APPENDIX H

Landscape and Visual Impact Assessment Technical Report

HELIDON TO CALVERT ENVIRONMENTAL IMPACT STATEMENT

IR_1381

Inland Rail

Helidon to Calvert

Appendix H

Landscape and Visual Impact Assessment Technical Report

Inland Rail: Helidon to Calvert

Landscape and Visual Impact Assessment

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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 Helidon to Calvert Project (the Project).

The Inland Rail Program (Inland Rail) is a major national interstate freight route between Melbourne and Brisbane. Australian Rail Track Corporation Ltd (ARTC) proposes to construct and operate the Helidon to Calvert (H2C) Project which extends approximately 47 km in length connecting the existing Queensland Rail (QR West Moreton System) rail corridor with the exiting Interstate Line.

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 47 kilometre (km) single track dual gauge railway. Where possible, the Project utilises land protected for a future railway corridor under the provisions of the Queensland (QLD) Transport Planning and Coordination Act 1994 known as the Gowrie to Grandchester future public passenger transport corridor.
- Tunnel: approximate 850 m tunnel traversing the Little Liverpool Range
- Crossing loops: four crossing loops, designed to accommodate trains initially up to 1,800 metre (m) long. It will ultimately accommodate trains up to 3,600 metres (m) long, based on business needs, but will be initially constructed to accommodate 1,800 m long double-stack freight trains
- Tie-ins: Tie-ins to the existing West Moreton System rail corridor at the Project boundary and other potential intermediate locations to be confirmed by operational modelling (approximately 24 km of parallel length)
- Bridges: 31 new bridge structures (rail bridges over waterways and roads, rail bridges over waterways and roads, rail bridges over waterways, rail bridges over roads, a rail bridge over rail, road bridges over rail and a pedestrian bridge over rail). The public road bridges over rail are located on Airforce Road and Eastern Drive.
- 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: ancillary infrastructure including signalling and communications infrastructure, signage, fencing and utilities
- Presence of the freight train: presence of double stacked trains, with a height of up to 6.5 m and length of up to 1,800 m
- 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 7.6 km of cut and approximately 34 km of fill sections
- Laydown areas: 32 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.

1.2. The landscape of the LVIA study area

The landscape between Helidon and Calvert is a populated working agricultural landscape. The landscape is characterised by generally flat, irrigated and non-irrigated croplands and undulating pastures, interspersed by a network of vegetated watercourses associated with Lockyer Creek and the Bremer River and set against a backdrop of forested ranges. The Project proposes to introduce 47 km of rail into the landscape, of which approximately 50 per cent would run parallel to an existing rail corridor.

The alignment traverses a broad range of landscapes, from developed urban areas, isolated rural settlements, open woodland, pastoral and agricultural landscapes to the undulating and vegetated foothills of the Great Dividing and Little Liverpool Ranges. Extensive areas within the LVIA study area have been cleared for agricultural purposes and for the development of residential communities. The largest town in the LVIA study area is Gatton, situated between Ipswich and Toowoomba in the heart of the Lockyer Valley. Other towns in the region include, in order of population size, Laidley, Rosewood, Murphys Creek, Withcott, Helidon Spa, Grantham, Ma Ma Creek, Forest Hill, Grandchester, and Calvert.

Major roads through the LVIA study area include the Warrego Highway, Murphys Creek Road, Gatton-Helidon Road, Gatton-Clifton Road, Western Drive, Railway Street, Eastern Drive, Gatton-Esk Road, Gatton-Laidley Road, Forest Hill-Fernvale Road, Laidley-Plainlands Road, and Rosewood-Laidley Road.

There are five regionally significant areas within the LVIA study area which the QLD Government has identified within the South East Queensland Regional Plan, ShapingSEQ. These areas include the mountain ranges of the Great Dividing Range, Little Liverpool Range, Marburg Range, Main Paradise Range, and elevated areas around Beins Mountain, the northern extent of the Mistake Mountains range.

1.3. Landscape and visual impacts

To analyse the impact of the Project on landscape and visual amenity, the urban design and landscaping aspects of the Project were assessed against the urban, rural and natural fabric of the existing environment within the LVIA study area. The LVIA study area extends approximately 10 km from the Project alignment and is located between Toowoomba and Ipswich, west of Brisbane, and includes areas within the Scenic Rim.

Within this LVIA study area, eight landscape character types (LCTs) have been identified to have up to high sensitivity to changes in the landscape character and values of the area. These LCTs were further distinguished into landscape character areas, which are single, unique areas, and are the discrete geographical areas of a particular landscape character type. The impacts of the Project on these eight LCTs were assessed, and it was found that one LCT may experience impacts of up to high significance. The highest impacted LCT was Landscape Type H: Forested Uplands, which comprises the regionally-significant Teviot and Little Liverpool Range scenic amenity areas.

Visual receptors are also considered in this chapter, as the LVIA study area includes several towns and settlements, all subject to visual receptors. Examples include residents in the various population centres close to the proposed alignment and transient receptors such as commuters on roads throughout the roads within the LVIA study area, including the Warrego highway and Tourist drives (including part of the Cobb and Co trail).

Seventeen representative viewpoints have been assessed to represent impacts on these views. Of these, six visual impacts of up to High significance are anticipated to be experienced during the operation of the Project. These comprise the impact of the Warrego Highway rail bridge on Viewpoint 3: Warrego Highway looking east; the impact on residents of Forest Hill represented by Viewpoint 7: Gordon Street looking northwest towards level crossing; the proposed rail over road bridge in Laidley North Viewpoint 8: Laidley-Plainlands Road looking north towards bridge crossing; impacts on residents of Valley Vista Estate represented by Viewpoint 9: Patrick Street underpass looking northwest and Viewpoint 10: Hardy Drive looking down Rampton Street in the new subdivision to the north of Laidley; and the impact of embankments and deep cuts at the foothills of the Little Liverpool Range at Viewpoint 12: Douglas McInnes Drive near existing rail line, looking north-west, also in Laidley.

An additional two representative viewpoints, Viewpoint 5: Gatton RSL car park looking north-west towards existing Railway Station and pedestrian crossing and Viewpoint 7: Gordon Street looking north-west towards level crossing, have the potential for the significance of impact during operation to increase from High to Major, should noise barriers be included at the detail design phase.

The most significant effect during construction is up to Moderate. This is due to the temporary nature of construction impacts.

The highest visual effect of lighting was identified of being up to Moderate significance during construction, Viewpoint 5: Gatton RSL car park looking north-west towards existing Railway Station and pedestrian crossing. The most significant effect during operation was assessed as Low at Viewpoint:16 Grandchester State School.

Cumulative impacts, particularly the effects in combination with the adjoining Gowrie to Helidon (G2H) and Calvert to Kagaru (C2K) Inland Rail projects and the Gatton West Industrial Zone have been considered but it is considered that the consequence of these cumulative impacts is Low during construction and up to Medium during operation.

1.4. Mitigation opportunities

The design has incorporated measures that are considered as initial mitigations 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.

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 H2C Project which extends approximately 47 kilometres (km) in length, connecting the existing QR West Moreton System rail corridor system with the Interstate Corridor. The Location of the Project is shown in **Figure 1: Inland rail** regional context and **Figure 2: Landscape and visual** impact assessment study area discussed in more detail below. The Project connects to the adjacent projects of G2Hin the west and C2Kto the 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 describe the matters the proponent must address in an EIS for the Project. The matters relating to landscape and visual amenity are described in **Table 1**.

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 10.11	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**. • Chapter 10, Section 10.8.3
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: Description of Existing Landscape and Visual Amenity Values** (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**. • Chapter 10, Section 10.6
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	• 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. • Chapter 10, Sections 10.7.1 and 10.7.3.1

Term of reference	Requirement	Relevant section where Term is addressed
	private viewpoints, including places of residence, work, and recreation.	
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**. • Chapter 10, Sections 10.6.1.4 and 10.7.2
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**. • Chapter 10, Section 10.8

2.2. Objectives of the LVIA

The purpose of the LVIA is to:

- Identify the urban design and landscaping aspects of the Project and its components
- 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 and any ancillary infrastructure 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 values of the LVIA study area (refer to **Section 1.1: Definition of the LVIA study area**) with respect to landscape character and visual amenity including scenic viewpoints
- To describe the existing landscape or visual values including 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 phases of the Project during day and night including cumulative impacts

- To describe any Project modifications or management techniques that can mitigate identified landscape and visual impacts and consider the likely significance of residual impacts once these measures have been implemented
- 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 Commonwealth, national, State and regional level) that may extend beyond the immediate context in which the Project is sited as well as those that apply at a local level. As an example, consideration of urban design principles set out in both New South Wales (NSW) and QLD guidelines will ensure that urban design and landscape mitigation addresses the separate requirements of these jurisdictions while ensuring design consistency throughout the rail corridor.

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 in **Table 2**, **Table 3**, **Table 4** and **Table 5** and, where applicable, shown on **Figure 3: Regional scenic amenity and planning designations.**

3.1. Commonwealth and national

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

Table 2: Regulatory Context – National

Legislation, policy or guideline	Relevance to the Project
Commonwealth/national	
AS4282-1997 Control of the obtrusive effects of outdoor lighting. (Australian standards 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. This Standard is also referenced for consideration as part of the Dis-5 Light Pollution credit in the Infrastructure Sustainability (IS) Rating Scheme.	• Lighting is proposed as part of the Project (see **Section 6.2: Key sources of potential impact** for details) • AS4282-1997 (Australian standards 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 11.00 pm), and the type of lighting uses • Public lighting is excluded because it is provided to facilitate all night safety and security • Section 2.4 of the standard 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

Legislation, policy or guideline	Relevance to the Project
	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 levels – a standard measurement of light intensity) 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 • 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 4.10: Lighting impact assessment methodology**).
AS4970: Protection of Trees on Development Site (Australian standard 2009)	• 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. (Australian Government 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 privately-owned 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. For example, ensuring consideration has been given to access for People with Disability where the alignment/bridges pass through settlements. • 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 the following documents referenced in the ToR or identified as being relevant to this Project through the LVIA process:

- *South East Queensland Regional Plan* (SEQRP) *Implementation Guideline No 8 Identifying and protecting scenic amenity values* (QLD Government 2007) (which is referred to in the Project Terms of Reference)
- *Road Landscape Manual* (RLM) (DTMR 2013)
- *Crime Prevention through Environmental Design* (CPTED) (QLD Government 2007)
- *South East Queensland Regional Plan* (SEQRP) *ShapingSEQ* (QLD Government 2017)

Table 3: Regulatory Context – QLD State and Regional

Legislation, policy or guideline	Relevance to the Project
QLD	
Road Landscape Manual (RLM) (DTMR 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 describes the process for visual assessment required in the planning and design of QLD roads.	• The Project requires the realignment 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 responds 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 • The visual assessment methodology does not directly apply as it is intended for the assessment of Department of Transport and Main Roads (DTMR) projects. However, the principles have informed the Inland Rail assessment methodology (described in **Section 4.10: Lighting impact assessment methodology**). • 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) (QLD Government 2007) The CPTED guidelines for QLD seek to promote the incorporation of Crime Prevention Through Environmental Design (CPTED) principles into the planning, design and management of development in QLD.	• 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.

