscapes and foothills of intrusive volcanic peaks are dominated by open eucalypt forests on sedimentary rocks, comprised of Forest Red Gum (*Eucalyptus tereticornis*), Red Ironbark (*E. crebra*), Moreton Bay Ash (*Corymbia tessellaris*), Smooth-Barked Apple (*Angophora spp.*), Silver-leafed Ironbark (*E. melanophloia*), Grey Box (*E. moluccana*), White Mahogany (*E. acmenoides*), QLD Grey Gum (*E. major*), Grey Ironbark (*E. siderophloia*) and Lemon-scented Gum (*Corymbia citriodora subsp. variegata*). Swamp Tea-tree (*Melaleuca irbyana*) is sometimes seen as a low understory.

Elevated areas on basalt plains and hills (e.g. Flinders-Goolman Reserve) are dominated by scrubby open woodland on igneous rocks, comprised of Red Ironbark (*E. crebra*), Forest Red Gum (*Eucalyptus tereticornis*), Yellow Box (*E. melliodora*), Scribbly Gum (*E. racemosa*), Smooth Branched Ironbark (*E. dura*) and Lemon-scented Gum (*Corymbia citriodora subsp. variegata*). The higher regions also support areas of heath and open woodland as well as remnant patches of vine forest with Hoop Pine (*Araucaria spp.*).

There are no national parks within the LVIA study area. However, the LVIA study area does encompass conservation areas which are known to attract recreational visitors.

The Flinders-Goolman Conservation Estate covers 2,200 ha and forms part of the regionally-significant Flinders-Karawatha Corridor which has a total area of over 56,350 ha and is recognised as one of QLD's most important biodiversity corridors. In addition, it supports scenic amenity, outdoor recreation and landscape heritage values of regional significance (EHP, 2014). The estate has two picnic areas and a large range of recreational trails that provide elevated views over the distinctive valleys and peaks of the Scenic Rim and towards Brisbane and the bay islands, described further in **Section 8: Visual Impact Assessment**.

The 138.5 ha Purga Nature Reserve and the Gum Tips Nature Refuge are also located within the LVIA study area and have been considered as they may attract visitors.

5.1.4 IBRA classifications

IBRA is a biogeographic regionalisation of Australia developed by the Australian Government department formerly known as Department of Sustainability, Environment, Water, Population and Communities (Department of the Environment and Energy, 2018). IBRA represents a landscape-based approach to classifying the land surface of Australia. The IBRA data consists of two datasets: IBRA bioregions, which are a larger scale regional classification of homogenous ecosystems; and sub regions, which are more localised.

Whilst bioregions have been defined mainly for the purposes of ecosystem planning and monitoring, the nominal attributes that make up IBRA are climate, lithology/geology, landform, vegetation, flora, fauna and land use, which are themes typically used to define landscape character at a high level. On 5 July 2012, IBRA version 7.0 was released, which delineates 89 biogeographic regions and 419 sub regions, each reflecting a unifying set of major environmental influences which shape the occurrence of flora and fauna, and their interaction with the physical environment across Australia. The bioregion information enables a high-level desktop understanding of the different landscape settings of the LVIA study area. The descriptions for the subregions that accompany IBRA 7.0 are not currently published. However, upon request, the Australian Government Environmental Resources Information Network (ERIN, 2012, personal communication) supplied descriptions of each of the subregions in the LVIA study area for the IBRA5.1 dataset (which follows similar boundaries).

As shown on **Figure 6: Interim Biogeographic Regionalisation Australia**, the Project falls within the SEQ Bioregions. The entirety of the LVIA study area falls within the SEQ02 Moreton Basin subregion. This is described in **Table 16**.

Table 16: IBRA subregion description

IBRA subregion name, code and total area (ha)	Description
Moreton Basin SEQ02 784,980 ha	Underlying geology is predominantly Jurassic and Triassic/Jurassic sandstones. It is an area of low, hilly relief and broad alluvial valleys. Some parts of the Moreton Basin subregion are dry with rainfall less than 750 mm per annum. Major vegetation types include eucalypt woodlands and open forests, (*Acacia harpophylla*) open forest and semi–evergreen vine thicket.

5.1.5 SEQRP regional landscape values

The current SEQRP *ShapingSEQ* (QLD Government, 2017) includes mapping of areas of 'regionally significant scenic amenity' on 'Map 5c Sustain – regional landscape values'. This is based upon the SEQ regional amenity methodology identified in the SEQRP *Implementation Guideline No 8 - Identifying and protecting scenic amenity values* (QLD Government, 2007).

As described in **Table 3**, the regional scenic amenity values are calculated using GIS analysis which combines visual exposure (least visible to most visible) and visual preference (least preferred to most preferred) to give a value between 1 and 10. Areas with a value of 9-10 are considered to be regionally significant.

Figure 3: Regional scenic amenity and planning designations shows the extent of regional scenic amenity values within the LVIA study area. This indicates the following four key areas, which accord with the elevated areas of mountain ranges described above:

- Teviot Range: encompassing the area of the Flinders-Karawatha corridor around Flinders Peak, Mount Blaine and Mount Goolman (north of the alignment) and Ivory's Knob and Mount Joyce (south of the alignment)
- Dugandan Range: encompassing the area around Mount Crumpet and Mount Juberra
- Little Liverpool Range: encompassing the area around Mount Grandchester down to Mount Beau Brumell
- The area around Mount Walker.

5.2. Landscape character baseline

The identified LCTs and LCAs falling within the LVIA study area are shown on **Figure 7: Landscape character assessment** and summarised in **Table 17**.Full descriptions of each LCT are provided in Section **7.1: Landscape character impact assessment.**

Table 17: Landscape character types and Areas

Landscape character type (LCT)	Associated Landscape character areas (LCAs)
Type A: Vegetated Watercourses - Rivers	• Bremer River Vegetated Watercourse (LCA A1)
LCT B: Vegetated Watercourses – Creeks and Channels	• Plain Creek Vegetated Watercourse (LCA B1) • Western Creek Vegetated Watercourse (LCA B2) • Warrill Creek Vegetated Watercourse (LCA B3) • Purga Creek Vegetated Watercourse (LCA B4) • Bundamba Creek Vegetated Watercourse (LCA B5) • Teviot Brook Vegetated Watercourse (LCA B6)

Landscape character type (LCT)	Associated Landscape character areas (LCAs)
LCT C: Irrigated Croplands	• Rosewood Irrigated Croplands (LCA C1) • Bremer River Irrigated Croplands (LCA C2) • Mount Walker Irrigated Croplands (LCA C3) • Warrill View Irrigated Croplands (LCA C4) • Yamanto Irrigated Croplands (LCA C5) • Willowbank Irrigated Croplands (LCA C6) • Warrill Creek West Irrigated Croplands (LCA C7) • Peak Crossing Irrigated Croplands (LCA C8) • Warrill Creek East Irrigated Croplands (LCA C9) • Hillside Irrigated Croplands (LCA C10) • Teviot Brook Irrigated Croplands (LCA C11) • Logan River West Croplands (LCA C12) • Gleneagle Irrigated Croplands (LCA C13) • Logan River East Croplands (LCA C14)
LCT D: Dry Croplands and Pastures	• Summerholm Dry Croplands and Pastures (LCA D1) • Ashwell Dry Croplands and Pastures (LCA D2) • Cottonvale Dry Croplands and Pastures (LCA D3) • Lower Mount Walker Dry Croplands and Pastures (LCA D4) • Thagoona Dry Croplands and Pastures (LCA D5) • Mount Forbes Dry Croplands and Pastures (LCA D6) • Willowbank Dry Croplands and Pastures (LCA D7) • Mutdapilly Dry Croplands and Pastures (LCA D8) • Warrill View Dry Croplands and Pastures (LCA D9) • Purga Dry Croplands and Pastures (LCA D10) • Limestone Ridges Dry Croplands and Pastures LCA D11) • Goolman Dry Croplands and Pastures (LCA D12) • Wyaralong Dry Croplands and Pastures (LCA D13) • Deebing Heights Dry Croplands and Pastures (LCA D14) • South Ripley Dry Croplands and Pastures (LCA D15) • Undullah Road Dry Croplands and Pastures (LCA D16) • Allenview Dry Croplands and Pastures (LCA D17) • Veresdale Dry Croplands and Pastures (LCA D18)
LCT E: Vegetated Grazing	• Calvert Vegetated Grazing (LCA E1) • Lower Mount Walker Vegetated Grazing (LCA E2) • Mount Mort Vegetated Grazing (LCA E3) • Mount Walker Vegetated Grazing (LCA E4) • Mount Forbes Vegetated Grazing (LCA E5) • Amberley Vegetated Grazing (LCA E6) • Willowbank Vegetated Grazing (LCA E7) • Mutdapilly Vegetated Grazing (LCA E8) • Peak Crossing Vegetated Grazing (LCA E9) • Limestone Ridges Vegetated Grazing (LCA E10) • Milbong Vegetated Grazing (LCA E11)

Landscape character type (LCT)	Associated Landscape character areas (LCAs)
LCT F: Rural Settlement	• Grandchester (LCA F1) • Calvert (LCA F2) • Rosewood (LCA F3) • RAAF Base Amberley (LCA F4) • Peak Crossing (LCA F5) • Harrisville (LCA F6)
LCT G: Transitional Landscapes	• New Oakleigh Coal Mine (LCA G1) • Willowbank (LCA G2) • Purga Quarry (LCA G3) • Limestone Hills (LCA G4)
LCT H: Forested Uplands	• Marburg Range Forested Uplands (LCA H1) • Little Liverpool Range Forested Uplands (LCA H2) • Mount Mort Forested Uplands (LCA H3) • Mount Walker Forested Uplands (LCA H4) • Teviot Range Forested Uplands (LCA H5) • Spring Mountain Forested Uplands (LCA H6) • Cedar Vale Forested Uplands (LCA H7)
LCT I: Rural Living	• Thagoona Rural Living (LCA I1) • Willowbank Rural Living (LCA I2) • Deebing Heights Rural Living (LCA I3) • Flagstone Rural Living (LCA I4) • Cedar Grove Rural Living (LCA I5)
LCT J: Suburban Living	• Yamanto Urban Living (LCA J1) • Ripley Valley Urban Living (LCA J2) • Flagstone Urban Living (LCA J3).

For clarity, full descriptions of these areas are included together with the impact assessment in **Section 7: Landscape Impact Assessment**.

5.3. Visual assessment baseline

5.3.1 Visual audiences and receptors

The VAM mapping indicates the potential visibility of the Project across the LVIA study area:

- Figure 8: Visual analysis map – permanent infrastructure indicates the extent to which permanent infrastructure is potentially visible
- Figure 9: Visual analysis map – rolling stock indicates the extent to which permanent infrastructure plus the train (double-stacked) may be potentially visible
- Figure 10: Visual analysis map – difference analysis indicates the extent of difference between permanent and temporary infrastructure
- Within the parts of the LVIA study area that the VAM studies indicated that the Project would be theoretically visible, a number of visual receptor audiences were assessed to have the potential to be affected by the Project including:

    - Local residents and workers in towns and rural settlements (including Rosewood, Calvert, Grandchester, Peak Crossing and Harrisville)
    - Local residents and workers on rural and acreage properties
    - Travellers on main and local roads
    - Tourists on roads including users of ‘scenic drives’ and staying in tourist accommodation within the LVIA study area

- Tourists on the 'Westlander' train
- Recreational users of the landscape, including those using walking trails within the Flinders-Goolman Conservation Estate and other nature reserves.

5.3.2 Viewpoint selection

Representative views from a range of visual audiences are assessed in detail in **Section 8: Visual Impact Assessment**.

Views from a range of residential properties in settlements and rural areas including Peak Crossing are assessed (refer **Figure 11: Sensitive receptors within 2 km of the Project**). Due to the distance from the alignment, no specific views from Rosewood have been included. Other rural residential developments within the LVIA study area such as those at Deebing Heights, Yamanto, Thagoona and Willowbank, are separated from the alignment by dense remnant vegetation. Therefore, these communities are also not considered further in the visual assessment.

Representative views from a range of local and State-controlled roads are described and assessed. However, some of the roads within the LVIA study area are considered unlikely to be affected due to distance and topography so views from these roads have not been included. These include Mount Lindesay Highway (5.30 km southwest of the easternmost extent of the alignment), Centenary Highway (7.0 km northeast), Beaudesert-Boonah Road (7.0 km to the south), Ipswich-Rosewood Road, (5.60 km north) and Warwick Road (7.25 km northeast).

As shown on **Figure 12: Tourist drives and recreation trails,** there are six recognised tourist routes within the LVIA study area. The *'Warrego Way'* and *Adventure Way'* are nationally marketed 'Great QLD Drives' (Outback QLD Tourist Association, 2015) that follow the Warrego Highway. At the regional level the *'Cobb and Co Tourist Drive'* is a well-known and signposted route that stops at several staging posts with informative tourist signage and infrastructure. Other self-drives that appear in tourist literature but are not signposted include the *'Main Range Drive', 'Scenic Rim-Cheese Pleaser'* drive and *'Aratula to Flinders Peak Winery Drive'*. Views from these drives have been considered and are incorporated into the relevant viewpoint assessments.

Recreational views have been captured. Due to the popularity of Flinders-Goolman Conservation Estate for bushwalkers and its relatively close distance to the alignment, it is anticipated that views from elevated areas could be affected by the Project, so specific views have been included from this area. However, views from Purga Nature Reserve and Gum Tips Nature Refuge have not been included. While both are within relatively close proximity to the alignment (200 m and 1 km respectively), due to the density of vegetation it is not anticipated that the Project would be visible.

Twelve viewpoints have been selected to represent potential visual impacts across the LVIA study area. These are identified in **Figure 13: Key visual receptors and location of representative viewpoints** (refer Appendix 1) and are summarised in **Table 18**. Full descriptions of each viewpoint are provided in **Section 8: Visual Impact Assessment** and described in **Table 30** to **Table 41**.

Table 18: Viewpoint selection

Viewpoint name	Anticipated approximate distance to alignment	Key visual receptors
Viewpoint 1: Rosewood-Warrill View Road Looking northeast	Alignment is approximately 100 m northeast of this viewpoint.	Residents and visitors, workers and tourists travelling along Rosewood-Warrill View Road.
Viewpoint 2: Paynes Road looking south	This viewpoint is approximately 60 m to the south of this viewpoint.	Residents and visitors, workers and tourists travelling along Paynes Road.
Viewpoint 3: Cunningham Highway looking southeast to Flinders Peak	Alignment is approximately 400 m to the east of this viewpoint.	Residents and visitors, workers and tourists travelling south along the Cunningham Highway.
Viewpoint 4: Middle Road, looking north	Alignment is approximately 500 m to the west of this viewpoint and 1 km to the north.	Residents and visitors, workers and tourists travelling Middle Road.
Viewpoint 5: Ipswich-Boonah Road looking northeast, near properties 276 and 288	Alignment is approximately 170 m to the northeast of this viewpoint	Residents and visitors, workers and tourists travelling Ipswich-Boonah Road.
Viewpoint 6: Peak Mountain View Park, near Peak Crossing State School and Peak Crossing township	Alignment is approximately 2.25 km east of this viewpoint.	School patrons, residents of Peak Crossing and visitors, workers and tourists travelling Ipswich-Boonah Road and utilising the facilities (playground, amenities and BBQ/picnic facilities) at Peak Mountain View Park.
Viewpoint 7: Ipswich-Boonah Road near Flinders Peak Winery	Alignment is approximately 1.65 km to the east of this viewpoint.	Residents, visitors and guests of Flinders Peak Winery and visitors, workers and tourists travelling Ipswich-Boonah Road.
Viewpoint 8: Cunningham Lookout off Rosewood-Warrill View Road east looking towards Flinders Peak	Alignment is approximately 17 km to the east of this viewpoint.	Visitors to Cunningham Lookout and visitors, workers and tourists travelling Rosewood-Warrill View Road.
Viewpoint 9: Flinders Peak	Alignment is approximately 4.70 km to the south-west of this viewpoint.	Typical views of those walking the Flinders Peak trail in Flinders – Goolman Conservation Estate.
Viewpoint 10: Washpool Road near rural properties 456-463	Alignment is approximately 300 m to the north of this viewpoint.	Residents, visitors, and workers travelling Washpool Road.
Viewpoint 11: Wild Pig Creek Road near rural properties 717-722	Alignment is approximately 100 m to the northeast of this viewpoint.	Residents, visitors, and workers travelling Wild Pig Creek Road.
Viewpoint 12: Undullah Road near “Brooklands” rural property	Alignment is approximately 150 m to the northeast of this viewpoint.	Residents, visitors, and workers travelling Undullah Road.

6. Potential Impacts

6.1. Project description

A summary of the key components of the Project to be assessed in this LVIA are described in **Table 19**:

Table 19: Key components of the Project

Key Component	
Start and finish point	Calvert to Kagaru
Local government areas	LCC ICC SRRC
Length of alignment	Approximately 53 km (single track dual gauge)
Rail corridor	Rail corridor with minimum width of 40 m, containing a single track dual gauge railway line with up to four crossing loops, with wider areas to accommodate earthworks associated with large cut and fill locations, drainage works, rail infrastructure, access roads and fencing. An additional 30 m width has been included for the eastern end of the tunnel to Kagaru due to the undulating terrain, multiple interfaces with Woollaman Creek and Wild Pig Creek, and the limited available geotechnical data for this area.
Train lengths	Up to 1,800 m (single stacked but with provision for double stacking) and with future provision for train lengths of up to 3,600 m. The approval for the construction of future 3,600 m crossing loops will be subject to separate approval applications in the future.
Expected construction completion	Operation anticipated to commence in 2026.

6.2. Key sources of potential impact

Potential impacts have been considered during construction and operation. **Table 20** describes potential impacts during the construction phase and provides indicative imagery (e.g. from other similar projects) to represent potential Project infrastructure and construction activities. Mitigation measures are discussed in **Section 11: Mitigation**.

6.2.1 Construction Phase

Table 20: Potential Project impacts during construction phase

Construction activities and infrastructure	**Indicative imagery**
Road and rail construction The construction of new haul roads and rail infrastructure within the Project site would convey construction traffic to and within the construction areas resulting in short-term impacts on landscape and visual values.	 *Source: Lat27*
Bridge construction Bridges, culverts and viaducts will be constructed over creeks, rivers, flood plains and existing road corridors. The construction of new infrastructure would convey construction traffic to and within the construction areas resulting in short-term impacts on landscape and visual values.	 *Source: ARTC*

Construction activities and infrastructure	Indicative imagery
Vegetation clearing and associated earthworks Much of the landscape is already cleared for agricultural purposes. Where required, large-scale machinery will be used to assist in vegetation clearance or trimming activities. This will generate traffic on surrounding roads. Temporary stockpiles of cleared vegetation may also be present. Topsoil, subsoil, rock and other unsuitable materials will be removed where necessary to create stable and level areas for infrastructure to be constructed. This will result in the temporary presence of exposed areas of land.	 *Source: ARTC*
Creation of stockpiles (existing material from site) Stockpiles of materials cleared from site will be present in the laydown areas in the construction disturbance footprint, where they will be stored prior to use, re-use or disposal. This includes soil from cut and fill sites.	 *Source: Lat27*
Creation of stockpiles (material delivered to site) Stockpiles of materials delivered to site will be present in the laydown areas and beside the existing rail corridor, where they will be stored prior to use. This includes clean ballast, soil stockpiles and rail materials including tracks and sleepers.	 *Source: ARTC*
Associated construction equipment Large-scale construction equipment and machinery such as cranes, excavators, trucks, water trucks, scrapers, graders, heavy bulldozers, generators and dump trucks will be required for construction activities.	 *Source: ARTC*
Construction workers The workforce on site for Project is estimated to peak at 620 full time equivalents at around week 70. No construction camp is proposed as part of the Project.	 *Source: ARTC*

Construction activities and infrastructure	Indicative imagery
Construction traffic movement There will be increased traffic movement on existing State-controlled roads and side roads. This will include a variety of vehicle types.	 *Source: Lat27*
Temporary construction lighting Site preparation activities undertaken to provide access to the rail corridor are commonly conducted during daylight hours. However, some activities may be undertaken outside of standard daytime hours. Security night lighting would be required at the site offices and fuel storage areas. Potentially, night lighting may also be required at bridge laydown areas. If a flash butt welding facility is utilised during construction, it is anticipated that there would be site security lighting. The primary light source will be from large-scale temporary flood security lighting.	 *Source: FFJV*
Embankments and mounding Embankments and mounding will be created to accommodate the proposed rail corridor. This will be evident in areas where there is a change in levels with the existing ground, for example major cuts. In addition, culverts and bridges will be constructed over creeks and existing road corridors.	 *Source: Lat27*
Shipping containers and storage sheds Shipping containers will be delivered to construction sites via crane trucks and then stored in laydown areas. The containers commonly contain construction equipment. The presence of these may result in short-term impacts on landscape and visual values.	 *Source: FFJV*
Site offices and associated car parking areas The Project will require a number of temporary buildings to facilitate construction activities. This will include site offices and workshops, as well as car parking areas, as follows: • LDN004.8: Coventry Road - Satellite Offices • LDN012.1: Paynes Road - Satellite Offices • LDN021.8: Middle Road - Satellite Offices • LDN026.0: Ipswich-Boonah Road - Satellite Offices • LDN036.6: Washpool Road - Satellite Offices • LDN045.5: Wild Pig Creek Road - Satellite Offices • LDN053.8: Undullah Road - Site Offices and potential flash butt welding facility or batch plant site.	 *Source: FFJV*

Construction activities and infrastructure	Indicative imagery
These sites will bring additional traffic, staff and machinery to the LVIA study area. The new, temporary built forms may be seen as uncharacteristic elements in a predominantly rural landscape. It is noted that no worker accommodation camps are required.	
Drainage infrastructure including concrete piping Temporary and permanent drainage infrastructure will be present, including areas in close proximity to existing road corridors.	 *Source: FFJV*
Signage A large number of signs will be displayed around construction sites, especially where existing road corridors are in close proximity to the Project.	 *Source: FFJV*

6.2.2 Operation Phase

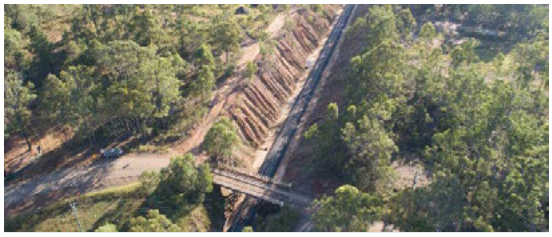
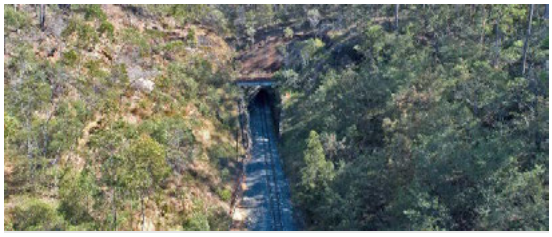
Table 21 describes potential impacts during the operation phase of the Project.

Table 21: Potential Project impacts during operation phase

Operation activities and infrastructure	Indicative imagery
Lighting infrastructure Permanent lighting infrastructure will comprise security lighting in key locations including tunnel portals. There will also be standard flashing lights located at all public level crossings as described below. Emergency lighting will also be provided to rail tunnels in accordance with AS 2293.1, including adjacent to the egress walkway and exit signs. There will also be standard street lighting to roads as necessary.	 *Source: ARTC*

Operation activities and infrastructure	Indicative imagery
Freight trains Trains will, at times, be visible in the landscape from existing roads and residential properties. The current assumption is that there will be on average 33 services per day in 2026 (likely to increase to an average of 47 train services per day in 2040). The Project is designed to accommodate double stack freight trains 6.5 m high initially up to 1,800 m long, with capacity for train lengths to increase to 3,600 m. It is expected to take between one and approximately 2.5 minutes for a train to pass. The train will have headlights. *Note: this assessment is based on the allowance for 1,800 m long trains, including double stacking. The approval for the construction of future 3,600 m crossing loops will be subject to separate approval applications in the future.*	 *Source: ARTC*  *Source: ARTC*
Road and rail bridges These bridges are an obvious built landmark for motorists and are likely to occur over rivers, creeks, rail tracks and roads. The Project proposes 27 bridges including: • 16 rail bridges over waterways • 3 rail bridges over road • 5 bridges over waterways and roads • 3 road bridges over rail. These are typically proposed as single track, Super-T girder type structures. Key rail bridges are proposed to be: • Western Creek #1 Rail Bridge: 966 m long • Western Creek #2 Rail Bridge: 782 m long • Bremer River Rail Bridge: 684 m long • Upper Tributary Ebenezer Creek Rail Bridge: 207 m long • Warrill Creek Rail Bridge: 713 m long • Purga Creek #1 Rail Bridge: 621 m long • Purga Creek #2 Rail Bridge: 759 m long • Ipswich-Boonah Road Rail Bridge: 88 m long • Mount Flinders Road Rail Bridge: 69 m long • Sandy Creek Rail Bridge: 115 m long • Upper Tributary #1 Purga Creek Rail Bridge: 115 m long • Upper Tributary #2 Purga Creek Rail Bridge: 138 m • Washpool Road Rail Bridge: 69 m long • Upper Tributary #3 Purga Creek Rail Bridge: 98 m long • Upper Tributary #4 Purga Creek Rail Bridge: 299 m long • Upper Tributary #3 Dugandan Creek Rail Bridge: 184 m long • Upper Tributary #1 Dugandan Creek Rail Bridge: 138 m long • Dugandan Creek #1 Rail Bridge: 161 m long • Dugandan Creek #2 Rail Bridge: 230 m long	**Road bridge over rail**  *Source: Lat27 (Visualisation)* **Rail bridge over road**  *Source: Lat27 (Visualisation)* **Rail bridge over waterway**  *Source: Lat27 (Visualisation)*

Operation activities and infrastructure	Indicative imagery
• Wild Pig Creek Rail Bridge: 115 m long • Upper Tributary #2 Dugandan Creek Rail Bridge: 161 m long • Upper Tributary #1 Woollaman Creek Rail Bridge: 207 m • Upper Tributary #2 Woollaman Creek Rail Bridge: 230 m • Teviot Brook Rail Bridge: 722 m long. Key road bridges are proposed to be: • Mount Forbes Road Bridge: 72 m long • Cunningham Highway Bridge: 53 m long • Undullah Road Bridge: 70 m long	
Level crossings Crossings occur where the rail alignment intersects a road. Infrastructure includes rail tracks, crossing protection measures (as required) and signage. The Project has eight level crossings on formed (public) roads, of which one (at M Hines Road) is passive and seven are active (with lights and barriers) level crossings. Active level crossings are located at: • Hayes Road at approx. Ch 4.4 km • Middle Road at approx. Ch 21.8 km • Dwyers Road at approx. Ch 32.3 km • Glencairn Road at approx. Ch 20.0 km • Washpool Road at approx. Ch 34.4 km • Wild Pig Creek Road at approx. Ch 45.5 km • Wild Pig Creek Road at approx. Ch 50.0 km The final number of occupational (private) crossings within private property will be determined during the detailed design phase.	**Passive level crossing**  *Source: FFJV* **Active level crossing**  *Source: FFJV*
Railway tracks Where buffers (for example, vegetation and topographic features) do not exist, the railway tracks are likely to become a visible element of infrastructure in the landscape, commonly sighted from adjacent roads and residents' properties.	 *Source: ARTC*
Culverts Culverts (including multiple barrel culverts) are required where the route crosses small creeks, drainage lines and waterway crossing. These comprise: • 69 Reinforced Concrete Pipes and 10 Reinforced Concrete Box Culverts along the rail alignment • 46 Reinforced Concrete Pipes and 7 Reinforced Concrete Box Culverts along roadways • 2 existing culverts are to be extended.	 *Source: ARTC*

Operation activities and infrastructure	Indicative imagery
Embankments, abutments and retaining walls Embankments and mounding will be created to accommodate the proposed rail infrastructure, this includes: • 30 fill sections totalling approximately 28.32 km, ranging from around 10 m to 1,620 m in length; maximum fill depths of up to 25 m and average fill depths of 9 m.	 *Source: Lat27*
Cuttings with associated retaining walls Cuts will be created through areas of elevated landform, for example in the Teviot Range, to accommodate the proposed rail infrastructure, this includes: • 30 cuttings totalling approximately 18.88 km, varying in length from 120 m up to 1,900 m; maximum cut depths of up to 42.95 m. A range of treatments may be used across the Project for the stabilisation of cut slopes including shotcrete (where batter 1V:1H); geosynthetics with high tensile steel wire nets and meshes (where batter between 1V:1H and 1V:1.5H and landscape where batter 1V:2H or shallower.	 *Source: ARTC*
Tunnel with associated tunnel portals and service buildings A 1,015 m tunnel will be created through the Teviot Range to accommodate the proposed rail infrastructure. At each tunnel entry, a portal will be created. It is also noted that venting will occur at this point with potential to create an exhaust plume. Service buildings will be located at both portals. It is noted that no ventilation stacks are proposed within the Project. Tunnel infrastructure has the potential to impact on landscape and visual values.	 *Source: ARTC*
Fencing and fauna crossings Fencing will be provided along the rail corridor, where required. The alignment will be fenced with three or four strand barbed wire fence. Where superior fencing is required near roads or where trespass is occurring a 1.8 m chain wire fence is proposed. The Project includes five fauna crossings for locations where bridge crossings will be constructed over waterways. A dedicated fauna corridor crossing will also be constructed as a canopy bridge and will require koala fencing to funnel fauna including koalas towards the crossing. Further information about potential impacts on flora and fauna is provided in EIS Appendix J: Terrestrial and Aquatic Ecology Technical Report.	 *Source: FFJV*  *Source: FFJV*

6.3. Illustrative cross sections of typical conditions

The following illustrations have been prepared to indicate typical cross sections of the rail and associated components found across the Project.

It is noted that these images are indicative “artist’s impressions” only, and representative of typical conditions found across the Project. The sections are not specific to any one location.