Legislation, policy or guideline	Relevance to the Project
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 IS Rating Scheme, although is not directly referenced.	• 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.
QLD (regional level)	
South East Queensland Regional Plan (SEQRP) *ShapingSEQ* (Department of Infrastructure, Local Government and Planning (DILGP) 2017a The South East Queensland (SEQ) Regional Plan 2017 (SEQRP), also known as *ShapingSEQ*, is the regional plan for the SEQ region. It was given effect on 11 August 2017. The region includes the following local government areas (LGAs) through which the Project passes or which fall within the LVIA study area: Ipswich; Lockyer Valley; and a small area of Scenic Rim. 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 plan supports investment in upgrades and new infrastructure, including the Melbourne to Brisbane Inland Rail 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 (DILGP 2017b) 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

Legislation, policy or guideline	Relevance to the Project
	• The Project passes through/close to areas of identified regionally significant scenic amenity as described in **Section 5.1: Regional landscape context** of this report. 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; 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 sub-region 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 Subregion'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: (a) Main Range-Helidon Hills Corridor, which links Helidon Hills to Toowoomba and Glenrock, and an offshoot including the Mistake Ranges, and Little Liverpool Range to Wivenhoe Dam (b) Helidon Hills-Blackall Range Corridor, which links Helidon Hills north to Benarkin, Imbil and Conondale, and to the Blackall Range.

Legislation, policy or guideline	Relevance to the Project
South East Queensland Regional Plan (SEQRP) Implementation Guideline No 8 Identifying and protecting scenic amenity values, (DILGP 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: ○ Scenic amenity: 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" (Australian Institute of Landscape Architects (AILA) 2009) ○ Scenic preference: defined as "a rating of the community's liking for scenery of open space compared to areas occupied by built structures, measured using photographs" (AILA 2009) ○ 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 ○ 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. ○ 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 • 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.

Legislation, policy or guideline	Relevance to the Project
	• 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 including the adjoining G2H project which is partly within the Darling Downs Region and therefore 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 Inland Rail) 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** below.

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. They are summarised in **Table 4**.

Table 4: Regulatory Context – New South Wales State and Regional

Legislation, policy or guideline	Relevance to the Project
NSW	
<u>Beyond the Pavement: RTA urban design policy, procedures and design principles</u> (RMS 2014) *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 Inland Rail, 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 during construction and operation: ○ Existing landscape and built environment qualities are understood and protected. ○ Built projects contribute to the quality of the built environment in urban and rural contexts and create a legacy for the future. ○ 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 LVIA, 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. ○ Major structures (such as bridges) associated with the entry to country towns should be planned and designed with special care as they can form 'gateways' and signature landmarks in the landscape. ○ 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.

Legislation, policy or guideline	Relevance to the Project
	○ 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.
The Environmental Impact Assessment Practice Note – Guideline for Landscape Character and Visual Impact Assessment EIA–N04 (practice note EIA-N04) (RMS 2013) This practice note applies to projects which Roads 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 Inland Rail. • The purpose of this practice note is to: ○ Inform the development of the preferred route and concept design to avoid and minimise impacts up front. ○ Inform RMS, other agencies and the community about what avoidance, management and mitigation strategies would be implemented. • Nine principles are described. • 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 desktop 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 to assess visual impacts. • Guidelines are given for refining the concept through siting and mitigation using the Roads and Maritime Services (RMS) suite of urban design guideline documents including construction and operation phases.
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 the bridge structures. 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 Inland Rail. 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.

Legislation, policy or guideline	Relevance to the Project
NSW Sustainable Design Guidelines Version 4.0 (Transport for NSW 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: ○ Minimising impacts on the environment, whether through transport operations, infrastructure delivery or maintenance. ○ Procuring, delivering and promoting sustainable transport options that achieve value for money and reduced life cycle costs. ○ 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 Inland Rail.
Crime prevention and the assessment of development applications (Department of Urban Affairs and Planning 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 Inland Rail. • 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 Ipswich and Lockyer Valley (formerly Laidley and Gatton Shires). The provisions of the two councils' former planning schemes still apply as follows:

- *City of Ipswich Planning Scheme* (2006)
- *Laidley Shire Planning Scheme* (2003)
- *Gatton Shire Planning Scheme* (2007)
- *Grantham Reconstruction Area Development Scheme* (2011).

These planning schemes recognise and protect areas valued for their landscape and/or scenic qualities, arising from nature conservation or rural characteristics. A small section of the study area passes through the Scenic Rim LGA, but this is not considered to have any implications for the LVIA for the Project, so is not considered further. The key policies at the local level are summarised in **Table 5**.

Table 5: Regulatory Context – QLD Local

Legislation, policy or guideline	Relevance to the Project
QLD (Local level)	
<u>City of Ipswich Planning Scheme</u> (Ipswich City Council (ICC) 2006) The Project alignment passes through part of the Ipswich City Planning Scheme area. The consolidated Ipswich Planning Scheme covers the entire LGA, divided into eight localities: Urban Areas; City Centre; Regionally Significant Business Enterprise and Industry Areas; Amberley; Rosewood; Township Areas; Rural Areas, and Springfield. 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.	• This plan is relevant to approximately 10.7 km of the Project alignment that runs through the Ipswich LGA. • The alignment predominantly traverses land zoned as rural, comprising Rural A (RA: Rural Agricultural) and Rural B (Rural Pastoral). • The wider LVIA study area includes Rural D (RD: Rural Conservation), Rural E (E: Special Land Management) and Conservation (CONRV). • Calvert and Grandchester 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; and – (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.
<u>Draft Lockyer Valley Regional Council Planning Scheme</u> Lockyer Valley Regional Council is in the process of producing a draft Lockyer Valley Planning Scheme.	• This draft planning scheme is relevant to approximately 36.8 km of the Project alignment that runs through Lockyer Valley LGA. • 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 the draft planning scheme and prepare an amended planning scheme document and amended mapping.

Legislation, policy or guideline	Relevance to the Project
Until its adoption, the planning schemes currently in force and effective across the Lockyer Valley LGA are those of the former Gatton and Laidley Shires which were in place when these shires were amalgamated to form the Lockyer Valley LGA on 15 March 2008.	• The draft Lockyer Valley Planning scheme is still under review by the State government. • The exception is in the Grantham area, where the Grantham Reconstruction Area Development Scheme prepared by the QLD Reconstruction Authority has been in force and effect since 4 August 2011. These plans are discussed below.
Laidley Shire Planning Scheme (Lockyer Valley Regional Council (LVRC) 2003) The scheme divides the area into zones with associated codes.	• This plan is directly relevant to a large section of the Project alignment. • The study area primarily 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". • Section 3.1 discusses desired environmental outcomes for the former 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: ○ 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; • Specific Outcomes for Existing and Proposed Rail Corridor are as follows: ○ 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 include:

Legislation, policy or guideline	Relevance to the Project
	○ 1. Filling and excavation activities do not detrimentally impact upon surrounding amenity, and the stability of adjoining land is compatible with such activities.
Gatton Shire Planning Scheme (Gatton Shire Council 2007) The scheme divides the area into zones with associated codes.	• Most of the LVIA study area is zoned "Rural – Agricultural" and "Rural-General", however, it also intersects land zoned as "Urban Residential", "Open Space and Recreation", "Industrial", "Commercial", "Community Facility", "Park Residential', "Rural Residential (Existing Rural Residential)", "Rural Residential (Homestead Residential)" • Section 3.1 discusses desired environmental outcomes making specific reference to the following desired outcome under the heading of 'Character and Landscape Quality': ○ (e) The rural character, significant natural features, cultural heritage and landscape values of the Shire are protected and enhanced. • Section 6.1.1 Earthworks Code states that the purpose of this code is to ensure that earthworks, including that not associated with a material change of use or building work: do not adversely affect the visual character or amenity of the site and the surrounding area; • Section 6.13 Specific Outcomes: seeks to ensure that: ○ P1 Earthworks do not: ○ (b) impact adversely on the visual amenity or privacy of surrounding premises including public places; ○ (e) adversely impact visual significance of the site. ○ P2 Earthworks minimise potential dust, odour or noise emissions and their impact on the amenity of adjoining premises and public places. ○ P4 Retaining walls and batters are designed, constructed and landscaped to: ○ (b) minimise the visual impact on any public place or adjoining land • Section 6.15 Landscaping Code states that the purpose of the code is to ensure that new development includes landscaping to a standard which will contribute to and strengthen the amenity and attractiveness of the Shire. Landscaping: ○ (5) enhances the appearance of the development and contributes to the positive streetscape character; ○ (6) effectively buffers incompatible or sensitive uses where necessary; ○ (8) minimises or mitigates adverse impact of development on the amenity of surrounding areas. • Section 6.17 Specific Outcomes states: ○ P1 Landscaping associated with new development is designed, established and maintained in a manner which: ○ (ii) achieves a high-quality frontage appearance that positively ○ contributes to the streetscape character; ○ (iv) screens the views of unsightly buildings, structures, open storage and refuse areas and the like from public view;

Legislation, policy or guideline	Relevance to the Project
	○ (v) integrates existing site attributes into the development including natural landform, existing vegetation, site views, availability of water and drainage; ○ (x) Maintains lines of sight along State-Controlled Roads. ○ P2. A landscape buffer is provided between the new development and existing or likely future incompatible/or sensitive uses on adjoining land such that the privacy and amenity of the adjoining use will be maintained, and a sensitive interface provided. • 6.19 Lighting Code seeks to ensure lighting associated with new development contributes to and strengthens the Shire image. Lighting: ○ (2) creates pleasant and safe working and living environments; ○ (5) enhances the appearance of the development and contributes to the positive streetscape character; ○ (6) effectively buffers incompatible or sensitive uses where necessary; ○ (9) minimises or mitigates adverse impact of development on the amenity of surrounding areas. • P2. Outdoor lighting provides a sense of security, is consistent with the character of the local area and does not cause unreasonable disturbance or nuisance because of emission of light.
Grantham Reconstruction Area Development Scheme (Queensland Reconstruction Authority 2011)	• This document applies to the area around Grantham within the Project section. • The proposed corridor and study area impact on the northern end of land covered by the Grantham Reconstruction Area Development Scheme, zoned for “Community Purposes”. • Land impacted by the Project alignment is shown in the plan as future dedication to the DTMR. • This land is intended to house a significant showground site for the Lockyer Valley. The precinct will cater for a broad range of events, including large agricultural and industry shows that require a significant area of land. • The land use plan includes the proposed future rail corridor. Therefore, the future intent to construct a railway through the Showgrounds precinct is consistent with the expectations for the area following the gazettal of the Gowrie to Grandchester rail corridor.
Scenic Amenity of the Lockyer (Forest Images 2002) This document provides a comprehensive inventory and assessment of scenic quality within the Lockyer region and proposes a series of management objectives that will protect, maintain, and enhance scenic amenity.	• This document includes recommendations and strategies for the management of scenic amenity, that informed the development of the planning schemes of Gatton, Laidley and Esk Shires • Identified areas of high scenic preference within the LVIA study area include: ○ Elevated parts of the Great Dividing Range in the vicinity of Toowoomba; ○ Elevated parts of the Main Range and the ranges around Mt Mistake and extending north into the Lockyer Valley; ○ Elevated parts of Little Liverpool Range; ○ Forest areas associated with Gatton National Park; and ○ Parts of Helidon Hills near gorges and peaks.

Legislation, policy or guideline	Relevance to the Project
This study has been based on the approach developed by the Regional Landscape Strategy Advisory Committee (RLSAC), which was developed in response to the Regional Framework for Growth Management (RFGM) (SEQ 2021, 2000).	

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*
- *Environmental Impact Assessment Practice Note – Guideline for Landscape Character and Visual Impact Assessment* EIA–N04 (practice note EIA-N04) (RMS 2013)
- 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*
- *Countryside Agency (2002) Landscape Character Assessment Guidance for England and Scotland*
- *Topic Paper 6: Techniques and Criteria for Judging Capacity and Sensitivity Scottish Natural Heritage and The Countryside Agency (2006)*
- *Australian St*andard 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 Guidance Note for Landscape and Visual Assessment (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, an LVIA study area has been defined as the that has potential to influence landscape and/or visual values and receptors (refer to **Figure 2: Landscape and visual** impact assessment study area). This is based on:

- The horizontal and vertical alignment for the Project
- Visibility analysis mapping (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 Southern Freight Rail Corridor (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 G2H and C2K 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 Project and 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 (as described in **Section 3: Legislation, Policies, Standards and Guidelines**)
- Publicly available information on recreation spaces and public visitor areas
- Traffic count data, based on traffic census data for the QLD State-controlled road (SCR) network (2017) and is generally consistent with the traffic, transport and access assessment undertaken as part of the EIS
- Digital aerial photography (imagery obtained 2018 from Google Earth)
- Cadastral data (showing roads, property boundaries and built areas)
- QLD bioregion data provided by the 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 - Matters of National Environmental Significance
- Department of Natural Resources, Mines and Energy (DNRME) (now Department of Regional Development, Manufacturing and Water) - watercourses and drainage features
- Department of Environment and Science (DES) - Matters of State Environmental Significance
- Other GIS information available online
  Publicly available LVIAs that have been prepared for Inland Rail projects within New South Wales or other similar projects in QLD including the SFRC Landscape and Visual Impact Assessment prepared by AECOM (2008).

4.3. Visibility Analysis Mapping study

The VAM study (sometimes also known as a ‘Zone of Theoretical Visibility’ 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, which are selected mapped points along the Project alignment at approximately 500 m intervals and their known elevations to give an appropriate spread of data points along the rail corridors, which provides an adequate range for the baseline assessment outputs (for further refinement through field survey as described below). The DEM was derived from a combined DEM lidar survey (resampled to a raster size of 20 m) within 5 km and SRTM data (DEM1s) beyond this distance (at 30 m resampled back to 20 m).

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 digitally-mapped representation indicates how many of the observation points are theoretically visible based on topography over the extent of the LVIA study area. No colour is applied to areas that are not in the theoretical visible line of sight of the Project from any observation points. Blue, turquoise, yellow, orange and red colour has been added to those areas in the theoretical visible line of sight of the Project with increasing number of observation points potentially visible (up to a maximum of 45).

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) but provide a coarse level of analysis to guide the fieldwork as described below.

An additional VAM was produced during the assessment period indicating the height of the double stacked train (i.e. to a height of up to 6.5 m above the Project 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, to meet the requirements of the ToR to assess 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 30 to 31 August and 27 to 28 September 2018. Conditions during the field trip were appropriate for carrying out an LVIA with fine weather, good visibility and occasional cloud cover. The visits 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 has been obtained from preliminary consultation activities undertaken by others (including as part of the Social Impact Assessment) and as part of the LVIA process, including attendance at a Community Consultative Committee Meeting held on 9 August 2019. This feedback has informed the LVIA, where appropriate and includes the following key issues raised by the community:

- Comments about the desirability of providing planting along embankments to screen the alignment

- Concerns about impacts upon the 'amenity' of towns and settlements, particularly Laidley, Forest Hill and Gatton
- Concerns about impacts upon visitors' enjoyment of the landscape including users of scenic drives, scenic lookouts and accommodation.

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 LVIA 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 4.9: Visual impact assessment methodology**.

4.6. Identification of potential Project impacts

This component of the LVIA includes describing permanent infrastructure that is likely to be associated with the Project, such as the presence of embankments, bridges, cuttings, fencing, noise barriers and level crossings. It also considers impacts associated with the transient presence of the train including the frequency, height, length and speed of the train moving 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 phases
- 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.

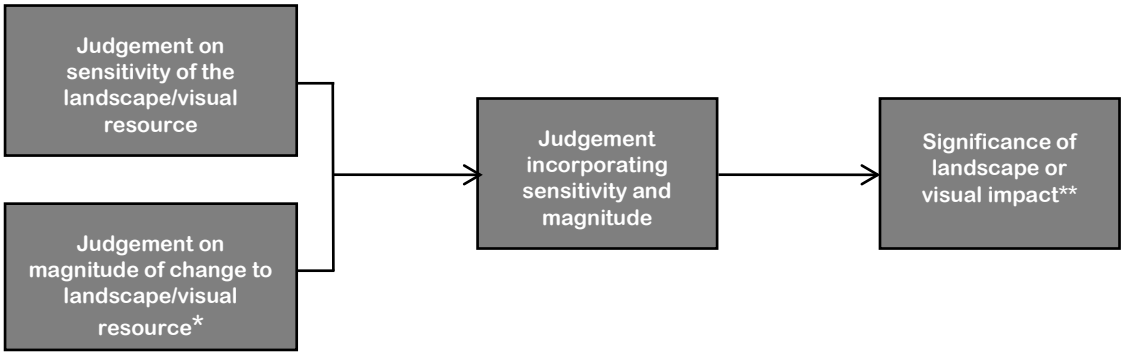
It is noted that the LVIA methodology has defined its own thresholds for sensitivity and magnitude that are different to the criteria in Chapter 4: Assessment Methodology of the EIS and follow criteria and principles more widely-used for the assessment of landscape and visual impacts. This is because 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: Visual impact assessment methodology**, **Section 4.9: Lighting impact assessment methodology** and **Section 4.10: Mitigation and Residual Impact Assessment**.

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 Guidance Note for Landscape and Visual Assessment (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) 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. LCTs have been defined and, where necessary, these have been further subdivided into geographically distinct landscape character areas (LCAs) defined (based on Countryside Agency 2002) as follows:

- Landscape character types (LCTs): Distinct types of landscape that are relatively homogeneous in character. They are generic in nature in that they may occur in different areas in different parts of the country, but wherever they occur they share broadly similar combinations of geology, topography, drainage patterns, vegetation and historical land use and settlement pattern.
- Landscape character areas (LCAs): These are single unique areas and are the discrete geographical areas of a particular landscape character type.

The general character of the landscape and the identified LCTs are described in **Section 5.1: Regional landscape context** and **Section 5.2: Regional landscape context**.

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 landscape character type include:

- The landscape's inherent values (e.g. perceptual qualities, cultural importance, and any specific values that may apply such as landscape planning designations)
- 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 is 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 landscape character type 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 the categories described.

Table 7: Defining magnitude of change to landscape character

Sensitivity of 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.
No Impact	No Change: No 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**.

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: based on previous experience of similar transportation projects the most affected visual receptors are typically anticipated to be located within a 5 km radius of the Project although views from elevated vantage points beyond this have also been considered where there may be potential to look down onto 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 GLVIA2 (Landscape Institute and the Institute of Environmental Management and Assessment 2002) states '*changes affecting large numbers of people are generally more significant than those affecting a relatively small group of users.*' Similarly, GLVIA3 (Landscape Institute and the Institute of Environmental Management and Assessment 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. It is noted that studies show that receptors can become used to new infrastructure, even large infrastructure such as wind farms, over time (Wilson and Dyke 2015). However, as this cannot be quantified this has not been factored into the assessment of impact.

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	Magnitude of change
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 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: Landscape impact assessment methodology** 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 visual impact is considered as described in **Table 9** above.

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 and benefits for Project modifications or landscape and urban design proposals to assist in integrating the Project into its visual and landscape setting, such as screen planting or alternative materials.

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 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 (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 (exported 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 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 viewpoint. 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.

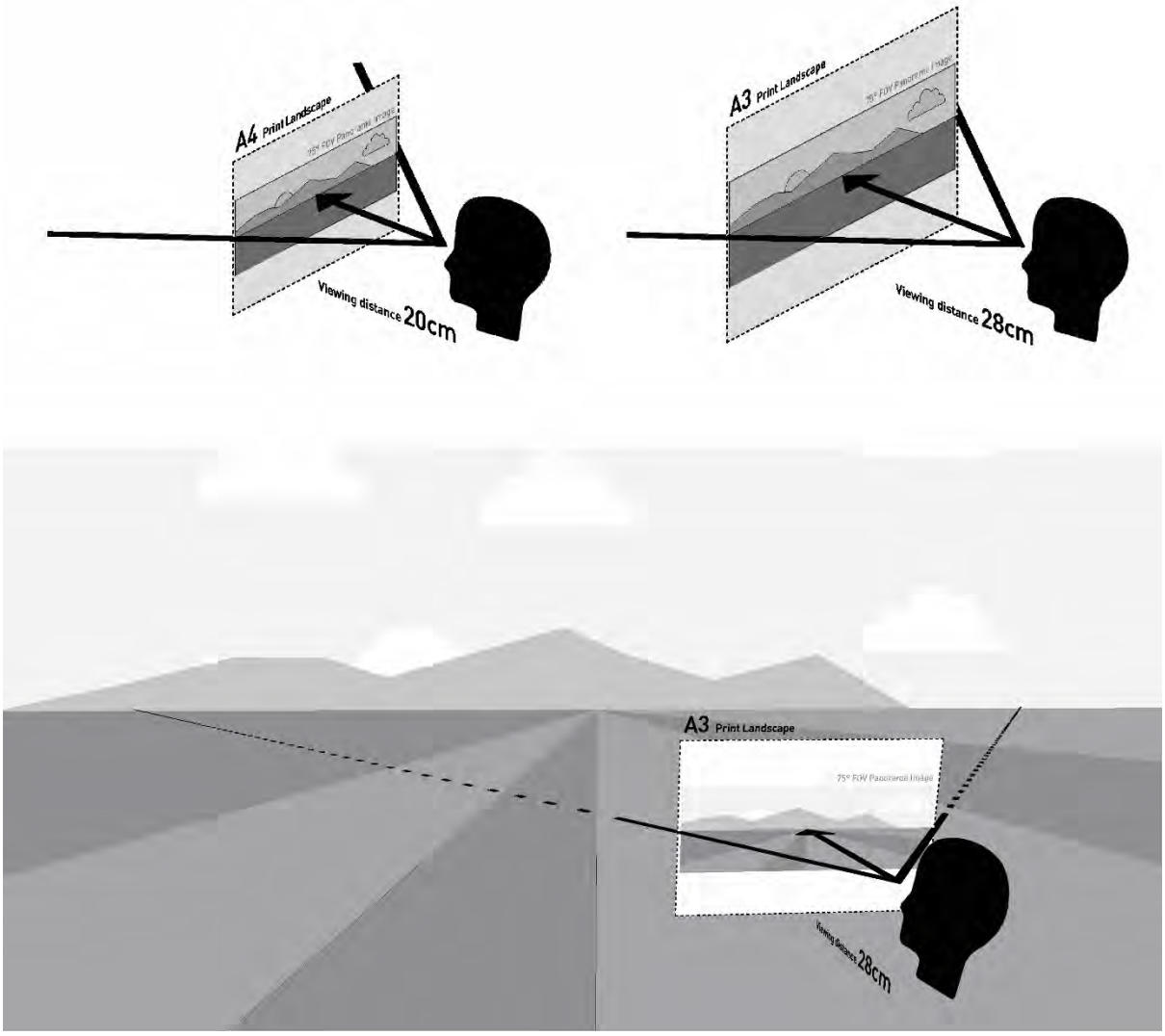
To ensure the photomontages consistently present a view which is representative of the human eye, the field assessment photographs were taken at around average human viewing height (typically considered to be 1.5 m to 1.7 m in accordance with the GLVIA3 (Landscape Institute and the Institute of Environmental Management and Assessment 2013). The photos were taken using a Canon EOS 6D Mark II body with a Sigma 50mm f/1.4 DG JSM lens. The Canon EOS 6D is a full sensor lens. Using a 50mm lens it has an equivalent Field of View as a Standard Single Lens Reflex (SLR) using 35mm film and 50mm focal length, which is the standard (albeit technologically outdated) recommendation for obtaining photographs that are representative of the human field of vision (40 degrees).

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 between the 45-60° (Scottish Natural Heritage and The Countryside Agency 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 view, 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 work 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, spoil haulage and tunnelling activities will proceed on a 7 day/24hr basis.

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 may involve:

- Delivery of concrete, steel, and other construction materials delivered to site by heavy vehicles
- Movements of heavy plant and materials
- Roadworks to arterial roads.