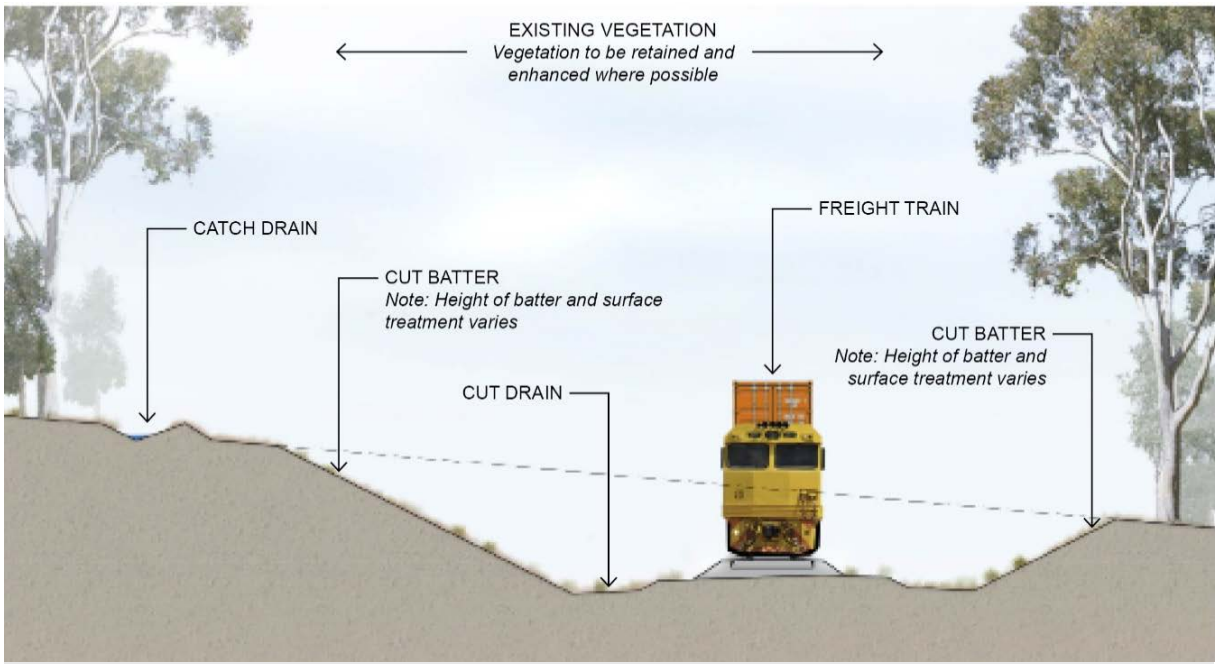


Figure 15: Typical Cut

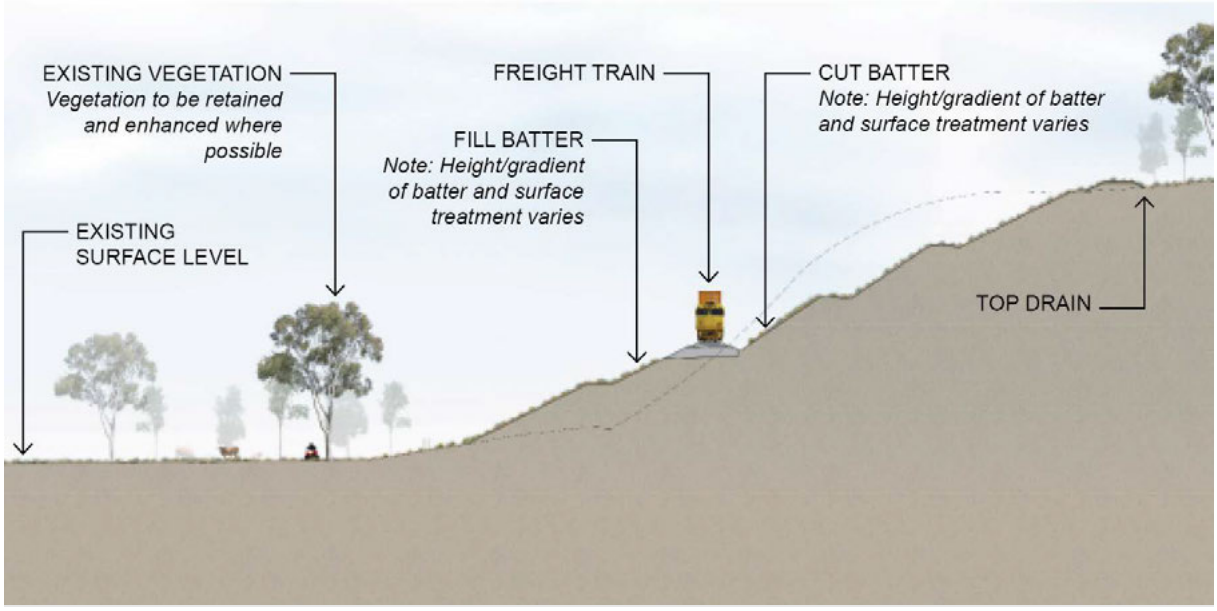


Figure 16: Typical Cut/Fill Batter

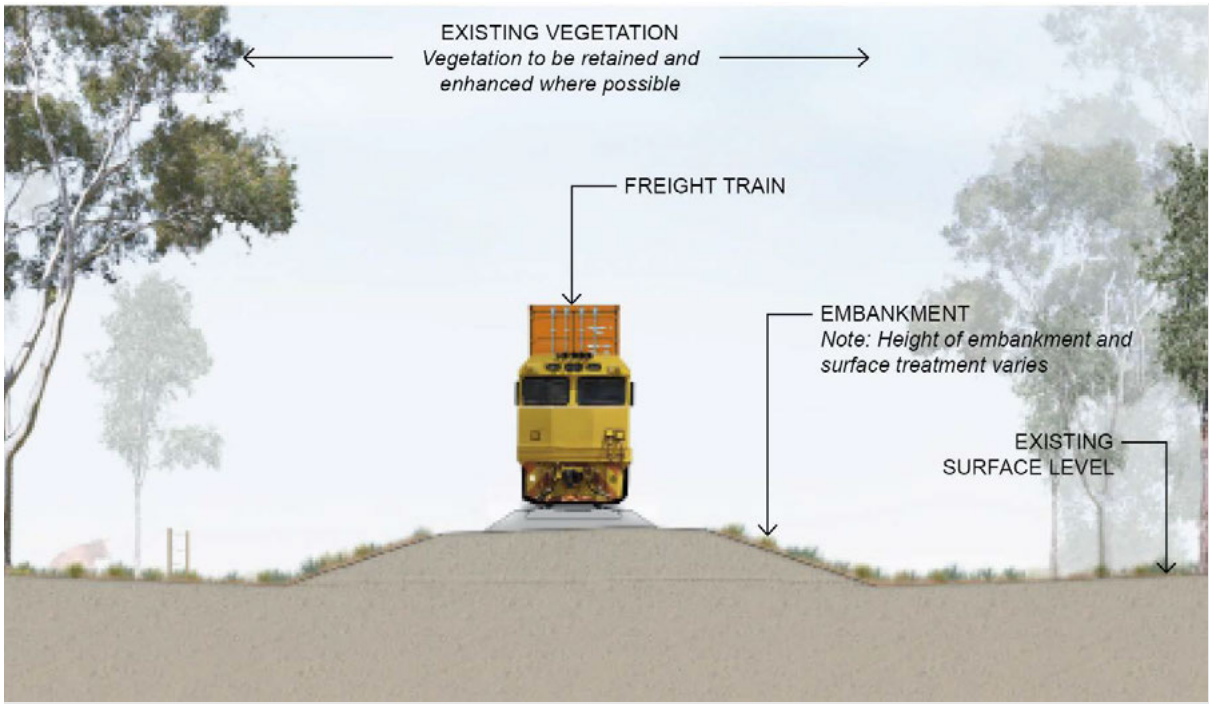


Figure 17: Typical Low Embankment

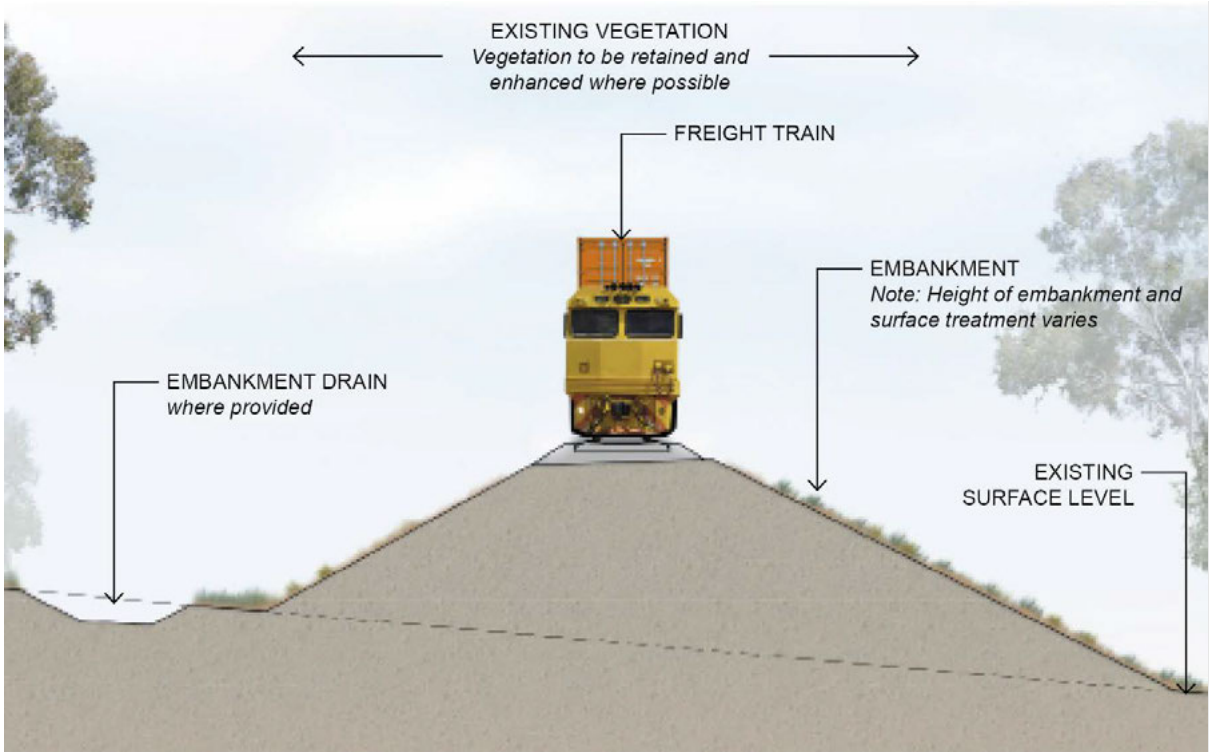


Figure 18: Typical High Embankment with Drain

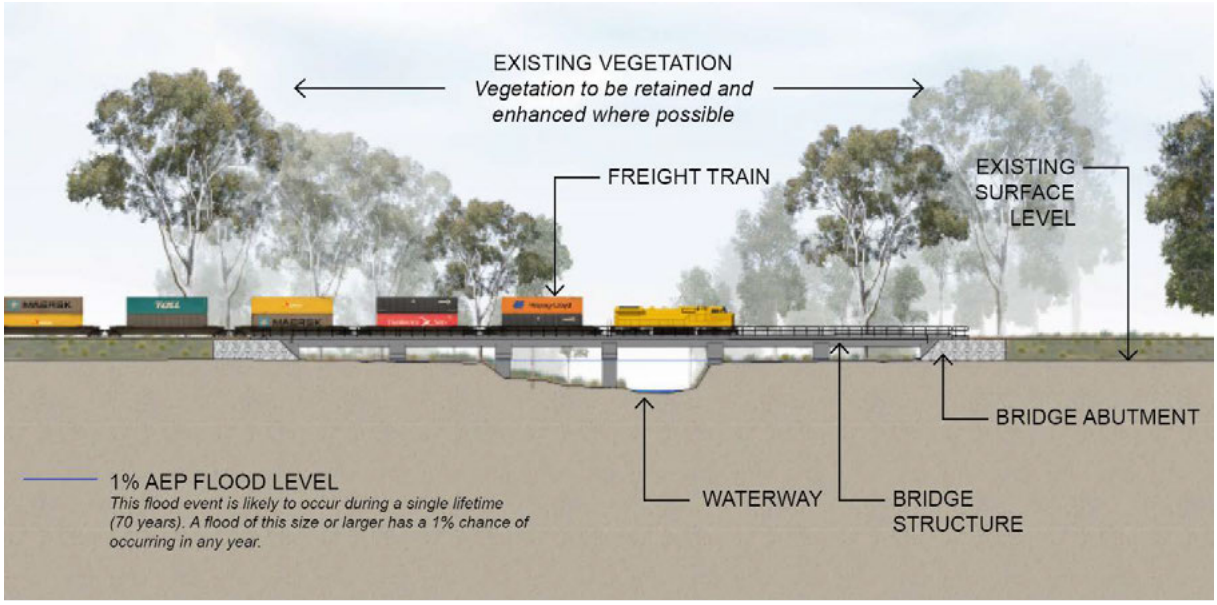


Figure 19: Typical Creek Crossing

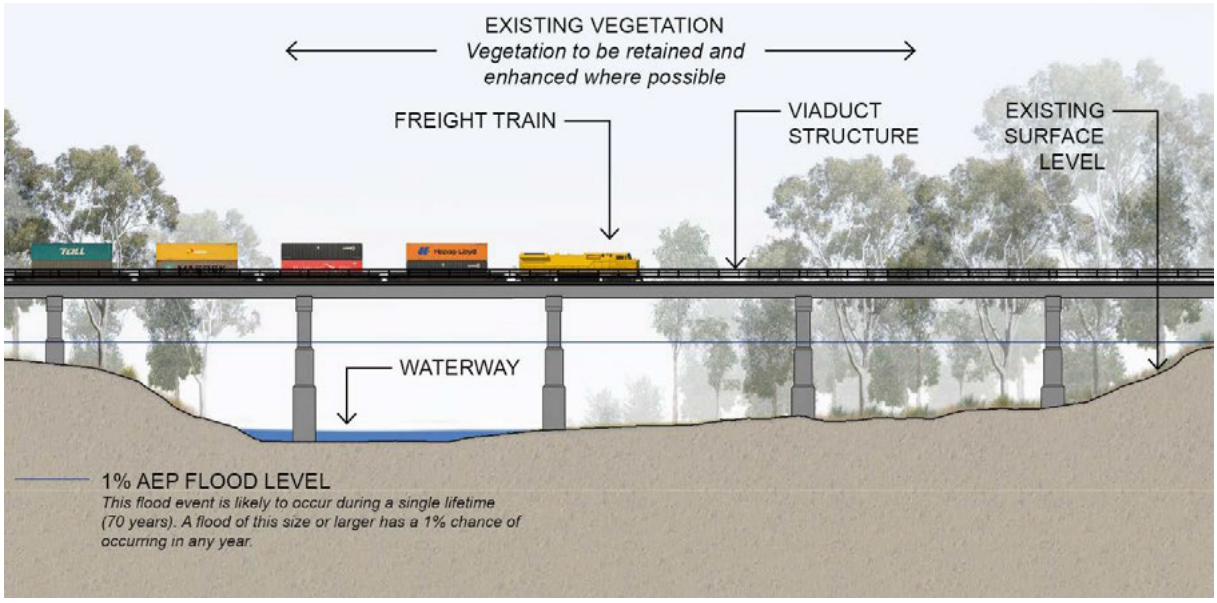


Figure 20: Typical River Crossing

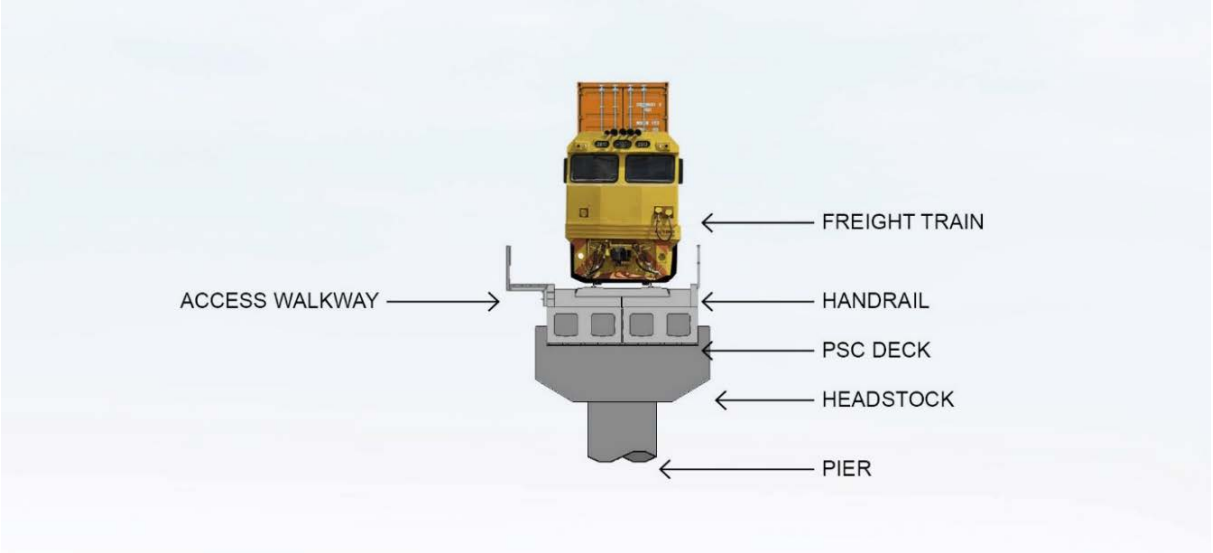


Figure 21: Typical Pier with Slab Span

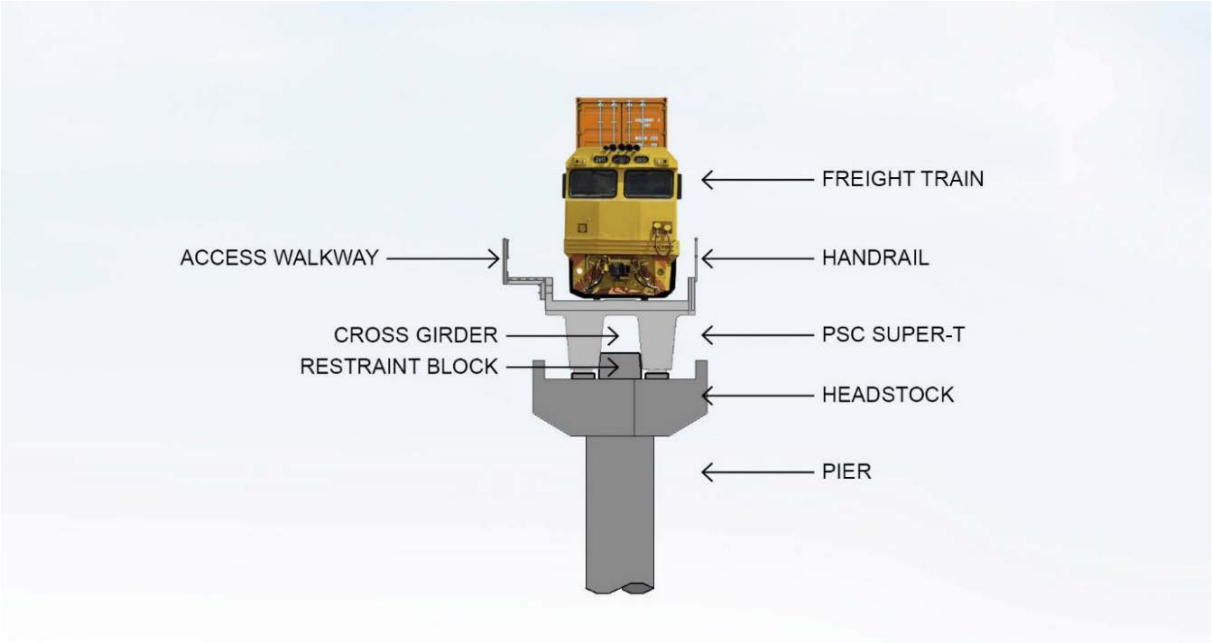


Figure 22: Typical Pier with Super-T Girder

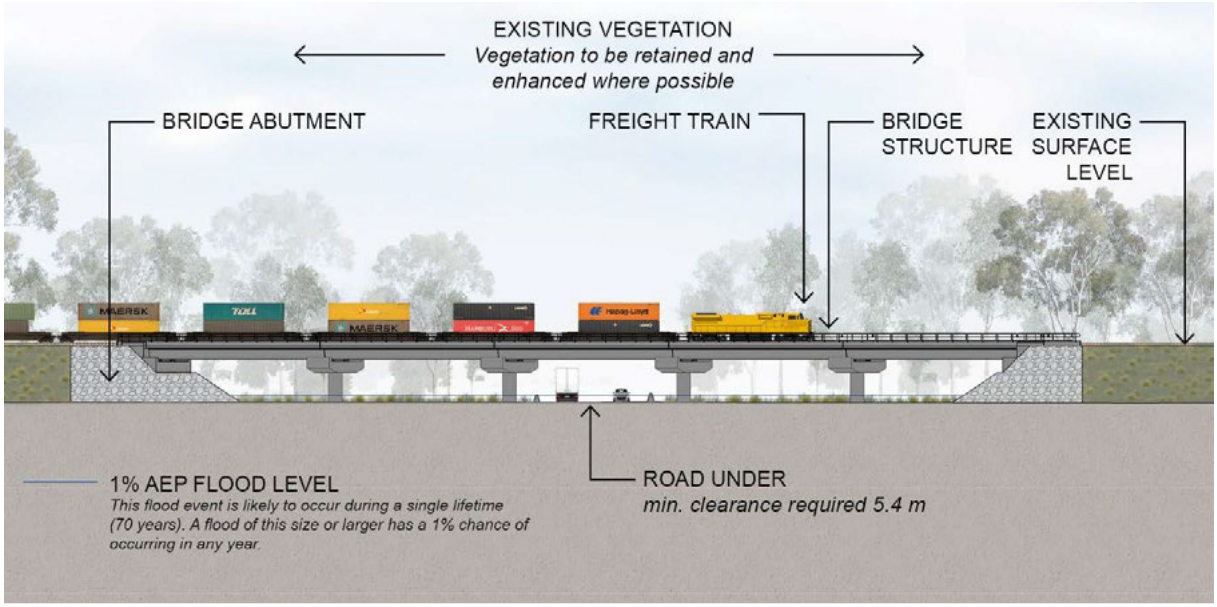


Figure 23: Typical Rail over Road Bridge

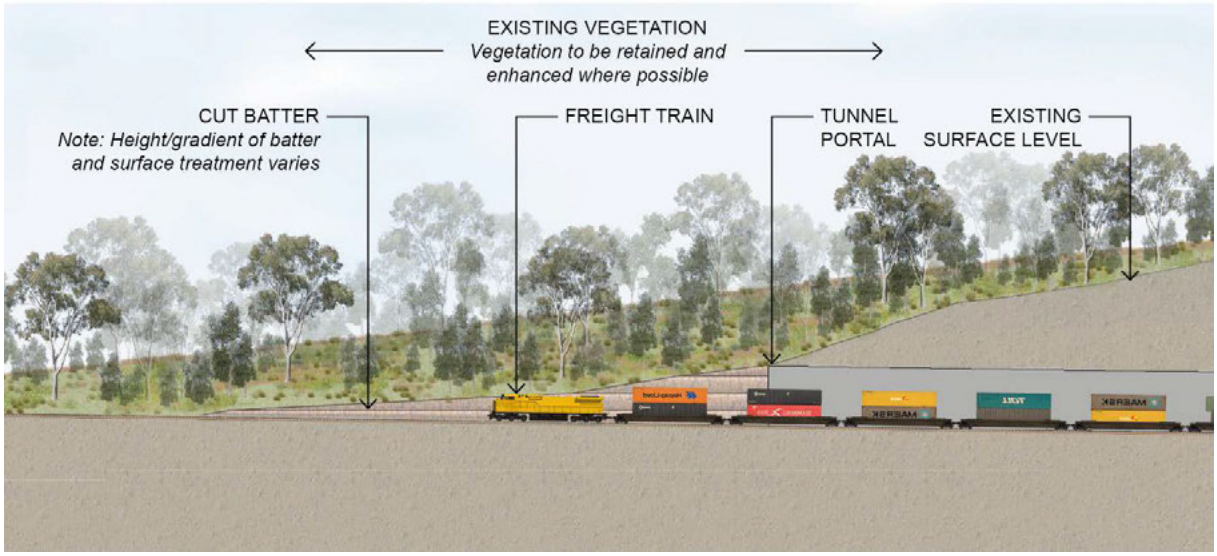


Figure 24: Typical Tunnel Portal

7. Landscape Impact Assessment

7.1. Landscape character impact assessment

Ten LCTs have been identified within the LVIA study area (refer **Table 17**)**.** These are identified in **Figure 7: Landscape character assessment** (refer Appendix 1). Eight LCTs are intersected by the Project:

- LCT A: Vegetated Watercourses - Rivers
- LCT B: Vegetated Watercourses - Creeks and Channels
- LCT C: Irrigated Croplands
- LCT D: Dry Croplands and Pastures
- LCT E: Vegetated Grazing
- LCT F: Rural Settlement
- LCT G: Transitional Landscapes
- LCT H: Forested Uplands.

Two other LCTs are present in the wider LVIA study area that are not directly intersected by and lie at some distance from the alignment; as such, no meaningful impacts are anticipated, and they are not considered further:

- LCT I: Rural Living
- LCT J: Suburban Living.

The eight LCTs intersected by the Project are described in **Table 22** to **Table 29**. These tables also assess the likely sensitivities for each identified LCT in relation to the Project and provide a preliminary indication of the likely magnitude of change and consequent likely significance of that effect on landscape amenity.

Construction impacts on landscape character are temporary and result from things such as the removal of vegetation which persist into the operational phase. Therefore, the assessment presented below is a combined assessment of impacts during both construction and operation, reflecting elements removed or disturbed during construction as well as the introduction of structures that affect the perception and character of the landscape over the longer term.

7.1.1 Landscape character type A

Table 22: Landscape impact assessment of LCT A: Vegetated Watercourses – Rivers

Type A: Vegetated Watercourses - Rivers		
Landscape Baseline Assessment		
Location and boundaries	This landscape type is located in the north-western extent of the LVIA study area, associated with the Bremer River. There is one LCA of this type in the LVIA study area – the *Bremer River Vegetated Watercourse* (LCA A1).	
Typical character images:		
		

Type A: Vegetated Watercourses - Rivers		
		
Key characteristics	• The majority of the Bremer River system exists on a gently undulating landscape • The alignment crosses the Bremer River where it meanders through a large alluvial floodplain. The river channel has a slight slope, so water movement is usually quite slow • The alluvial plain surrounding the mid-reaches of the Bremer River receives large volumes of surface water run-off from surrounding steep ranges during rainfall events, so waters can rise rapidly • Low-lying areas contain numerous freshwater wetlands scattered throughout the floodplain • Typically, well-vegetated river banks with mature Forest red gums (*Eucalyptus tereticornis*) and Paperbark (*Melaleuca spp.*) fringing woodland creating a visually interesting natural character • Not the subject of any landscape planning designations but likely to be valued locally for scenic amenity.	
Precedent modifications and infrastructure elements	• Natural landscape with few built infrastructure elements • Some areas of the Upper Bremer River have levees to enable expansion of agricultural production • Existing rail and road bridge crossings across the river allowing views of the river.	
Landscape character sensitivity assessment	• High degree of perceived naturalness, with little evidence of human uses and waterway modifications • Significant fringing vegetation on the river banks and floodplains contain views to and from the waterways, reducing the sensitivity • The overall sensitivity is considered to be ***Low***. This recognises that there are no formal landscape designations associated with this LCT and the landscape does not appear to be widely used by the local community for recreation (due to limited availability of publicly accessible land e.g. parks along the Bremer River), so is largely valued at the local level. Additionally, localised parts of the LCT are already affected by the presence of road and rail infrastructure (albeit some of which is disused) so it is considered to have capacity to accommodate further change.	
Impact Assessment		
Magnitude of change assessment	• The proposed alignment will cross the Bremer River (A1), approximately 4.5 km south-west of Rosewood • Construction of new bridge and railway infrastructure will result in highly-localised removal of vegetation • During operation the intrusion of built infrastructure within what is currently a relatively un-developed riparian landscape will be noticeable • This location and the river crossing will only be visible from Rosewood-Warrill View Road, primarily impacting local rural residents • The overall magnitude of change is predicted to be ***Moderate***.	
Significance of effect	• The effect of the Project on LCT A: Vegetated Watercourses - Rivers is ***Low***.	

7.1.2 Landscape character type B

Table 23: Landscape impact assessment of LCT B: Vegetated Watercourses – Creeks and Channels

Type B: Vegetated Watercourses - Creeks and Channels	
Landscape Baseline Assessment	
Location and boundaries	This landscape type is located throughout many parts of the LVIA study area, associated with the numerous small tributaries of the Bremer River and Logan River. There are six LCAs of this type – the *Plain Creek Vegetated Watercourse* (LCA B1), *Western Creek Vegetated Watercourse* (LCA B2), *Warrill Creek Vegetated Watercourse* (LCA B3), *Purga Creek Vegetated Watercourse* (LCA B4), *Bundamba Creek Vegetated Watercourse* (LCA B5) and *Teviot Brook Vegetated Watercourse* (LCA B6).
Typical character images:	
     	
Key characteristics	• LCT B Includes creeks and low-lying effluent channels that form part of Bremer River and Logan River catchments, conveying large amounts of runoff away from the steep surrounding ranges in rainfall events • Remnant areas of flood-dependent forest/woodlands and wetlands.
Precedent modifications and infrastructure elements	• Relatively natural landscape with minimal infrastructure, comprising road and existing rail bridges over the main creek channels • Generally, fringing vegetation has been retained and creates a buffer between adjacent agricultural areas • Telecommunication infrastructure, including telegraph poles, typically follows road alignments through these landscapes.
Landscape character sensitivity assessment	• Moderate degree of perceived naturalness, with some instances of evidence of human uses and modifications to the waterways • Significant fringing vegetation contains views to and from creek lines • The overall sensitivity is considered to be ***Low***. This recognises that there are no formal landscape designations associated with this LCT and the landscape does not appear to be used by the local community for recreation. Additionally, parts of the LCT are already affected by the presence of road and rail infrastructure (albeit some of which is disused) so it is considered to have capacity to accommodate further change.
Impact Assessment	
Magnitude of change assessment	• The alignment traverses rural and grazing lands, introducing new rail infrastructure into the rural setting and will include 21 creek crossings, where the alignment crosses Western Creek (in B2), Ebenezer and Warrill Creeks (B3) Purga and UT Purga Creek (B4), Sandy, Dugandan and Wild Pig Creeks and Teviot Brook (Ickkaybin) (B6)

Type B: Vegetated Watercourses - Creeks and Channels	
	• New bridge and railway infrastructure, as well as associated drainage infrastructure (e.g. culverts) will result in localised removal of vegetation and introduction of built elements into the natural landscape • Views to creek and floodplain infrastructure within these LCTs will be evident from Waters Road, Coveny Road, Rosewood-Warrill View Road, the Cunningham Highway, Glencairn Road, Ipswich-Boonah Road, Mount Flinders Road, Washpool Road, Wild Pig Creek Road and Undullah Road • The overall magnitude of change is predicted to be ***Moderate*** due to the number of incursions into this landscape over the LVIA study area.
Significance of effect	• The effect of the Project on LCT B: Vegetated Watercourses – Creeks and Channels is ***Low***.

7.1.3 Landscape character type C

Table 24: Landscape impact assessment of LCT C: Irrigated Croplands

Type C: Irrigated Croplands	
Landscape Baseline Assessment	
Location and boundaries	This landscape type is located within the alluvial valleys and fertile floodplains of the Bremer River and Logan River catchments. There are 14 LCAs of this type located across the LVIA study area – the *Rosewood Irrigated Croplands* (LCA C1), *Bremer River Irrigated Croplands* (LCA C2), *Mount Walker Irrigated Croplands* (LCA C3), *Warrill View Irrigated Croplands* (LCA C4), *Yamanto Irrigated Croplands* (LCA C5), *Willowbank Irrigated Croplands* (LCA C6), *Warrill Creek West Irrigated Croplands* (LCA C7), *Peak Crossing Irrigated Croplands* (LCA C8), *Warrill Creek East Irrigated Croplands* (LCA C9), *Hillside Irrigated Croplands* (LCA C10), *Teviot Brook Irrigated Croplands* (LCA C11), *Logan River West Croplands* (LCA 12), *Gleneagle Irrigated Croplands* (LCA 13), *Logan River East Croplands* (LCA 14). These 14 LCAs are typically located in areas with highly fertile vertosol soils.
Typical character images:	
     	
Key characteristics	• Extensively developed agricultural areas • Irrigation channels occur in flatter areas, particularly around the areas of Radford, Harrisville and Warrill View • Typically located in areas with highly fertile vertosol soils • The vertosols are typically cracking clay soils with high nutrient levels that can support intensive agriculture • Extensive large and relatively flat open fields of irrigated cropland with a verdant character contrasting with adjoining dryland areas • Landscape substantially cleared of vegetation, except at the periphery, along creek lines (LCT B), on the skyline and along local roads

Type C: Irrigated Croplands	
	• In addition to irrigated production, current land use activities include grazing, dryland farming, irrigated and intensive industries such as feedlots, forestry and recreation • LCT F: Rural Settlement lying adjacent to and strongly associated with this landscape type.
Precedent modifications and infrastructure elements	• To enhance agricultural productivity, works have been built on the floodplain to improve land used for grazing, dryland cropping and irrigated cropping • Typically, works such as channels have been constructed to manage and store irrigation and domestic water. These channels are particularly evident along Warrill Creek near Radford, Harrisville and Kalbar.
Landscape character sensitivity assessment	• LCT C is predominantly visually open, with a sparsely settled rural character (farmsteads and agricultural buildings) and no large-scale infrastructure elements. It has long distant views and strong skylines • Vegetation within low-lying areas is extensively cleared and very sparse, with denser remnant vegetation along adjacent waterways • Due to the extensively modified character of the landscape and local value of the landscape in terms of landscape amenity the overall inherent sensitivity is considered to be ***Low***.
Impact Assessment	
Magnitude of change assessment	• The primary impact where new rail infrastructure is being introduced will be on private land • Four areas of this landscape type will be affected by the alignment: C2 (Bremer River), C8 (Peak Crossing), C10 (Hillside) and C11 (Teviot Brook) • Due to the transient nature of views from the roads, the property owners of affected properties will be most affected • Impact on private land and valuable irrigated areas will be most evident near Peak Crossing, where the alignment crosses C8: Peak Crossing and C10: Hillside. Several residential properties will be resumed in these areas. • During construction, these areas will be affected by the presence of plant and associated earthworks. Vegetation clearance will be limited, as much of this landscape has already been extensively cleared. • During operation, the new earthwork infrastructure within this landscape will contrast with the current open landscape character introducing embankments of up to and over 10 m into the open landscape with associated permanent rail infrastructure • The overall magnitude of change is predicted to be ***High***.
Significance of effect	• The effect of the Project on LCT C: Irrigated Croplands is ***Moderate***.

7.1.4 Landscape character type D

Table 25: Landscape impact assessment of LCT D: Dry Croplands and Pastures

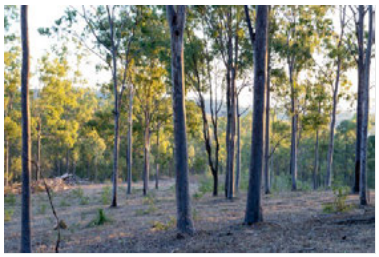
Type D: Dry Croplands and Pastures	
Landscape Baseline Assessment	
Location and boundaries	This landscape type is found across the LVIA study area and is largely defined by extensively cleared, often undulating, open rural areas utilised for agriculture and livestock production. There are 18 LCAs – the *Summerholm Dry Croplands and Pastures* (LCA D1), *Ashwell Dry Croplands and Pastures* (LCA D2), *Cottonvale Dry Croplands and Pastures* (LCA D3), *Lower Mount Walker Dry Croplands and Pastures* (LCA D4), *Thagoona Dry Croplands and Pastures* (LCA D5), *Mount Forbes Dry Croplands and Pastures* (LCA D6), *Willowbank Dry Croplands and Pastures* (LCA D7), *Mutdapilly Dry Croplands and Pastures* (LCA D8), *Warrill View Dry Croplands and Pastures* (LCA D9), *Purga Dry Croplands and Pastures* (LCA D10), *Limestone Ridges Dry Croplands and Pastures* LCA D11), *Goolman Dry Croplands and Pastures* (LCA D12), *Wyaralong Dry Croplands and Pastures* (LCA D13), *Deebing Heights Dry Croplands and Pastures* (LCA D14), *South Ripley Dry Croplands and Pastures* (LCA D15), *Undullah Road Dry Croplands and Pastures* (LCA D16), *Allenview Dry Croplands and Pastures* (LCA D17) and the *Veresdale Dry Croplands and Pastures* (LCA D18).
Typical character images:	
     	
Key characteristics	• Land use is predominately rural, characterised by dryland cropping and pastoral properties for livestock production on elevated undulating land with localised irrigated cropping on low-lying alluvial valleys associated with ephemeral branching creek lines; these include the upper reaches of Western Creek, the Bremer River, Purga Creek, Sandy Creek, Wild Pig Creek and Teviot Brook. • Mixed soils including sodosols, dermosols, tenosols and kurosols resulting in localised variations in character • Sodosols have a gravelly, sandy character, often exposed in areas and vulnerable to tunnel and gully erosion • Tenosols have generally shallow, stony soils with low fertility and low water-holding capacity • Dermosols are associated with previous volcanic activity and are found in higher rainfall regions here they are used for intensive crop production • Kurosols are strongly acidic and occur predominately in upland regions with higher rainfall • LCT D is typically undulating occupying the land lying between the low-lying alluvial floodplains in valleys and the steep Little Liverpool and Teviot Ranges to the west and east of the LVIA study area respectively

Type D: Dry Croplands and Pastures	
	• Vegetation within this landscape type comprises native roadside shelter belts and sporadic riparian vegetation associated with the upper reaches of creek lines • Views are contained by landform and vegetation in adjacent LCTs with particularly strong skylines created against LCT H: Forested Uplands except where views are contained by roadside or creek-side vegetation • Sparsely settled landscape, with only homesteads and cottages • Harmonious but fairly typical rural character, which is valued at a local level by local communities and visitors.
Precedent modifications and infrastructure elements	• Highly modified for agricultural practices, including clearing and levelling of land for cultivation of arable farmland and pastures for grazing • Presence of roads, railways and bridges • Telecommunication infrastructure including telegraph poles.
Landscape character sensitivity assessment	• LCT D is predominantly visually open, with a sparsely settled rural character and little large-scale infrastructure. It has long distant views and strong skylines • Roadside shelter belts and sporadic riparian vegetation associated with creek lines and flood channels provide some screening • Due to the simple character of the landscape and local value of the landscape, which is not protected in any planning scheme, the overall inherent sensitivity is considered to be ***Low***.
Impact Assessment	
Magnitude of change assessment	• Impact on private land, including agricultural and pastoral areas will be evident in the vicinity of Ebenezer, Willowbank, Washpool, Undullah and Kagaru (LCA D6, D7, D12, D16 and D17). The Project will be introducing new infrastructure into what is a relatively intact rural environment • Impacts within this LCT will be due to localised vegetation removal, major earthworks including significant cuts and embankments of up to 10 m and proposed road and creek bridges • Overall, therefore, the impact on this LCT is up to ***High***.
Significance of effect	• The effect of the Project on LCT D: Dry Croplands and Pastures is ***Moderate***.

7.1.5 Landscape character type E

Table 26: Landscape impact assessment of LCT E: Vegetated Grazing

Type E: Vegetated Grazing	
Landscape Baseline Assessment	
Location and boundaries	This landscape type is typically located in elevated parts of the LVIA study area, and is characterised by poorer quality soils, remnant vegetation and cattle and sheep grazing. There are 11 LCAs of this type in the LVIA study area – the *Calvert Vegetated Grazing* (LCA E1), *Lower Mount Walker Vegetated Grazing (*LCA E2), *Mount Mort Vegetated Grazing* (LCA E3), *Mount Walker Vegetated Grazing* (LCA E4), *Mount Forbes Vegetated Grazing* (LCA E5), *Amberley Vegetated Grazing* (LCA E6), *Willowbank Vegetated Grazing* (LCA E7), *Mutdapilly Vegetated Grazing* (LCA E8), *Peak Crossing Vegetated Grazing* (LCA E9), *Limestone Ridges Vegetated Grazing* (LCA E10), and the *Milbong Vegetated Grazing* (LCA E11).

Type E: Vegetated Grazing	
Typical character images:	
  	
Key characteristics	• Very sparsely settled landscape with large land holdings (stations) and scattered farmsteads • Comprises pastureland with broad areas of open wooded remnant and regrowth vegetation, typically denser along creek and drainage lines and hill tops • Roads are typically straight in character and unsealed gravel. Views are usually contained by roadside shelter belts • Harmonious but fairly typical rural character.
Precedent modifications and infrastructure elements	• Typically, limited levels of modification for agricultural practices, with some localised vegetation clearing • Roads are typically unsealed.
Landscape character sensitivity assessment	• LCT E is predominantly visually contained, with a sparsely settled rural character and little large-scale infrastructure • Long distance views are possible at breaks in roadside shelter breaks • Harmonious but fairly typical rural character, which is valued at a local level by local communities and visitors • Due to the simple character of the landscape and local value of the landscape the overall inherent sensitivity is considered to be ***Low***.
Impact Assessment	
Magnitude of change assessment	• Only one area of this LCT is directly affected by the alignment E5: Ebenezer • The Project will be introducing new infrastructure into what is a relatively intact rural environment. Impact on private land, including vegetated pastoral areas will be evident near Ebenezer (E5) • Impacts during construction will be due to vegetation removal, major earthworks (e.g. cuts and embankments) and proposed road and creek bridges • Overall, therefore, the impact on this LCT is ***High***.
Significance of effect	• The effect of the Project on LCT E: Vegetated Grazing is ***Moderate***.