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 carparks, 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 AS 4282 – *Control of Obtrusive Effects of Outdoor Lighting* (Australian standard 1997) and *Guidance Notes for Reduction of Obstructive Lighting* (The Institution of Lighting Engineers UK 2005). 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 visual sensitivity 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 to, 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 very 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 dominant, considerable, noticeable or imperceptible 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

Sensitivity of landscape	Magnitude of Change
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 significance of change to lighting amenity and individual viewpoints is determined 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 Classifications**.

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 between Toowoomba and Ipswich, west of Brisbane. The western part falls predominantly within the Lockyer Valley LGA, renowned for its fertile agricultural landscapes and referred to as “Australia’s salad bowl”. The eastern part falls within the Ipswich LGA with a small area to the south-east lying within the Scenic Rim LGA, a popular tourist destination recognised for its scenic beauty. In the eastern part of the LVIA study area, the alignment passes through the undulating uplands of Little Liverpool Range, a dominant feature in the landscape that separates the fertile arable floodplains of the Fassifern and Lockyer Valleys. Within the LVIA study area, large areas of land have been cleared for pasture, agricultural production and for rural and urban residential settlements. Tracts of remnant vegetation are also present, limited to the steep, hilly landscapes of Lockyer National Park, Gatton National Park and the Little Liverpool Range. The Project and its wider landscape context are illustrated in **Figure 1: Inland rail regional context** and **Figure 2: Landscape and visual impact assessment study area** in Appendix 1. The purpose of this section is to provide context to the more detailed assessments included in **Section 7: Landscape Impact Assessment** and **Section 8: Visual Impact Assessment**.

5.1.1 Settlement and infrastructure

The location of settlement and infrastructure, particularly roads, indicates the number and location of visual receptors with potential to view the Project. The alignment traverses a broad range of landscapes, from developed urban areas, isolated rural settlements, open woodland, pastoral and agricultural landscapes to the undulating and vegetated foothills of the Great Dividing and Little Liverpool Ranges. Extensive areas within the LVIA study area have been cleared for agricultural purposes and for the development of residential communities.

The largest town in the LVIA study area is Gatton, situated between Ipswich and Toowoomba in the heart of the Lockyer Valley, approximately 90 km west of Brisbane with a population of 7,101, Australian Bureau of Statistics (ABS) reported in the 2016 census data. Laidley is the second largest town, situated 83 km west of Brisbane with a population of 3,808 (ABS 2016). Rosewood is situated 17 km west of Ipswich in the eastern extent of the LVIA study area with a population of 2,835 (ibid), however, lies closes to the C2K alignment. Smaller rural settlements within the LVIA study area comprise Murphys Creek (population 664), Withcott (population 1,000), Helidon Spa (population 538), Grantham (population 634), Ma Ma Creek (population 394), Forest Hill (population 968), Grandchester (population 444) and Calvert (population 310) (ibid). There are also several areas of acreage estates and emerging rural residential communities within the vicinity of Postmans Ridge, Helidon Spa, Grantham, Placid Hills, Adare, Plainland, Laidley North and Laidley Heights.

The major road within the LVIA study area is the Warrego Highway (M2), with Annual Average Daily Traffic (AADT) counts between 15,138, near Helidon, to 21,880, near Laidley. Other key roads and their respective AADT counts include Murphys Creek Road (2,150), Gatton-Helidon Road (4,536), Gatton-Clifton Road (1,334), Western Drive (6,383), Railway Street (8,674), Eastern Drive (11,941), Gatton-Esk Road (4,141), Gatton-Laidley Road (3,973), Forest Hill-Fernvale Road (2,373), Laidley-Plainlands Road (6,396) and Rosewood-Laidley Road (2,591). 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 Rosewood-Warrill View Road and Rosewood-Marburg Road. The Toowoomba Bypass is in the westernmost part of the LVIA study area and a key route through the region.

The West Moreton System rail corridor is an existing operational freight and passenger rail line located within the LVIA study area, connecting rail services from Brisbane to the west and southwest of the State and providing an important connection to the Darling Downs. The rail line supports the twice weekly 'Westlander' service between Brisbane to Charleville (Australian Rail Maps 2018).

The section of line from the end of Murphys Creek railway station to the Ruthven Street overbridge, Harlaxton, is listed on the QLD Heritage Register. The Murphys Creek Railway Complex, Lockyer Creek Railway Bridge (Lockyer) and Lockyer Creek Railway Bridge (Murphys Creek) are also heritage listed (QLD Heritage Register 2018).

A former branch line known as the Laidley Valley Branch Railway once linked Laidley to Mulgowie. The line was constructed in 1911 to provide access to rich agricultural areas along Laidley Creek, but was unprofitable and closed in 1955.

The Powerlink Springdale to Halys 550 kV transmission line easement is located in the eastern part of the LVIA study area; a construction date of the new transmission line is yet to be determined.

5.1.2 Geology, landform and hydrology

Geology landform and hydrology have a large influence on the landscape character of the area, while landform affects the potential for elevated views to be obtained across the landscape. 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 igneous, metamorphic, and sedimentary rocks. Accordingly, landform across the LVIA study area varies greatly and is characterised by broad cultivated alluvial plains surrounded by steep, densely vegetated hilly to sub-mountainous basaltic uplands.

Much of the catchment is underlain by sandstone formations, including the Koukandowie Formation to the south, Gatton Sandstone in the central lower lying areas and Woogaroo Subgroup to the north-western extent of the LVIA study area, near Lockyer National Park. Small areas of impermeable rocks to the north occur within Lockyer National Park, while there are isolated patches of basalt, providing sandstone ridges and sandy soils. Elevated areas of Lockyer National Park are steep and rugged with gorges, exposed cliff lines and waterfalls in the foothills of the Great Dividing Range (DNPRSR, 2013).

As illustrated on **Figure 4: Landform context and hydrological context,** the most notable landscape features within the LVIA study area are the mountainous regions of the Great Dividing, Main Paradise, Little Liverpool, Mistake Mountains and Marburg ranges. Within the LVIA study area there are several local peaks including Wards Hill, Vinegar Hill, Stringybark Mountain, Evans Hill and Mount Grandchester. Key views identified from these areas are described in **Section 8: Visual Impact Assessment**.

The study area falls within the Lockyer and Bremer River Catchments, both of which are sub-basins of the Brisbane River Basin. The Bremer River sub-basin collects runoff from the eastern slopes of the Little Liverpool and Marburg ranges, while the Lockyer Creek sub-basin collects runoff from the western slopes of the Little Liverpool and Marburg ranges as well as the eastern slopes of the Great Dividing Range and the slopes of the Main Paradise and Mistake Mountain ranges. Lockyer Creek is a macro channel, capable of containing all levels of flood except the most extreme events (DES 2016). Several waterways within these catchments intersect the alignment and flow throughout the LVIA study area, including (from west to east) Lockyer Creek, Sheep Station Creek, Dinner Corner Gully, Sandy Creek (Grantham), Sandy Creek (Forest Hill), Laidley Creek and Western Creek.

The steep slopes of the upper catchments have the capacity to transfer large volumes of water during rain events, causing high flows and flash flooding in areas where the floodplain has restricted channels and gullies (ibid). Within the LVIA study area and Lockyer catchment there are two off-stream water storage systems which supply the Central Lockyer irrigation scheme; Lake Clarendon and Lake Dyer. Lake Clarendon is situated to the east of Gatton and provides recreational opportunities for paddle craft, fishing and bird watching, while Lake Dyer, west of Laidley is a popular recreational spot with boating, water skiing, fishing and swimming permitted (ibid).

5.1.3 Soils, vegetation and land use

Existing land use within and adjacent to the LVIA study area is shown on **Figure 5: Land use** and is largely characterised by rural activities on a variety of allotment sizes, in particular grazing, irrigated horticulture and production forestry. However, a diverse range of other land uses are found in the area including rural properties, urban development, industrial areas and more localised specialist land uses including orchards, explosives storage and production, commercial sandstone mining, poultry farms, golf courses, rifle ranges, hobby farms, the University of QLD (UQ) Gatton campus, Gatton racecourse and the South QLD Prison Precinct.

Low-lying areas of the Lockyer Valley and Fassifern Valleys are renowned for their fertile soils and productive agricultural landscapes. The most productive soils within these valleys 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. These productive landscapes are surrounded by dryland cropping and cattle grazing, predominately beef cattle, on the poorer gently undulating foothills of the surrounding mountain ranges. These ranges are characterised by densely-vegetated undulating to mountainous areas (including reserves and National Parks), on siliceous sands, sandstones and basalts.

Approximately half the catchment has been cleared for agricultural, urban development and industrial land uses, particularly within the low lying fertile floodplains. Despite this, the region is rich in biodiversity and still has several distinct remnant ecosystems. Native remnant vegetation comprises remnant patches of open blue gum woodlands and endangered brigalow and swamp tea-tree forests on alluvial plains, brigalow and dry scrub communities on alluvial terraces, patches of rainforest and semi-evergreen vine thickets in steeper escarpment areas, tree belts associated with the edge of local and state roads and scattered riparian vegetation along waterways (DES 2016).

Low lying alluvial river and creek flats have been extensively cleared and remnant patches of open forest woodlands on floodplains are typically confined to constrained gullies with limited access and creek channels. These fringing woodlands are typically comprised of Blue Gum (*Eucalyptus tereticornis*), Casuarina cunninghamiana (*River She-oak*) and Paperbark (*Melaleuca spp.*), with Grey Box (*E. moluccana*) and Red Ironbark (*E. crebra*) sometimes present in more elevated areas of the floodplain.

Vegetated swamps, limited to isolated areas near Lake Claredon, are dominated by *Cyperus* spp., *Schoenoplectus* spp. and *Eleocharis* spp. and include a wide range of sedges, grasses with some instances of emergent Melaleuca spp. occurring.

Undulating landscapes and foothills within the LVIA study area are dominated by open eucalypt forests on sedimentary rocks, typically comprised of Brown Bloodwood (*Corymbia trachyphloia subsp. trachyphloia*), Lemon-scented Gum (*Corymbia citriodora subsp. variegata*), Narrow-leaved Ironbark (*E. crebra*), Red Ironbark (*E. fibrosa subsp. fibrosa).* Within elevated parts of the Great Dividing Range, there are remnant pockets of Narrow-leaved Ironbark woodland, which contains Narrow-leaved Ironbark (*E. crebra*), Forest Red Gum (*Eucalyptus tereticornis*), Moreton Bay Ash (*Corymbia tessellaris*), Smooth-Barked Apple (*Angophora spp.*), Silver-leaved Ironbark (*E. melanophloia*).

Elevated areas on basalt plains and hills (e.g. Great Dividing Range) are dominated by scrubby open woodland on igneous rocks, comprised of Red Ironbark (*E. crebra*), Blue Gum (*Eucalyptus tereticornis*), Yellow Box (*E. melliodora*), Scribbly Gum (E. racemosa), Smooth Branched Ironbark (*E. dura*), Lemon-scented Gum (*Corymbia citriodora subsp. variegata*). The higher regions also support areas of heath and open woodland as well as small remnant patches of semi-evergreen vine thicket, limited to steep gullies and slopes on both sedimentary and basalt rocks which can be easily identified in the landscape as bands of dark green low vegetation in contrast to the surrounding bushland (Healthy Land and Water 2018). This endangered vegetation community is mostly seen to the south of the alignment within the Great Dividing Range, Paradise Range and Mistake Mountains. Key species include Narrow-leaved Bottle Tree (*Brachychiton rupestris*), Crows Ash (*Flindersia australis*), Rosewood (*Acacia fasciculifera*) and Small-leaved Fig (*Ficus obliqua*). Scattered trees of Brigalow (*Acacia harpophylla*) are also present.

There are two national parks with the LVIA study area, Lockyer National Park and Gatton National Park, and two State forests, Lockyer State Forest and Lilydale State Forest.

The Lockyer National Park is located north of Gatton and covers 11,079 hectares, with Lockyer Resource Reserve (612 ha) and Lockyer State Forest (818 ha) are adjacent. Lockyer National Park and Lockyer National Park (Recovery) were gazetted as national parks in 2008 in recognition of the important biodiversity and conservation values of the area (DNPRSR 2013). The area includes remote sandstone gorges surrounded by remnant eucalypt forest and provides a range of recreational opportunities, including opportunities for four-wheel driving and motor bikes on public roads. To the area west of Seventeen Mile Road, recreation opportunities are limited to low impact activities such as bushwalking and orienteering. There are no facilities or formed walking trails (ibid.).

Gatton National Park is situated approximately 3.3 km to the southwest of the Project and covers 426 ha. It was gazetted in 2006 in recognition of the important biodiversity and conservation values of the area. Although small, the park conserves and represents six regional ecosystems (two of which are endangered) that have been extensively cleared throughout the region, while also providing habitat for several bird species of international conservation significance (DNPRSR 2018). Visitors to the park can go bushwalking and birdwatching.

The study area also includes several nature refuge areas and conservation estates. To the north of the alignment near Helidon, Alice Creek Nature Refuge (310 ha), Xanthorrhoea Nature Refuge (98 ha) and Gattonview Nature Refuge (60.5 ha) provide fauna links between the various sections of Lockyer National Park. Mount Grandchester Conservation Estate (975 ha) is a large reserve located within the Little Liverpool Range, which includes the Woolshed Nature Refuge, and Bowman Park Koala Nature Refuge.

South of the alignment is the Old Hiddenvale Nature Refuge (3,106 ha) and the small Danroben Nature Refuge (4 hectares (ha)). Old Hiddenvale Nature Refuge is privately owned and managed by Spicers Hidden Vale and is a popular recreational area with more than 110 km of trail network for mountain bikers, runners and walkers. The Spicers Scenic Rim Trail is a three-day walking experience within the foothills of the Great Diving Range.

These national parks and nature refuge areas are all located within elevated, vegetated areas, which are considered to have high scenic amenity value.

5.1.4 IBRA classifications

The Interim Biogeographic Regionalisation for Australia (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 (DoEE) 2018 (now Department of Agriculture, Water and the Environment)). 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 subregions, 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 and 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 subregions, 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 supplied descriptions of each of the sub-bioregions in the LVIA study area for the IBRA5.1 dataset (ERIN, 2012, personal communication), which follows similar boundaries).

As shown on **Figure 6: Interim biogeographic regionalisation Australia**, the LVIA study area is located within the SEQ Bioregion. The majority of the area falls within the SEQ02 Moreton Basin subregion, while a very small portion is located within SEQ06 South Burnett subregion. These bioregions are described in **Table 16**.

Table 16: IBRA Sub bioregion descriptions

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 750mm per annum. Major vegetation types include eucalypt woodlands and open forests, (*Acacia harpophylla*) open forest and semi–evergreen vine thicket.
South Burnett SEQ 06 563,873 ha	This subregion contains basalt flows and old land surfaces interspersed with sedimentary rocks, acid volcanics and metamorphics. The subregion is relatively elevated and contains the Bunya Mountains. The highest parts of the subregion are closely linked to the Scenic Rim province in terms of fauna and flora. In places the boundary between the South Burnett subregion and the Eastern Downs subregion of the Brigalow Belt bioregion is difficult to define.

5.1.5 SEQRP regional landscape values

The current SEQRP *ShapingSEQ* (Queensland Government, 2017a) 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* (DILGP 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 five key areas, which accord with the elevated areas of mountain ranges described above:

- Great Dividing Range: encompassing the area of the Main Range National Park to Don River State Forest corridor and Emu Creek to Mt Lawson corridor and including the peaks of Vinegar Hill (north of the alignment), Wards Hill (west of the alignment), and Mount Sugarloaf, Stringybark Mountain, Evans Hill and Mount Ma (south of the alignment).
- Little Liverpool Range: encompassing the area of the Little Liverpool Range corridor extending from Hatton Vale area near Mount Grandchester down to Mount Beau Brumell Conservation Park and the area of the Mount Grandchester to Pine Mountain corridor, including Perrys Knob and Stirling Road Reserve
- Marburg Range: encompassing the area of the Mount Grandchester to Mount Hancock corridor, including Two Tree Hill
- Main Paradise Range: encompassing the area around Mount Whitestone and elevated areas south east of Ma Ma Creek
- Elevated areas around Beins Mountain, the northern extent of the Mistake Mountains range.

5.1.6 Lockyer regional landscape values

The *Scenic Amenity of the Lockyer* (Forest Images 2002) includes mapping of areas of high scenic amenity value, as identified within the study area. This study was also based upon the approach developed by the Regional Landscape Strategy Advisory Committee (RLSAC), which was developed in response to the Regional Framework for Growth Management (RFGM) (SEQ 2021, 2000).

This study identifies the following areas within the LVIA study area as having high levels of regionally significant scenic amenity value, that should be protected:

- Elevated parts of the Great Dividing Range in the vicinity of Toowoomba
- Elevated parts of the Main Range and the ranges around Mt Mistake and extending north into the Lockyer Valley
- Elevated parts of Little Liverpool Range
- Forest areas associated with Gatton National Park
- Parts of Helidon Hills near gorges and peaks.

5.2. Landscape character baseline

The identified LCTs and LCAs areas 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)
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 12) • Gleneagle Irrigated Croplands (LCA 13) • Logan River East Croplands (LCA 14)
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) • Amberly 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)
LCT F: Rural Settlement	• Grandchester (LCA F1) • Calvert (LCA F2) • Rosewood (LCA F3) • Amberly RAAF Base (LCA F4) • Peak Crossing (LCA F5) • Harrisville (LCA F6)
LCT G: Transitional Landscapes	• New Oakleigh Coal Mine (LCA G1) • Willowbank (LCA G2)

Landscape character type (LCT)	*Associated landscape character areas (LCAs)*
	• 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 14) • 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 10: Visual analysis map – permanent infrastructure** indicates the extent to which permanent infrastructure is potentially visible
- **Figure 11: Visual analysis map – rolling stock** indicates the extent to which permanent infrastructure plus the train (double-stacked) may be potentially visible
- **Figure 12: 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, particularly using walking trails within the national parks, state forests and other nature reserves.

5.3.2 Viewpoint selection

Representative views from a range of visual audiences are assessed in detail in **Section 8.1: Viewpoint Assessment.**

Views from a range of residential properties in settlements and rural areas around the Project including Helidon, Gatton, Forest Hill, Laidley, Grandchester and Calvert are described and assessed. Views from Grantham, Placid Hills, UQ Gatton, and Laidley North were also considered although no specific views are included due to the topography and/or distance from the alignment.

Representative views from a range of local and state-controlled roads are also described and assessed including the Warrego Highway and Laidley-Rosewood Road.

As shown on **Figure 8: Tourist drives and sensitive receptors**, there are five 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 both 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 *'Glen Rock Tourist Drive'* and *'Spring Bluff Tourist Drive'*. Views from these drives have been considered and are incorporated into the relevant viewpoint assessments.

Recreational views have also been considered and viewpoints assessed as appropriate. This includes the Cunningham Crest Lookout which is a marketed tourist viewpoint and views from local parks within settlements, such as William Kemp Park at Gatton and the Gatton Showgrounds.

Seventeen viewpoints have been selected to represent potential visual impacts across the LVIA study area. These are identified in **Figure 9: 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 29** to **Table 45**.

Table 18: Viewpoint selection

Viewpoint name	Anticipated approximate distance to alignment	Key visual receptors
Viewpoint 1: Airforce Road near 45 and 47 Airforce Road, looking northwest	Alignment is approximately 190 m north of this viewpoint.	Represents typical and accessible views of nearby rural residents and of travellers travelling along Airforce Road.
Viewpoint 2: Seventeen Mile Road looking north	Alignment is approximately 120 m north of this viewpoint.	Represents typical and accessible views of rural residents and of visitors travelling along Seventeen Mile Road towards Lockyer National Park.
Viewpoint 3: Warrego Highway looking east	Alignment is approximately 140 m to the northeast of this viewpoint.	Represents typical and accessible views of those travelling along the Warrego Highway towards Brisbane and Ipswich
Viewpoint 4: Beavan Street looking southwest towards existing Lockyer Creek rail bridge	Alignment is approximately 250 m to the southwest of this viewpoint.	Represents typical and accessible views of residents of Gatton and of visitors, workers and tourists travelling along Beavan Street. Also representative of views from William Kemp Park.
Viewpoint 5: Gatton RSL car park looking northwest towards existing Railway Station and pedestrian crossing	Alignment is approximately 20 m to the north of this viewpoint.	Represents typical and accessible views of visitors, workers and tourists visiting Gatton and Gatton RSL.
Viewpoint 6: Spencer Street looking northeast near Gatton Showgrounds	Alignment is approximately 250 m to the north of this viewpoint.	Represents typical and accessible views of visitors, workers and tourists travelling along Spencer Street and those visiting Gatton Showgrounds and the Lockyer Valley Sports and Aquatic Centre.
Viewpoint 7: Gordon Street looking northwest towards level crossing	Alignment is approximately 40 m to the northeast of this viewpoint.	Represents typical and accessible views of, residents or Forest Hill and of visitors, workers and tourists travelling along Gordon Street.

Viewpoint name	Anticipated approximate distance to alignment	Key visual receptors
Viewpoint 8: Laidley-Plainlands Road towards bridge crossing	Alignment is approximately 70 m to the north of this viewpoint.	Represents typical views of travellers along Laidley-Plainlands Road and nearby residents on the northern outskirts of Laidley.
Viewpoint 9: Patrick Street towards underpass	Alignment is approximately 80 m to the northeast of this viewpoint.	Represents typical views of residents and visitors of the Valley Vista Estate. Is also representative of typical views from the nearby Cunningham Park residential estate.
Viewpoint 10: Hardy Drive looking northeast down Rampton Street over new subdivision	Alignment is approximately 220 m to the north.	Represents typical and accessible views of residents and visitors of Valley Vista and Cunningham Park residential estates.
Viewpoint 11: Branell Homestead Luxury Cabins on Paroz Road, looking west	Alignment is approximately 1.20 km to the west of this viewpoint.	Represents typical and accessible views of nearby rural residents and of residents and visitors of McInnes Field at Laidley residential estate.
Viewpoint 12: McInnes Drive near existing rail line	Alignment is approximately 380 m to the northeast of viewpoint.	Represents typical and accessible views of nearby rural residents and of residents and visitors of McInnes Field at Laidley residential estate.
Viewpoint 13: Kessling Drive, looking southwest towards western tunnel portal	Alignment is approximately 135 m to the southwest of this viewpoint.	Represents accessible views of residents of 208-212 Kessling Drive.
Viewpoint 14: Cunningham's Crest Lookout, looking southwest towards Laidley	Alignment is approximately 960 m to the southwest of this viewpoint.	Represents typical and accessible views of visitors and tourists visiting Cunningham's Crest Lookout, a scenic viewpoint with picnic facilities, artwork and information signage on local heritage.
Viewpoint 15: Laidley-Rosewood Road near properties 113-117, looking east	Alignment is approximately 175 m to the northeast of this viewpoint.	Represents typical and accessible views of rural residents and of visitors, workers and tourists travelling along Laidley-Rosewood Road.
Viewpoint 16: Grandchester State School looking north toward alignment and old railway station	Alignment is approximately 135 m north of this viewpoint.	Represents typical and accessible views of rural residents, students, teachers and visitors of Grandchester State School and community hall and of those travelling along School Road.
Viewpoint 17: End of Calvert School Road, looking west near properties 917-923	Alignment is approximately 15 m north of this viewpoint.	Represents typical and accessible views of residents of Calvert and people driving down Calvert School Road.