7.1.6 Landscape character type F

Table 27: Landscape impact assessment of LCT F: Rural Settlement

Type F: Rural Settlement	
Landscape Baseline Assessment	
Location and boundaries	Six rural settlements are located within the LVIA study area. They include the towns of Grandchester, Rosewood, Peak Crossing and Harrisville, the small settlement of Calvert and the RAAF Base Amberley. Accordingly, there are six associated LCAs: *Grandchester* (LCA F1); *Calvert* (LCA F2); *Rosewood* (LCA F3); *RAAF Amberley Base* (LCA F4); *Peak Crossing* (LCA F5); and *Harrisville* (LCA F6). Note: While Grandchester is located within the LVIA study area, it lies closest to the H2C alignment so the impact on this LCT is primarily considered in the H2C LVIA.

Type F: Rural Settlement	
Typical character images:	
     	
Key characteristics	• Small rural towns, villages and communities comprise low-scale built form with limited services • Typically, single storey buildings of varying ages and variable condition • Larger settlements (Rosewood, Peak Crossing and Harrisville) have social infrastructure including parks, public schools and sport facilities • Remnants of the historic railway are located throughout the LVIA study area, most evident in LCT F • Grandchester (LCA F1) is a small rural town located south-west of Rosewood. The existing Main Line runs through the centre of town. The historic Grandchester Station is a local tourist destination. • Calvert (LCA F2) is a small rural community. The existing Main Line runs alongside the town to the north of the rural residential properties • Rosewood (LCA F3) is a small town with services including three schools, located in the northern extent of the LVIA study area. Rosewood is the terminus of the Ipswich and Rosewood railway line, providing commuter services to Ipswich and Brisbane. • RAAF Base Amberley (LCA F4) is located on the outskirts of Ipswich and employs over 5,000 people • Peak Crossing (LCA F5) is a small rural town located 20 km south of Ipswich • Harrisville (LCA F6) is a small rural town 7 km south-west of Peak Crossing.
Precedent modifications and infrastructure elements	• Highly modified for urban land uses, including clearing of remnant vegetation and levelling of land for construction • Presence of extensive areas of residential buildings and support buildings • Roads, railways and bridges, including infrastructure associated with the Fassifern Branch of the Dugandan railway • Telecommunication infrastructure including telegraph poles.
Landscape character sensitivity assessment	• LCT F is predominantly enclosed, with a settled rural character. Smaller rural communities such as Calvert are very sparsely settled with no services. • Street trees, remnant vegetation and planting in gardens provide some screening effect • The landscape sensitivity of these settlements is considered to be ***Moderate***. While not valued within planning schemes for their landscape or scenic amenity, these settlements have a distinctive character with some elements of interest (such as heritage buildings) and are also likely to be valued by the people that reside in or visit them.

Type F: Rural Settlement	
Impact Assessment	
Magnitude of change assessment	• The Project alignment does not pass directly through any of these settlements, however it does pass alongside Calvert within the existing railway corridor • Rural residents of Calvert are situated close to existing railway infrastructure and will be affected by the proposed alignment • Rosewood is approximately 4.0 km from the alignment and will not be impacted • RAAF Base Amberley is approximately 6.8 km from the alignment, and it is considered there will be no impact due to its distance from the alignment • Distant views to the alignment may be possible from Peak Crossing, however these views are limited due to the screening vegetation of Purga Creek • Harrisville is approximately 8.0 km from the alignment, and it is considered there will be no impact due to its distance from the alignment • Grandchester is located 6.0 km from the alignment. As the H2C project passes directly through the town of Grandchester, impacts on Grandchester have been assessed as part of the H2C project EIS. • The impact on this LCT would be indirect and is considered to be ***Negligible***.
Significance of effect	• The effect of the Project on LCT F: Rural Settlement is ***Low***.

7.1.7 Landscape character type G

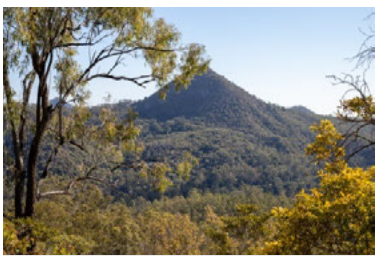
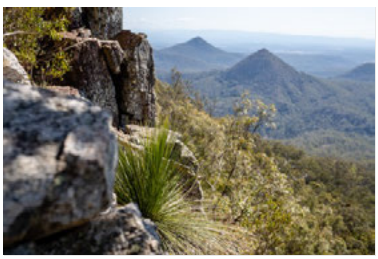
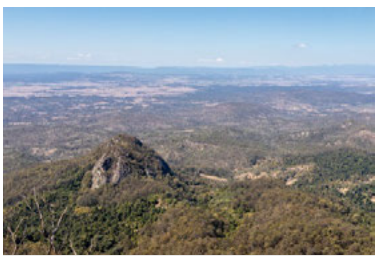
Table 28: Landscape impact assessment of LCT G: Transitional Landscapes

Type G: Transitional Landscapes			
Landscape Baseline Assessment			
Location and boundaries	This landscape is found in discrete areas across the LVIA study area, typically in locations where there are natural extractive resources (coal and limestone). The boundary is largely defined by land use changes (extensively cleared, open cut mines and industrial precincts) and areas zoned for longer-term changes. There are four LCAs of this type – the *New Oakleigh Coal Mine* (LCA G1), *Willowbank* (LCA G2), *Purga Quarry* (LCA G3) and *Limestone Hills* (LCA G4).		
Typical character images:			
			
Key characteristics	• Landscapes which are undergoing modification either as a result of extractive processes or due to zoning for future redevelopment • Mining is a visually prominent landscape type including for coal (G1: New Oakleigh Mine (New Hope Coal), sand and gravel (G3: Purga Quarry) or Flinders dolomite (G4: Limestone Hills) • This landscape has been subjected to intensive mining activities that have significantly changed the visual character of the landscape • Presence of structures associated with land use including power lines • Typically, vegetation has been extensively removed, with remnant vegetation limited to road corridors • Generally, the most visible aspects of this landscape are the spoil dumps, the rehabilitated mounds and the associated infrastructure • Access into this landscape is generally restricted to workers with security fencing around site boundaries • Views within and into the mined areas are typically restricted by the boundary landform and vegetation		

Type G: Transitional Landscapes	
	• Other parts of this landscape currently appear as other adjoining rural land uses but have been included in this category because of zoning for future industrial development i.e. LCA G2: Willowbank.
Precedent modifications and infrastructure elements	• Significant modification to topography with large cut areas bounded by large spoil dumps • Removal of vegetation, although remnant vegetation stands remain within and around site boundaries and along road corridors.
Landscape character sensitivity assessment	The overall sensitivity of this landscape is considered to be ***Negligible***. This is because: • The landscape a highly modified and is not valued for its scenic quality • The LCA that would be affected by the alignment is G2: Willowbank which largely falls within the Ebenezer Regional Industrial Area; an industrial area of regional, State and national significance • These areas typically fall within zones allocated for mining leases, potential key resource areas and mineral development licences/extractive resources • Modification within this area is consistent with the transient character of the landscape and could readily accommodate additional change.
Impact Assessment	
Magnitude of change assessment	• The alignment runs through land within the Ebenezer Regional Industrial Precinct and close to the Purga Quarry • Impacts within this LCT will be due to localised vegetation removal, major earthworks (e.g. cuts and embankments) and proposed road and creek bridges • Overall, therefore, the impact on this LCT is ***Moderate***.
Significance of effect	• The effect of the Project on LCT G: Transitional Landscapes is ***Low***.

7.1.8 Landscape character type H

Table 29: Landscape impact assessment of LCT H: Forested Uplands

Type G: Forested Uplands	
Landscape Baseline Assessment	
Location and boundaries	This LCT comprises large tracts of elevated, undulating areas primarily associated with the Teviot Range in the east, Little Liverpool Range in the west and Mount Walker in the centre of the LVIA study area. There are seven LCAs of this type – the *Marburg Range Forested Uplands (*LCA H1), *Little Liverpool Range Forested Uplands (*LCA H2), *Mount Mort Forested Uplands (*LCA H3), *Mount Walker Forested Uplands (*LCA H4), *Teviot Range Forested Uplands (*LCA H5), *Spring Mountain Forested Uplands (*LCA H6) and the *Cedar Vale Forested Uplands* (LCA H7).
Typical character images:	
	
	

Type G: Forested Uplands	
  	
Key characteristics	• Elevated and undulating topography, typically above 100m AHD • Areas of very steep slopes • Distinctive landform including characteristic mountain peaks such as Flinders Peak, Mount Walker, Mount Blaine and other prominent volcanic extrusions in the Teviot Range, and ridgelines, such as the Little Liverpool Range • Flinders Peak is the highest point within the Teviot Range at 679 m AHD • Incised dry creek valleys are evident where waterways drain the elevated area • Typically, eucalyptus woodland or forest but microclimatic variation includes areas of other vegetation including rainforest fragments • Generally, an enclosed landscape but where vegetation has been cleared or where rock outcrops are present extensive views out can be achieved, particularly at the summit of Flinders Peak from which extensive 360° panoramic views can be obtained across Brisbane, Logan and the Fassifern valley • Highly visible landscape type throughout the LVIA study area forming a distinctive backdrop to the adjoining rural landscape • Much of this LCT (including peaks of the Teviot Range, Little Liverpool Range and Mount Walker) are considered to have high scenic amenity and are included on the Regional Significant Scenic Amenity overlay (as shown on **Figure 3: Regional scenic amenity and planning designations**) • The alignment transects land within the regionally significant Flinders-Karawatha wildlife corridor parts of which were listed on the Register of the National Estate (noting this is now a non-statutory archive). This corridor is recognised as one of QLD's most important biodiversity corridors, connecting Mount Barney National Park to Karawatha Forest via Knapp Creek, Flinders Peak and Mount Perry Conservation Parks.
Precedent modifications and infrastructure elements	• Due to the undulating steep terrain, much of the vegetation is remnant due to the inaccessibility to clear the areas • Natural landscape with very limited settlement and little large-scale infrastructure elements • Some telecommunications towers and powerlines in elevated locations.
Landscape character sensitivity assessment	• LCT H has little capacity to accommodate development as this would require vegetation clearance and earthworks to level the ground which would be visually intrusive in this elevated and undulating landscape • Key areas of this landscape are also protected for their scenic qualities and are regionally significant, being recognised for their scenic amenity values through *ShapingSEQ* (peaks of Teviot Range, Little Liverpool Range and Mount Walker) • Therefore, the landscape sensitivity of LCT H is considered to be ***High***.
Impact Assessment	
Magnitude of change assessment	• The alignment transects and runs adjacent to LCA H5: Teviot Range Forested Uplands, including land within the Flinders-Karawatha biodiversity corridor. No other LCAs of this type are directly affected. • The key impact on this landscape type will be as a result of clearing due to proposed earth works to facilitate the construction of the railway corridor, embankments and tunnels • A portion of the alignment within the Teviot Range and the biodiversity corridor will be tunnelled, so will not directly affect the surface reducing the impact of the Project locally. However, during construction the presence of plant in the area undertaking tunnel boring and other earthworks will intrude upon the natural scenic and perceptual qualities of the landscape.

Type G: Forested Uplands	
	• Following construction, the key impacts would result from the presence of tunnel portals and treatment of the cut batters leading to the tunnel as well as localised cut and fill (embankment). The introduction of significant rail infrastructure into this natural landscape would be an important change; albeit over a relatively localised area at the southern boundary of this LCT. • Elsewhere this landscape type is not within proximity to the alignment, therefore, the impacts on this landscape type would be indirect/not applicable to other LCAs • Due to tunnelling under the ground level, it is considered that impacts on this landscape have been minimised. While the impacts on character will be noticeable from elevated vantage points such as Flinders Peak, the railway will eventually become another element in the rural landscape. This results in a ***Moderate*** magnitude of change.
Significance of effect	• The effect of the Project on LCT H: Forested Uplands is ***High.***

8. Visual Impact Assessment

Twelve viewpoints have been selected within the LVIA study area to represent potential visual impacts across the LVIA study area. These are identified in Figure 13: Key visual receptors and location of representative (refer Appendix 1) and described in Table 30 to Table 41.

8.1. Viewpoint Assessment

8.1.1 Viewpoint 1

Table 30: Likely visual effect of the Project on Viewpoint 1 (VP1)

VP1: Rosewood-Warrill View Road Looking north-east	
Visual Baseline Assessment	
 **Existing view from Viewpoint 1 (VP1)** *Refer to* **Figure 25: Viewpoint 1: Rosewood-Warrill View Road looking northeast - existing context** *in Appendix 2 for appropriate scaled image.*	
Location and description	• GPS Location: 27°40'56.766" S 152°34'22.625" E • Elevation: 48.0 m • North-easterly view from Rosewood-Warrill View Road, looking in the direction of Rosewood • Presence of vegetation adjoining Bremer River to the west (left hand side) of the view • Proposed alignment is approximately 100 m to the north-east of this viewpoint • Represents typical and accessible views of rural residents and of visitors, workers and tourists travelling along Rosewood-Warrill View Road • North-easterly views from this viewpoint provide open views towards the proposed alignment including landscapes typical of LCT A: Vegetated Watercourses – Rivers (LCA A1 Bremer River) and LCA D: Dry Croplands and Pastures - (LCA D6 Mount Forbes).
Key visual sensitivities	• Receptors, including few rural residents, workers and travellers experiencing transient views along Rosewood-Warrill View Road (AADT around 1,041 per day, of which up to 14.5 per cent are heavy vehicles) • The presence of existing infrastructure (power poles and powerlines) reduces the overall sensitivity of this view • This viewpoint it is considered to have a ***Moderate*** sensitivity overall to the change proposed, due to the number and interest of viewers (i.e. small numbers of nearby rural residents and travellers along Rosewood-Warrill View Road).

VP1: Rosewood-Warrill View Road Looking north-east	
Visual Evaluation	
 **Photomontage view from Viewpoint 1 (VP1) Rosewood-Warrill View Road Looking north-east** *Refer to* **Figure 26: Viewpoint 1: Rosewood-Warrill View Road looking northeast - visualisation** *in Appendix 2 for appropriate scaled image.*	
Construction	
Magnitude of change assessment	• The proposed alignment and associated earthworks will introduce considerable construction works into the view. This change will be exacerbated by the relatively open and flat nature of the landscape in this location. • The proposed location of a laydown area immediately west of this viewpoint would cause a reduction in visual amenity from this viewpoint, however this would be temporary • The key impacts will relate to the presence of construction plant and disturbance due to the construction of the Bremer River Rail Bridge, Hallam Road Rail Bridge and associated embankments • Substantial vegetation clearing for the construction of the proposed alignment, bridge structures and laydown area will reduce the density of screening vegetation, increasing the visibility of the alignment from Rosewood-Warrill View Road and surrounding isolated rural properties • While construction works will be clearly evident from this viewpoint the impact of these is temporary which represents a considerable change and ***Moderate*** magnitude of change.
Significance of effect (construction)	The effect of the Project on VP1 during construction is considered to be ***Moderate***.
Operation	
Magnitude of change assessment - permanent infrastructure	The nearest section of the alignment is approximately 100 m north-east of this viewpoint. The skyline is already affected by the presence of powerlines. The magnitude of change on this receptor is anticipated to be dominant, therefore high, due to the following factors: • Widespread change in the view due to the introduction of new rail infrastructure into the rural landscape, including the Bremer River Rail Bridge (over road) and reconstruction of Rosewood-Warrill View Road, with embankments and the rail bridge reaching heights up to around 9.5 m above the existing surface level of Rosewood-Warrill View Road • Vegetation clearing for the construction of the proposed alignment, service road and laydown area will reduce the density of screening vegetation and open views to the permanent infrastructure • Fencing is to be provided for the extent of the rail corridor, typically located on the corridor boundary. Fencing is to extend between the corridor and private land adjoining the railway. Standard rural fencing is proposed and will be in keeping with the existing rural character. • At this close distance, the proposed alignment will be highly evident and will change the fundamental visual character of the landscape, as it will be introducing new rail infrastructure into what is currently a relatively intact rural setting. This represents a ***High*** magnitude of change.

VP1: Rosewood-Warrill View Road Looking north-east	
Magnitude of change assessment - train	• Movement of double stacked freight trains up to 1,800 m long with a height of 6.5 m will highly evident to local rural residents due to the elevated design level of the railway track. Trains will be evident to travellers on Rosewood-Warrill View Road but only experienced intermittently due to the moderate number and transient nature of travellers on this road. Therefore, the magnitude of impact is considered to be ***Moderate***.
Significance of effect (operation)	The effect of the Project on VP1 during operation is considered to be ***High.***

8.1.2 Viewpoint 2

Table 31: Likely visual effect of the Project on Viewpoint 2 (VP2)

VP2: Paynes Road looking south	
Visual Baseline Assessment	
 **Existing view from Viewpoint 2 (VP2)** *Refer to* ***Figure* 27: Viewpoint 2: Paynes Road looking south - existing context** *in Appendix 2 for appropriate scaled image.*	
Location and description	• GPS Location: 27°41'22.866" S 152°36'24.948" E • Elevation: 80.0 m • South-westerly view towards private rural property from Paynes Road near the junction with Mount Forbes Road • Proposed alignment is approximately 60 m to the south of this viewpoint • Represents typical accessible views of the residents living in rural properties accessed off Paynes Road and of any visitors or workers travelling along this quiet local road • South-westerly views from this viewpoint provide close views towards the proposed alignment that are somewhat screened by existing vegetation, including landscapes typical of LCT E: Vegetated Grazing (E5: Mount Forbes Vegetated Grazing). • It is noted that this characteristic continues along the length of Paynes Road with properties set back from the road behind fairly dense partially wooded edge of mature trees.
Key visual sensitivities	• ***Low*** sensitivity of receptors predominantly comprising a low density of rural residents as well as small numbers of workers and travellers driving along Paynes Road • The presence of existing infrastructure (power poles, powerlines and mobile phone tower) reduces the overall sensitivity of this view • This viewpoint it is considered to have a ***Low*** sensitivity overall • It is noted that this viewpoint lies close to LCA G4: Willowbank Transitional and the surrounding area is likely to be considerably developed as part of the Ebenezer Major Development Area in the near future

VP2: Paynes Road looking south	
	• It is also noted that there would be resumption of a number of properties in this area further reducing the number of residential receptors likely to be affected by changes to the view.
Visual Evaluation	
*Please note that no visualisation has been provided for this viewpoint, as discussed in **Section 4.9: Visual impact assessment methodology.***	
Construction	
Magnitude of change assessment	• Substantial vegetation clearing for the construction of the proposed Paynes Road realignment, rail alignment, bridge structures and laydown area will reduce the density of screening vegetation, increasing the visibility of the alignment from Paynes Road and surrounding rural properties • The construction of the proposed alignment will require the resumption and demolition of the property shown in this viewpoint as well as another property on the northern (right hand) side of the view • Earthworks associated with the proposed alignment will require large volumes of material and vegetation to be removed • The construction of the Mount Forbes Road Bridge, cuts and embankments will also temporarily disturb the landscape character • Construction works will occur within and alongside the road reserve, therefore the construction of the alignment would cause a considerable change in views from this viewpoint and other similar viewpoints along the road during construction • The proposed alignment and associated earthworks will introduce new rail infrastructure into and noticeably modify the existing landscape, representing a ***Moderate*** magnitude of change.
Significance of effect (construction)	The effect of the Project on VP2 during construction is considered to be ***Low.***
Operation	
Magnitude of change assessment - permanent infrastructure	The nearest section of the alignment is approximately 60 m to the south of this viewpoint. The skyline is already affected by the presence of powerlines, power poles and a mobile phone tower. The magnitude of change on this receptor is anticipated to be considerable, therefore ***Moderate***, due to the following factors: • Change due to the provision of new rail infrastructure, including the Mount Forbes Road Bridge (7.1 m minimum clearance over rail) • Vegetation clearing for the construction of the proposed alignment, Mount Forbes Road Bridge and laydown area will reduce the density of screening vegetation and open views • However, views to the rail alignment from local rural properties (the key visual receptor audience in this location) will be limited, as the alignment is at a lower elevation than the remaining surrounding properties due to the cut (depths of up to 20 m) and due to the removal of a number of residential properties in this location • Fencing is to be provided for the extent of the rail corridor, typically located on the corridor boundary. Fencing is to extend between the corridor and private land adjoining the railway. Standard rural fencing is proposed and will be in keeping with the existing rural character. • At this distance, the alignment and new Mount Forbes Road Bridge will be visible and considerably change the visual character of the landscape, as it will be introducing new rail and road infrastructure into what is currently a relatively intact and vegetated rural setting. This represents a ***Moderate*** magnitude of change.
Magnitude of change assessment - train	• Movement of double stacked freight trains up to 1,800 m long with a height of 6.5 m will be predominately screened due to the lower design level of the railway track. Trains will be evident to travellers passing over Mount Forbes Road Bridge, but only experienced occasionally due to the low number and transient nature of travellers on this road. Therefore, the magnitude of impact is considered to be ***Low***.
Significance of effect (operation)	The effect of the Project on VP2 during operation is considered to be ***Low.***

8.1.3 Viewpoint 3

Table 32: Likely visual effect of the Project on Viewpoint 3 (VP3)

VP3: Cunningham Highway looking south-east to Flinders Peak	
Visual Baseline Assessment	
 **Existing view from Viewpoint 3 (VP3)** *Refer to* **Figure 28: Viewpoint 3: Cunningham Highway looking southeast to Flinders Peak - existing context** *in Appendix 2 for appropriate scaled image.*	
Location and description	• GPS Location: 27°41'59.387" S 152°40'17.412" E • Elevation: 50.0 m • South-easterly view towards Flinders Peak from Cunningham Highway • Proposed alignment is approximately 80 m to the south of this viewpoint • Represents views of people travelling south along the Cunningham Highway. It is also located relatively close to the Ipswich Motorsports Precinct and a few rural properties • South-easterly views from this viewpoint provide open views towards the proposed alignment, and the Flinders-Goolman Conservation Estate on the horizon, including foreground landscapes typical of the LCD D: Dry Croplands and Pastures (D7: Willowbank), midground elements of LCT B: Vegetated Watercourses – Creeks and Channels (Warrill Creek) with LCT H: Forested Uplands (H5: Teviot Range) beyond.
Key visual sensitivities	• A high number of receptors travel along Cunningham Highway (AADT around 5,675 per day, of which up to 25 per cent are heavy vehicles) and would experience changes to the view. However, it is noted that these are passing at speed and would experience transient views • This part of the Cunningham Highway is not a formal tourist drive/scenic route • The presence of existing infrastructure (power poles, powerlines and transmission towers) reduces the overall sensitivity of this view • This viewpoint it is considered to have a ***Moderate*** sensitivity overall to the change proposed, due to the large number of viewers tempered with the transience of and lack of specific interest in the views.

VP3: Cunningham Highway looking south-east to Flinders Peak	
Visual Evaluation	
 **Photomontage view from Viewpoint 3 (VP3): Cunningham Highway looking south-east to Flinders Peak** *Refer to* **Figure 29: Viewpoint 3: Cunningham Highway looking southeast to Flinders Peak - visualisation** *in Appendix 2 for appropriate scaled image.*	
Construction	
Magnitude of change assessment	• Construction will be a temporary impact • Substantial vegetation clearing for the construction of the proposed alignment, bridge structures and laydown area will reduce the density of screening vegetation, increasing the visibility of the alignment from the Cunningham Highway and surrounding rural properties • Earthworks associated with the proposed alignment will require the movement of large volumes of material • The presence of construction plant constructing the alignment, Cunningham Highway Bridge, Warrill Creek Rail Bridge, service road, cuts and embankments will temporarily change the character of the landscape, creating a considerable change in the landscape character of this viewpoint • This represents a ***Moderate*** magnitude of change.
Significance of effect (construction)	The effect of the Project on VP3 during construction is considered to be ***Moderate***.
Operation	
Magnitude of change assessment - permanent infrastructure	The nearest section of the alignment is approximately 80 m to the south-east of this viewpoint. The skyline is already affected by the presence of powerlines, power poles and transmission towers. The magnitude of change on this receptor is anticipated to be dominant, therefore high, due to the following factors: • Introduction of significant new rail infrastructure, including the Cunningham Highway Bridge (7.1 m clearance over rail) and Warrill Creek Rail Bridge (1.4 m clearance) which are new elements in the view • Provision of new road bridge will provide elevated views over the general landscape and alignment, increasing the visibility of the Project • Vegetation clearing for the construction of the proposed alignment, Cunningham Highway Bridge, Warrill Creek Rail Bridge, service road and laydown area will reduce the density of screening vegetation • Fencing is to be provided for the extent of the rail corridor, typically located on the corridor boundary. Fencing is to extend between the corridor and private land adjoining the railway. Standard rural fencing is proposed and will be in keeping with the existing rural character. • At this distance, the alignment and new Cunningham Highway Bridge will be highly evident and will have a dominant impact on the character of the landscape as it will be introducing new rail and road infrastructure into what is currently a relatively intact and vegetated rural setting as experienced from the highway. This represents a ***High*** magnitude of change.

VP3: Cunningham Highway looking south-east to Flinders Peak	
Magnitude of change assessment - train	• Movement of double stacked freight trains up to 1,800 m long with a height of 6.5 m will be partially screened due to the lower design level of the railway track. Elevated views to the alignment will be possible for travellers passing over the Cunningham Highway Bridge. While experienced by a large number of motorists, these views are of transient nature. Therefore, the magnitude of change is considered to be ***Moderate***.
Significance of effect (operation)	The effect of the Project on VP3 during operation is considered to be ***High.***

8.1.4 Viewpoint 4

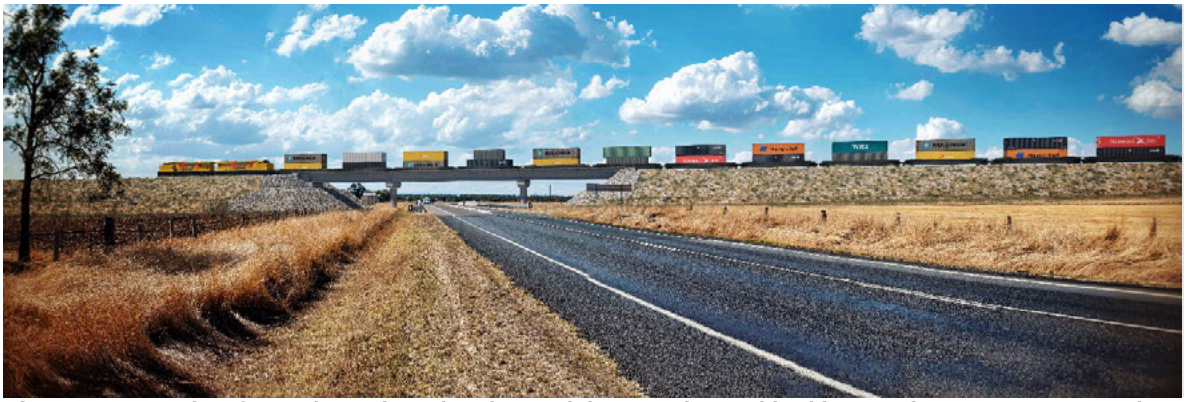
Table 33: Likely visual effect of the Project on Viewpoint 4 (VP4)

VP4: Middle Road, looking north	
Visual Baseline Assessment	
 **Existing view from Viewpoint 4 (VP4)** *Refer to* **Figure 30: Viewpoint 4: Middle Road, looking north - existing context** *in Appendix 2 for appropriate scaled image.*	
Location and description	• GPS Location: 27°44'20.658" S 152°42'5.633" E • Elevation: 49.0 m • North-easterly view towards Purga Nature Reserve from Middle Road near871 Middle Road and north of junction with Bill Morrow Road • Proposed alignment is approximately 150 m to the north of this viewpoint • Represents typical and accessible views of a small number of rural residents and of residents and workers travelling north along Middle Road • North-easterly views from this viewpoint provide open views towards the proposed alignment and Purga Reserve within LCD D: Dry Croplands and Pastures (D10: Purga) and distant views to the wooded backdrop created by the Flinders-Goolman Conservation Estate, LCT H: Forested Uplands (H5: Teviot Range) beyond.
Key visual sensitivities	• Low sensitivity of receptors, including rural residents, workers, travellers driving along Middle Road and visitors to Purga Nature Reserve • The presence of existing infrastructure (power poles, powerlines and existing high voltage transmission towers) reduces the overall sensitivity of this view • This viewpoint it is considered to have a ***Low*** sensitivity overall to the change proposed, due to the relatively small number of receptors, most of whom would obtain only transient views from this location i.e. travellers on Middle Road and nearby rural residents).
Visual Evaluation	
Please note that no visualisation has been provided for this viewpoint, as discussed in ***Section 4.9: Visual impact assessment methodology.***	

VP4: Middle Road, looking north	
Construction	
Magnitude of change assessment	• The proposed alignment and associated earthworks will modify the existing landscape during construction • Substantial vegetation clearing for the construction of the proposed alignment and laydown area will reduce the density of screening vegetation, increasing the visibility of the alignment from Middle Road and surrounding rural properties, exacerbated by the open and flat nature of the landscape • While, the change would be considerable, the change is only temporary, decreasing the magnitude of change • Overall, this is considered to represent a ***Moderate*** magnitude of change.
Significance of effect (construction)	The effect of the Project on VP4 during construction is considered to be ***Low***.
Operation	
Magnitude of change assessment - permanent infrastructure	The nearest section of the alignment is approximately 150 m to the north of this viewpoint. The proposed alignment will cross Middle Road. The skyline is already affected by the presence of powerlines, power poles and transmission towers. The magnitude of change on this receptor is anticipated to be considerable, due to the following factors: • Introduction of rail infrastructure, including controlled level crossing on Middle Road and embankments associated with the Purga Creek Rail Bridge which in places may restrict views to the distant ranges • Earthworks associated with the proposed alignment and resurfacing of Middle Road will require vegetation to be removed opening views to the alignment • Fencing is to be provided for the extent of the rail corridor, typically located on the corridor boundary. Fencing is to extend between the corridor and private land adjoining the railway. Standard rural fencing is proposed and will be in keeping with the existing rural character. • At this distance, the alignment will be highly evident and will change the visual character of the landscape, as it will be introducing new rail infrastructure into what is currently a relatively intact and vegetated rural setting. However, elements of the rural landscape including the existing dwelling and foreground trees will remain, helping to assimilate the rail infrastructure. This represents a ***Moderate*** magnitude of change.
Magnitude of change assessment - train	• Movement of double stacked freight trains up to 1,800 m long with a height of 6.5 m will be partially screened due to the lower design level of the railway track. Trains will be evident to travellers on Middle Road but only experienced intermittently due to the moderate number and transient nature of travellers on this road. Therefore, the magnitude of impact is considered to be ***Moderate***.
Significance of effect (operation)	The effect of the Project on VP4 during operation is considered to be ***Low.***

8.1.5 Viewpoint 5

Table 34: Likely visual effect of the Project on Viewpoint 5 (VP5)

VP5: Ipswich-Boonah Road looking north-east, near properties 276 and 288	
Visual Baseline Assessment	
 **Existing view from Viewpoint 5 (VP5)** *Refer to* **Figure 31: Viewpoint 5: Ipswich-Boonah Road looking northeast, near properties 276 and 288 - existing context** *in Appendix 2 for appropriate scaled image.*	
Location and description	• GPS Location: 27°45'17.321" S 152°44'9.33" E • Elevation: 51.0 m • North-easterly view towards Boral Quarries Peak Crossing (Purga) and Flinders Peak from Ipswich-Boonah Road • Proposed alignment is approximately 170 m to the north-east of this viewpoint • Represents typical views of residents and of visitors, workers and tourists travelling Ipswich-Boonah Road as well as representative publicly accessible a small cluster of rural dwellings located near this location • North-easterly views from this viewpoint provide open views towards the proposed alignment across LCT D: Dry Croplands and Pastures (D12: Goolman) and LCT G: Transitional Landscapes (G3: Purga Quarry) and more distant views towards LCT H: Forested Uplands (H5: Teviot Range).
Key visual sensitivities	• Medium sensitivity of receptors, including rural residents, workers and travellers along Ipswich-Boonah Road (AADT around 6,449 per day, of which up to 11 per cent are heavy vehicles) • The presence of existing infrastructure (power poles, powerlines, transmission towers and the quarry) reduce the overall sensitivity of this view • This viewpoint it is considered to have a ***Moderate*** sensitivity overall due to the relatively large numbers of travellers on Ipswich-Boonah Road and presence of nearby rural residents.
Visual Evaluation	
 **Photomontage view from Viewpoint 5 (VP5): Ipswich-Boonah Road looking north-east, near properties 276 and 288**	

VP5: Ipswich-Boonah Road looking north-east, near properties 276 and 288	
Refer to **Figure 32: Viewpoint 5: Ipswich-Boonah Road looking northeast, near properties 276 and 288 - visualisation** *in Appendix 2 for appropriate scaled image.*	
Construction	
Magnitude of change assessment	• Vegetation clearing will have minimal impact due to how sparse vegetation is in this location • Considerable construction areas are proposed that would be visible from this viewpoint, including a major construction laydown area, fuel storage, and satellite offices • Construction of proposed embankments, cuts, installation of rail bridge infrastructure and the resurfacing of the Ipswich-Boonah Road will cause temporary disturbance within the landscape • The construction of the proposed alignment will require the resumption and demolition of the property located on Castle Hill Lane shown to the west of this viewpoint (right hand side of view) • At this distance, construction works and laydown areas will be highly evident and change the visual character of the landscape, albeit temporarily. This is considered to be a ***Moderate*** magnitude of change.
Significance of effect (construction)	The effect of the Project on VP5 during construction is considered to be ***Moderate.***
Operation	
Magnitude of change assessment - permanent infrastructure	The nearest section of the alignment is approximately 170 m to the north-east of this viewpoint. The skyline is already affected by the presence of powerlines, power poles, transmission towers and the Boral Quarries Peak Crossing (Purga) Peak Crossing (Purga). The magnitude of change on this receptor is anticipated to be dominant, therefore high, due to the following factors: • Dominant change due to proposed earthworks and the provision of significant new rail infrastructure, including the Ipswich-Boonah Road Rail Bridge (rail over road) with a clearance of 5.1 m and Mount Flinders Road Rail Bridge (5.4 m) and resurfacing of Ipswich-Boonah Road. Other changes visible along this road, to the west (left hand side) of the view include Purga Creek 2 Rail bridge (1.4 m clearance). • Height of proposed embankments varies, with the maximum proposed height being approximately 12 m above natural ground, and the deepest cut being approximately 7.8 m below existing surveyed level • Due to the sparse nature of existing vegetation, vegetation will provide minimal screening of the alignment • Fencing is to be provided for the extent of the rail corridor, typically located on the corridor boundary. Fencing is to extend between the corridor and private land adjoining the railway. Standard rural fencing is proposed and will be in keeping with the existing rural character. • At this distance, the alignment and associated infrastructure will be clearly evident, and represent a dominant change the visual character of the landscape introducing new, dominant visual elements into the landscape, considered to be up to ***High*** magnitude of change.
Magnitude of change assessment - train	• Movement of double stacked freight trains up to 1,800 m long with a height of 6.5 m will be partially screened due to proposed embankments, however they will still be experienced at close distance will have a considerable impact on travellers on Ipswich-Boonah Road. Therefore, the magnitude of impact is considered to be ***Moderate***.
Significance of effect (operation)	The effect of the Project on VP5 during operation is considered to be ***High.***

8.1.6 Viewpoint 6

Table 35: Likely visual effect of the Project on Viewpoint 6 (VP6)

VP6: Peak Mountain View Park, near Peak Crossing State School and Peak Crossing township	
Visual Baseline Assessment	
 **Existing view from Viewpoint 6 (VP6)** *Refer to* **Figure 33: Viewpoint 6: Peak Mountain View Park, near Peak Crossing State School and Peak Crossing township - existing context** *in Appendix 2 for appropriate scaled image.*	
Location and description	• GPS Location: 27°46'46.8" S 152°43'57.912" E • Elevation: 51.0 m • Easterly views from Peak Mountain View Park towards Purga Creek • Proposed alignment is approximately 2.25 km to the east of this viewpoint • Represents accessible and representative views of Peak Crossing State School patrons and of visitors, workers and tourists travelling Ipswich-Boonah Road and utilising the facilities (playground, amenities and BBQ/picnic facilities) at Peak Mountain View Park. Also representative of worst-case views of residents of Peak Crossing. • The viewpoint falls on the edge of LCT F: Rural Settlement (LCT F5: Peak Downs) • Easterly views towards the proposed alignment are screened by vegetation along associated with LCT B: Vegetated Watercourses Creeks and Channels (B4: Purga Creek) while there are distant views to the Flinders-Goolman Conservation Estate within LCT H: Forested Uplands (H5: Teviot Range).
Key visual sensitivities	• Receptors include residents of Peak Crossing, people visiting/parking in Peak Mountain View Park (including people waiting to pick up school children) and travellers passing through Peak Crossing along Ipswich-Boonah Road • The presence of existing infrastructure (power poles and powerlines) reduces the overall sensitivity of this view • This viewpoint it is considered to have a ***High*** sensitivity overall to the change proposed, due to the number and types of viewers who are anticipated to spend some time at the viewpoint (e.g. travellers on Ipswich-Boonah Road and visitors to Peak Mountain View Park).
Visual Evaluation	
Please note that no visualisation has been provided for this viewpoint, as discussed in ***Section 4.9: Visual impact assessment methodology.***	
Construction	
Magnitude of change assessment	• Due to the distance of this viewpoint from the proposed alignment, and screening foreground vegetation along Purga Creek and retained vegetation along Dwyers Road, it is anticipated that there will be, at most, only marginal views of construction activities through gaps in vegetation • This will have negligible impact, creating a barely perceptible change in the visual amenity of this viewpoint • This represents a ***Negligible*** magnitude of change.