As described previously, the selection of the viewpoints is based upon accessibility, anticipated receptor concern (particularly in locations with many viewers, such as towns or highways), the likely extent of impact and providing a representative selection of views and viewer settings across the Project.

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	• Helidon to Calvert
Local government areas	• Lockyer Valley • Ipswich • Scenic Rim (not directly impacted by this Project)
Length of alignment	• 47 km (new dual gauge track) • Comprises approximately 23 km of new greenfield track and 24 km of brownfield track, parallel to existing twin tracks • Corridor includes space provision for Gowrie to Grandchester future public passenger transport corridor • Includes 850 m of tunnel.
Track dimensions	• A rail corridor 62.5m wide, containing a single track dual gauge railway line with four crossing loops (Helidon, Gatton, Laidley and Calvert)
Train lengths	• Up to 1,800 m single stacked (but with future provision to accommodate double stacked trains up to 3,600 m long, not assessed at this stage).
Expected construction completion	• 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 and Residual Impact Assessment**.

6.2.1 Construction Phase

Table 20: Potential Project impacts during construction phase

Construction activities and infrastructure	Indicative imagery
Construction Phase	
Demolition of Existing Infrastructure The alignment will involve cross overs of existing redundant rail infrastructure where sections of the existing track will be removed and replaced with new infrastructure. Approximately 24 km of the alignment is within a brownfield corridor. This may result in short-term impacts on landscape and visual values.	 *Source: Lat27*

Construction activities and infrastructure	Indicative imagery
Vegetation clearing and associated earthworks Where the alignment follows the existing rail corridor (e.g. between chainage (Ch) 37.50 km to Ch 55.50 km and Ch 67.50 km to Ch 73.40 km), vegetation clearance will typically be limited as the existing rail corridor has been cleared previously to facilitate existing rail infrastructure. Much of the remaining landscape is already cleared for agricultural purposes, although parts of the western and eastern Project alignment pass through forested landscapes (e.g. between Ch 28.95 km to Ch 33.00 km and Ch 60.50 km to Ch 63.10 km). The clearance of vegetation will be required to facilitate the construction of new and realigned road infrastructure, which will be particularly evident in the following locations: • Between Ch 26.80 km to Ch 29.10 km with the realignment of Airforce Road, Warringal Road, Wright Road and Seventeen Mile Road • Near Ch 31.39 km with the realignment of Connors Road • Between Ch 36.80 km to Ch 38.00 km with the realignment of Philps Road and Brooks Road • Between Ch 41.00 km to Ch 43.50 km with the realignment of Jamieson and Smithfield Roads • Near Ch 43.20 km with the realignment of Old College and Beavan Roads • Between Ch 43.80 km to Ch 44.20 km with the realignment of Hickey Street • Near Ch 44.30 km with the construction of Eastern Drive road bridges and realignment of Crescent Street, Golf Links Drive and Chadwick Road • Between Ch 52.40 km to Ch 52.60 km with the realignment of Glenore Grove Road, Railway Street and Gordon Street • Near Ch 57.40 km with the realignment of Laidley Plainlands Road, Old Laidley Forest Hill Road and Boundary Road • Near Ch 61.50 km with realignment of Railway Street • Between Ch 63.80 km to Ch 64.95 km with the realignment of Rosewood-Laidley Road and Doonan's Road • Near Ch 66.00 km with the realignment of Grandchester Mt Mort Road and School Road • Between Ch 69.95 km to Ch 70.50 km with the realignment of Neumann's Road. Where required, large-scale machinery will be used to assist in vegetation clearing 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*

Construction activities and infrastructure	Indicative imagery
Road and rail construction The construction of new infrastructure along the Project alignment would result in construction traffic travelling to and within the construction areas and result in short-term impacts on landscape and visual values.	 *Source: ARTC*
Bridge Construction Bridges, culverts, and viaducts and (as detailed in Operation impacts below) 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*
Creation of stockpiles (existing material from site) Stockpiles of materials cleared from site will be present in the laydown areas in the temporary construction disturbance footprint, where they will be stored prior to use, re-use or disposal. This includes ballast from the existing rail corridor; rail tracks and 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 ballast, soil stockpiles (no soil from outside disturbance corridor), rock protection and rail materials including tracks and sleepers. Approximately 10mt of material will be stored during the life of the construction of the Project.	 *Source: ARTC*
Associated construction equipment and activities Large-scale construction equipment and machinery such as cranes, excavators, trucks, water trucks, scrapers, graders, heavy bulldozers, generators, road headers and dump trucks will be required for construction activities. In particular, it is noted the intention to mine the proposed tunnel through the Little Liverpool Range using either roadheader and/or drill and blast methods.	 *Source: ARTC*

Construction activities and infrastructure	Indicative imagery
Construction workers Th workforce on site for Project is estimated to peak at 410 full time equivalents between weeks 56 and 57. The average number of full-time equivalent workforce on site across the full construction period is in the order of 190 people.	 *Source: ARTC*
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. A traffic impact assessment has been undertaken as part of the EIS and this detailed the impacts to traffic numbers. Refer to the traffic impact assessment undertaken by the FFJV located in Appendix U of the EIS.	 *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, traffic management/road diversions and fuel storage areas. The primary light source will likely be from temporary security lighting and lighting towers. The number and details of the lighting requirements is yet to be determined and will be available after detailed design and a construction plan has been developed.	 *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.	 *Source: FFJV*

Construction activities and infrastructure	Indicative imagery
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. This 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. Four locations are proposed to have site offices: • Connors Road (Ch 30.70 km) • Warrego Highway (Ch 35.40 km) • Off Boundary Road (Ch 58.00 km) • Rosewood Laidley Road (Ch 64.00 km).	 *Source: FFJV*
Drainage infrastructure including concrete piping Temporary and permanent drainage infrastructure will be present, including areas in close proximity to existing road corridors, examples include: • Near Airforce Road, Helidon (Ch 27.04 km to Ch 27.40 km) • Near the Warrego Highway, Grantham (Ch 34.30 km) • Near Chadwick Road, Gatton (Ch 44.43 km) • Near Luck Road, Laidley (Ch 58.80 km) • Near Paroz Road, Laidley (Ch 59.61 km to Ch 59.66 km) • Near Rosewood-Laidley Road, Grandchester (Ch 64.78 km) • Near Grandchester-Mount Mort Road and School Road, Grandchester (Ch 65.87 km to Ch 66.48 km).	 *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 proposed rail corridor. Signage will include speed signs, stop signs, and safety signs and construction signage such as truck access signage.	 *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
Operation Phase	
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.	 *Source: ARTC*
Freight trains Trains may be at times 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. It is noted that part of the Project alignment is currently operational so some receptors already experience impacts from moving trains. *Note: this assessment is based on the allowance for 1,800 m long trains, including double stacking. The approval for the construction of future crossing loops to accommodate 3,600 m long trains will be subject to separate approval applications in the future.*	 *Source: ARTC*  *Source: ARTC*
Maintenance sidings There are no rail yards proposed for the Project. Maintenance sidings are provided at each crossing loop location. The maintenance siding has a minimum clear length of 250 m. This includes hard standing and storage space for temporary maintenance activities.	 *Source: AECOM*
Road and rail bridges Bridges are an obvious built landmark for motorists and are provided to cross over rivers, creeks, rail tracks and roads. The Project has approximately 31 bridges including: • Six rail bridges over waterways and roads • Thirteen rail bridges over waterways • Six rail bridges over roads	**Road bridge over rail**

Operation activities and infrastructure	Indicative imagery
• One rail bridge over rail • Four road bridges over rail • One pedestrian bridge over rail The rail bridges are typically proposed as single track, Super-T girder type structures Anti-throw screens are likely to be required for both road and rail bridges. Key bridges are proposed to be: **Rail bridge over waterway and road** • Paroz Road Rail Bridge: 92 m, four spans • Sandy Creek 1 Rail Bridge: 418 m, 11 spans • Lockyer Creek Rail Bridge: 122 m, four spans • Lockyer Creek QR Rail Bridge: 122 m, four spans • Lagoon Creek 1 Rail Bridge: 760 m, 20 spans • Lagoon Creek 1 Loop Rail Bridge: 760 m, 20 spans • UT1 Sandy Creek Bridge Rail Bridge: 437 m, 19 spans. **Rail bridge over waterway** • UT1 Sandy Creek Rail Bridge: 437 m, 19 spans • UT1 Laidley Creek Rail Bridge: 28 m, two spans • UT2 Laidley Creek Rail Bridge: 28 m, two spans • Sandy Creek 2 Rail Bridge: 29 m, two spans • Sandy Creek 3 Rail Bridge: 44 m, three spans • Laidley Creek Rail Bridge: 128 m, nine spans • Lagoon Creek 2 Rail Bridge: 437 m, 19 spans • Lagoon Creek 2 Loop Rail Bridge: 437 m, 19 spans • Western Creek 1 Rail Bridge: 516 m, 22 spans • Western Creek 2 Rail Bridge: 31.8 m, three spans • UT Western Creek Rail Bridge: 56 m, four spans • Western Creek 3 Rail Bridge: 84 m, six spans • Western Creek 4 Rail Bridge: 47.2 m, four spans. **Rail bridge over road** • Warrego Highway Rail Bridge: 184 m, four spans • Philps Road Rail Bridge: 69 m, three spans • Laidley Plainlands Road Rail Bridge: 75 m, three spans • Francis Road Rail Bridge: 38 m, one span • Luck Road Rail Bridge: 69 m, three spans • Rosewood Laidley Road Rail Bridge: 148 m, six spans. **Rail bridge over rail** • QR Rail Bridge: 90 m, six spans. **Road bridge over rail** • Airforce Road Bridge: 24 m, one span • Eastern Drive Bridge Northbound: 103 m, three spans • Eastern Drive Bridge Southbound: 103 m, three spans • QR Access Road Bridge: 83.6 m, six spans. **Pedestrian bridge over rail** • Gatton Station Pedestrian Bridge: 36 m, one span.	 *Source: Lat27 (Visualisation)* **Rail bridge over road**  *Source: Lat27 (Visualisation)* **Rail bridge over waterway**  *Source: Lat27 (Visualisation)*

Operation activities and infrastructure	Indicative imagery
Level crossings Crossings occur where the Project alignment intersects a road. Infrastructure includes rail tracks, crossing protection measures (as required) and signage. The Project has 7 active (lit) level crossings as follows: • Connors Road, Helidon • Jamiesons Road, Gatton • Dodt Road, Forest Hill • Glenore Grove Road, Forest Hill • Grandchester Mount Mort Road, Grandchester • Neumann Road, Calvert • Calvert Station Road, Calvert No passive level crossings are proposed.	**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. In addition, there will be four locations with crossing loops: Helidon, Gatton, Laidley and Calvert. The rail corridor (62.5m) is of sufficient width to accommodate the proposed crossing loops.	 *Source: ARTC*
Culverts In addition to bridges, approximately 86 culverts, including multiple barrel culverts, are required where the route crosses small creeks, drainage lines and waterway crossing. These comprised: • 51 reinforced concrete pipes (RCP) locations (multiple cells in places) • 35 are reinforced concrete box culvert (RCBC) locations.	 *Source: ARTC*
Embankments, abutments and retaining walls Embankments and mounding will be created to accommodate the proposed rail infrastructure, this includes: • Approximately 34 km of embankments and mounding, excluding structures, will be created to accommodate the proposed rail infrastructure. The maximum height of mounding will be 23 m.	 *Source: Lat27*

Operation activities and infrastructure	Indicative imagery
Cuttings with associated retaining walls Cuts will be created through areas of elevated landform, for example in the Little Liverpool Range, to accommodate the proposed rail infrastructure, this includes: • The Project is expected to require approximately 3,500,000 m3 of cuttings along the length of the alignment, spanning approximately 7.60 km. 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*
Tunnels with associated tunnel portals An 850 m tunnel will be created through the Little Liverpool Range to accommodate the proposed rail infrastructure. At each tunnel entry a portal will be created with associated vent building. 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.	 *Source: ARTC*
Fencing and Noise Barriers 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 (e.g. at rail yards and where crossing loops are in close proximity to roads or where critical infrastructure is to be protected). Fauna fencing is also required in some places. It is noted that noise barriers are not currently included within the Project design. However, at detailed design phase the provision of noise barriers and other potential feasible and practicable mitigation options to reduce and control noise levels and noise related impacts at sensitive land uses will be considered, in particular in the vicinity of Gatton and Forest Hill. Therefore, the potential visual impact of the concept noise barriers in these locations has been considered in this assessment.	**Fencing**  *Source: FFJV*  *Source: FFJV* **Noise Barriers**  *Source: Lat27 (Visualisation)*

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 alignment.