VP6: Peak Mountain View Park, near Peak Crossing State School and Peak Crossing township	
Significance of effect (construction)	The effect of the Project on VP6 during construction is considered to be ***Low***.
Operation	
Magnitude of change assessment - permanent infrastructure	The nearest section of the alignment is approximately 2.25 km to the east of this viewpoint. The skyline is already affected by the presence of powerlines and power poles. The magnitude of change on this receptor is anticipated to be barely perceptible due to the following factors: • Distance from the alignment, and obstruction of views to the alignment by screening vegetation along Purga Creek and Dwyers Road • At this distance, the alignment will be barely perceptible and will not change the fundamental visual character of the landscape, as it will become just another element in the rural landscape • This represents a ***Negligible*** magnitude of change.
Magnitude of change assessment - train	• Movement of double stacked freight trains up to 1,800 m long with a height of 6.5 m experienced at long distances may be noticeable where there are breaks in screening vegetation (to the north-east of this viewpoint) and will have a noticeable impact on residents of Peak Crossing and those visiting Peak Mountain View Park. Therefore, the magnitude of impact is considered to be ***Low***.
Significance of effect (operation)	The effect of the Project on VP6 during operation is considered to be up to ***Moderate***.

8.1.7 Viewpoint 7

Table 36: Likely visual effect of the Project on Viewpoint 7 (VP7)

VP7: Ipswich-Boonah Road near Flinders Peak Winery	
Visual Baseline Assessment	
 **Existing view from Viewpoint 7 (VP7)** *Refer to* **Figure 34: Viewpoint 7: Ipswich-Boonah Road near Flinders Peak Winery - existing context** *in Appendix 2 for appropriate scaled image.*	
Location and description	• GPS Location: 27°48'0.701" S 152°44'6.839" E • Elevation: 77.0 m • North-easterly view towards Flinders Peak Winery and Flinders-Goolman Conservation Estate, including Flinders Peak from Ipswich-Boonah Road • Proposed alignment is approximately 1.72 km to the east of this viewpoint. • Represents accessible transient views of residents, workers and tourists travelling along the Ipswich-Boonah Road. Also represents longer-term views obtained by a relatively small number of residents, visitors and guests of Flinders Peak Winery.

VP7: Ipswich-Boonah Road near Flinders Peak Winery	
	• North-easterly views from this viewpoint provide generally open views towards the proposed alignment across LCT D: Dry Croplands and Pastures (D11: Limestone Ridges) towards LCT B: Vegetated Watercourses - Creeks and Channels (B4: Purga Creek) while there are distant views to the distinctive landform of LCT H: Forested Uplands (H5: Teviot Range).
Key visual sensitivities	• Receptors include visitors to Flinders Peak Winery who are tourists and therefore anticipated to be interested in the view which contributes to the ambience of the winery. Receptors also include travellers driving along Ipswich-Boonah Road who would be less concerned about the view from this particular location • The presence of existing infrastructure (power poles and powerlines) reduce the overall sensitivity of this view • This viewpoint is considered to have a ***Moderate*** sensitivity overall to the change proposed, due to the combination of number and type of viewers (e.g. travellers on Ipswich-Boonah Road and tourists/visitors to Flinders Peak Winery).
Visual Evaluation	
Please note that no visualisation has been provided for this viewpoint, as discussed in ***Section 4.9: Visual impact assessment methodology.***	
Construction	
Magnitude of change assessment	• Vegetation clearing, excavation and bulk earthworks will have a localised impact and reduce the density of screening vegetation, including the formation of a construction access road within the existing road easement (Flinders-Dolomite Road) to the south of the Flinders Peak Winery • At this distance, views towards construction works from Ipswich-Boonah Road and Flinders Peak Winery will be distant and create a noticeable change in the visual character of the landscape • This represents a ***Low*** magnitude of change.
Significance of effect (construction)	The effect of the Project on VP7 during construction is considered to be ***Low***.
Operation	
Magnitude of change assessment - permanent infrastructure	The nearest section of the alignment is approximately 1.72 km to the east of this viewpoint. The skyline is already affected by the presence of powerlines and power poles. The magnitude of change on this viewpoint is anticipated to be noticeable due to the following factors: • Proposed earthworks and the introduction of new rail infrastructure, including a controlled level crossing • Vegetation clearing for the construction of the proposed alignment, particularly within land to the east of Dwyers Road will reduce the density of screening vegetation • Depth of proposed cuts varies, with the maximum proposed depth being approximately 18.25 m below natural ground - it is likely that views to the rail alignment from Ipswich-Boonah Road and Flinders Peak Winery will be partially screened due to the rail line being at a lower elevation than the foreground landscape i.e. infrastructure in cut would not be visible from this viewpoint • Fencing is to be provided for the extent of the rail corridor, typically located on the corridor boundary. Fencing is to extend between the corridor and private land adjoining the railway. Standard rural fencing is proposed and will be in keeping with the existing rural character • At this distance, the alignment will be noticeable, however it will not change the fundamental visual character or amenity of the landscape • Due to the speed at which people are driving along Ipswich-Boonah Road the change would have a noticeable impact on views representing a ***Low*** magnitude of change • The alignment will 'blend' into the existing view to a considerable extent.
Magnitude of change assessment - train	• Movement of double stacked freight trains up to 1,800 m long with a height of 6.5 m will be partially screened due to the lower design level of the railway track. Distant views to the alignment will be possible for travellers on Ipswich-Boonah Road, and while experienced by a large number of motorists, these views are of transient nature. Views from Flinders Peak Winery to the alignment would be relatively unobstructed, albeit distant and, as

VP7: Ipswich-Boonah Road near Flinders Peak Winery	
	described, partially screened by the landscape. Therefore, the magnitude of impact is considered to be ***Low.***
Significance of effect (operation)	The effect of the Project on VP7 during operation is considered to be ***Low***.

8.1.8 Viewpoint 8

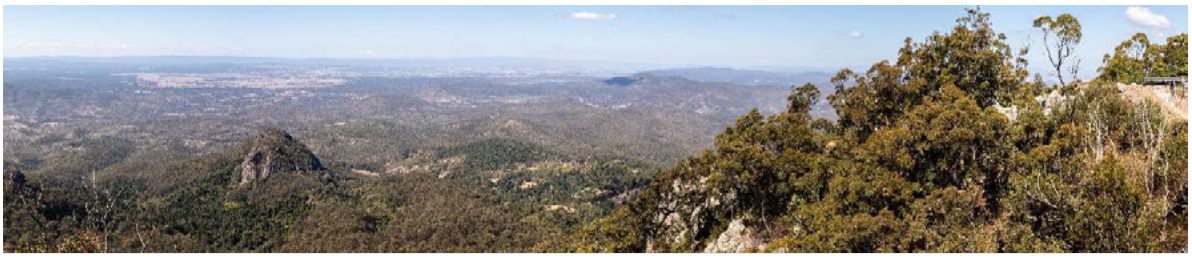
Table 37: Likely visual effect of the Project on Viewpoint 8 (VP8)

VP8: Cunningham Lookout off Rosewood-Warrill View Road east looking towards Flinders Peak	
Visual Baseline Assessment	
 **Existing view from Viewpoint 8 (VP8)** *Refer to* **Figure 35: Viewpoint 8: Cunningham Lookout off Rosewood-Warrill View Road east looking towards Flinders Peak - existing context** *in Appendix 2 for appropriate scaled image.*	
Location and description	• GPS Location: 27°49'20.586" S 152°34'59.891" E • Elevation: 161 m • Easterly view towards the rural settlement of Warrill View and elevated peaks associated with Flinders-Goolman Conservation Estate including Flinders Peak from Cunningham Lookout, off Rosewood-Warrill View Road • Viewpoint located beyond LVIA study area - proposed alignment is approximately 17 km to the east of this viewpoint. However, this viewpoint has been included due to its potential significance. • Represents typical and accessible views of workers, residents, and tourists travelling along Rosewood-Warrill View Road as well as visitors of Cunningham Lookout • North-easterly views from this viewpoint provide very distant views towards the proposed alignment across a range of Landscape Types to the LCT H: Forested Uplands (H5: Teviot Range).
Key visual sensitivities	• Regional lookout with tourist signposting and facilities • However, relatively low number of visitors anticipated to be stopping at Cunningham Lookout, on the basis of the relatively low numbers of people travelling along Rosewood-Warrill View Road (AADT around 271 per day, of which up to 19 per cent are heavy vehicles). However, these visitors have a high level of interest in this environment and, particularly, the views they obtain from the lookout. • Overall, therefore, this viewpoint is considered to have a ***Moderate*** sensitivity.
Visual Evaluation	
Please note that no visualisation has been provided for this viewpoint, as discussed in ***Section 4.9: Visual impact assessment methodology.***	
Construction	
Magnitude of change assessment	Due to the distance of this viewpoint from the proposed alignment (17 km), it is anticipated construction works will not be evident and will have no impact.
Significance of effect (construction)	The effect of the Project on VP8 during construction is considered to have ***No Impact***.

VP8: Cunningham Lookout off Rosewood-Warrill View Road east looking towards Flinders Peak	
Operation	
Magnitude of change assessment - permanent infrastructure	• Due to the distance of this viewpoint from the proposed alignment (17 km), it is anticipated that permanent infrastructure will not be discernible, and the Project will have no impact.
Magnitude of change assessment - train	• Due to the distance of this viewpoint from the proposed alignment (17 km), it is anticipated the moving train will not be evident and will have no impact.
Significance of effect (operation)	The effect of the Project on VP8 during operation is considered to have ***No Impact***.

8.1.9 Viewpoint 9

Table 38: Likely visual effect of the Project on Viewpoint 9 (VP9)

VP9: Flinders Peak	
Visual Baseline Assessment	
 **Existing view from Viewpoint 9A (VP9A)** *Refer to* **Figure 36: Viewpoint 9A: Flinders Peak - existing context** *in Appendix 2 for appropriate scaled image.*	
 **Existing view from Viewpoint 9B (VP9B)** *Refer to* **Figure 38: Viewpoint 9B: Flinders Peak - existing context** *in Appendix 2 for appropriate scaled image.*	
Location and description (Viewpoint 9A)	• GPS Location: 27°48'30.774" S 152°48'17.135" E • Elevation: 543.0 m • Westerly view towards Peak Crossing • Proposed alignment is approximately 4.70 km to the south-west • Represents typical views of those doing the Flinders Peak trail in Flinders – Goolman Conservation Estate • Westerly views from this elevated viewpoint provide panoramic views towards the proposed alignment across a variety of landscapes including LCT H: Forested Uplands (H5: Teviot Range), LCT E: Vegetated Grazing, LCT A: Vegetated Watercourses – Creeks and Channels and LCT G: Transitional Landscapes (G4: Limestone Hills) • Boral Quarries Peak Crossing (Purga), Flinders Peak Winery and Ivory's Rock Conventions and Events facility can be seen in the foreground • Distant views to Mount Walker and Main Range National Park

VP9: Flinders Peak	
	• It is noted that this viewpoint is selected to represent a multitude of views obtained while on the trail and from the summit. Viewpoint 9B (also included and considered to have similar sensitivities and effects) provides an alternative perspective for reference purposes.
Key visual sensitivities	• Low number of visitors undertaking the Flinders Peak hiking track, due to its classification as a Class 5 – difficult trail. However, these visitors have a very high level of interest in this environment and views obtained from the summit and trail. • Although this view comprises a strong forested and rural character, the presence of the existing rural infrastructure, and views of extractive industries (e.g. Boral Quarry) detract from the rural and natural qualities and sense of remoteness • This viewpoint it is considered to have a ***High*** sensitivity overall to the change proposed, due to the low number, but very high sensitivity of viewers (e.g. hikers) who are walking specifically to obtain the view in this regionally significant landscape (within Flinders-Goolman Conservation Estate, Flinders-Karawatha Regional Corridor, and the *ShapingSEQ* Regional Scenic Amenity Overlay Area).
Visual Evaluation	
 **Photomontage view from Viewpoint 9A: Flinders Peak (VP9A)** *Refer to* **Figure 37: Viewpoint 9A: Flinders Peak - visualisation** *in Appendix 2 for appropriate scaled image.*	
Construction	
Magnitude of change assessment	• The proposed alignment and associated earthworks will introduce new rail infrastructure into and the existing rural landscape, creating a noticeable change in the landscape character of this viewpoint • Due to the distance from the alignment, the most evident construction impact will be the clearance of vegetation for the construction of the proposed alignment, which will reduce the density of screening vegetation and increase the visibility of the alignment from Flinders Peak • This represents a ***Low*** magnitude of change.
Significance of effect (construction)	The effect of the Project on VP9 during construction is considered to be ***Moderate***.
Operation	
Magnitude of change assessment - permanent infrastructure	The nearest section of the Project is approximately 4.70 km to the south-west of this viewpoint. The skyline is already affected by the presence of powerlines, power poles, transmission towers and the Boral Quarries Peak Crossing (Purga). The magnitude of change on this receptor is anticipated to be noticeable, therefore low, due to the following factors: • Noticeable change due to the provision of new rail infrastructure, which will at this distance become another element in the rural landscape • Vegetation clearing during bulk earthworks and for the construction of the proposed alignment, will have limited impact due to how dense vegetation is at this location • At this distance, the alignment will be noticeable and will not change the fundamental visual character of the landscape, as it will 'blend' into the existing rural landscape to a considerable extent

VP9: Flinders Peak	
	• This represents a ***Low*** magnitude of change.
Magnitude of change assessment - train	• Movement of double stacked freight trains up to 1,800 m long with a height of 6.5 m will only be experienced occasionally due to the low number of people undertaking the Flinders Peak hiking track. Therefore, the magnitude of impact is considered to be ***Low***.
Significance of effect (operation)	The effect of the Project on VP9 during operation is considered to be ***Moderate.***

8.1.10 Viewpoint 10

Table 39: Likely visual effect of the Project on Viewpoint 10 (VP10)

VP10: Washpool Road near rural properties 456-463	
Visual Baseline Assessment	
 **Existing view from Viewpoint 10 (VP10)** *Refer to* **Figure 39: Viewpoint 10: Washpool Road near rural properties 456-463 - existing context** *in Appendix 2 for appropriate scaled image.*	
Location and description	• GPS Location: 27°50'39.96" S 152°46'6.353" E • Elevation: 82.0 m • Northerly views towards private rural properties and distant views to Flinders Peak from Washpool Road • Proposed alignment is approximately 300 m to the north of this viewpoint • Represents typical and accessible views of residents, visitors, and workers travelling Washpool Road • Northerly views from this viewpoint provide open views towards the proposed alignment, as well as including landscapes typical of the LCT B: Vegetated Watercourses – Creeks and Channels (B4: Purga Creek), LCT D: Dry Croplands and Pastures (D13: Wyaralong) and LCT H: Forested Uplands (H5: Teviot Range) landscape types.
Key visual sensitivities	• Small number of receptors, including residents of the few rural properties located in this area, workers and visitors driving along Washpool Road • The lack of existing infrastructure increases the overall sensitivity of this view • It is noted that due to the proposed realignment of Washpool Road, this part of the road will only be accessed by a very small number of local residents in the future. However, this viewpoint is considered representative of the impacts likely to be experienced by viewers travelling along the newly-aligned Washpool Road to the north. • This viewpoint is considered to have a ***Low*** sensitivity overall to the change proposed, due to the small number of viewers.
Visual Evaluation	
Please note that no visualisation has been provided for this viewpoint, as discussed in ***Section 4.9: Visual impact assessment methodology.***	

Construction	
Magnitude of change assessment	• The construction of the alignment, rail bridges, service road, cuts and embankments will introduce new rail infrastructure into and result in changes to the existing landscape that will be a dominant change in the landscape character of this viewpoint • Substantial vegetation clearing for the construction of the proposed alignment, bridge structures, laydown area, realignment of Washpool Road and service roads will reduce the density of screening vegetation, increasing the visibility of the alignment from Washpool Road and surrounding rural properties • This represents a ***High*** magnitude of change.
Significance of effect (construction)	The effect of the Project on VP10 during construction is considered to be ***Moderate***.
Operation	
Magnitude of change assessment - permanent infrastructure	The nearest section of the alignment is approximately 300 m to the north of this viewpoint. This is anticipated to have a dominant change on the viewpoint due to the following factors: • Introduction of new rail infrastructure within what is currently a relatively intact rural setting, including introduction of the Purga Creek rail bridges, realignment of Washpool Road and associated major earthworks • Vegetation clearing for the construction of the proposed alignment, Purga Creek rail bridges, service road and large laydown area will reduce the density of screening vegetation • Fencing is to be provided for the extent of the rail corridor, typically located on the corridor boundary. Fencing is to extend between the corridor and private land adjoining the railway. Standard rural fencing is proposed and will be in keeping with the existing rural character. • At this distance, the alignment and new Upper Tributary 2 and Upper Tributary 3 Purga Creek rail bridges (1.4 m) and Washpool Road Rail Bridge (5.4 m) will be highly evident and will change the fundamental visual character of the landscape, as it will be introducing new rail and road infrastructure into what is currently a relatively intact and vegetated rural setting. This represents a ***High*** magnitude of change.
Magnitude of change assessment - train	• Movement of double stacked freight trains up to 1,800 m long with a height of 6.5 m will be experienced by a small number of rural residents and by those travelling on Washpool Road. Therefore, the magnitude of impact is considered to be ***Moderate***.
Significance of effect (operation)	The effect of the Project on VP10 during operation is considered to be ***Moderate.***

8.1.11 Viewpoint 11

Table 40: Likely visual effect of the Project on Viewpoint 11 (VP11)

VP11: Wild Pig Creek Road near rural properties 717-722	
Visual Baseline Assessment	
 **Existing view from Viewpoint 11 (VP11)** *Refer to* **Figure 40: Viewpoint 11: Wild Pig Creek Road near rural properties 717-722 - existing context** *in Appendix 2 for appropriate scaled image.*	
Location and description	• GPS Location: 27°52'22.58" S 152°50'38.94" E • Elevation: 75.0 m • Northerly view towards from Wild Pig Creek Road • Proposed alignment is approximately 280 m to the north of this viewpoint • Represents typical and accessible views of residents, visitors, and workers travelling Wild Pig Creek Road • Northerly views from this viewpoint provide open views towards the proposed alignment at the transition of LCT D: Dry Croplands and Pastures (D16: Undullah Road) and LCT H: Forested Uplands (H5: Teviot Range).
Key visual sensitivities	• Very small number of receptors in this location, including rural residents, workers and few travellers driving along Wild Pig Creek Road • This viewpoint it is considered to have a ***Low*** sensitivity overall to the change proposed, due to the low sensitivity of viewers (e.g. very small numbers of viewers including rural residential properties).
Visual Evaluation	
 **Photomontage view from Viewpoint 11 (VP11): Wild Pig Creek Road near rural properties 717-722** *Refer to* **Figure 41: Viewpoint 11: Wild Pig Creek Road near rural properties 717-722 – visualisation** *in Appendix 2 for appropriate scaled image.*	

VP11: Wild Pig Creek Road near rural properties 717-722	
Construction	
Magnitude of change assessment	• The construction of the alignment, level crossing, service road, cuts and embankments will introduce new rail infrastructure into and significantly modify the existing landscape, creating a dominant change in the landscape character of this viewpoint • Proposed large laydown area to the east of Wild Pig Creek Road (right hand side of the view) will introduce activity and infrastructure into the view • Substantial vegetation clearing for the construction of the proposed alignment, bridge structures, laydown area, realignment of Wild Pig Creek Road and service roads will reduce the density of screening vegetation, increasing the visibility of the alignment from Wild Pig Creek Road and surrounding rural properties • This represents a ***High*** magnitude of change.
Significance of effect (construction)	The effect of the Project on VP11 during construction is considered to be ***Moderate***.
Operation	
Magnitude of change assessment - permanent infrastructure	The nearest section of the alignment is approximately 280 m to the north of this viewpoint. The magnitude of change on this receptor is anticipated to be dominant, due to the following factors: • Dominant change due to the provision of new rail infrastructure within what is currently a relatively intact rural setting, including a level crossing and major earthworks • Vegetation clearing for the construction of the proposed alignment, service road and laydown area will reduce the density of screening vegetation • Fencing is to be provided for the extent of the rail corridor, typically located on the corridor boundary. Fencing is to extend between the corridor and private land adjoining the railway. Standard rural fencing is proposed and will be in keeping with the existing rural character. • At this distance, the alignment will be highly evident and will change the fundamental visual character of the landscape, as it will be introducing new rail and road infrastructure into what is currently a relatively intact and vegetated rural setting. This represents a ***High*** magnitude of change.
Magnitude of change assessment - train	• Movement of double stacked freight trains up to 1,800 m long with a height of 6.5 m will be experienced by a small number of rural residents and by those travelling on Wild Pig Creek Road. Therefore, the magnitude of impact is considered to be ***Moderate***.
Significance of effect (operation)	The effect of the Project on VP11 during operation is considered to be ***Moderate.***

8.1.12 Viewpoint 12

Table 41: Likely visual effect of the Project on Viewpoint 12 (VP12)

VP12: Undullah Road near 'Brooklands" rural property	
Visual Baseline Assessment	
 **Existing view from Viewpoint 12 (VP12)** *Refer to* **Figure 42: Viewpoint 12: Undullah Road near "Brooklands" rural property - existing context** *in Appendix 2 for appropriate scaled image.*	
Location and description	• GPS Location: 27°51'47.658" S 152°55'20.345" E • Elevation: 50.0 m • North-easterly view towards Flagstone from Undullah Road • Viewpoint is located at the intersection of the new rail with the existing rail so is located in a 'triangle' of land between new and old tracks • Proposed alignment is approximately 270 m to the north of this viewpoint (as well as 140 m to the south-west) • Represents typical and accessible views of residents, visitors, and workers travelling Undullah Road • North-easterly views from this viewpoint provide open views towards the proposed alignment across and distant views to the Flagstone residential growth area across LCT D: Dry Croplands and Pastures (D17: Allenview) towards LCT H: Forested Uplands (H5: Teviot Range).
Key visual sensitivities	• Low sensitivity of receptors, including rural residents, workers and travellers driving along Undullah Road • The presence of existing infrastructure (power poles, powerlines, and the presence of the existing railway line (decommissioned) reduces the overall sensitivity of this view • This viewpoint it is considered to have a ***Low*** sensitivity overall to the change proposed, due to the low sensitivity of viewers (e.g. travellers on Undullah Road and small numbers of nearby rural residents).
Visual Evaluation	
Please note that no visualisation has been provided for this viewpoint, as discussed in ***Section 4.9: Visual impact assessment methodology.***	
Construction	
Magnitude of change assessment	• The construction of the alignment, Undullah Road Bridge, realignment of Undullah Road, large laydown areas, cuts and embankments will introduce new rail infrastructure into the landscape, creating a dominant change in the landscape character of this viewpoint • It is noted that the new alignment ties into the existing (decommissioned) rail line in this location • Vegetation clearing will have minimal impact due to how sparse the existing vegetation is in this location

VP12: Undullah Road near 'Brooklands" rural property	
	• This represents a ***High*** magnitude of change.
Significance of effect (construction)	The effect of the Project on VP12 during construction is considered to be ***Moderate.***
Operation	
Magnitude of change assessment - permanent infrastructure	The nearest section of the alignment visible within this viewpoint is approximately 270 m to the north, while additional rail infrastructure is proposed 140 m to the south-west of this viewpoint (not visible within the view). The skyline is already affected by the presence of powerlines, power poles and there is existing rail infrastructure. The magnitude of change on this receptor is anticipated to be dominant, therefore high, due to the following factors: • Dominant change due to the provision of new rail infrastructure, including the realignment of Undullah Road and the new Undullah Road Bridge (7.1 m clearance over rail) • Provision of new road bridge will provide elevated views over the general landscape and alignment, increasing the visibility of the Project • Due to the sparse nature of existing vegetation, vegetation clearance will have minimal impact on the screening of the alignment • Fencing is to be provided for the extent of the rail corridor, typically located on the corridor boundary. Fencing is to extend between the corridor and private land adjoining the railway. Standard rural fencing is proposed and will be in keeping with the existing rural character. • At this distance, while the alignment, realignment of Undullah Road and new Undullah Road Bridge will be more evident than the existing rail line, it will not change the fundamental visual character of the landscape • This represents a ***High*** magnitude of change.
Magnitude of change assessment - train	• Movement of double stacked freight trains up to 1,800 m long with a height of 6.5 m will be evident, however they will only be experienced at close distance by a small number of people travelling along Undullah Road and isolated rural residences. Therefore, the magnitude of impact is considered to be ***Moderate***.
Significance of effect (operation)	The effect of the Project on VP12 during operation is considered to be up to ***Moderate.***

9. Lighting Impact Assessment

This section considers the impact of Project lighting.

As described in **Section 6: Potential Impacts**, construction lighting will only be associated with site offices and fuel storage areas and is for safety and security purposes. It may also be used at bridge laydown areas and if provided, with proposed flash butt welding facilities. In terms of operational lighting, proposed permanent lighting for the Project is associated with safety lighting at proposed level crossings (including on Middle Road), and minimal internal lighting within the tunnel, with only low-level and emergency lighting expected. There would also be transient lighting associated with train headlights.

9.1. Lighting assessment

On the basis of the proposed lighting, most of the assessed viewpoints would not receive any lighting impacts. Therefore, only the following viewpoints have been assessed, which are reported in **Table 42** to **Table 45**:

- Viewpoint 4
- Viewpoint 5
- Viewpoint 7
- Viewpoint 11.

9.1.1 Viewpoint 4

Table 42: Likely visual effect of the Project lighting on Viewpoint 4 (VP4)

VP4: Middle Road, looking north	
Lighting Assessment	
Visual Evaluation	
Sensitivity assessment	• ***Low*** as described for daytime assessment. There will be few receptors in this location at night – the residents of 871 Middle Road would be the key night-time viewers.
Construction	
Magnitude of change assessment (construction)	• During construction, it is anticipated that minimal works will be undertaken at night. However, the laydown area proposed within this view would be lit. • The current light levels are assumed to be 'intrinsically dark' and it is assumed that, with careful planning, the levels would be 'predominantly dark' representing a noticeable ***Low*** magnitude of change.
Significance of effect (construction)	***Negligible*.**
Operation	
Magnitude of change assessment (operation)	• The active level crossing proposed would be controlled by automatic warning systems including flashing lights and would be visible from the rural property at 871 Middle Road, as well as nearby rural properties on Middle Road and Bill Morrow Road. • This would, at worst, change a 'intrinsically dark' landscape into a 'predominantly dark' landscape representing a noticeable change considered to have a ***Low*** magnitude of change.
Level of effect (operation)	***Negligible****.*

9.1.2 Viewpoint 5

Table 43: Likely visual effect of the Project lighting on Viewpoint 5 (VP5)

VP5: Ipswich-Boonah Road looking north-east, near properties 276 and 288	
Lighting Assessment	
Visual Evaluation	
Sensitivity assessment	• ***Moderate*** as described for daytime assessment. There will be few receptors in this location at night – the residents of 276 and 288 Ipswich-Boonah Road would be the key night-time viewers.
Construction	
Magnitude of change assessment (construction)	• During construction it is anticipated that minimal works will be undertaken at night. However, the laydown area proposed within this view would be lit. • The current light levels are assumed to be 'intrinsically dark' and it is assumed that, with careful planning, the levels would be 'predominantly dark' representing a noticeable ***Low*** magnitude of change.
Significance of effect (construction)	***Low*.**
Operation	
Magnitude of change assessment (operation)	• There would be no lighting associated with the new Ipswich-Boonah Road Rail Bridge and Mount Flinders Road Rail Bridge (over road). Therefore, there would be ***no impact*** at night.
Level of effect (operation)	***No Impact.***

9.1.3 Viewpoint 7

Table 44: Likely visual effect of the Project lighting on Viewpoint 7 (VP7)

VP7: Ipswich-Boonah Road near Flinders Peak Winery	
Lighting Assessment	
Visual Evaluation	
Sensitivity assessment	• ***Moderate*** as described for daytime assessment. Tourists staying at the Flinders Peak Winery would be the key night-time viewers.
Construction	
Magnitude of change assessment (construction)	• During construction it is anticipated that minimal works will be undertaken at night. It is assumed that the laydown area this view would not be lit. It is also assumed that construction traffic would not travel along Flinders-Dolomite Road after approved working hours. Therefore, there would be ***no impact*** at night.
Significance of effect (construction)	***No Impact*.**
Operation	
Magnitude of change assessment (operation)	• The active level crossing proposed on Dwyers Road would be controlled by automatic warning systems including flashing lights and would be visible to people travelling along Dwyers Road and nearby residential properties. • The current light levels are assumed to be 'intrinsically dark' and it is assumed that, with careful planning, the levels would remain 'intrinsically dark' representing a ***negligible*** magnitude of change due to the distance of this viewpoint and the Flinders Peak Winery from the active level crossing.
Level of effect (operation)	***Low*.**

9.1.4 Viewpoint 11

Table 45: Likely visual effect of the Project lighting on Viewpoint 11 (VP11)

VP11: Wild Pig Creek Road near rural properties 717-722	
Lighting Assessment	
Visual Evaluation	
Sensitivity assessment	• ***Negligible***, largely as for daytime assessment but noting that even fewer people would be likely to be in this location at night. There will be very few receptors in this location at night – the residents of rural properties 717-722 Wild Pig Creek Road are the key night-time viewers, with the closest lying 390 m from the laydown area and 500 m from the proposed level crossing.
Construction	
Magnitude of change assessment (construction)	• During construction it is anticipated that minimal works will be undertaken at night. However, the laydown area proposed within this view would be lit. • The current light levels are assumed to be 'intrinsically dark' and it is assumed that, with careful planning, the levels would be 'predominantly dark' representing a noticeable ***Low*** magnitude of change***.***
Significance of effect (construction)	***Negligible*.**
Operation	
Magnitude of change assessment (operation)	• The active level crossing proposed would be controlled by automatic warning systems including flashing lights and would be visible to people travelling along Wild Pig Creek Road. • This would, at worst, change a 'intrinsically dark' landscape into a 'predominantly dark' landscape representing a noticeable change considered to have a ***Low*** magnitude of change.
Level of effect (operation)	***Negligible.***

10. Cumulative Impacts

Cumulative impacts are those that result from the successive, incremental and or combined effects of an action, Project or activity when added to other existing, planned and or reasonably anticipated future ones (World Bank IFC, Good Practice Handbook, 2013).

10.1. Cumulative LVIA methodology

The aim of the cumulative LVIA, is to describe and assess the ways in which the Project could have additional impacts when considered in combination with other proposed built developments in the area. For the purposes of cumulative LVIA, the assessment considers if the cumulative impact would be:

- Combined: for example, two or more projects visible from one viewpoint
- Successive: two or more projects visible from one location and with the same viewfield
- Sequential: developments viewed at different times, for example passing along a road.

The cumulative impact assessment methodology follows a qualitative method based on a three-step process, as follows:

- Identification of proposed developments situated within or around the LVIA study area
- Identification of Area of Influence (AOI) for the landscape and visual assessment, within which it is anticipated that cumulative effects could occur
- Cumulative impact assessment based on the assessment matrix set out in Table 46 and impact significance assessment matrix set out in Table 47.

Table 46: Relevance factors for assessing cumulative impact

Aspect	**Relevance Factors**		
	Low	**Medium**	**High**
Probability of Impact	1	2	**3**
Duration of Impact	1	2	**3**
Magnitude / Intensity of Impact	1	2	**3**
Sensitivity of Receiving Environment	1	2	**3**

Table 47: Impact significance for assessing cumulative impact

Aspect	**Sum of relevance factors**	**Consequences**
Low	1-6	Negative impacts need to be managed by standard environmental management practices. Special approval conditions unlikely to be necessary. Monitoring to be part of general Project monitoring program
Medium	7-9	Mitigation measures likely to be necessary and specific management practices to be applied. Specific approval conditions are likely. Targeted monitoring program required, where appropriate.
High	10-12	Alternative actions should be considered and/or mitigation measures applied to demonstrate improvement. Specific approval conditions required. Targeted monitoring program necessary, where appropriate.

10.2. Cumulative impact area and project inclusion

The cumulative LVIA is based on descriptions of other similar scale projects to the extent that such data was publicly available at the time of this assessment. The cumulative situation may change as applications are made or withdrawn.

A provisional review has been conducted to streamline the assessment process to eliminate or scope out projects, which are anticipated to generate negligible landscape and visual impacts. Due to the potential for sequential impacts, for example when driving through the landscape, a wider AOI than the LVIA study area was considered, extending 50 km (approximately 30 minutes' drive or more). Beyond this distance, it is considered that there would be no reasonable expectation of cumulative impact being registered by a viewer.

A number of projects were identified and considered for the cumulative impact assessment but were discounted on the basis of location (distance from the Project) or lack of available information. Projects not included within the LVIA cumulative impact assessment on this basis include:

- Salisbury to Beaudesert Rail Connection
- Cunningham Highway, Yamanto to Ebenezer
- Ebenezer Regional Industrial Area
- Willowbank Raceway Upgrade (within Ipswich Motorsports Precinct)
- Western Ipswich Bypass
- Bus and Passenger Rail Connection to Brisbane
- Cross River Rail.

Based on this assessment, the projects considered to have potential cumulative landscape and visual impacts are shown on **Figure 14: Cumulative LVIA**. **Table 48** sets out the key criteria for inclusion of a project. The selected projects are described in **Table 49**.

Table 48: Project inclusion criteria – cumulative impact assessment

No.	Consequences
a)	Are currently being assessed under Part 1 of the Chapter 3 of the *Environmental Protection Act 1994* (EP Act) (Qld) and, as a minimum, have an initial advice statement (IAS) available on the DES website.
b)	Have been declared a 'coordinated Project' by the Coordinator General under the SDPWO Act and an EIS is currently being prepared or is complete, or an IAS is available on the QLD Department of State Development, Manufacturing, Infrastructure and Planning (DSDMIP) website.
c)	May use resources located within the region (including materials, groundwater, road networks or workforces) that are the same as those to be used by the Inland Rail Program.
d)	Could potentially compound residual impacts that the Inland Rail Program may have on environmental or social values.

10.3. Cumulative impact assessment

Cumulative impacts to the landscape and visual amenity of the Project will be largely the product of:

- Temporal construction impacts - presence of construction traffic, workforce and machinery operating on adjoining projects at the same time
- Spatial operational impacts - the residual impact of the visibility of infrastructure of identified projects to sensitive receptors and also including as a result of the introduction of additional visual receptors (including residential receptors) into an area and with potential to view the Project.

In terms of temporal impact, it appears likely that the K2ARB, H2C, Greater Flagstone PDA, Bromelton SDA, Ripley Valley PDA and RAAF Base Amberley upgrade may all have some overlap in construction periods. This has potential to result in the perception of relatively high amounts of construction activity within the AOI.

Table 49: Projects included in the LVIA cumulative impact assessment

Project and Proponent	Location	Description	Project status	Construction dates and jobs	Relationship to the Project	Selection criteria[1]
Kagaru to Acacia Ridge and Bromelton (K2ARB) (ARTC)	Rail corridor from Kagaru to Acacia Ridge and Bromelton	Enhancing and connecting the existing rail corridor (approximately 49 km) from north-east of Kagaru to Acacia Ridge and from south of Kagaru to Bromelton.	Proponent awaiting coordinated project decision by the Coordinator-General	2023-2025 Jobs TBA	Potential overlap of construction for C2K and K2ARB.	c)
Helidon to Calvert (H2C) (ARTC)	Rail alignment from Helidon to Calvert	The H2C project will include the following: • 47 km single-track dual-gauge freight rail line to accommodate double stack freight trains up to 1,800 metres long • 1.1 km tunnel through the Little Liverpool Range • Construction of rail infrastructure, culverts, bridges, viaducts and crossing loops • Connection to the existing West Moreton Railway Line • Ancillary works including road and public utility crossings and realignments.	Proponent currently preparing EIS	2021-2026 Average 193 full-time construction jobs	Potential overlap of construction H2C and for C2K.	b) and c)
Greater Flagstone PDA (including passenger transport trunk infrastructure) (QLD Government)	Located within Logan City, west of Jimboomba and the Mount Lindesay Highway, along the Brisbane-Sydney rail line.	When fully developed, it is anticipated that the Greater Flagstone PDA will provide approximately 50,000 dwellings to house a population of up to 120,000 people.	PDA declared by the QLD Government 8 October 2011	2011-2041 Jobs TBA	Potential overlap of construction times, demand for resources and traffic volumes in the Kagaru area.	c) and d)
Bromelton SDA (QLD Government)	South of Kagaru in Bromelton	Delivery of critical infrastructure within the Bromelton SDA will support future development and economic growth. This includes a trunk water main and the Beaudesert Town Centre Bypass. This infrastructure provides opportunities to build on the momentum of current development activities by major landowners in the SDA.	Current Development Scheme approved by Governor in Council, December 2017	2016 – 2031 Jobs TBA	Ongoing development north of Kagaru in the Bromelton SDA could result in a conflict for construction resources and see an increase of traffic volumes in the Kagaru area.	c) and d)

Project and Proponent	Location	Description	Project status	Construction dates and jobs	Relationship to the Project	Selection criteria[1]
Ripley Valley PDA (QLD Government)	Approximately 5 km southwest of the Ipswich CBD and south of the Cunningham Highway	The Ripley Valley PDA covers a total area of 4,680 ha and may provide approximately 50,000 dwellings to house a population of approximately 120,000 people. It is located in one of the largest industry growth areas in Australia and offers opportunities for further residential growth to meet the region's affordable housing needs.	PDA declared 8 October 2011	2009-2031 Jobs TBA	Development could result in potential conflict for construction resources and see an increase in vehicle traffic.	c) and d)
South West Pipeline: Bulk Water Connection to Beaudesert (Seqwater)	East of Kagaru, running north from Beaudesert	The proposal is investigating a bulk water pipeline connection from the Southern Regional Water Pipeline to Beaudesert, connecting Beaudesert to the SEQ Water Grid. The pipeline will pass through the site of the future Wyaralong Water Treatment Plant.	Currently completing detailed business case.	2021 Jobs TBA	Potential conflict with demand for construction resources.	c)
RAAF Base Amberley future works (Department of Defence)	RAAF Base Amberley	White paper dedicated future upgrades to RAAF Base Amberley at a cost of $1 billion.	N/A	2016 – 2022 7,000 jobs	Ongoing development at RAAF Base Amberley may see increase in road traffic with heavy vehicles and further increase as the C2K construction occurs.	c)
Remondis Waste to Energy facility (Remondis)	Swanbank Industrial Estate	Remondis has announced plans to build a $400 million energy-from-waste facility in Swanbank, south of Ipswich.	Proponent awaiting draft terms of reference for EIS	2024 200 (construction) 80 (operational)	Potential overlap of construction for C2K and Remondis and potential for sequential views for road travellers.	c) and d)

Table note: [1] Refer to Table 48 for project inclusion criteria.

The area likely to be most affected lies in the east of the LVIA study area around Kagaru. This area will be potentially (depending upon specific Project phasing) affected simultaneously by Flagstone PDA, Bromelton SDA, and K2ARB activities. As there are relatively few existing visual receptors in this area and the construction impacts are temporary the consequence of this cumulative impact during construction in this area is considered to be ***Low***.

While there are more existing visual receptors in the west of the area, particularly around Calvert and Rosewood, it is considered that the consequence of cumulative impact of construction activities in this area is also ***Low***. The main projects in this area are the Ebenezer Industrial Area; the Ripley Valley PDA project, which is visually separated from the Project by the Teviot Range landscape; and the H2C project, which, in practice, will be viewed as the 'same' project as C2K by affected receptors. Similarly, while there are a relatively high number of visual receptors around Swanbank, Ipswich and Yamanto, cumulative impacts will be ***Low***, limited to the overlap in construction period of the Project and the Remondis Waste to Energy facility and potential sequential visual impacts for travellers passing through the area during operation.

In terms of spatial impacts, the K2ARB and H2C projects immediately adjoin the Project and will, for operations, be a component of the Inland Rail Program. Overall, therefore, these Projects are anticipated to result in a ***Low*** level of cumulative impact.

The South West Pipeline: Bulk Water Connection to Beaudesert has been approved for construction. However, it lies over 5 km from the alignment at its closest point and is also underground, so no cumulative landscape and visual impacts are anticipated.

With regards to the other projects, these are all large-scale major land development projects that will affect many hectares of land with associated landscape and visual impacts. Collectively, these projects will result in a noticeable intensification of built development and extension into the rural and natural landscape character west of Greater Brisbane, particularly in terms of sequential impacts gained while travelling around the region.

Localised areas will also be affected by combined and successive impacts, where the projects will both be visible at the same time – particularly around Kagaru (Flagstone, C2K, K2ARB and Bromelton) and Willowbank (C2K and Ebenezer Regional Industrial Area). These projects will also potentially introduce additional visual receptors (residents and workers) into the landscape overlooking the Project. In the context of these projects, the landscape and visual impact of the Project, which occupies a narrow, linear corridor, is considered to be fairly modest. The significance of the contribution of the Project to cumulative impact is considered to be up to ***Medium*** for both landscape and visual values. Mitigation to address this impact will be as described for the standalone C2K Project, with other mitigation necessarily needing to be incorporated into other projects to minimise impacts on the railway on properties and open space located near to the Project.

Due to the low level of lighting proposed for the Project, there are not anticipated to be any significant cumulative lighting impacts associated with these projects.

Overall, the cumulative landscape and visual impact in the region is likely to be up to ***Medium***. This is summarised in **Table 50**.

Table 50: Project inclusion criteria – cumulative impact assessment

Residual cumulative landscape and visual impact.	**Consequence**
Construction impacts associated with views of increase in construction traffic and construction areas	***Low***
Operation impacts associated with views of combined, successive and sequential views of adjoining projects	***Medium***
Impacts of night lighting	***Nil***

11. Mitigation and Residual Impact Assessment

11.1. Mitigation

This section outlines the initial mitigation measures included in the Project design and identifies proposed mitigation measures to manage predicted environmental impacts in the pre-construction, construction and construction and operational phases of the Project.

11.2. Design considerations

The mitigation measures presented in **Table 51** have been incorporated into the Project design. These design measures have been identified through collaborative development of the design and consideration of environmental constraints and issues, including proximity to sensitive receptors. These design measures are relevant to both construction and operational phases of the Project.

Table 51: Initial mitigation through design response

Aspect	Initial design measures
Landscape and visual issues	• The horizontal alignment of the Project has avoided direct impacts on nationally or regionally protected landscape areas such as the Flinders-Goolman Conservation Estate and Purga Nature Reserve • The Project is generally located within the existing SFRC, which was gazetted as a future rail corridor in 2010. The design has been developed to utilise the existing rail corridor protection and minimise land severance and impacts to natural and rural landscapes to the greatest extent possible. • The Project has been aligned to be co-located with existing road infrastructure where possible • The disturbance footprint defined in Project design has aimed to minimise vegetation clearing extents to that required to construct and operate the works. • The Project has minimised direct impacts on areas noted as being of regional landscape significance defined using the regional scenic amenity methodology (*ShapingSEQ*) • Alignment has sought to reduce the extent of impact on watercourses and their landscape setting • The extent of cut and fill including the height of structures and embankments has been kept to the minimum consistent with required engineering design and requirements for cross-corridor connectivity for people and vehicles • The alignment has been kept away from settlements to the greatest extent possible.

11.3. Proposed mitigation measures

In order to manage and mitigate impacts, a number of mitigation measures and design objectives are proposed for implementation in future stages of design and delivery to achieve a further reduction in significance from the initial significance rating. These proposed mitigation measures respond to Project specific issues and opportunities, address legislative requirements, accepted government plans, policy and practice.

Table 52 presents these proposed mitigation measures in accordance with the Project phase during which they would be implemented, as follows:

- Detailed design
- Pre-construction
- Construction
- Operation.

These mitigation measures include Project-wide considerations as well as location or issue specific measures in response to impacts identified in the LVIA.

Table 52: Proposed mitigation measures

Delivery Phase	Aspect	Proposed mitigation measures
Detailed design	Landscape and visual impacts due to vegetation removal	Clearing extents of visually significant vegetation are further limited, where feasible, to that required to safely construct, operate and maintain the Project. Locations include: • Between Mt Forbes Road and the Cunningham Highway (approximately Ch 9.7 km to Ch 16.5 km) • Areas adjacent to and within the Teviot Range and the Flinders-Goolman Conservation Estate, particularly around Dwyers Road near the Flinders Peak Winery and near the proposed Teviot Range tunnel between Ch 39.0 km and Ch 45.5 km. Develop a Reinstatement and Rehabilitation Plan for areas within the disturbance footprint that do not form part of the permanent works (e.g. construction compounds, laydown areas, temporary access tracks etc). The Plan will include and clearly identify: • Location of areas subject to rehabilitation and/or reinstatement/stabilisation, in accordance with the landscape and rehabilitation design developed during detailed design • Objectives and timeframes for rehabilitation and/or reinstatement/stabilisation works (including biodiversity, vegetation establishment and erosion and sediment control outcomes to be achieved) • Where appropriate, the plan describes how the objectives align with relevant recovery plans, threat abatement plans, conservation advices or policy guidance for target species in areas identified for rehabilitation • Details of the actions and responsibilities to progressively rehabilitate, regenerate, and/or revegetate areas, consistent with the objectives • Native flora species endemic to the Scenic Rim and Ipswich regions or other suitable species appropriate to the landscape context and nursery/seed stock sources • Procedures, timeframes, measurable performance objectives and responsibilities for monitoring the success of rehabilitation and/or reinstatement/stabilisation areas • Corrective actions if the outcomes of rehabilitation and/or reinstatement/stabilisation are not achieved. A Landscape and Rehabilitation Management Plan must be developed to define post construction maintenance requirements, monitoring requirements and completion criteria for areas defined in the landscape design and/or identified in the Reinstatement and Rehabilitation Plan.
	Landscape and visual impacts on watercourses	Develop the detailed design to minimise impacts to waterways, riparian vegetation and in-stream flora and habitats (particular locations include Western Creek, Bremer River, Warrill Creek, Purga Creek, Sandy Creek, Dugandan Creek, Wild Pig Creek, Woollaman and Teviot Brook and their tributaries). Aim to avoid, then minimise the extent of temporary or permanent waterway diversions.
	Visual impact of rail infrastructure	Infrastructure (such as structures, embankments/cuttings, tunnel portals, tunnel control centre and bridges) should be designed following an integrated design process with regard to landscape character and views as identified in the EIS seeking to: • ***Legacy:*** Create consistent design treatments along the Project alignment to enhance the overall recognition and legacy of the Project • ***Bridges***: Bridge design considers appropriate design principles at key viewpoints, including the Cunningham Highway, Ipswich – Boonah Road, Undullah Road and the Bremer River near Rosewood-Warrill View Road

Delivery Phase	Aspect	Proposed mitigation measures
		• ***Embankments***: At locations where embankments are near roads and/or adjoin bridge structures, minimise the extent to which landform (embankments) restricts views or affects views from nearby residences, to the greatest extent possible, via sensitive stabilisation, revegetation or – where appropriate, screen planting. These locations may include Rosewood-Warrill View Road (VP1), Ipswich-Boonah Road (VP5) and Mt Flinders Road, and in locations close to the future Greater Flagstone Priority Development Area (PDA), between Ch 49.3 km and Ch 54.5 km. • ***Tunnel approaches and cuttings***: Where practical, minimise the extent of cut batters and undertake sensitive design of these to blend them into their landscape setting (for example considering potential for revegetation, rock pitching, etc.). Locations to consider include the approach to the Teviot Range tunnel portal, cuts around Paynes Road, the Cunningham Highway and Undullah Road.
	Landscape design treatments	Develop a Project landscape design with landscaping treatments determined by reference to the key landscape characteristics and elements identified in the EIS, with particular emphasis on sensitive design that is appropriate to the setting as described below. The Project landscape design will also define appropriate treatments for areas subject to the Reinstatement and Rehabilitation Plan (or equivalent), and comply with the ARTC *Engineering (Track & Civil) Code of Practice Section 17 Right of Way Requirements*: • ***Rural and natural landscapes***: The landscape design shall respect and enhance the rural landscapes. Considerations include: o Design of the landscape earthworks and planting to screen and integrate the railway and associated structures and features, wherever practicable and appropriate to the character and maintenance of desired views. This includes further opportunity for design of targeted planting of buffer/shelterbelts adjacent to major earthworks within the rail corridor to the extent consistent with safety. For example, planting strips could be introduced adjacent to significant embankments to reduce visual impact and assist in integrating the landform into the existing landscape setting (which, it is noted, already incudes similar shelterbelts beside roads and riparian vegetation along watercourses), as described above, and in the following locations: - Adjacent to Dwyers Road, between Ch 31.2 km to Ch 32.4 km to screen views from Flinders Peak Winery and buffer adjacent properties to the west of Dwyers Road - Selective planting adjacent to the Cunningham Highway Bridge to screen the alignment and bridge abutments whilst maintain distant views to Flinders Peak and the Teviot Range - The landscape design shall seek to enhance the features and qualities that give the landscape its particular characteristic, ensuring the design responds to the natural patterns of the rural or natural landscape o Where appropriate consult with stakeholders and landholders during design (and construction) in order to understand the landscape context and the particular qualities of existing landscapes. • ***Ecologically sensitive areas***: Design to provide opportunities for ecological gain to benefit biodiversity. This includes: o Development of diverse planting and seed mixes to maximise and connect habitat types for ecological gain o Enhancement of landscape corridors and ecological links across the landscape by, where possible, joining or re-joining fragmented areas of habitat o Landscape design and planting to incorporate ecological requirements to benefit the characteristic and visual amenity of local landscapes including revegetation with locally indigenous species.

Delivery Phase	Aspect	Proposed mitigation measures
	Visual impacts of lighting	During detailed design, review assessment of the potential for operational light impacts to residents and identify if/where attenuation measures are required.
Pre-construction	Landscape and visual values	Implement the relevant aspects of the Reinstatement and Rehabilitation Plan and progressively deliver to minimise disturbance to landscape and visual amenity values during and post the pre-construction period. Where feasible and practicable, construction areas including compounds, stockpiles, fuel storage, laydown areas and staff parking to be located outside the tree protection zone as defined in AS4970-2009 Protection of trees on development sites.
Construction and commissioning	Landscape and visual values	Establish vegetation protection zones and project clearing extents prior to commencement of works to avoid impacts on adjoining vegetation and habitats as far as practicable.
	Visual impacts of construction activities	Avoid or minimise locating construction compounds within close proximity to sensitive receptors to provide as much separation as possible. Minimise height of all stockpiles to the greatest extent possible to reduce their visual impact. Cover stockpiles with temporary vegetative cover (such as mulch, grass seeding/hydro-mulch, soil binder etc). Temporary treatments (such as hoardings and shade-cloth screens) to site compound fencing must be considered to assist in reducing visual impacts of temporary infrastructure and sun glare within close proximity of sensitive receptors (such as Peak Crossing township and road networks).
	Lighting impacts of construction activities	Implement attenuation measures in discussion with potentially affected landholders.
	Reinstatement/ rehabilitation	Implement the landscape design, the Reinstatement and Rehabilitation Plan and the relevant requirements of the Landscape and Rehabilitation Management Plan, until performance criteria are satisfactorily achieved.
Operation	Visual impact of disturbed areas	As required, implement the relevant requirements of the Landscape and Rehabilitation Management Plan, until performance criteria are satisfactorily achieved and incorporate any specific ongoing management requirements into the Inland Rail Operation and Maintenance Management Plan.

11.4. Residual Impact assessment

Potential impacts to landscape and visual amenity associated with the Project in the construction and operation phases are outlined in **Table 20** and **Table 21**. These impacts have been subjected to a significance assessment as per the methodology described in **Section 4: Methodology**.

The initial impact assessment is undertaken on the basis that the design measures (or initial mitigation measures) detailed in **Table 51** have been incorporated into the Project design.

Proposed mitigation measures, described in **Table 52,** were then applied as appropriate to the phase of the Project to reduce the level of potential impact.

The residual significance level of the potential impacts was then reassessed after the proposed mitigation measures were applied. The initial significance levels were compared to the residual significance levels in order to assess the effectiveness of the proposed mitigation measures.

In conclusion, the Project is assessed to have the following impacts, shown in **Table 53**, on landscape and visual values.

Table 53: Impact Assessment summary

Aspect	Phase	Landscape character type/viewpoint	Initial significance[#1]			Residual significance[#2]	
			Sensitivity	Magnitude	Significance	Magnitude	Significance
Landscape impacts	**Construction/ Operation**	LCT A: Vegetated Watercourses - Rivers	Low	Moderate	Low	Low	Negligible
		LCT B: Vegetated Watercourses – Creeks and Channels	Low	Moderate	Low	Low	Negligible
		LCT C: Irrigated Croplands	Low	High	Moderate	High	Moderate
		LCT D: Dry Croplands and Pastures	Low	High	Moderate	High	Moderate
		LCT E: Vegetated Grazing	Low	High	Moderate	High	Moderate
		LCT F: Rural Settlement	Moderate	Negligible	Low	Negligible	Low
		LCT G: Transitional Landscapes	Negligible	Moderate	Low	Moderate	Low
		LCT H: Forested Uplands	High	Moderate	High	Moderate	High
		LCT I: Rural Living	No impact	No impact	No impact	No impact	No impact
		LCT J: Suburban Living	No impact	No impact	No impact	No impact	No impact
Visual impacts	**Construction**	Viewpoint 1: Rosewood-Warrill View Road Looking north-east	Moderate	Moderate	Moderate	Moderate	Moderate
		Viewpoint 2: Paynes Road looking south	Low	Moderate	Low	Moderate	Low
		Viewpoint 3: Cunningham Highway looking south-east to Flinders Peak	Moderate	Moderate	Moderate	Moderate	Moderate
		Viewpoint 4: Middle Road, looking north	Low	Moderate	Low	Moderate	Low
		Viewpoint 5: Ipswich-Boonah Road looking north-east, near properties 276 and 288	Moderate	Moderate	Moderate	Moderate	Moderate
		Viewpoint 6: Peak Mountain View Park, near Peak Crossing State School and Peak Crossing township	High	Negligible	Low	Negligible	Low
		Viewpoint 7: Ipswich-Boonah Road near Flinders Peak Winery	Moderate	Low	Low	Negligible	Low

Aspect	Phase	Landscape character type/viewpoint	Initial significance[#1]			Residual significance[#2]	
			Sensitivity	Magnitude	Significance	Magnitude	Significance
		Viewpoint 8: Cunningham Lookout off Rosewood-Warrill View Road east looking towards Flinders Peak	Moderate	No Impact	No Impact	No Impact	No impact
		Viewpoint 9: Flinders Peak	High	Low	Moderate	No Impact	No impact
		Viewpoint 10: Washpool Road near rural properties 456-463	Low	High	Moderate	Low	Moderate
		Viewpoint 11: Wild Pig Creek Road near rural properties 717-722	Low	High	Moderate	High	Moderate
		Viewpoint 12: Undullah Road near “Brooklands” rural property	Low	High	Moderate	High	Moderate
Visual impacts	**Operation**	Viewpoint 1: Rosewood-Warrill View Road Looking north-east	Moderate	High	High	Moderate	Moderate
		Viewpoint 2: Paynes Road looking south	Low	Moderate	Low	Moderate	Low
		Viewpoint 3: Cunningham Highway looking south-east to Flinders Peak	Moderate	High	High	Moderate	Moderate
		Viewpoint 4: Middle Road, looking north	Low	Moderate	Low	Moderate	Low
		Viewpoint 5: Ipswich-Boonah Road looking north-east, near properties 276 and 288	Moderate	High	High	High	High
		Viewpoint 6: Peak Mountain View Park, near Peak Crossing State School and Peak Crossing township	High	Low	Moderate	Low	Moderate
		Viewpoint 7: Ipswich-Boonah Road near Flinders Peak Winery	Moderate	Low	Low	Negligible	Low
		Viewpoint 8: Cunningham Lookout off Rosewood-Warrill View Road east looking towards Flinders Peak	Moderate	No Impact	No Impact	No Impact	No Impact
		Viewpoint 9: Flinders Peak	High	Low	Moderate	Low	Moderate
		Viewpoint 10: Washpool Road near rural properties 456-463	Low	High	Moderate	High	Moderate
		Viewpoint 11: Wild Pig Creek Road near rural properties 717-722	Low	High	Moderate	High	Moderate

Aspect	Phase	Landscape character type/viewpoint	Initial significance[#1]			Residual significance[#2]	
			Sensitivity	Magnitude	Significance	Magnitude	Significance
		Viewpoint 12: Undullah Road near "Brooklands" rural property	Low	High	Moderate	High	Moderate
Lighting impacts	**Construction/ Operation**	Viewpoint 1: Rosewood-Warrill View Road Looking north-east	Low	No impact	No impact	No impact	No impact
		Viewpoint 2: Paynes Road looking south	Low	No impact	No impact	No impact	No impact
		Viewpoint 3: Cunningham Highway looking south-east to Flinders Peak	Low	No impact	No impact	No impact	No impact
		Viewpoint 4: Middle Road, looking north	Low	Low	Negligible	Low	Negligible
		Viewpoint 5: Ipswich-Boonah Road looking north-east, near properties 276 and 288	Moderate	Low	Low	Low	Low
		Viewpoint 6: Peak Mountain View Park, near Peak Crossing State School and Peak Crossing township	High	No impact	No impact	No impact	No impact
		Viewpoint 7: Ipswich-Boonah Road near Flinders Peak Winery	Moderate	Negligible	Low	Negligible	Low
		Viewpoint 8: Cunningham Lookout off Rosewood-Warrill View Road east looking towards Flinders Peak	Moderate	No impact	No impact	No impact	No impact
		Viewpoint 9: Flinders Peak	High	No impact	No impact	No impact	No impact
		Viewpoint 10: Washpool Road near rural properties 456-463	Low	No impact	No impact	No impact	No impact
		Viewpoint 11: Wild Pig Creek Road near rural properties 717-722	Negligible	Low	Negligible	Low	Negligible
		Viewpoint 12: Undullah Road near "Brooklands" rural property	Low	No impact	No impact	No impact	No impact

[#1] *Includes implementation of initial mitigation measures specified in* ***Table 51****.*

[#2] *Includes implementation of additional mitigation measures and controls as identified in* ***Table 52****.*

12. Conclusions and recommendations

12.1. Summary of landscape impacts

Ten LCTs with associated character areas were identified through the landscape assessment process. A summary of the overall likely landscape impact anticipated during both the construction and operation of the Project for each LCT is presented in **Table 54**.

Table 54: Summary landscape assessment (construction and operation)

Landscape character type (LCT)	Landscape sensitivity	Magnitude of change	Potential landscape effect
LCT A: Vegetated Watercourses - Rivers	Low	Moderate[1]	Low[1]
		Low[2]	Negligible[2]
LCT B: Vegetated Watercourses – Creeks and Channels	Low	Moderate[1]	Low[1]
		Low[2]	Negligible[2]
LCT C: Irrigated Croplands	Low	High[1 and 2]	Moderate[1 and 2]
LCT D: Dry Croplands and Pastures	Low	High[1 and 2]	Moderate[1 and 2]
LCT E: Vegetated Grazing	Low	High[1 and 2]	Moderate[1 and 2]
LCT F: Rural Settlement	Moderate	Negligible[1 and 2]	Low[1 and 2]
LCT G: Transitional Landscapes	Negligible	Moderate[1 and 2]	Low[1 and 2]
LCT H: Forested Uplands	High	Moderate[1 and 2]	High[1 and 2]
LCT I: Rural Living	No impact	No impact[1 and 2]	No impact[1 and 2]
LCT J: Suburban Living	No impact	No impact[1 and 2]	No impact [1 and 2]

[1] *Initial mitigation only*
[2] *Assessment including additional mitigation measures*

This shows that the landscapes within the LVIA study area were assessed to be of Negligible to High sensitivity, and that impacts of Negligible to High magnitude of change are anticipated. The most significant impact identified was a High impact on LCT H: Forested Uplands (H5: Teviot Range). This relates to the introduction of extensive cut and fill and tunnelling and vegetation clearance within the forested landscapes of the Teviot Range south of Flinders Peak. Other impacts of up to Moderate significance are anticipated. Measures to manage these impacts are described in **Section 11: Mitigation and Residual Impact Assessment**.

12.2. Summary of visual impacts

Based on digital mapping (VAM) and the field survey, 12 representative viewpoints were selected for detailed assessment. A summary of the baseline analysis and overall likely visual impact anticipated during the construction of the Project (as described in **Section 8: Visual Impact Assessment**) is summarised for each viewpoint in **Table 55**.

Table 55: Summary preliminary visual assessment (construction)

Viewpoint name	Viewpoint sensitivity	Magnitude of change	Potential visual effect
Viewpoint 1: Rosewood-Warrill View Road Looking north-east	Moderate	Moderate	Moderate
Viewpoint 2: Paynes Road looking south	Low	Moderate	Low
Viewpoint 3: Cunningham Highway looking south-east to Flinders Peak	Moderate	Moderate	Moderate

Viewpoint name	Viewpoint sensitivity	Magnitude of change	Potential visual effect
Viewpoint 4: Middle Road, looking north	Low	Moderate	Low
Viewpoint 5: Ipswich-Boonah Road looking north-east, near properties 276 and 288	Moderate	Moderate	Moderate
Viewpoint 6: Peak Mountain View Park, near Peak Crossing State School and Peak Crossing township	High	Negligible	Low
Viewpoint 7: Ipswich-Boonah Road near Flinders Peak Winery	Moderate	Low	Low
Viewpoint 8: Cunningham Lookout off Rosewood-Warrill View Road east looking towards Flinders Peak	Moderate	No impact	No impact
Viewpoint 9: Flinders Peak	Moderate	Low	Low
Viewpoint 10: Washpool Road near rural properties 456-463	Low	High	Moderate
Viewpoint 11: Wild Pig Creek Road near rural properties 717-722	Low	High	Moderate
Viewpoint 12: Undullah Road near “Brooklands” rural property	Low	High	Moderate

This shows that the Project is not considered likely to result in visual impacts up to Moderate significance during construction. Measures to manage these impacts are described in **Section 11: Mitigation and Residual Impact Assessment**.

A summary of the overall likely visual impact on the same representative viewpoints during the operation of the Project is summarised in **Table 56**.

Table 56: Summary preliminary visual assessment (operation)

Viewpoint name	Viewpoint sensitivity	Magnitude of change	Potential visual effect
Viewpoint 1: Rosewood-Warrill View Road Looking north-east	Moderate	High[1]	High[1]
		Moderate[2]	Moderate[2]
Viewpoint 2: Paynes Road looking south	Low	Moderate[1 and 2]	Low[1 and 2]
Viewpoint 3: Cunningham Highway looking south-east to Flinders Peak	Moderate	High[1]	High[1]
		Moderate[2]	Moderate[2]
Viewpoint 4: Middle Road, looking north	Low	Moderate[1 and 2]	Low[1 and 2]
Viewpoint 5: Ipswich-Boonah Road looking north-east, near properties 276 and 288	Moderate	High[1 and 2]	High[1 and 2]
Viewpoint 6: Peak Mountain View Park, near Peak Crossing State School and Peak Crossing township	High	Low[1 and 2]	Moderate[1 and 2]
Viewpoint 7: Ipswich-Boonah Road near Flinders Peak Winery	Moderate	Low[1]	Low[1]
		Negligible[2]	Low[2]
Viewpoint 8: Cunningham Lookout off Rosewood-Warrill View Road east looking towards Flinders Peak	Moderate	No impact[1 and 2]	No impact[1 and 2]
Viewpoint 9: Flinders Peak	High	Low[1 and 2]	Moderate[1 and 2]
Viewpoint 10: Washpool Road near rural properties 456-463	Low	High[1 and 2]	Moderate[1 and 2]

Viewpoint name	Viewpoint sensitivity	Magnitude of change	Potential visual effect
Viewpoint 11: Wild Pig Creek Road near rural properties 717-722	Low	High[1 and 2]	Moderate[1 and 2]
Viewpoint 12: Undullah Road near “Brooklands” rural property	Low	High[1 and 2]	Moderate[1 and 2]

[1] *Initial mitigation only*
[2] *Assessment including additional mitigation measures*

This shows that the Project is considered likely to result in High initial impacts on three representative views: Viewpoint 1: Rosewood-Warrill View Road Looking north-east; Viewpoint 3: Cunningham Highway looking south-east to Flinders Peak and Viewpoint 5: Ipswich-Boonah Road looking north-east, near properties 276 and 288. Measures to manage these impacts are described in **Section 11: Mitigation and Residual Impact Assessment** and have potential to reduce the significance of two of these impacts to Moderate.

12.3. Summary of lighting impacts

As there is limited Project lighting proposed, most of the viewpoints are not anticipated to be affected by night lighting. A summary of the baseline analysis and overall likely visual impact anticipated during the operation of the Project is provided for each viewpoint is presented in **Table 57**.

Table 57: Summary lighting assessment (construction and operation)

Viewpoint name	Viewpoint sensitivity	Magnitude of change	Potential lighting effect
Viewpoint 1: Rosewood-Warrill View Road Looking north-east	Low	No impact	No impact
Viewpoint 2: Paynes Road looking south	Low	No impact	No impact
Viewpoint 3: Cunningham Highway looking south-east to Flinders Peak	Low	No impact	No impact
Viewpoint 4: Middle Road, looking north	Low	Low	Negligible
Viewpoint 5: Ipswich-Boonah Road looking north-east, near properties 276 and 288	Moderate	Low	Low
Viewpoint 6: Peak Mountain View Park, near Peak Crossing State School and Peak Crossing township	High	No impact	No impact
Viewpoint 7: Ipswich-Boonah Road near Flinders Peak Winery	Moderate	Negligible	Low
Viewpoint 8: Cunningham Lookout off Rosewood-Warrill View Road east looking towards Flinders Peak	Moderate	No impact	No impact
Viewpoint 9: Flinders Peak	High	No impact	No impact
Viewpoint 10: Washpool Road near rural properties 456-463	Low	No impact	No impact
Viewpoint 11: Wild Pig Creek Road near rural properties 717-722	Negligible	Low	Negligible
Viewpoint 12: Undullah Road near “Brooklands” rural property	Low	No impact	No impact

In summary, the qualitative desktop lighting assessment concludes that the proposed alignment and associated infrastructure is unlikely to create any significant obtrusive lighting into the external environment during typical night time scenarios. Measures to manage these impacts are described in **Section 11: Mitigation and Residual Impact Assessment**.

12.4. Impact assessment summary

In conclusion, the Project is assessed to have the following impacts on landscape and visual values summarised in **Table 58**.

Table 58: Impact assessment summary

Impact	Significance
Landscape impacts during construction and operation	Impacts of up to ***High*** significance on LCT H: Forested Uplands (H5: Teviot Range). Impacts of up to ***Moderate*** significance on three LCTs (LCT C: Irrigated Croplands; LCT D: Dry Croplands and Pastures and LCT E: Vegetated Grazing).
Visual impacts during construction	Up to ***Moderate*** significance for six representative viewpoints (Viewpoint 1: Rosewood-Warrill View Road Looking north-east, Viewpoint 3: Cunningham Highway; Viewpoint 5: Ipswich-Boonah Road looking north-east, near properties 276 and 288; Viewpoint 10: Washpool Road near rural properties 456-463; Viewpoint 11: Wild Pig Creek Road near rural properties 717-722; and Viewpoint 12: Undullah Road near "Brooklands" rural property).
Visual impacts during operation	Up to ***High*** significance for three representative viewpoints (Viewpoint 1: Rosewood-Warrill View Road Looking north-east; Viewpoint 3: Cunningham Highway and Viewpoint 5: Ipswich-Boonah Road looking north-east, near properties 276 and 288). Other impacts of up to ***Moderate*** significance on five representative viewpoints (Viewpoint 6: Peak Mountain View Park, near Peak Crossing State School and Peak Crossing township; Viewpoint 9: Flinders Peak; Viewpoint 10: Washpool Road near rural properties 456-463; Viewpoint 11: Wild Pig Creek Road near rural properties 717-722; and Viewpoint 12: Undullah Road near "Brooklands" rural property).
Lighting impacts	Up to ***Low*** significance for one viewpoint during construction (Viewpoint 5: Ipswich-Boonah Road, looking north-east) and one viewpoint during operation (Viewpoint 7: Ipswich-Boonah Road near Flinders Peak Winery).
Cumulative impacts during construction	***Low consequence***
Cumulative impacts during operation	***Moderate consequence*** primarily in the east of the LVIA study area around Kagaru.
Cumulative impacts of night lighting	***Nil***

Table note: Impact significance in the summary table above is given for the most significant impact identified for each attribute prior to any mitigation.

In conclusion, the most significant impacts are landscape impacts on LCT H: Forested Uplands and visual impacts during operation on three representative viewpoints (Viewpoint 1: Rosewood-Warrill View Road Looking north-east; Viewpoint 3: Cunningham Highway and Viewpoint 5: Ipswich-Boonah Road looking north-east, near properties 276 and 288).

12.5. Conclusions

The landscape between Calvert and Kagaru is highly varied, comprising intensive irrigated agriculture, dry croplands and pastures interspersed with a network of rivers and creeks, and set against the distinctive backdrop of forested hills created by the Teviot and Little Liverpool Ranges. An existing operational rail line is present in parts of the LVIA study area and, historically, a passenger rail also extended through parts of the landscape.

The Project would introduce 53 km of new single track dual gauge railway into the landscape occupying the low-lying area east of Calvert and skirting the Teviot Range to the east.