It is noted that these images are indicative “artist’s impressions” only, and representative of typical conditions found within the Project rail corridor. The sections are not specific to any one location, and do not illustrate the provision of any additional mitigation measures. For full details on cross sections at particular locations refer to the relevant engineers’ drawings.

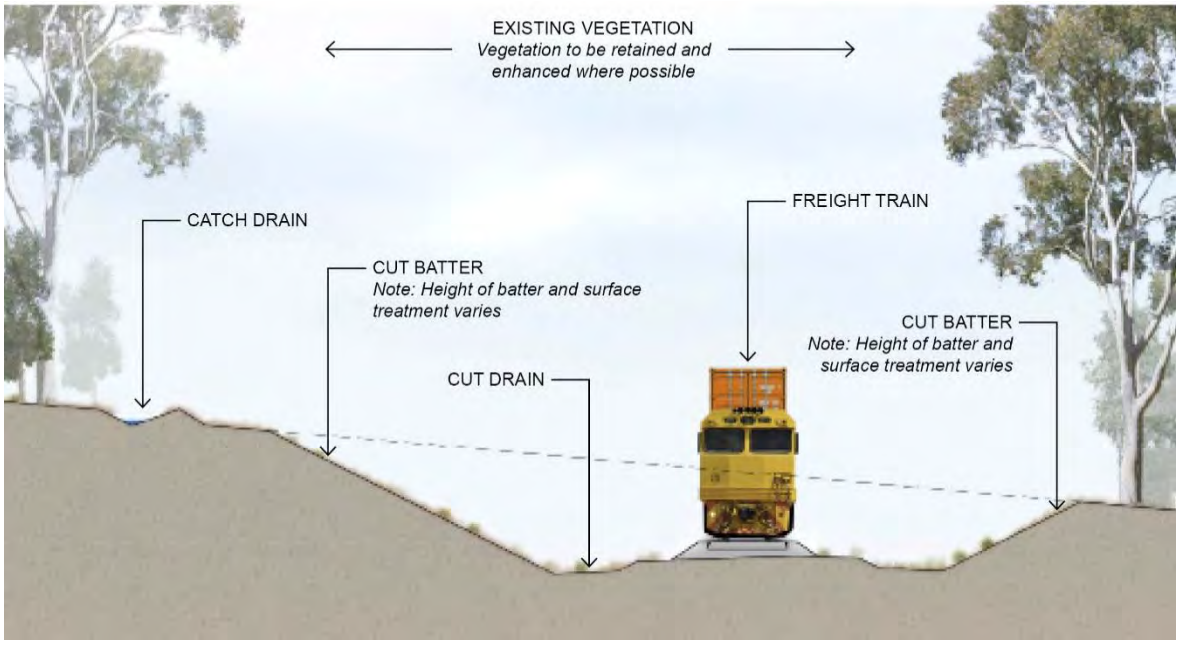


Figure 14: Typical cut

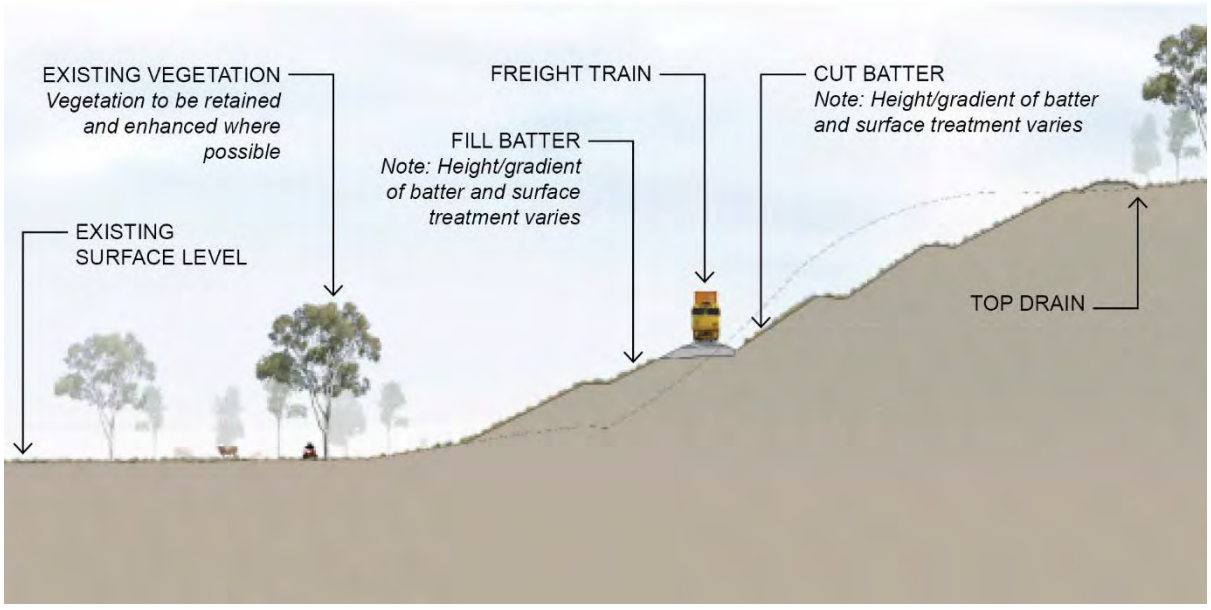


Figure 15: Typical cut/fill Batter

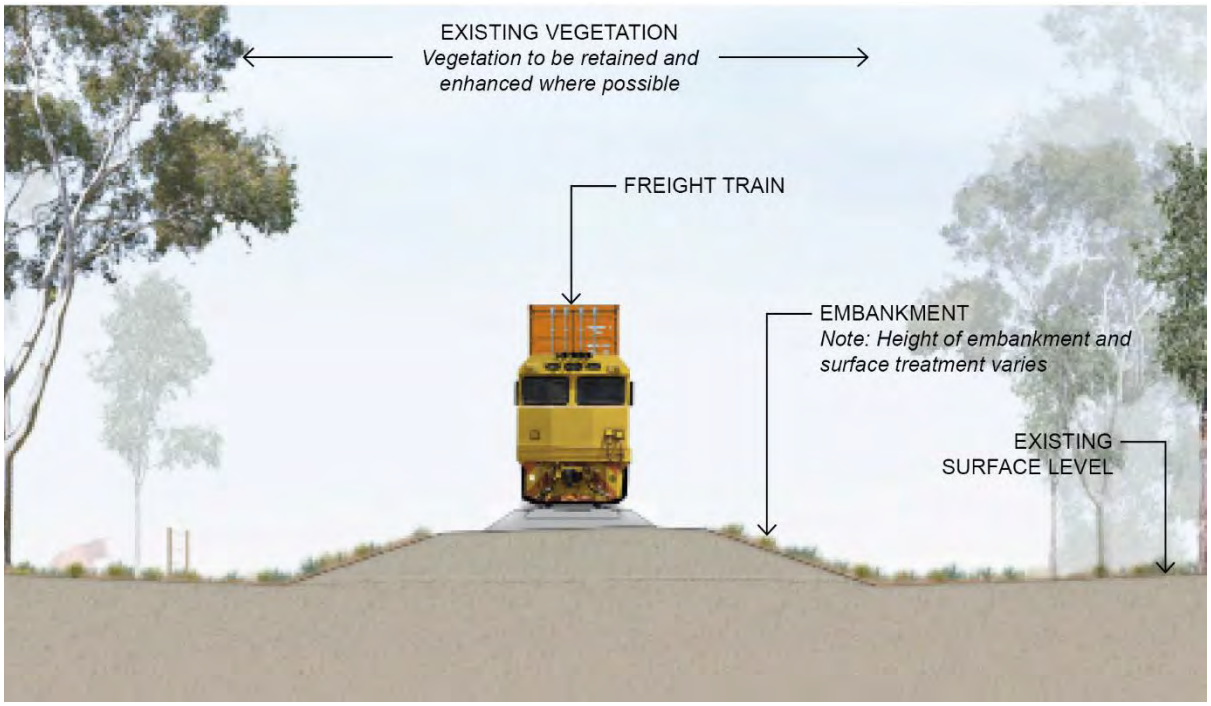