The key landscape and visual impacts of the Project relate to the removal of vegetation, the raising of embankments and creation of new rail bridges.

Ten LCTs have been identified within the LVIA study area, of which eight are potentially affected by the Project. One impact of High significance was identified on LCT H: Forested Uplands (H5: Teviot Range Forested Uplands) relating to the introduction of extensive cut and fill and tunnelling within the forested landscapes of the Teviot Range south of Flinders Peak.

For much of the area, there are relatively few visual receptors with the landscape comprising isolated farmsteads set on large private farms. However, there are some settlements within the potential viewshed of the Project including Calvert, Peak Crossing and Harrisville. Visual impacts are typically contained by the presence of vegetation, including along creek lines, and localised undulations in landform. Elevated and panoramic views over the alignment are also available from the Forested Uplands, particularly from walking trails around Flinders Peak. Elsewhere, there are fairly open views across the rural landscape from the network of local roads and highways, including the Cunningham Highway, Rosewood-Laidley Road and Ipswich-Boonah Road.

Twelve representative viewpoints have been assessed. The key visual impacts of the Project of High significance identified relates to the presence of railway infrastructure (bridges) as viewed from Viewpoint 1: Rosewood-Warrill View Road Looking north-east; Viewpoint 3: Cunningham Highway looking south-east to Flinders Peak and from Viewpoint 5: Ipswich-Boonah Road looking north-east. Other visual impacts during both construction and operation are of lower significance, typically relating to views experienced by relatively small numbers of homesteads or with lower modification to visual amenity.

No significant lighting impacts were identified for either construction or operation phases of greater than Low significance.

Cumulative impacts, particularly the effects in combination with the adjoining K2ARB and H2C ARTC alignments have been considered as well as projects including the Ripley Valley PDA, Greater Flagstone PDA, Ebenezer Regional Industrial Area and Bromelton SDA. It is concluded that the cumulative impact is up to Medium consequence level.

ARTC will develop a Rehabilitation and Reinstatement Plan which will include landscape objectives and principles, as well as outline landscape and rehabilitation treatments for various phases of the Inland Rail Program. These will include reference to the mitigation measures described in **Table 52** that will reduce the residual impact for some of the identified effects on landscape and visual values.

13. Glossary

13.1. Acronyms

AADT	Annual Average Daily Traffic
ABS	Australian Bureau of Statistics
AHD	Australian Height Datum
AILA GNLVA	AILA Queensland Guidance Note for Landscape and Visual Assessment
C2K	The Calvert to Kagaru alignment of the Inland Rail Program
CBD	Central Business District
FFJV	Future Freight Joint Venture
ECW	Enhanced Compression Wavelet (a raster image format used for georeferenced ortho aerial photography)
ERIN	(Australian Government) Environmental Resources Information Network
FOV	Field of View (H FOV is Horizontal Field of View)
GLVIA	Guidelines for Landscape and Visual Impact Assessment
H2C	Helidon to Calvert – Inland Rail Project from Helidon to Calvert
IBRA	Interim Biogeographic Regionalisation for Australia
K2ARB	Kagaru to Acacia Ridge and Bromelton – Inland Rail Project from Kagaru to Acacia Ridge and Bromelton
LCA	Landscape character area
LCT	Landscape character type
LGA	Local Government Area
LVIA	Landscape and Visual Impact Assessment
NSW	New South Wales
QLD	Queensland
QR	Queensland Rail
SEQ	South-east Queensland
SRTM	Shuttle Radar Topography Mission
TIN	Triangular Irregular Network

13.2. Glossary of Assessment Terms

Amenity	The pleasantness of a place as conveyed by desirable attributes including visual, noise, odour etc.
Artist's impression	An indicative visual representation illustrating the appearance of a proposal. Typically to communicate a concept when photomontages are not available and / or when accuracy cannot be assured.
Character	A distinct, recognisable and consistent pattern of elements in the landscape that makes one landscape different from another, and often conveys a distinctive sense of place. This term does not imply a level of value or importance.
Effect	The landscape or visual outcome of a proposed change. It may be the combined result of sensitivity together with the magnitude of the change.
Impact	The categorisation of effects. Legislative context is considered in defining impacts and their significance.
Landscape	Landscape is an all-encompassing term that refers to areas of the earth's surface at various scales. It includes those landscapes that are: urban, rural, and natural; combining bio-physical elements with the cultural overlay of human use and values.
LVIA study area	LVIA study area; comprising land within the potential viewshed of and forming the wider landscape context of the Project
Magnitude of change	The extent of change that will be experienced by receptors. This change can be adverse or beneficial. Factors that could be considered in assessing magnitude are: the proportion of the view / landscape affected; extent of the area over which the change occurs; the size and scale of the change; the rate and duration of the change; the level of contrast and compatibility.
Mitigation	Measures to avoid, reduce and manage identified potential adverse impacts.
Project	The Inland Rail Calvert to Kagaru Project
Rail alignment	The exact positioning of the track, accurately defined both horizontally and vertically, along which the rail vehicles operate.
Rail corridor	The corridor within which the rail tracks and associated infrastructure are located.
Route	A primary description of the path which a railway will follow.
Receptor	A place, route, viewer audience or interest group which may require assessment.
Sensitivity	Capacity of a landscape or receptor to change without losing valued attributes.
Values	Any aspect of landscape or views people consider to be important. Landscape and visual values may be reflected in local, State or federal planning regulations, other published documents or be established through community consultation and engagement, or as professionally assessed.
View	Any sight, prospect or field of vision as seen from a place, and may be wide or narrow, partial or full, pleasant or unattractive, distinctive or nondescript, and may include background, mid ground and/or foreground elements or features.
Viewpoint	The specific location of a view, typically used for assessment purposes.
Viewshed	Areas visible from a particular location (may be modelled or field-validated).
Visual catchment	Areas visible from a combination of locations within a defined setting (may be modelled or field-validated).
Visual audience	Groups of visual receptors with common attributes and sensitivities to changes in views (e.g. residents, golfers, road travellers, walkers, shoppers, beach goers, farmers, recreational users).
Visual absorption capacity	Potential for a landscape or scene to absorb a particular change without a noticeable loss of valued attributes.
Visual amenity	The attractiveness of a scene or view.
Photomontages/ Visualisations	A visual representation of a proposal from a particular receptor viewpoint, on a photographic base. The methodology for the preparation of any photomontage and its accuracy should be defined.

Scenic amenity A measure of the relative contribution of each place in the landscape to the collective appreciation of open space as viewed from places that are important to the public. (Department of Natural Resources, 2001).

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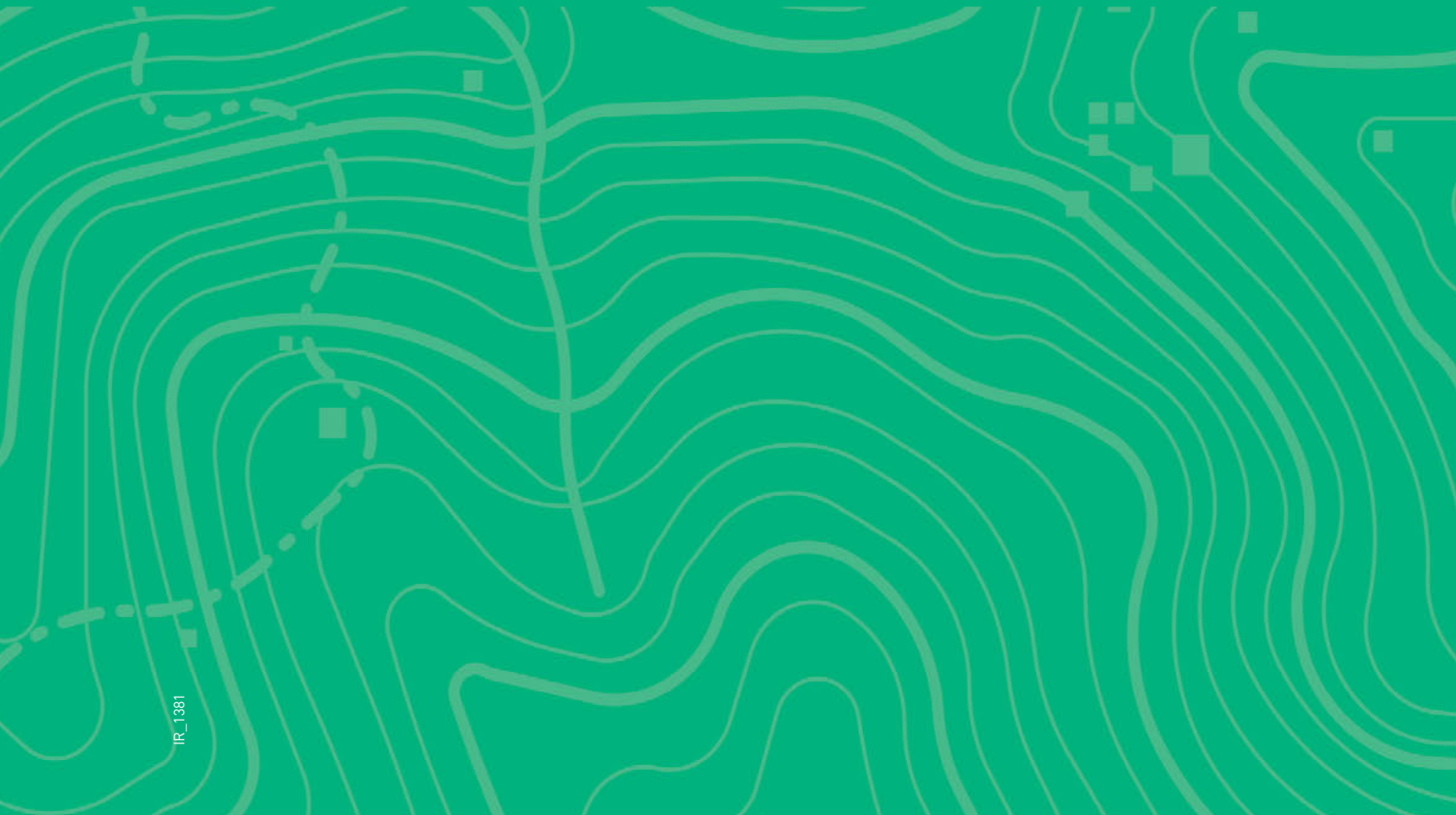
APPENDIX

I

Landscape and Visual Impact Assessment Technical Report

Appendix 1 Plans

CALVERT TO KAGARU ENVIRONMENTAL IMPACT STATEMENT



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APPENDIX 1: PLANS

The following plans prepared by FFJV have been used to inform and illustrate this assessment:

Figure 1: Inland Rail regional context

Figure 2: LVIA Study Area

Figure 3: Regional scenic amenity and planning designations

Figure 4: Landform context and hydrological context

Figure 5: Land use context

Figure 6: Interim Biogeographic Regionalisation Australia

Figure 7: Landscape character assessment

Figure 8: Visual analysis map – permanent infrastructure

Figure 9: Visual analysis map – rolling stock

Figure 10: Visual analysis map – difference analysis

Figure 11: Sensitive receptors within 2 km of the Project

Figure 12: Tourist drives and recreation trails

Figure 13: Key visual receptors and location of representative

Figure 14: Cumulative LVIA

Map by: CWMF/GNZ:\GIS\GIS_General\Tasks\Environment\390-ELE-20180806159_LVIA\C2K\390-ELE-20180806159_Fig1_Project Context_rev5_FFJW_A3L.mxd Date: 11/10/2019 12:12

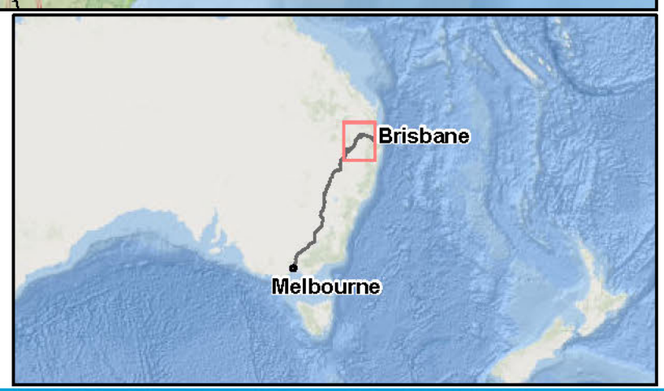
QUEENSLAND

NEW SOUTH WALES

Brisbane
Cleveland
Slacks Creek
Logan
Upper Coomera
Gold Coast
Nerang
Kingscliff
Murwillumbah
Byron Bay
Lismore
Ballina
Casino
Kyogle
Maclean
Grafton
Glen Innes
Inverell
Warwick
Stanthorpe
Goondiwindi
Moree
Flinton
MOONIE
ALTON

Legend

- Narrabri to North Star (N2NS)
- North Star to Border (NS2B)
- Border to Gowrie (B2G)
- Gowrie to Helidon (G2H)
- Helidon to Calvert (H2C)
- Calvert to Kagaru (C2K)
- Kagaru to Acacia Ridge and Bromelton (K2ARB)
- Existing rail
- C2K LVIA study area (10 km from rail alignment)



A3 scale: 1:1,500,000

0 10 20 40 60 80 Kilometers

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Issue date: 06/02/2020 Version: 5
Coordinate System: GDA 1994 MGA Zone 56

CALVERT TO KAGARU

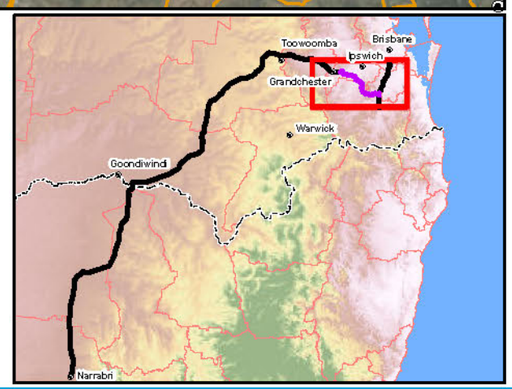
Figure 1: Inland Rail regional context

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Map by: GN Z:\GIS\GIS_General\Task\Environment\390-ELE-20180806\1159_LVIA\C2K\390-ELE-20180806\1159_Fig2_LVIA_rev7_FFJV_A3L.mxd Date: 5/02/2020 11:23

Legend

- 5 Chainage (km)
- Localities
- Existing rail
- Major roads
- Minor roads
- H2C project alignment
- C2K project alignment
- K2ARB project alignment
- LVIA study area (10 km from rail alignment)
- Local Government Areas



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0 2 4 6 8 10km

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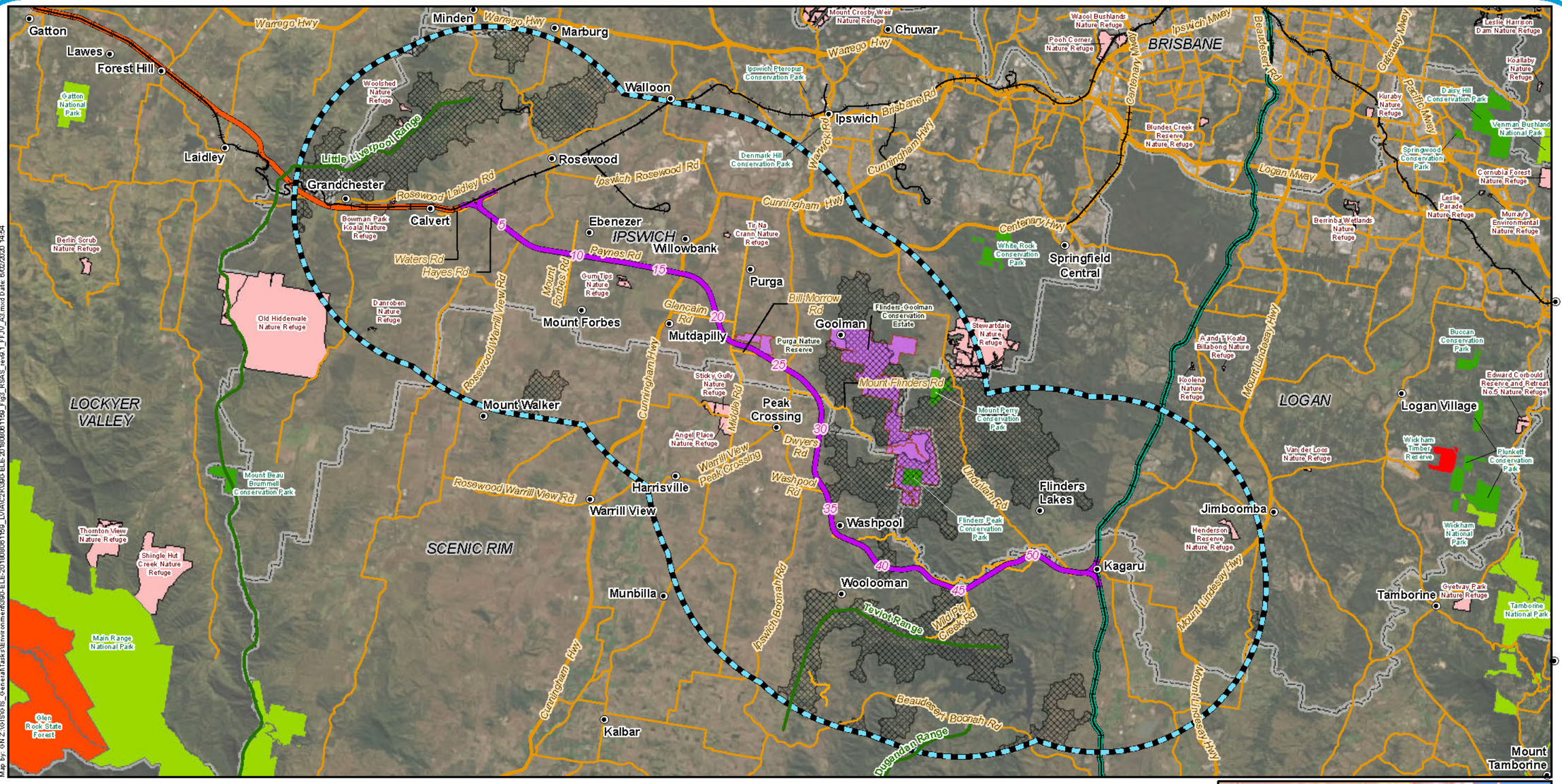
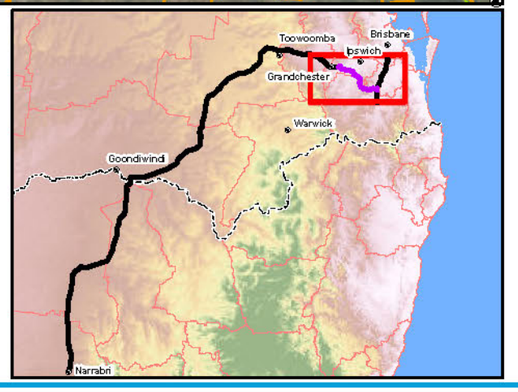
Calvert to Kagaru

Figure 2: Landscape and visual impact assessment study area

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community





Legend

- Localities
- Chainage (km)
- H2C project alignment
- C2K project alignment
- K2ARB project alignment
- Existing rail
- Mountain ranges
- Major roads
- Minor roads
- LVIA study area (10 km from rail alignment)
- Local Government Areas

Protected areas

- Conservation Park
- National Park
- State Forest
- Timber Reserve
- Ipswich parks
- Nature Refuge
- Regionally significant scenic amenity (within LVIA study area)

A3 scale: 1:250,000

0 2 4 6 8 10km

Future Freight
Integrating Community, Environment and Engineering

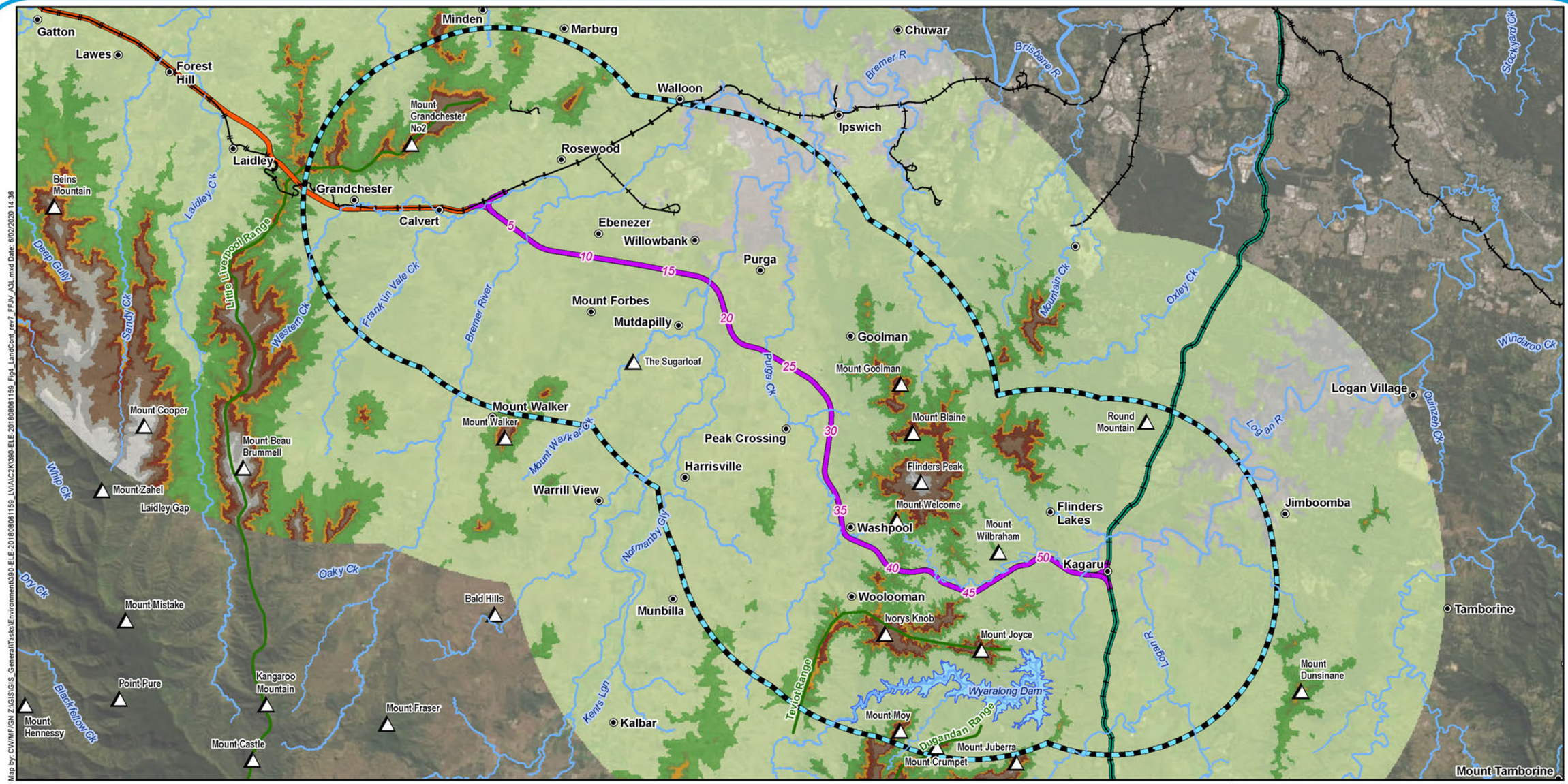
Issue date: 05/02/2020 Version: 9
Coordinate System: GDA 1994 MGA Zone 56

Calvert to Kagaru

Figure 3: Regional scenic amenity and planning designations

Map by: GN Z:\GIS\GIS_General\Tasks\Environment\3390-ELE-20180806\159_LVIA\C2K\3390 ELE 20180806\159_Fig3_RSAS_rev01_FFJV_A3.mxd Date: 6/02/2020 14:54

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



Map by: CVI/MF/GN Z:\GIS\GIS_General\Tasks\Environment\390-ELE-20180806159_Fig4_LandCont_rev7_FFJV_A3L.mxd Date: 6/02/2020 14:36

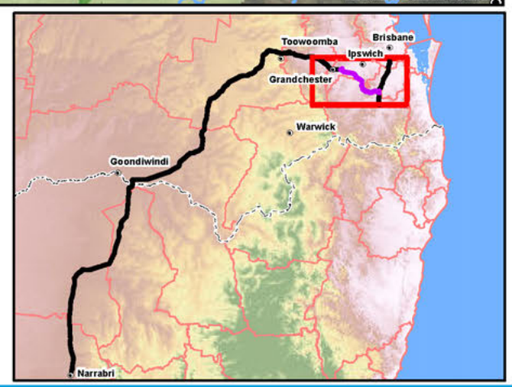
20180806159_LVIA\C2K\390-ELE-20180806159_LVIAC2K390-ELE-20180806159_Fig4_LandCont_rev7_FFJV_A3L.mxd Date: 6/02/2020 14:36

Legend

- Mountain
- 5 Chainage (km)
- Localities
- Existing rail
- H2C project alignment
- C2K project alignment
- K2ARB project alignment
- Mountain ranges
- Watercourses
- Wyaralong Dam
- LVIA study area (10 km from rail alignment)

Elevation (m)

< 30	250 - 275
30 - 150	275 - 300
150 - 200	300 - 325
200 - 225	325 - 350
225 - 250	> 350



A3 scale: 1:250,000

0 2 4 6 8 10 km

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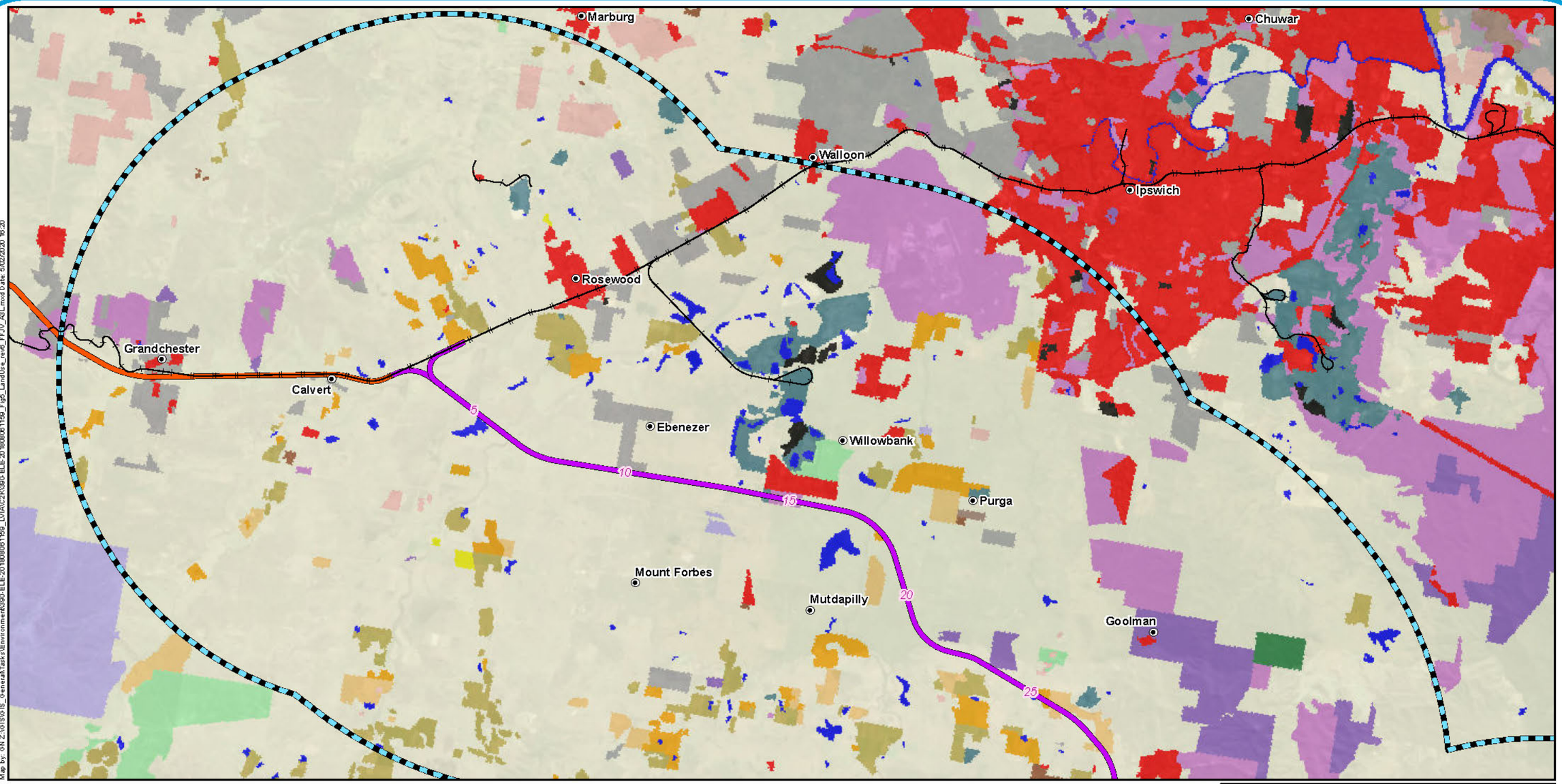
Calvert to Kagaru

Figure 4: Landform context and hydrological context

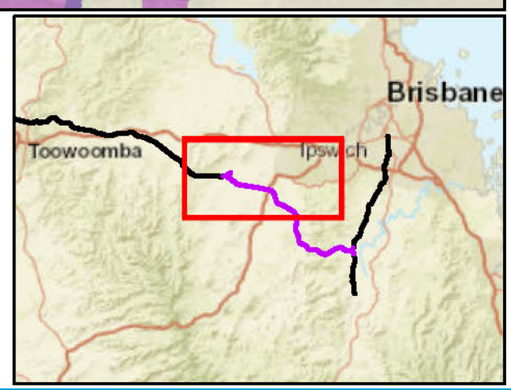


Legend

- Localities
- 5 Chainage (km)
- Existing rail
- H2C project alignment
- C2K project alignment
- LVIA study area (10 km from rail alignment)

Land Use

- Nature conservation
- Other protected areas
- Minimal use
- Grazing native vegetation
- Production forestry
- Grazing modified pastures
- Plantation forestry
- Dryland cropping
- Dryland horticulture
- Land in transition
- Irrigated pastures
- Irrigated cropping
- Irrigated horticulture
- Urban intensive uses
- Intensive animal and plant production
- Rural residential and farm infrastructure
- Mining and waste
- Water



A3 scale: 1:125,000

0 1 2 3 4 5km

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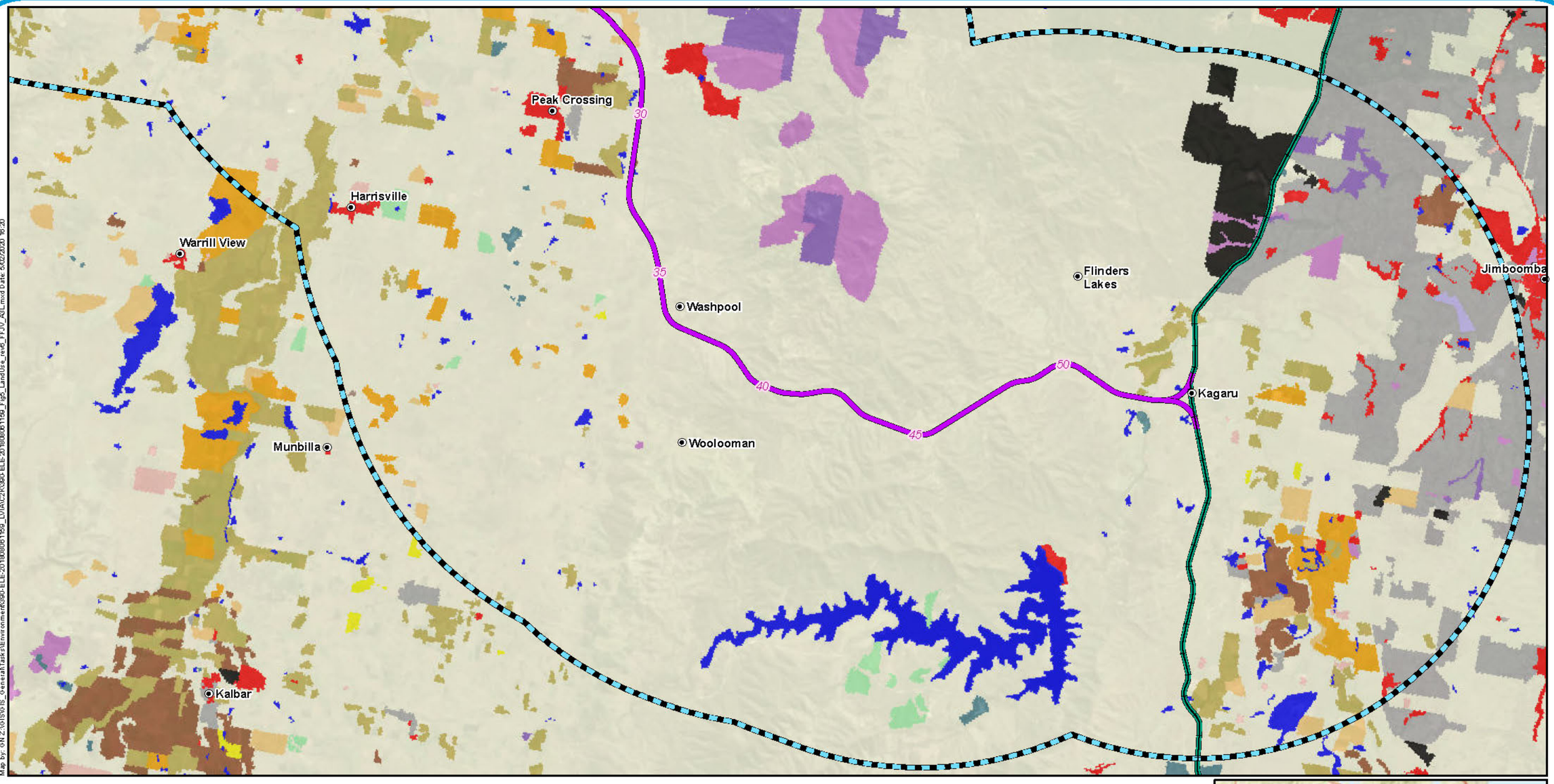
Calvert to Kagaru
Figure 5a: Land use context



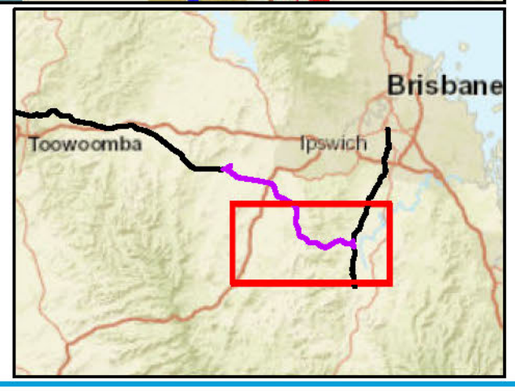
Map by: G:\N Z:\GIS\GIS18_General\Tasks\Environment\390-ELE-20180806\1159_LVIA\C2K\390-ELE-20180806\1159_Fig5_LandUse_rev5_FFJV_AGL.mxd Date: 6/02/2020 16:20

Legend

- Localities
- 5 Chainage (km)
- Existing rail
- C2K project alignment
- K2ARB project alignment
- LVIA study area (10 km from rail alignment)

Land Use

- Nature conservation
- Other protected areas
- Minimal use
- Grazing native vegetation
- Grazing modified pastures
- Plantation forestry
- Dryland cropping
- Dryland horticulture
- Land in transition
- Irrigated pastures
- Irrigated cropping
- Irrigated horticulture
- Urban intensive uses
- Intensive animal and plant production
- Rural residential and farm infrastructure
- Mining and waste
- Water



A3 scale: 1:125,000

0 1 2 3 4 5km

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Coordinate System: GDA 1994 MGA Zone 56

Calvert to Kagaru
Figure 5b: Land use context

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Gatton
Lawes
Forest Hill
Laidley
Minden
Marburg
Grandchester
Calvert
Rosewood
Walloon
Chuwar
Ipswich
Ebenezer
Willowbank
Waters Rd
Hayes Rd
Raynes Rd
Mount Forbes
Purga
Bill Morrow Rd
Glancaim Rd
Mutdapilly
Goolman
Springfield Central
Logan Village
Peak Crossing
Dwyers Rd
Mount Flinders Rd
Mount Walker
Warrill View
Harrisville
Warrill View Peak Crossing
Washpool Rd
Washpool
Flinders Lakes
Jimboomba
Kagaru
Munbilla
Woolooman
Wild Pig Creek Rd
Tamborine
Eagle Heights
Mount Tamborine
Kalbar
Beaudesert Boonah Rd
SEQ02 Moreton Basin
SEQ03 Burringbar-Conondale Ranges
SEQ10 Scenic Rim
Warrego Hwy
Rosewood Laidley Rd
Ipswich Rosewood Rd
Cunningham Hwy
Centenary Hwy
Logan Mway
Pacific Mway
Gateway Mway
Ipswich Mway
Beaudesert Rd
Brisbane Rd
Warwick Rd
Rosewood Warrill View Rd
Mount Forbes Rd
Middle Rd
Unoodan Rd
Mount Lindesay Hwy
Ipswich Boonah Rd
5
10
15
20
25
30
35
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50

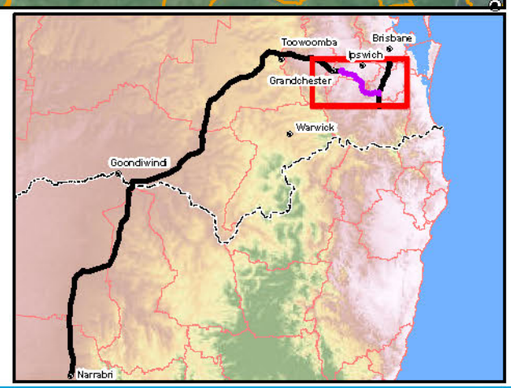
Map by: GN Z:\GIS\GIS_General\Tasks\Environment\3390-ELE-20180806\1159_LVIA\C2K\3390 ELE 20180806\1159_Fig6_IBRA_rev0_FFJV_A3L.mxd Date: 5/02/2020 16:28

Legend

- Localities
- Chainage (km)
- Major roads
- Minor roads
- Existing rail
- H2C project alignment
- C2K project alignment
- K2ARB project alignment
- LVIA study area (10 km from rail alignment)

IBRA Subregions

- SEQ02 Moreton Basin
- SEQ03 Burringbar-Conondale Ranges
- SEQ10 Scenic Rim



A3 scale: 1:250,000

0 2 4 6 8 10km

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Coordinate System: GDA 1994 MGA Zone 56

Calvert to Kagaru

Figure 6: Interim Biogeographic Regionalisation Australia

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Map by: GN Z:\GIS\GIS_General\Tasks\Environment\090-ELE-20180806\1169_LVIA\C2K\090-ELE-20180806\1169_Fig7_LandChar_C2K_rev0_no_roads_FFJV_A3L.mxd Date: 5/02/2020 16:50

Gatton
Lawes
Forest Hill
Laidley
Minden
Marburg
Chuwar
Walloon
Ipswich
Rosewood
Grandchester
Calvert
Ebenezer
Willowbank
Springfield Central
Purga
Mount Forbes
Mutdapilly
Goolman
Logan Village
Mount Walker
Peak Crossing
Warrill View
Harrisville
Flinders Lakes
Jimboomba
Washpool
Kagaru
Munbilla
Wooloman
Tamborine
Kalbar
Mount Tamborine

5 10 15 20 25 30 35 40 45 50

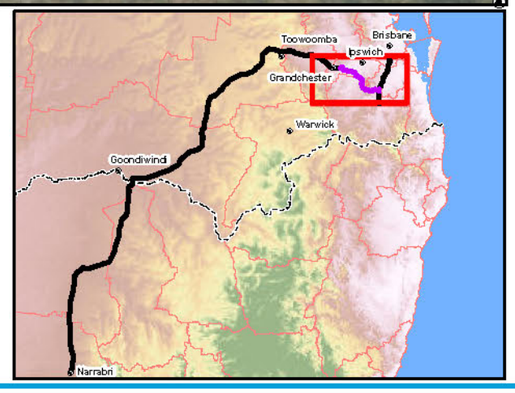
B1 H1 D1 H2 G1 F3 I1 D5 A1 F4 D2 C1 E6 G2 J1 E1 I2 C5 F1 F2 D3 E2 H3 I3 J2 C6 E7 E5 D6 D7 D10 D15 E3 B2 D12 D14 B5 D4 E4 C2 C4 C8 G3 C10 D8 C7 C3 H4 E8 E9 H5 H6 D9 F5 J3 C9 F6 G4 I4 E10 D12 B4 D16 C11 B6 D11 I5 E11 H7 D17 C14 H5 D18 D13 C12 C13

Legend

- Localities
- 5 Chainage (km)
- Existing rail
- H2C project alignment
- C2K project alignment
- K2ARB project alignment
- LVIA study area (10 km from rail alignment)

Landscape Character Type

- LCTA: Vegetated watercourses (River)
- LCTB: Vegetated watercourses (Creeks & Channels
- LCTC: Irrigated Croplands
- LCTD: Dry Croplands and Pastures
- LCTE: Vegetated Grazing
- LCTF: Rural Settlement
- LCTG: Transitional Landscapes
- LCTH: Forested Uplands
- LCTI: Rural Living
- LCTJ: Suburban Living



A3 scale: 1:250,000

0 30 60 90 120 150 km

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Coordinate System: GDA 1994 MGA Zone 56

Calvert to Kagaru

Figure 7: Landscape character assessment

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Gatton
Lawes
Forest Hill
Laidley
Minden
Marburg
Grandchester
Calvert
Rosewood
Walloon
Ebenezer
Willowbank
Mount Forbes
Mutdapilly
Purga
Goolman
Peak Crossing
Mount Walker
Harrisville
Warrill View
Washpool
Munbilla
Woolooman
Kalbar
Kagaru
Chuwar
Ipswich
Springfield Central
Flinders Lakes
Logan Village
Jimboomba
Tamborine
Mount Tamborine

Warrego Hwy
Rosewood Laidley Rd
Ipswich Rosewood Rd
Waters Rd
Hayes Rd
Paynes Rd
Mount Forbes Rd
Rosewood Warrill View Rd
Cunningham Hwy
Glencaim Rd
Bill Morrow Rd
Mount Flinders Rd
Middle Rd
Dwyers Rd
Warrill View Peak Crossing Rd
Washpool Rd
Rosewood Warrill View Rd
Ipswich Boonah Rd
Wild Pig Creek Rd
Beaudesert Boonah Rd
Wamego Hwy
Warwick Rd
Brisbane Rd
Cunningham Hwy
Centenary Hwy
Ipswich Mway
Centenary Mway
Beaudesert Rd
Logan Mway
Gateway Mway
Pacific Mway
Mount Lindesay Hwy
Unamlah Rd

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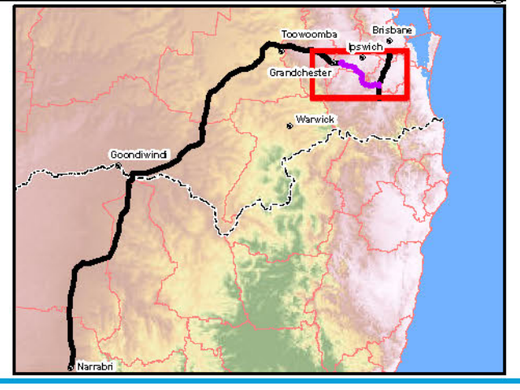
Map by: CM/MF/KN Z:\GIS\GIS_General\Tasks\Environment\390-ELE-20180800\1199_LVIA\C2K\390 ELE 20180800\1199_Fig8_VAM_C2K_Level8_FFJV_A3L.mxd Date: 06/02/2020 14:48

Legend

- Localities
- 5 Chainage (km)
- Major roads
- Minor roads
- Existing rail
- H2C project alignment
- C2K project alignment
- K2ARB project alignment
- LVIA study area (10 km from rail alignment)

Observation points theoretically visible

- 0
- 1 - 5
- 6 - 10
- 11 - 15
- 16 - 20
- 21 - 25
- 26 - 30
- 31 - 45



A3 scale: 1:250,000

0 2 4 6 8 10km

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Issue date: 05/02/2020 Version: 8
Coordinate System: GDA 1994 MGA Zone 56

Calvert to Kagaru

Figure 8: Visual analysis map - permanent infrastructure

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Map by: CW/MF/KN Z:\GIS\GIS_General\Tasks\Environment\390-ELE-20180806\189_LVIA\C2K\390-ELE-20180806189_Fig9_RS_C2K_rev5_FFJV_A3L.mxd Date: 6/02/2020 08:38

Gatton
Lawes
Forest Hill
Laidley
Minden
Marburg
Grandchester
Calvert
Rosewood
Ebenezer
Willowbank
Walloon
Chuwar
Ipswich
Springfield Central
Purga
Mount Forbes
Mutdapilly
Goolman
Peak Crossing
Mount Walker
Harrisville
Warrill View
Flinders Lakes
Washpool
Kagaru
Woolooman
Munbilla
Kalbar
Logan Village
Jimboomba
Tamborine
Mount Tamborine

Warrego Hwy
Rosewood Laidley Rd
Ipswich Rosewood Rd
Waters Rd
Hayes Rd
Raynes Rd
Mount Forbes Rd
Rosewood Warrill View Rd
Glencaim Rd
Bill Morrow Rd
Cunningham Hwy
Middle Rd
Mount Flinders Rd
Dwyers Rd
Warrill View Peak Crossing Rd
Washpool Rd
Rosewood Warrill View Rd
Ipswich Boonah Rd
Wild Pig Creek Rd
Beaudesert Boonah Rd
Warwick Rd
Brisbane Rd
Cunningham Hwy
Centenary Hwy
Ipswich Mway
Centenary Mway
Beaudesert Rd
Gateway Mway
Pacific Mway
Logan Mway
Mount Lindesay Hwy
Unanimah Rd

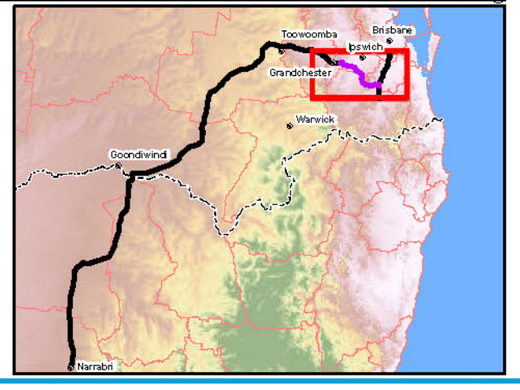
5
10
15
20
25
30
35
40
45
50

Legend

- 5 Chainage (km)
- Localities
- Existing rail
- Major roads
- Minor roads
- H2C project alignment
- C2K project alignment
- K2ARB project alignment
- LVIA study area (10 km from rail alignment)

Observation points theoretically visible

- 0
- 1 - 5
- 6 - 10
- 11 - 16
- 16 - 20
- 21 - 25
- 26 - 30
- 31 - 52



A3 scale: 1:250,000
0 2 4 6 8 10 km

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Coordinate System: GDA 1994 MGA Zone 56

Calvert to Kagaru
Figure 9: Visual analysis map - rolling stock

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Gatton
Lawes
Forest Hill
Laidley
Minden
Marburg
Warrego Hwy
Grandchester
Rosewood
Rosewood Laidley Rd
Ipswich Rosewood Rd
Calvert
Ebenezer
Willowbank
Waters Rd
Hayes Rd
Paynes Rd
Mount Forbes Rd
Mount Forbes
Glencaim Rd
Mutdapilly
Rosewood Warrill View Rd
Mount Walker
Cunningham Hwy
Middle Rd
Purga
Bill Morrow Rd
Goolman
Mount Flinders Rd
Peak Crossing
Dwyers Rd
Warrill View Peak Crossing
Harrisville
Warrill View
Rosewood Warrill View Rd
Washpool Rd
Washpool
Munbilla
Ipswich Boonah Rd
Wooloomen
Wild Pig Creek Rd
Kalbar
Cunningham Hwy
Beaudesert Boonah Rd
Walloon
Chuwar
Ipswich
Brisbane Rd
Warwick Rd
Cunningham Hwy
Springfield Central
Centenary Hwy
Centenary Mway
Ipswich Mway
Logan Mway
Beaudesert Rd
Gateway Mway
Pacific Mway
Mount Lindesay Hwy
Logan Village
Flinders Lakes
Unonlah Rd
Kagaru
Jimboomba
Tamborine
Mount Tamborine

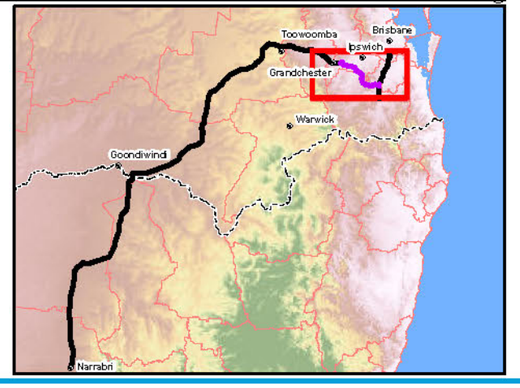
Map by: MF/GN Z:\GIS\GIS_GeneralTasks\Environment\390-ELE-20180806\159_Fig10_Diff_C2K_rev5_FFJV_A3.mxd Date: 6/02/2020 09:06

Legend

- 5 Chainage (km)
- Localities
- Existing rail
- Major roads
- Minor roads
- H2C project alignment
- C2K project alignment
- K2ARB project alignment
- LVIA study area (10 km from rail alignment)

Difference between permanent infrastructure and rolling stock

- 0
- 1 - 5
- 6 - 10
- 11 - 15
- 16 - 20
- 21 - 25



A3 scale: 1:250,000

0 2 4 6 8 10km

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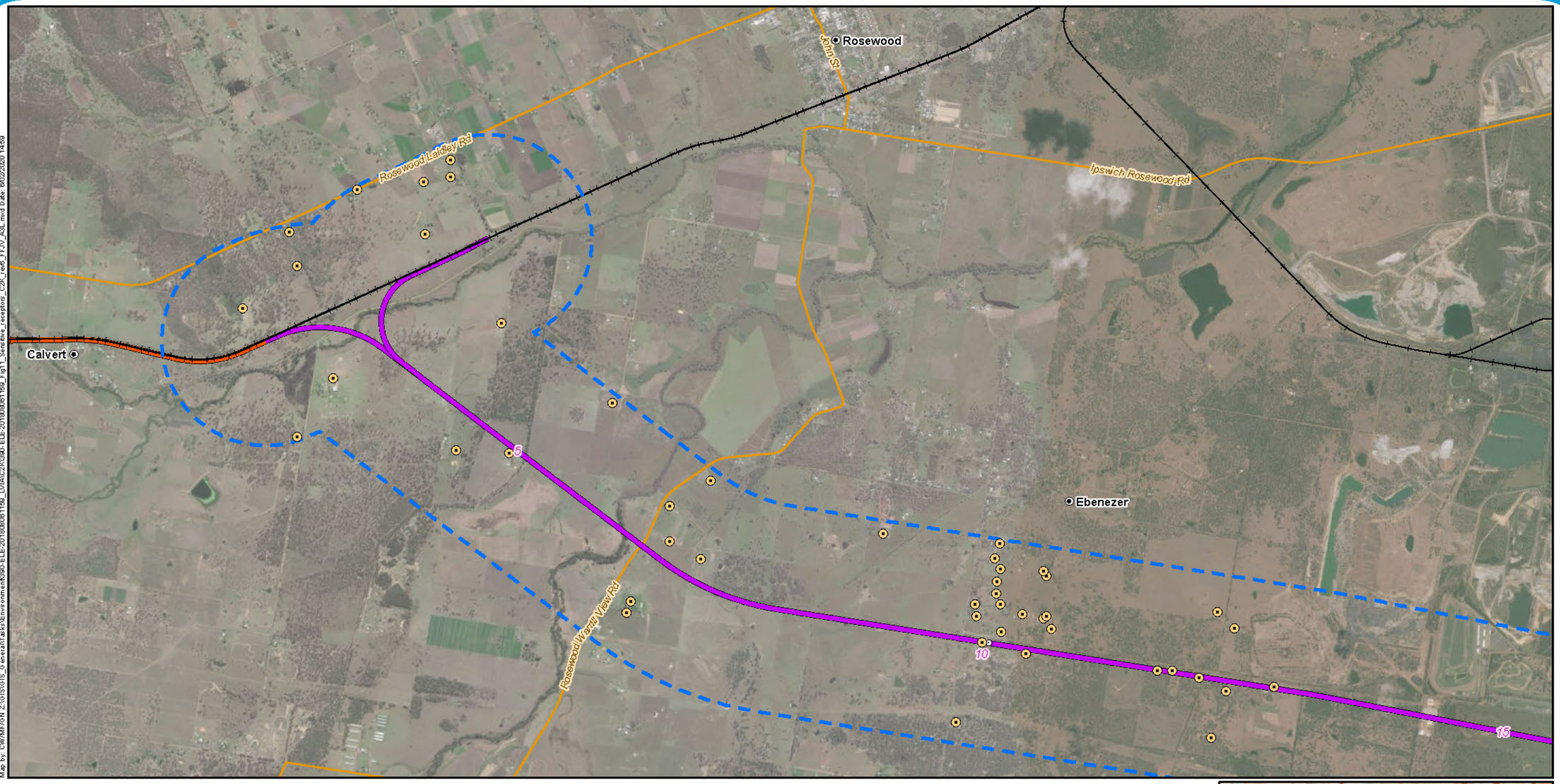
Coordinate System: GDA 1994 MGA Zone 56

Calvert to Kagaru

Figure 10: Visual analysis map – difference analysis

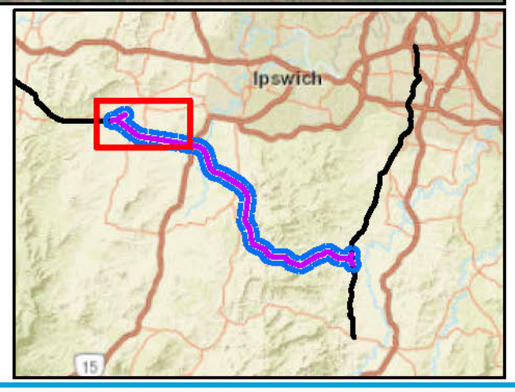
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



Map by: CW/MF/GN Z:\GIS\GIS_General\Tasks\Environment\300-ELE-20180606\159_Lv\A\C2K\300-ELE-20180606\159_Fig11_Sensitive_receptors_C2K_rev6_FFJV_A3L.mxd Date: 6/02/2020 14:59

Legend

- Sensitive receptors (within 1 km)
- Chainage label points
- 5 Chainage (km)
- Localities
- Existing rail
- Minor roads
- H2C project alignment
- C2K project alignment
- 1 km buffer



A3 scale: 1:40,000
0 1 2km

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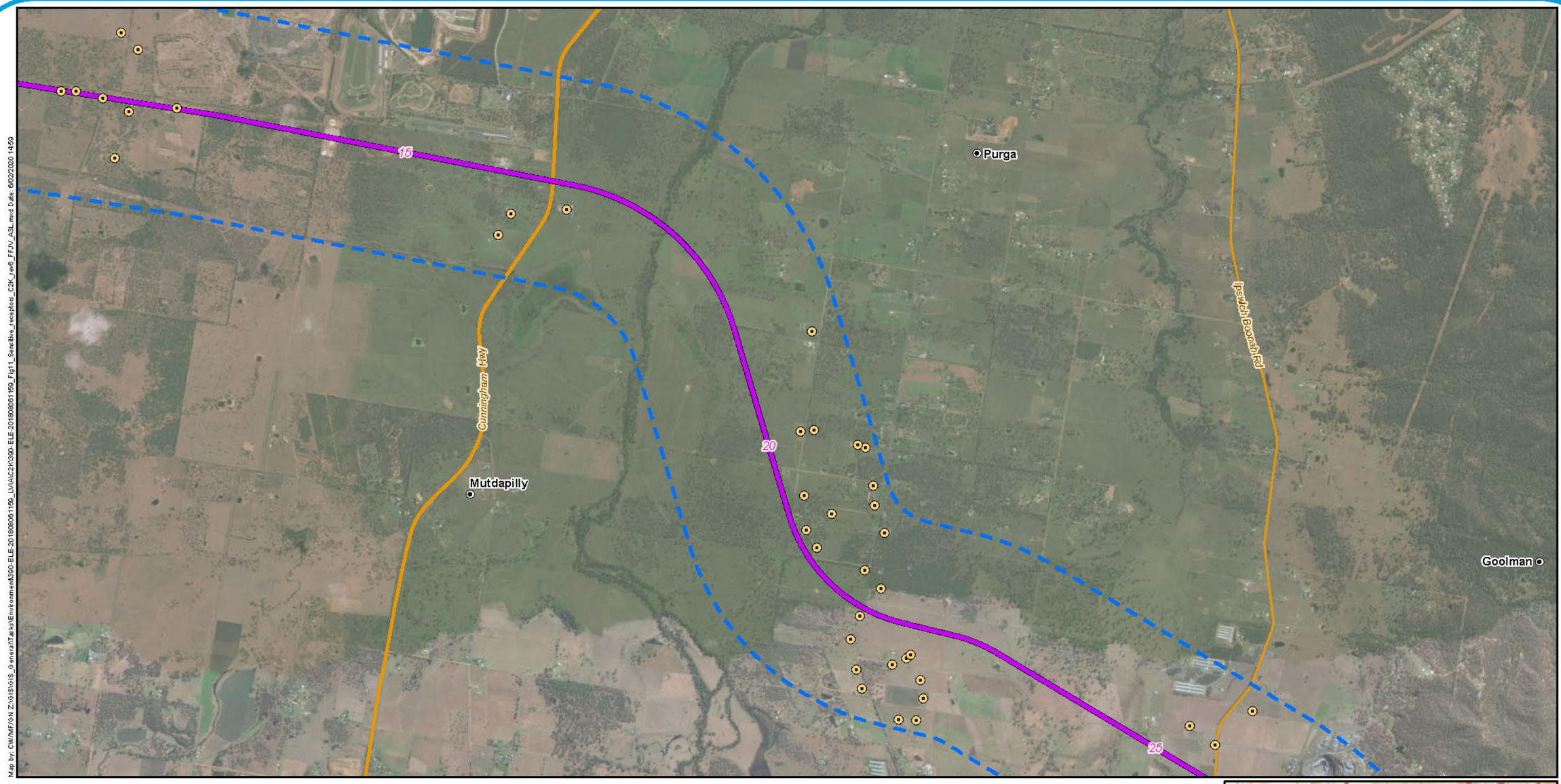
Coordinate System: GDA 1994 MGA Zone 56

Calvert to Kagaru

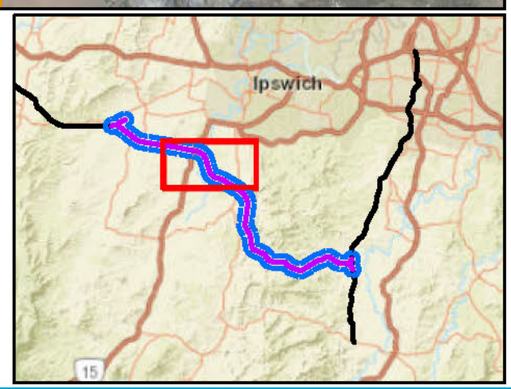
Figure 11a: Sensitive receptors within 1 km of the Project

Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



Legend

- Sensitive receptors (within 1 km)
- Chainage label points
- 5 Chainage (km)
- Localities
- Major roads
- Minor roads
- C2K project alignment
- 1 km buffer



A3 scale: 1:40,000

0 1 2km

Future Freight
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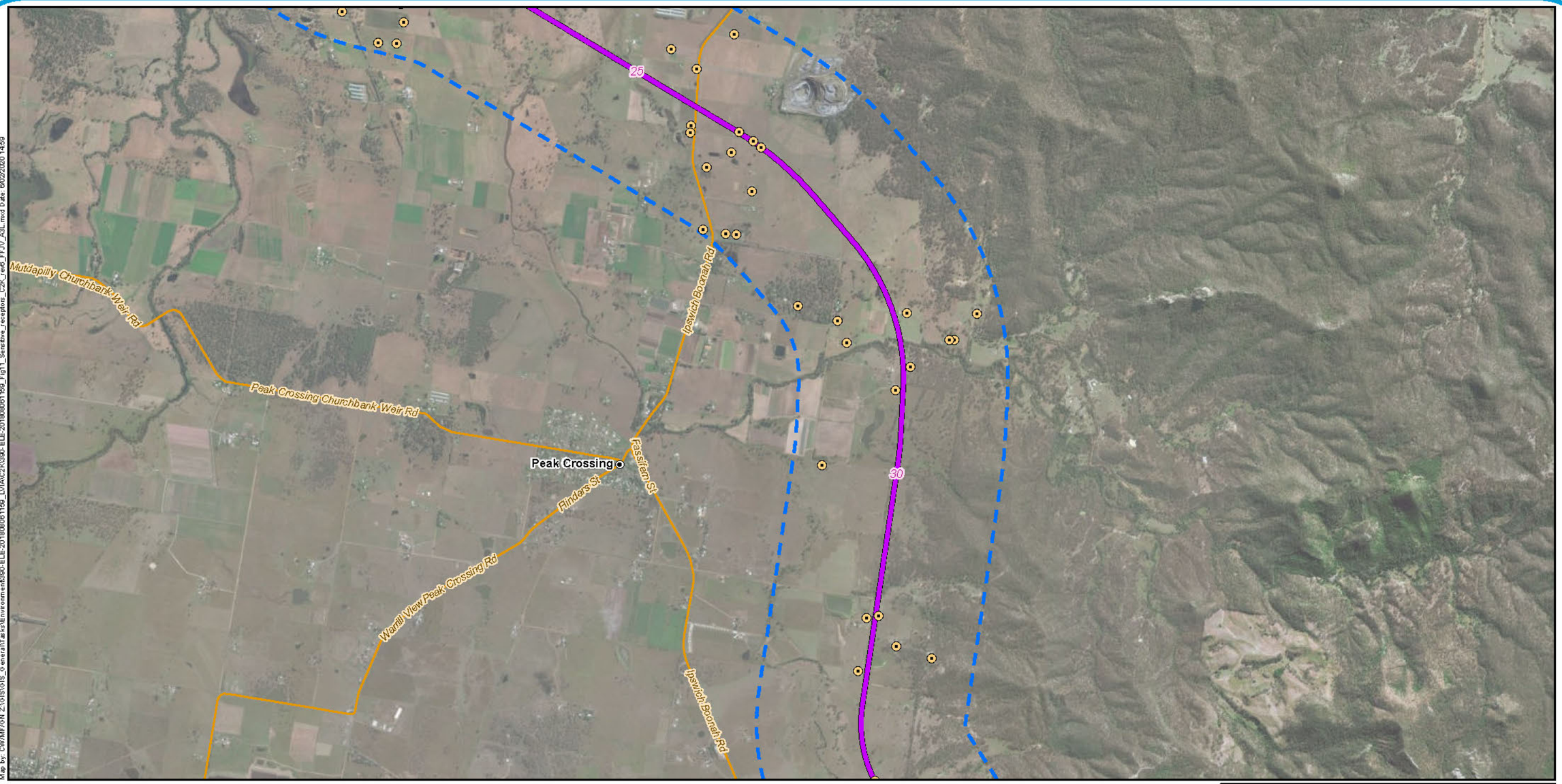
Issue date: 06/02/2020 Version: 6
Coordinate System: GDA 1994 MGA Zone 56

Calvert to Kagaru

Figure 11b: Sensitive receptors within 1 km of the Project

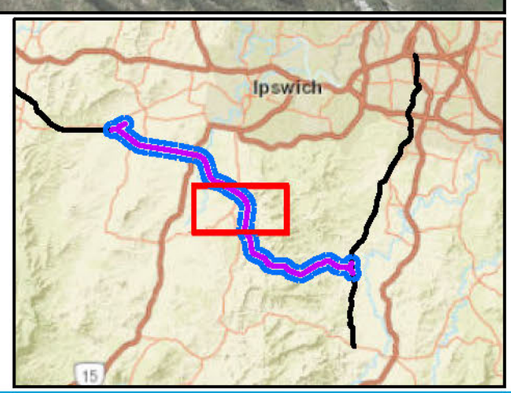
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



Map by: CW/MF/GN Z:\GIS\GIS_General\Tasks\Environment\390-ELE-20180806\189_LV\AC2K\390-ELE-20180806\189_Fig11_Sensitive_receptors_C2K_rev6_FFJV_A3L.mxd Date: 6/02/2020 14:59

Legend

- Sensitive receptors (within 1 km)
- Chainage label points
- 5 Chainage (km)
- Localities
- Minor roads
- C2K project alignment
- 1 km buffer



A3 scale: 1:40,000
0 1 2km

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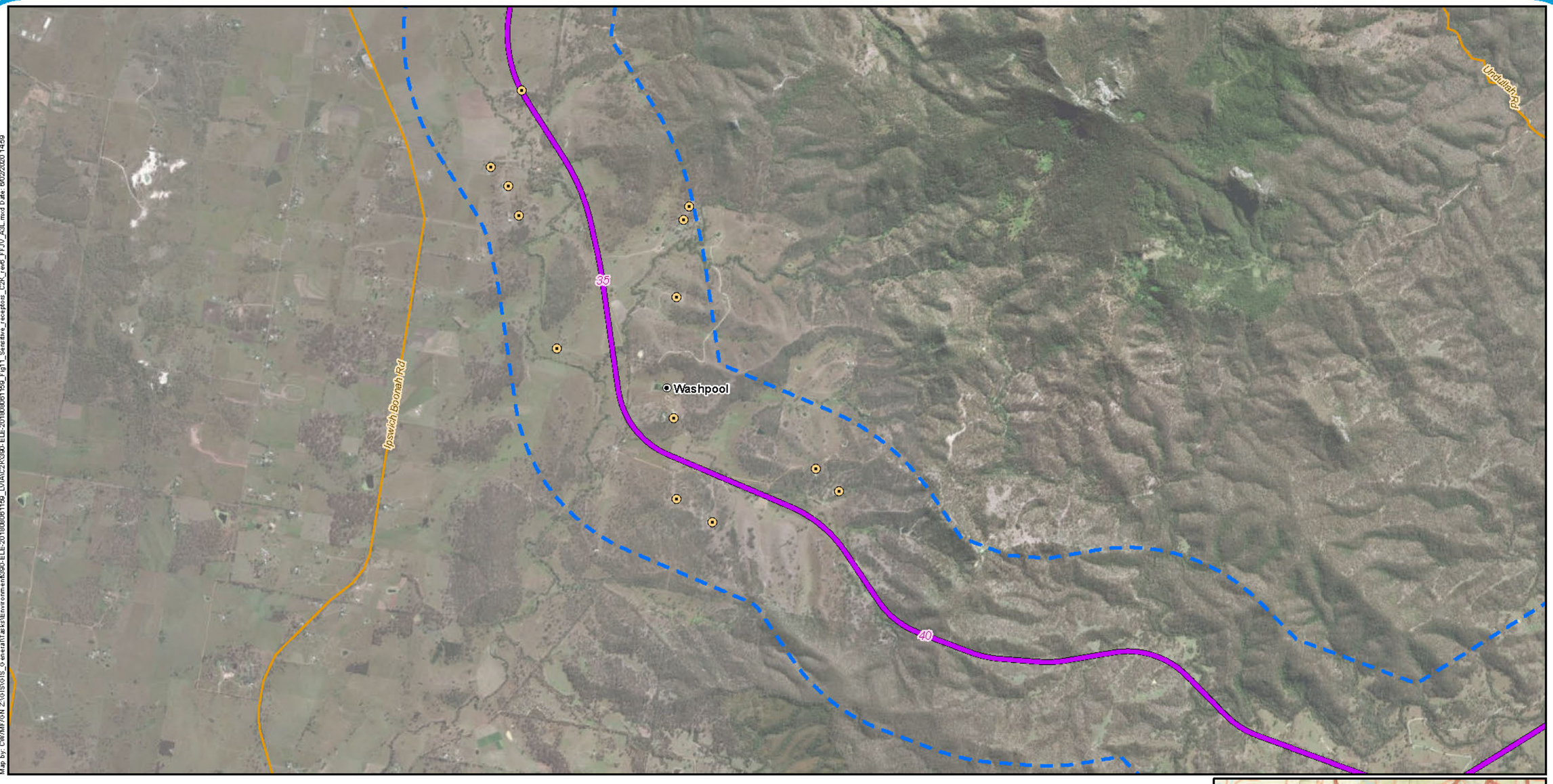
Coordinate System: GDA 1994 MGA Zone 56

Calvert to Kagaru
Figure 11c: Sensitive receptors within 1 km of the Project

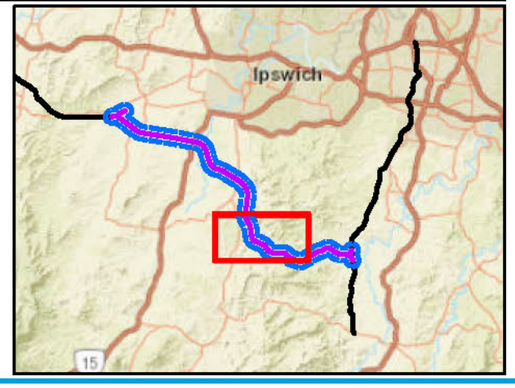
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



Map by: CW/MF/GN Z:\GIS\GIS_General\Tasks\Environment\390-ELE-20180806\1159_LVIA\C2K\390-ELE-20180806\1159_Fig11_Sensitive_receptors_C2K_rev6_FFJV_A3L.mxd Date: 6/02/2020 14:59

Legend

- Sensitive receptors (within 1 km)
- Chainage label points
- 5 Chainage (km)
- Localities
- Minor roads
- C2K project alignment
- 1 km buffer



A3 scale: 1:40,000
0 1 2km

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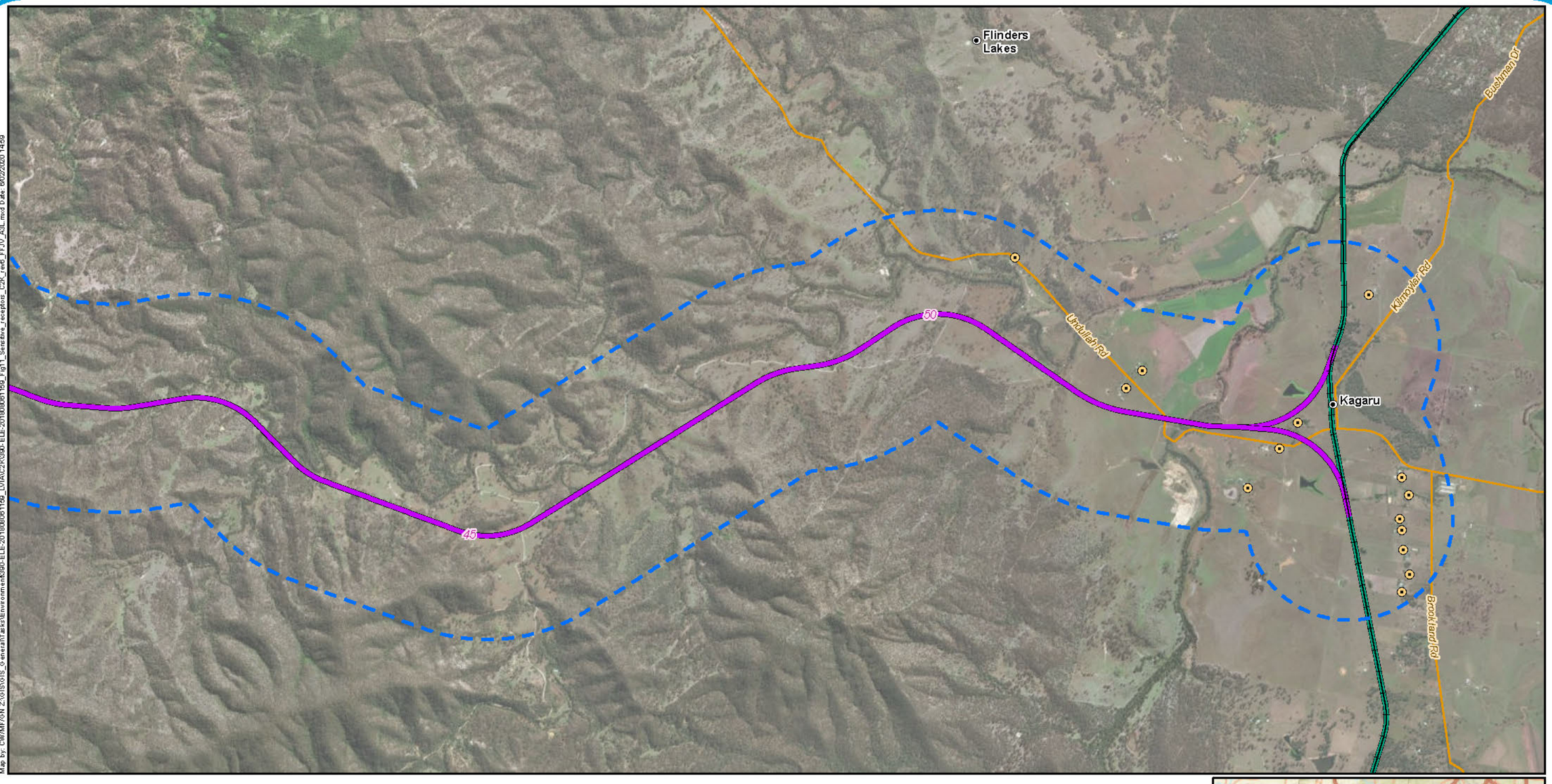
Issue date: 06/02/2020 Version: 6
Coordinate System: GDA 1994 MGA Zone 56

Calvert to Kagaru

Figure 11d: Sensitive receptors within 1 km of the Project

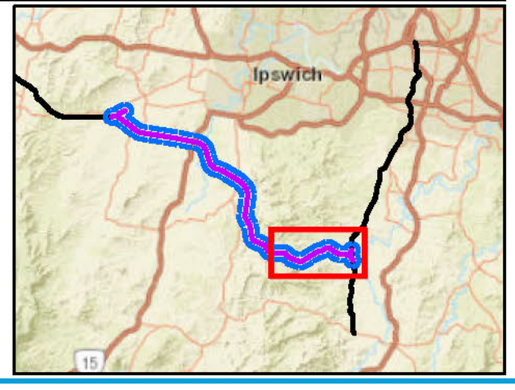
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



Map by: CW/MF/GN Z:\GIS\GIS_General\Tasks\Environment\390-ELE-20180806\1159_LVIA\C2K\390-ELE-20180806\1159_Fig11_Sensitive_receptors_C2K_rev6_FFJV_A3L.mxd Date: 6/02/2020 14:59

Legend

- Sensitive receptors (within 1 km)
- Chainage label points
- 5 Chainage (km)
- Localities
- Existing rail
- Minor roads
- C2K project alignment
- K2ARB project alignment
- 1 km buffer



A3 scale: 1:40,000
0 1 2km

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Integrating Community, Environment and Engineering

Issue date: 06/02/2020 Version: 6
Coordinate System: GDA 1994 MGA Zone 56

Calvert to Kagaru

Figure 11e: Sensitive receptors within 1 km of the Project

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Map by: CW/MF/KN Z:\GIS\GIS_General\Tasks\Environment\390-ELE-20180800199_LVIA\C2K\390-ELE-20180800199_Fig12_Tourist_C2K_rev6_FFJV_A3L.mxd Date: 6/02/2020 11:03

Gatton
Lawes
Forest Hill
Laidley
Minden
Marburg
Walloon
Chuwar
Ipswich
Rosewood
Grandchester
Calvert
Ebenezer
Willowbank
Waters Rd
Hayes Rd
Rosewood Warrill View Rd
Mount Forbes Rd
Mount Forbes
Mutdapilly
Glencaim Rd
Purga
Bill Morrow Rd
Goolman
Mount Flinders Rd
Springfield Central
Logan Village
Jimboomba
Tamborine
Mount Tamborine
Mount Walker
Peak Crossing
Middle Rd
Dwyers Rd
Washpool Rd
Harrisville
Warrill View
Peak Crossing
Warrill View
Rosewood Warrill View Rd
Washpool
Flinders Lakes
Kagaru
Woolooman
Munbilla
Kalbar
Ipswich Boonah Rd
Wild Pig Creek Rd
Beaudesert Boonah Rd
Cunningham Hwy
Warrego Hwy
Ipswich Rd
Brisbane Rd
Warwick Rd
Cunningham Hwy
Centenary Hwy
Ipswich Mway
Gateway Mway
Pacific Mway
Beaudesert Rd
Logan Mway
Mount Lindesay Hwy
Rosewood Laidley Rd
Ipswich Rosewood Rd
Unonlah Rd
5
10
15
20
25
30
35
40
45
50

Legend

- Localities
- 5 Chainage (km)
- Major roads
- Minor roads
- Existing rail
- H2C project alignment
- C2K project alignment
- K2ARB project alignment
- LVIA study area (10 km from rail alignment)

Walking Trails

- Flinders Goolman Conservation Estate
- Mount Joyce Recreation Park Trails
- Northern Bound Wyaralong Dam
- Flinders Peak Hiking Track

National Tourist Drives

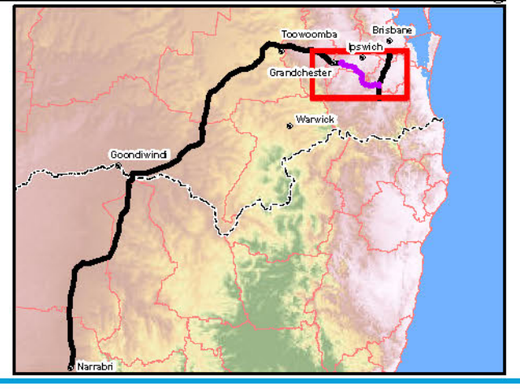
- Warrego Way & Adventure Way

Regional Tourist Drives

- Cobb & Co Tourist Drive

Local Tourist Drives

- Aratula to Flinders Peak Winery Drive
- Main Range Drive
- Scenic Rim - Cheese Pleaser
- Glen Rock Tourist Drive



A3 scale: 1:250,000

0 2 4 6 8 10km

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Issue date: 06/02/2020 Version: 6
Coordinate System: GDA 1994 MGA Zone 56

Calvert to Kagaru

Figure 12: Tourist drives and recreation trails

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Map by: CW/MF/GN Z:\GIS\GIS_General\Tasks\Environment\390-ELE-20180806\1159_LVIA\C2K\390-ELE-20180806\1159_Fig13_Viewpoints_C2K_rev5_FFJV_A3L.mxd Date: 6/02/2020 15:08

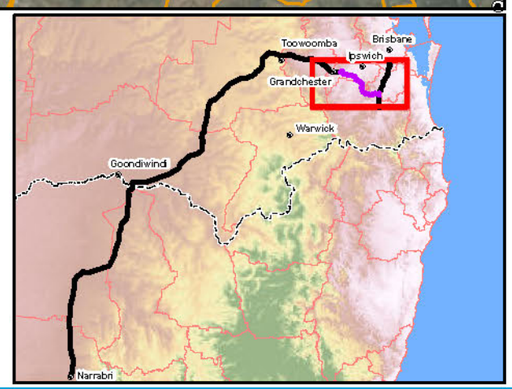
Gatton
Lawes
Forest Hill
Laidley
Grandchester
Calvert
Minden
Marburg
Walloon
Rosewood
Ebenezer
Willowbank
Mount Forbes
Mutdapilly
Purga
Goolman
Mount Walker
Peak Crossing
Harrisville
Warrill View
Munbilla
Kalbar
Wooloman
Washpool
Chuwar
Ipswich
Springfield Central
Flinders Lakes
Kagaru
Jimboomba
Logan Village
Tamborine
Mount Tamborine

Warrego Hwy
Rosewood Laidley Rd
Ipswich Rosewood Rd
Waters Rd
Hayes Rd
Mount Forbes Rd
Paynes Rd
Glancaim Rd
Bill Morrow Rd
Mount Flinders Rd
Dwyers Rd
Washpool Rd
Middle Rd
Warrill View Peak Crossing
Rosewood Warrill View Rd
Cunningham Hwy
Ipswich Boonah Rd
Beaudesert Boonah Rd
Wild Pig Creek Rd
Unonlah Rd
Warwick Rd
Brisbane Rd
Centenary Hwy
Ipswich Mway
Logan Mway
Gateway Mway
Pacific Mway
Beaudesert Rd
Mount Lindesay Hwy

5 10 15 20 25 30 35 40 45 50
1 2 3 4 5 6 7 8 9a 9b 10 11 12

Legend

- Viewpoints
- Chainage label points
- Chainage (km)
- Localities
- Major roads
- Minor roads
- Existing rail
- H2C project alignment
- C2K project alignment
- K2ARB project alignment
- LVIA study area (10 km from rail alignment)



A3 scale: 1:250,000
0 2 4 6 8 10km

Future Freight
Integrating Community, Environment and Engineering

Issue date: 06/02/2020 Version: 5
Coordinate System: GDA 1994 MGA Zone 56

Calvert to Kagaru

Figure 13: Key visual receptors and location of representative viewpoints

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Gatton
Lawes
Forest Hill
Laidley
Grandchester
Calvert
Minden
Marburg
Walloon
Rosewood
Ebenezer
Willowbank
Purga
Mount Forbes
Mutdapilly
Mount Walker
Harrisville
Warrill View
Munbilla
Kalbar
Peak Crossing
Washpool
Wooloomban
Chuwar
Ipswich
Springfield Central
Goolman
Flinders Lakes
Kagaru
Jimboomba
Logan Village
Tamborine
Mount Tamborine

Warrego Hwy
Rosewood Laidley Rd
Ipswich Rosewood Rd
Waters Rd
Hayes Rd
Raynes Rd
Mount Forbes Rd
Glencaim Rd
Bill Morrow Rd
Mount Flinders Rd
Rosewood Warrill View Rd
Cunningham Hwy
Middle Rd
Dwyers Rd
Warrill View Peak Crossing
Washpool Rd
Rosewood Warrill View Rd
Ipswich Boonah Rd
Wild Pig Creek Rd
Beaudesert Boonah Rd
Warwick Rd
Brisbane Rd
Centenary Hwy
Ipswich Mway
Logan Mway
Gateway Mway
Pacific Mway
Beaudesert Rd
Mount Lindesay Hwy
Unonlah Rd

5 10 15 20 25 30 35 40 45 50

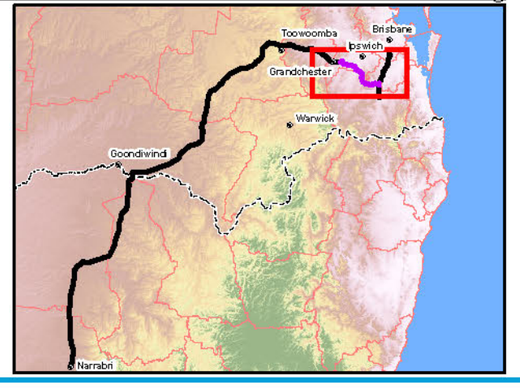
Map by: GN Z:\GIS\GIS_General\Tasks\Environment\390-ELE-20180806\1159_LVIA\C2K\390-ELE-20180806\1159_Fig14_CA_C2K_rev7_FFJV_A3_mxd Date: 31/08/2020 10:03

Legend

- 5 Chainage (km)
- Localities
- Existing rail
- H2C project alignment
- C2K project alignment
- K2ARB project alignment
- Major roads
- Minor roads
- LVIA study area (10 km from rail alignment)

Projects

- Remondis Waste to Energy Facility
- South West Pipeline
- Ripley Valley Priority Development Area
- RAAF Base Amberley
- State Development Area Boundary - Bromelton
- Priority Development Area Boundary - Greater Flagstone



A3 scale: 1:250,000

0 2 4 6 8 10 km

Future Freight
Integrating Community, Environment and Engineering

Issue date: 28/08/2020 Version: 7
Coordinate System: GDA 1994 MGA Zone 56

Calvert to Kagaru
Figure 14: Cumulative LVIA

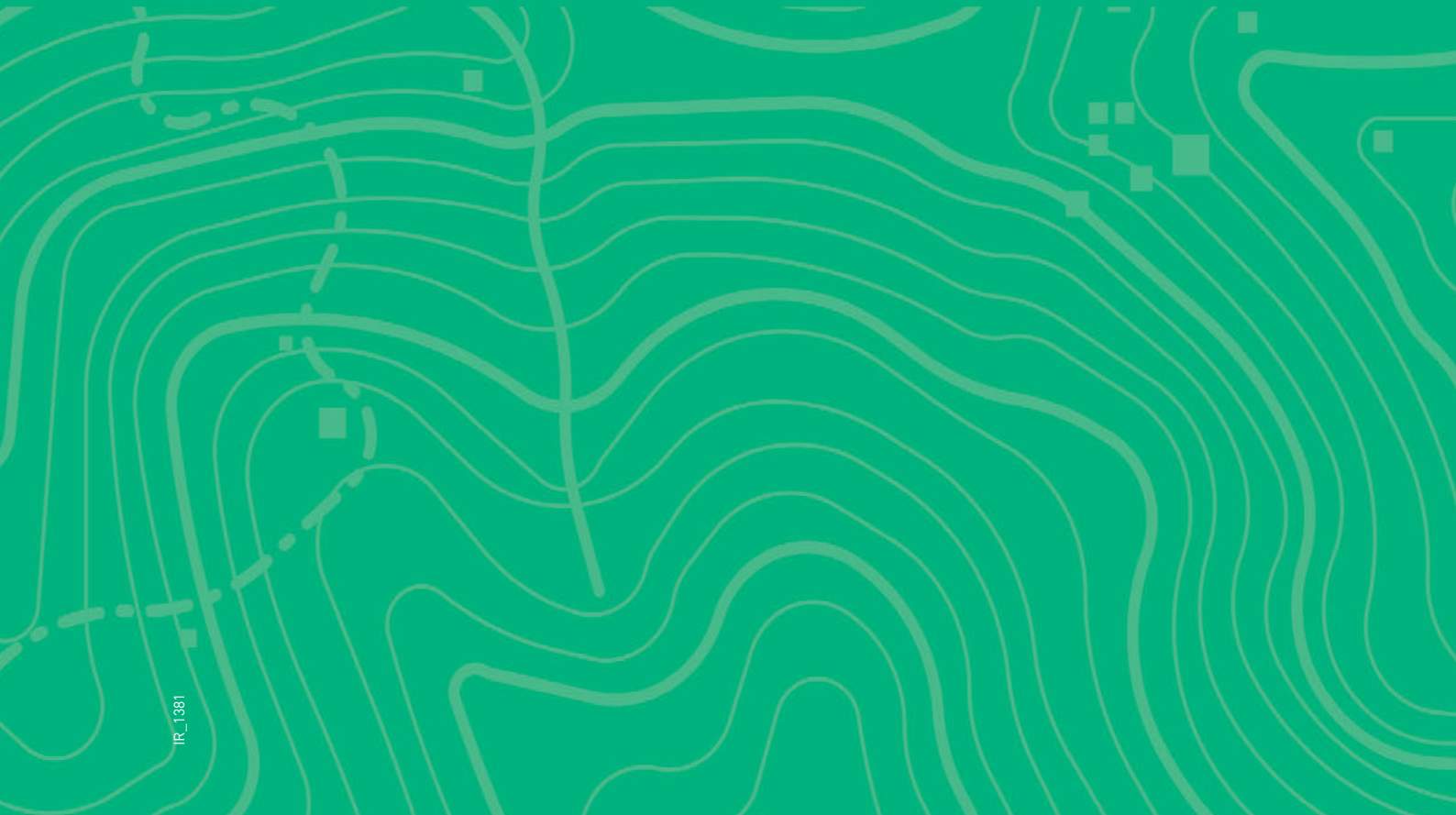
APPENDIX

I

Landscape and Visual Impact Assessment Technical Report

Appendix 2 Viewpoints

CALVERT TO KAGARU ENVIRONMENTAL IMPACT STATEMENT



IR_1381

APPENDIX 2: VIEWPOINTS

The following viewpoints have been used to inform and illustrate this assessment:

Figure 25: Viewpoint 1: Rosewood-Warrill View Road looking northeast - existing context

Existing View Showing Site Context and Key Features

Indicative extent of 75º field of view

Figure 26: Viewpoint 1: Rosewood-Warrill View Road looking northeast - visualisation

Existing View (75º field of view)

Visualisation of Proposed Development (75º field of view)

Figure 27: Viewpoint 2: Paynes Road looking south - existing context

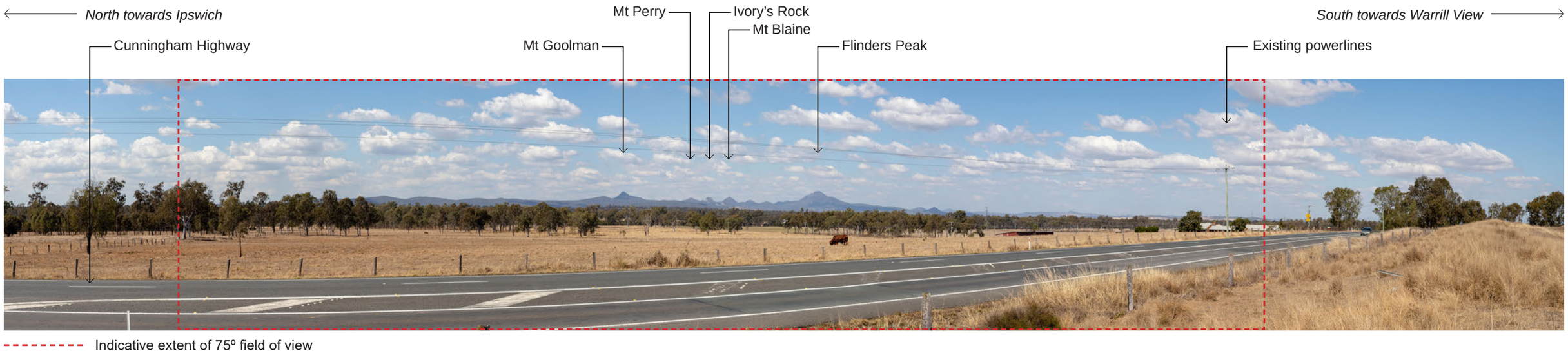
Existing View Showing Site Context and Key Features

Indicative extent of 75º field of view

Note: Please note that no visualisation has been provided for this viewpoint, as discussed in Section 4.9: Visual Impact Assessment of the Landscape and Visual Impact Assessment Technical Report.

Figure 28: Viewpoint 3: Cunningham Highway looking southeast to Flinders Peak - existing context

Existing View Showing Site Context and Key Features



Note: Please refer to Figure 27b for visualisation of this viewpoint.

Figure 29: Viewpoint 3: Cunningham Highway looking southeast to Flinders Peak - visualisation

Existing View (75º field of view)

Visualisation of Proposed Development (75º field of view)

Figure 30: Viewpoint 4: Middle Road, looking north - existing context

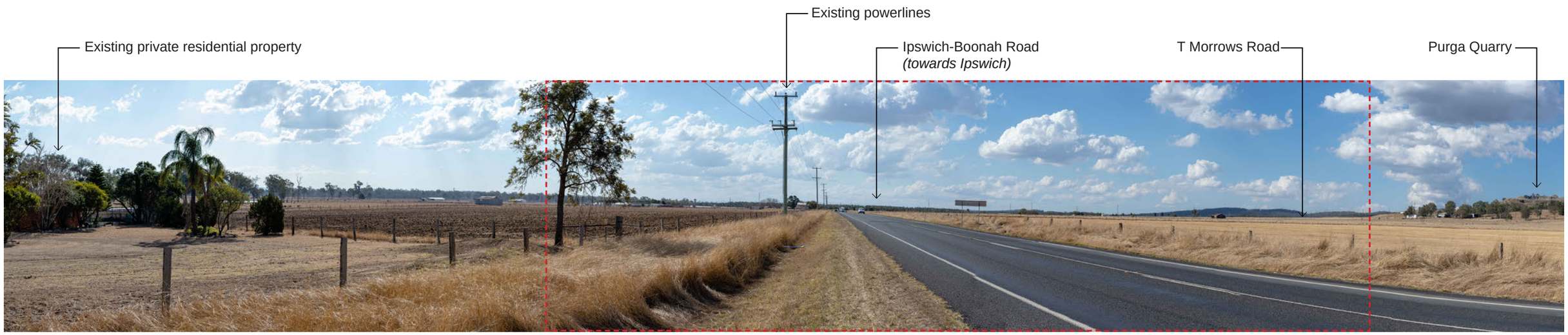
Existing View Showing Site Context and Key Features

Indicative extent of 75º field of view

Note: Please note that no visualisation has been provided for this viewpoint, as discussed in Section 4.9: Visual Impact Assessment of the Landscape and Visual Impact Assessment Technical Report.

Figure 31: Viewpoint 5: Ipswich-Boonah Road looking northeast, near properties 276 and 288 - existing context

Existing View Showing Site Context and Key Features



Indicative extent of 75º field of view

Note: Please refer to Figure 29b for visualisation of this viewpoint.

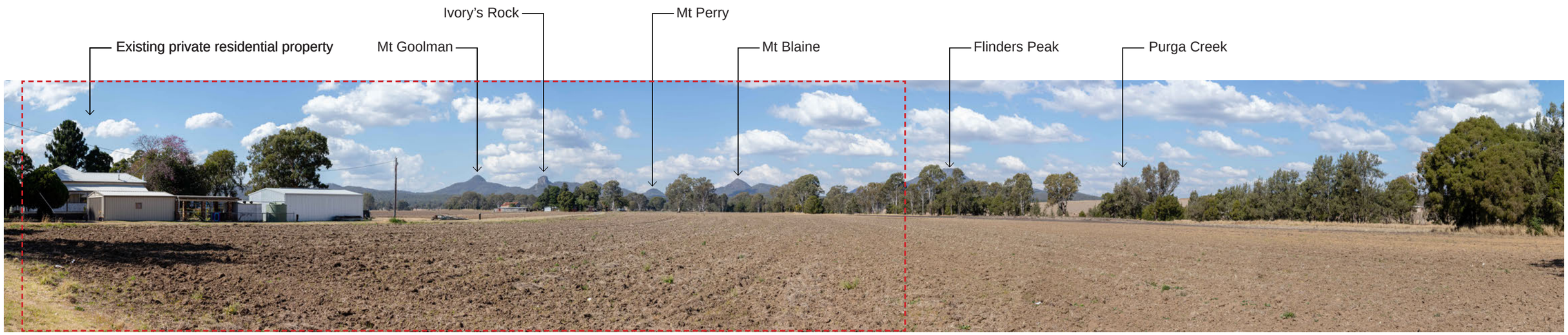
Figure 32: Viewpoint 5: Ipswich-Boonah Road looking northeast, near properties 276 and 288 - visualisation

Existing View (75º field of view)

Visualisation of Proposed Development (75º field of view)

Figure 33: Viewpoint 6: Peak Mountain View Park, near Peak Crossing State School and Peak Crossing township - existing context

Existing View Showing Site Context and Key Features



Note: Please note that no visualisation has been provided for this viewpoint, as discussed in Section 4.9: Visual Impact Assessment of the Landscape and Visual Impact Assessment Technical Report.

Figure 34: Viewpoint 7: Ipswich-Boonah Road near Flinders Peak Winery - existing context

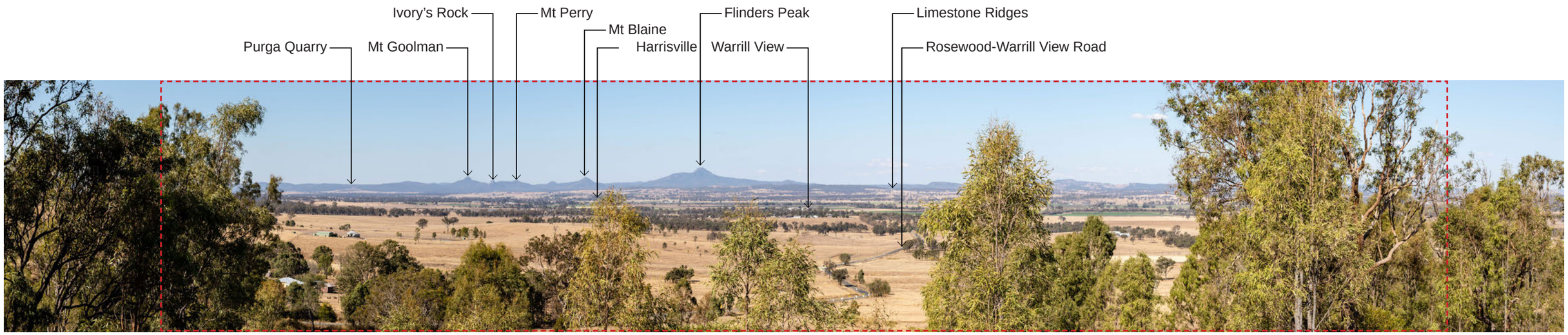
Existing View Showing Site Context and Key Features

Indicative extent of 75º field of view

Note: Please note that no visualisation has been provided for this viewpoint, as discussed in Section 4.9: Visual Impact Assessment of the Landscape and Visual Impact Assessment Technical Report.

Figure 35: Viewpoint 8: Cunningham Lookout off Rosewood-Warrill View Road east looking towards Flinders Peak - existing context

Existing View Showing Site Context and Key Features

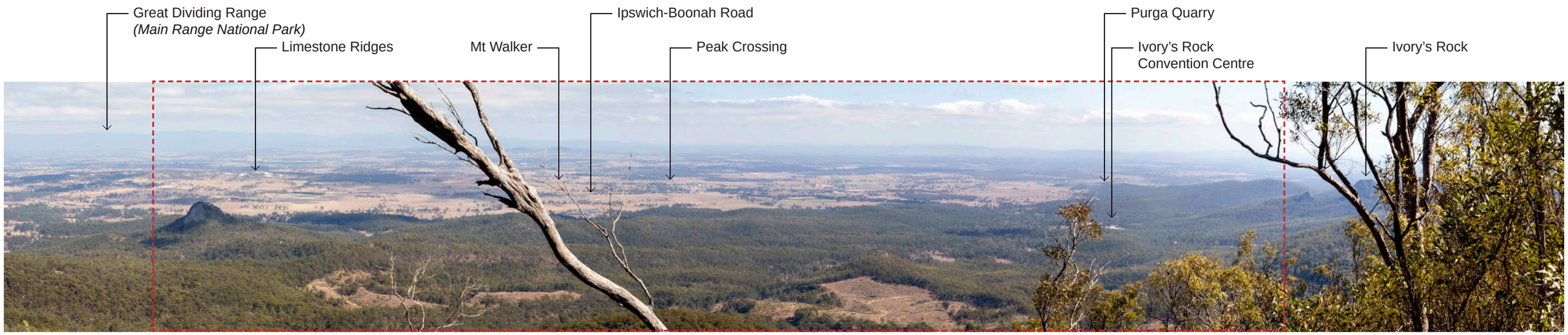


Indicative extent of 75º field of view

Note: Please note that no visualisation has been provided for this viewpoint, as discussed in Section 4.9: Visual Impact Assessment of the Landscape and Visual Impact Assessment Technical Report.

Figure 36: Viewpoint 9A: Flinders Peak - existing context

Existing View Showing Site Context and Key Features



Indicative extent of 75º field of view

Note: Please refer to Figure 33b for visualisation of this viewpoint. Please note for the purposes of the visualisation the dead branch has been digitally removed to allow clearer views towards the project.

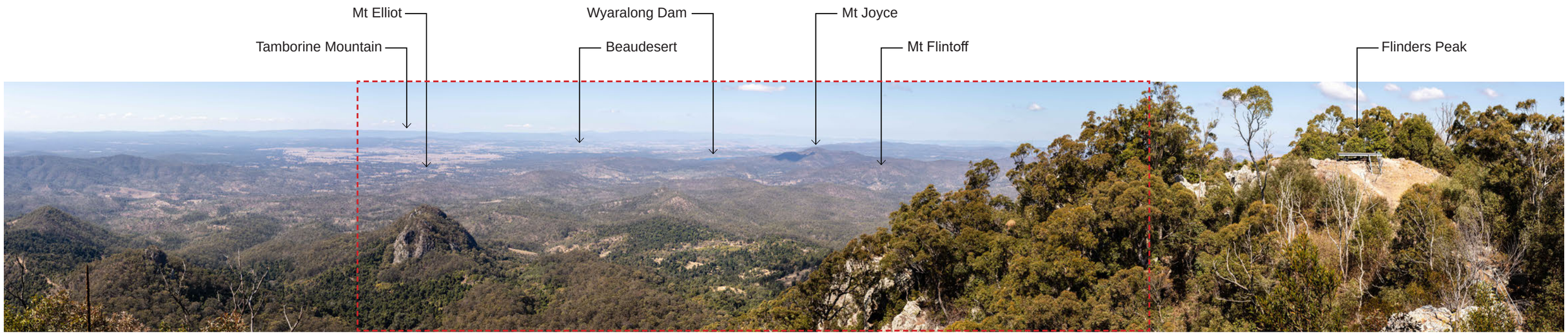
Figure 37: Viewpoint 9A: Flinders Peak - visualisation

Existing View (75º field of view)

Visualisation of Proposed Development (75º field of view)

Figure 38: Viewpoint 9B: Flinders Peak - existing context

Existing View Showing Site Context and Key Features

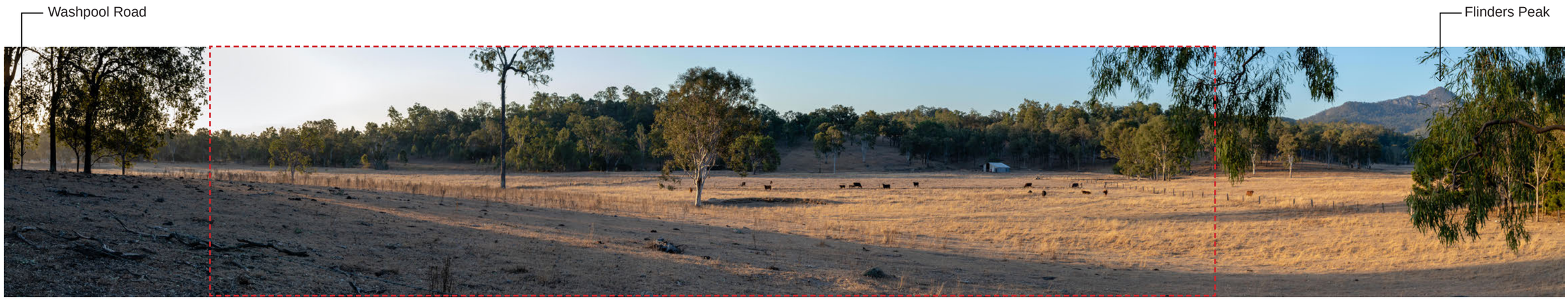


Indicative extent of 75º field of view

Note: Please note that no visualisation has been provided for this viewpoint, as discussed in Section 4.9: Visual Impact Assessment of the Landscape and Visual Impact Assessment Technical Report.

Figure 39: Viewpoint 10: Washpool Road near rural properties 456-463 - existing context

Existing View Showing Site Context and Key Features

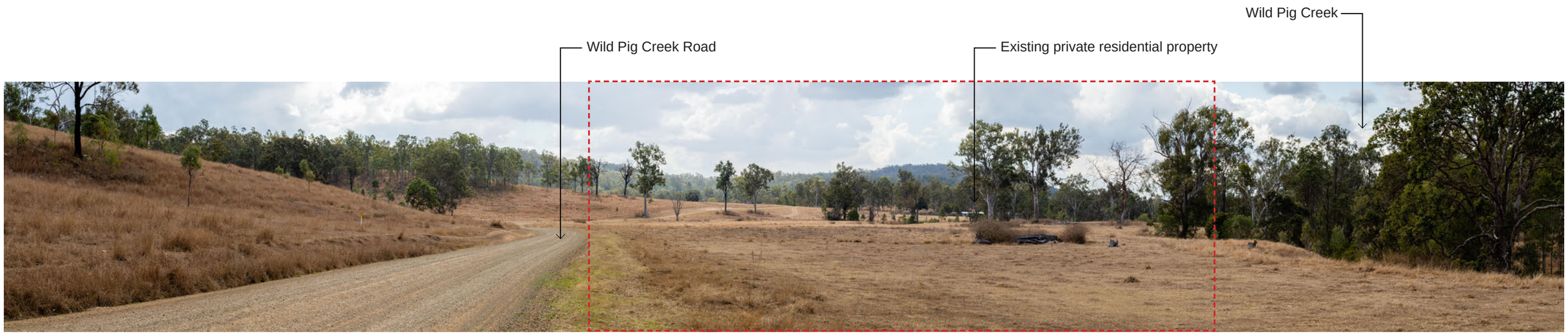


Indicative extent of 75º field of view

Note: Please note that no visualisation has been provided for this viewpoint, as discussed in Section 4.9: Visual Impact Assessment of the Landscape and Visual Impact Assessment Technical Report.

Figure 40: Viewpoint 11: Wild Pig Creek Road near rural properties 717-722 - existing context

Existing View Showing Site Context and Key Features



Note: Please refer to Figure 36b for visualisation of this viewpoint.

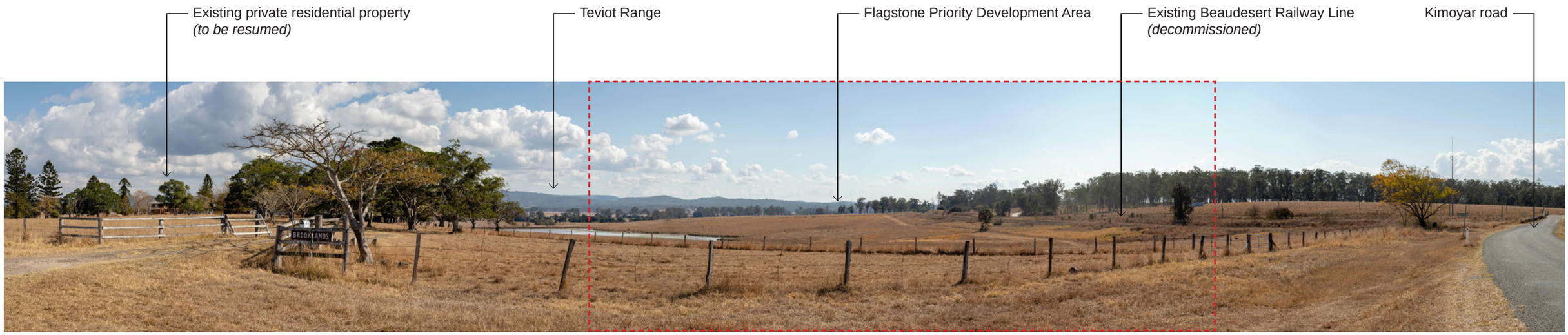
Figure 41: Viewpoint 11: Wild Pig Creek Road near rural properties 717-722 - visualisation

Existing View (75º field of view)

Visualisation of Proposed Development (75º field of view)

Figure 42: Viewpoint 12: Undullah Road near “Brooklands” rural property - existing context

Existing View Showing Site Context and Key Features



Indicative extent of 75º field of view

Note: Please note that no visualisation has been provided for this viewpoint, as discussed in Section 4.9: Visual Impact Assessment of the Landscape and Visual Impact Assessment Technical Report.