Figure 16: Typical low embankment

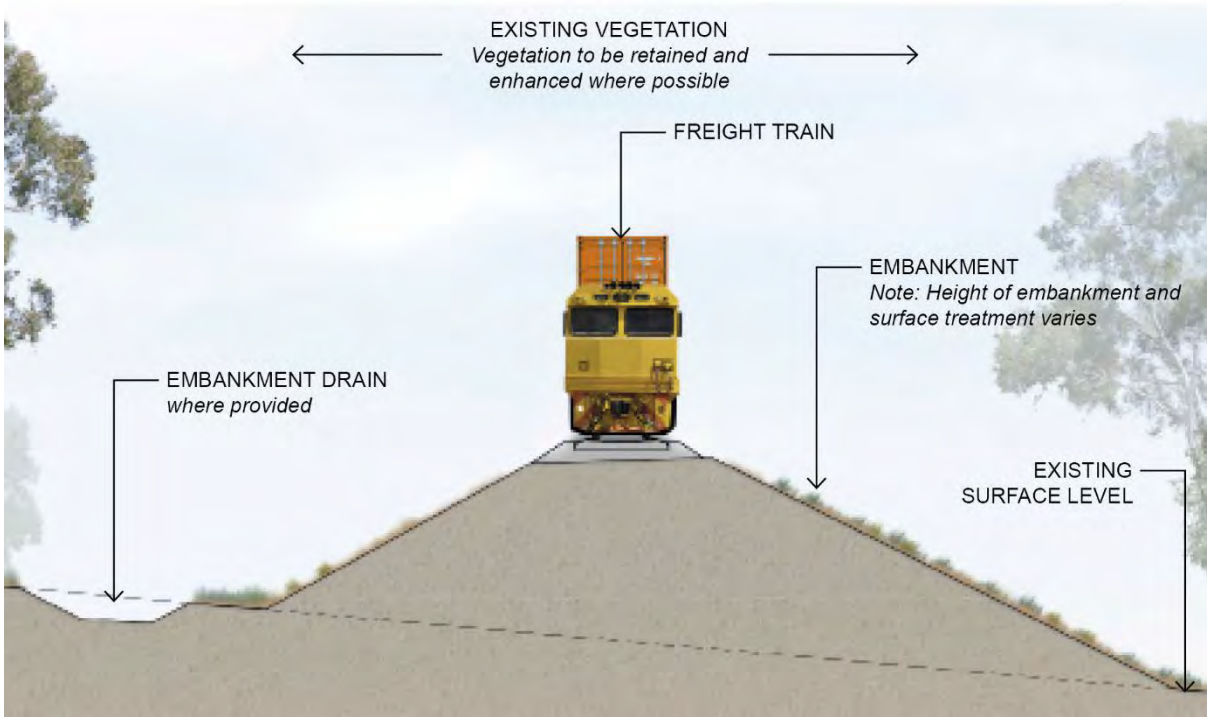


Figure 17: Typical high embankment with drain

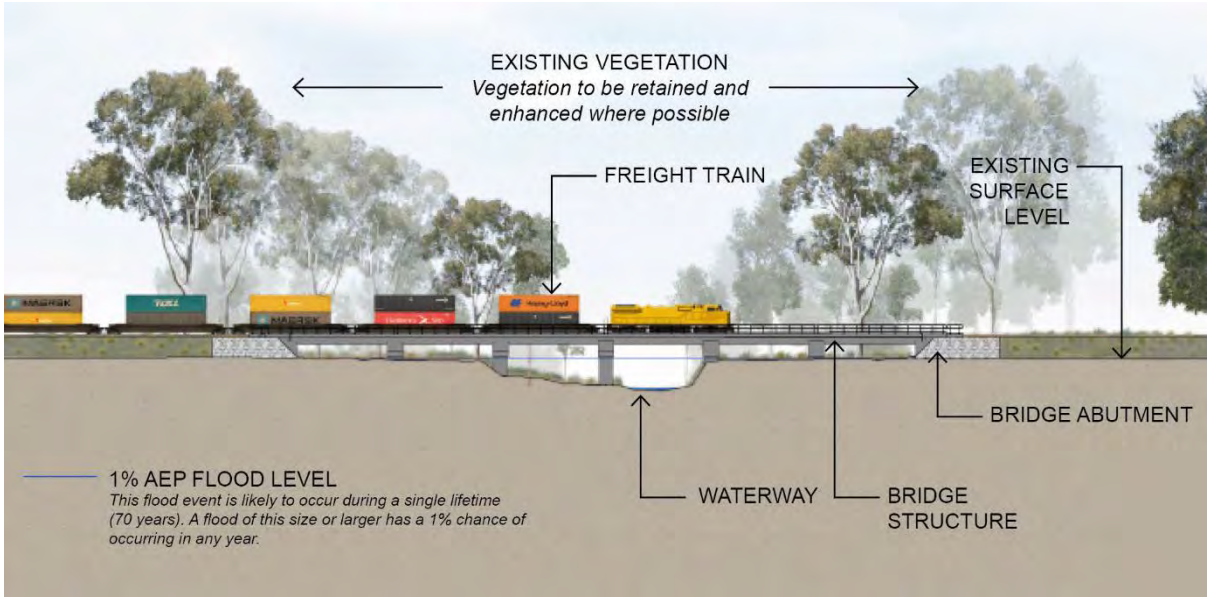


Figure 18: Typical creek crossing

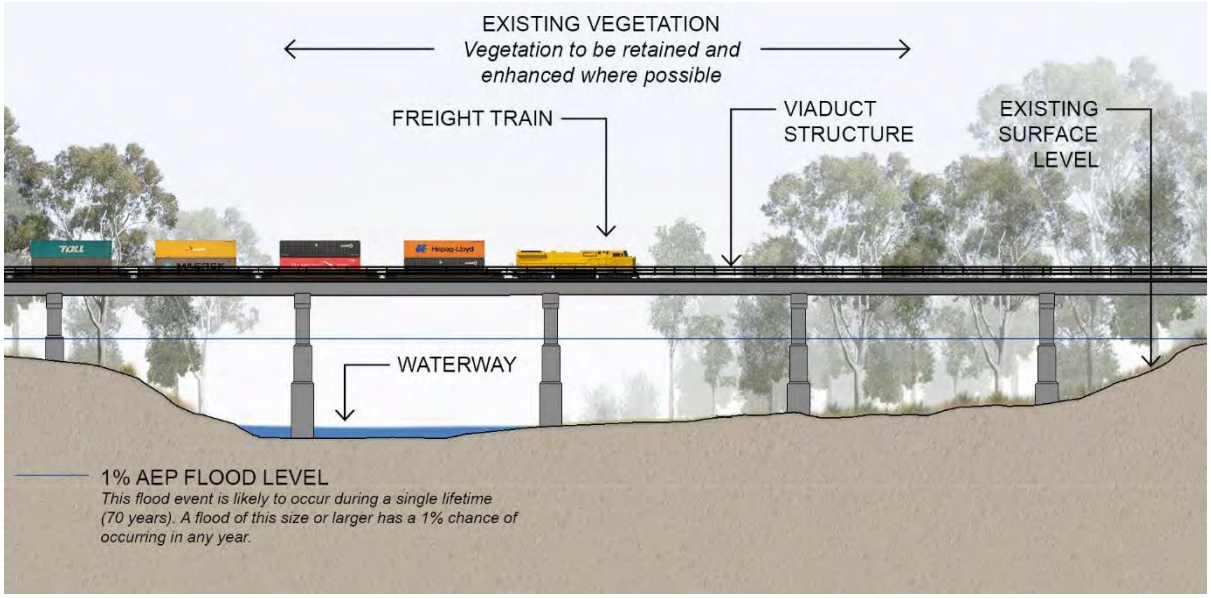


Figure 19: Typical river crossing

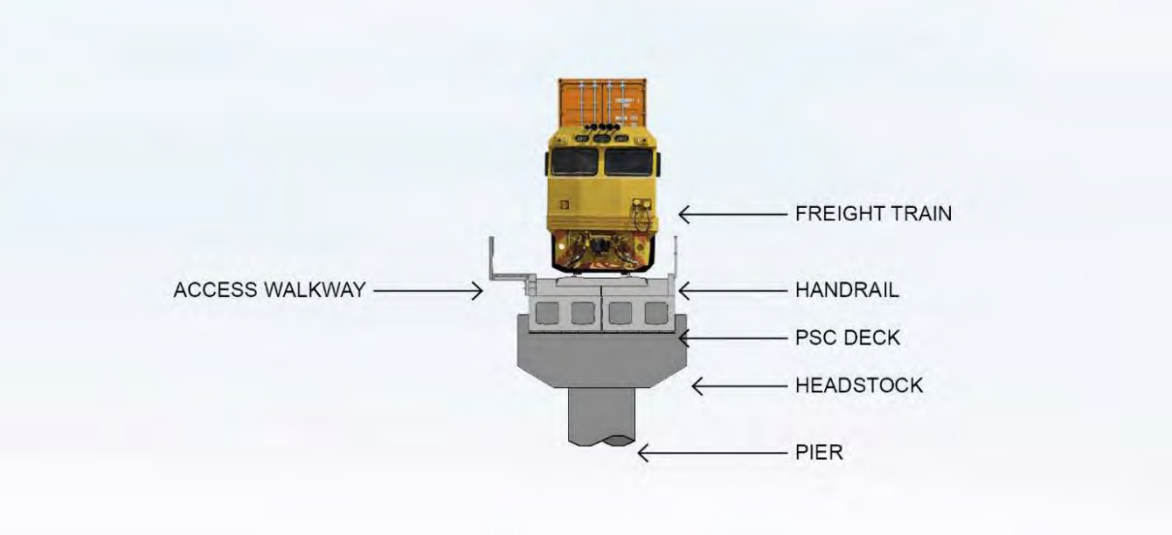


Figure 20: Typical pier with slab span

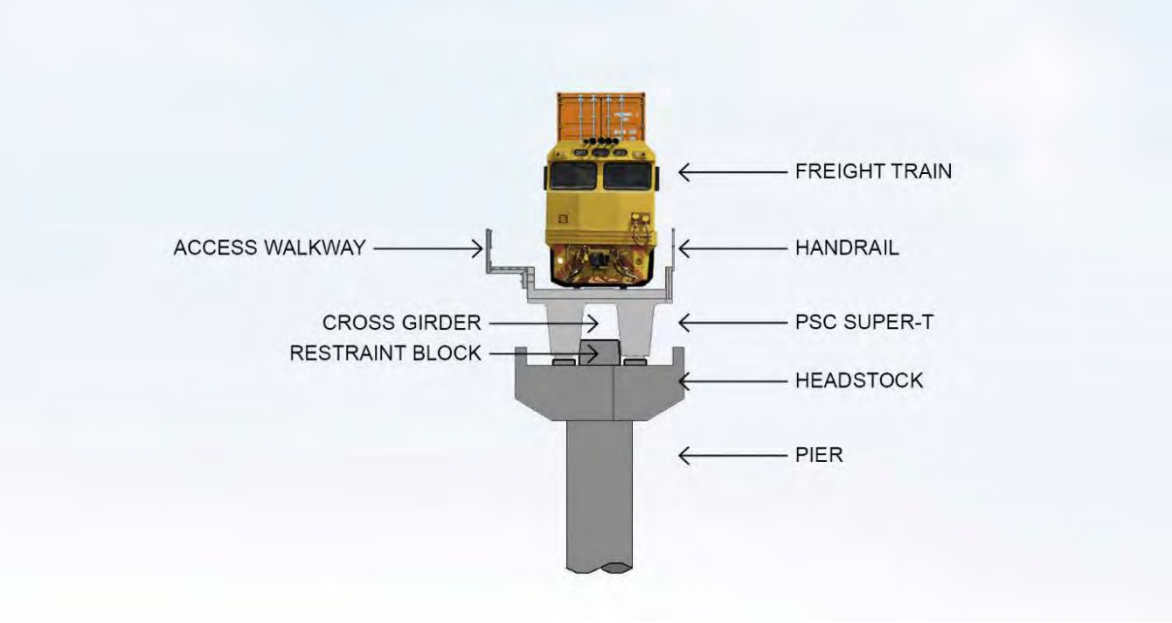


Figure 21: Typical pier with super-T girder

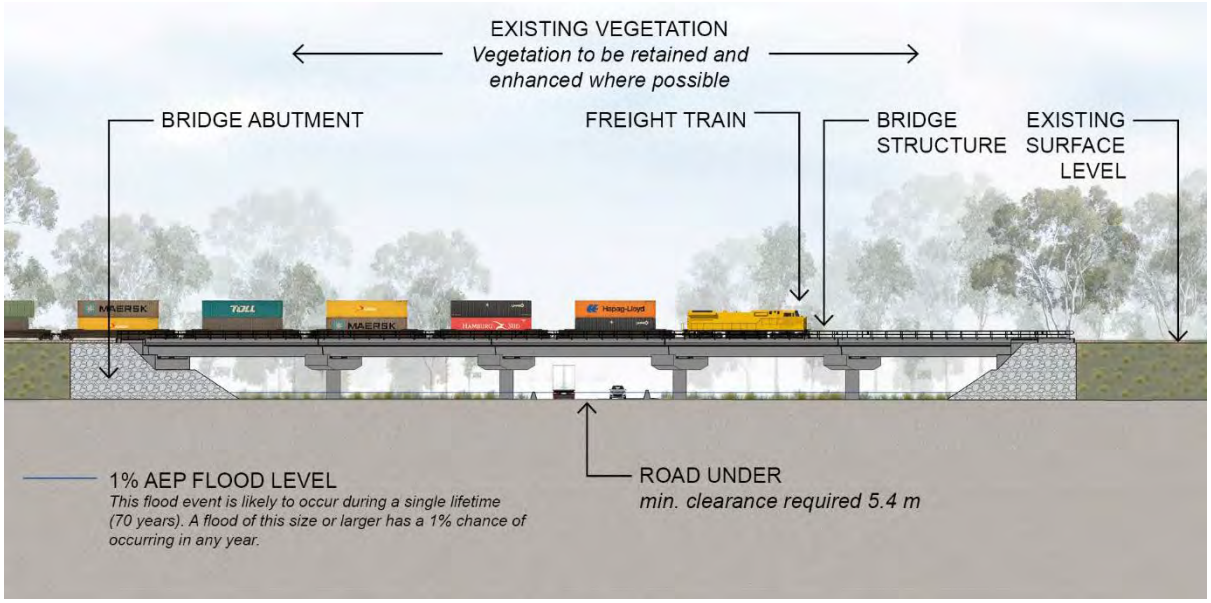


Figure 22: Typical rail over road bridge

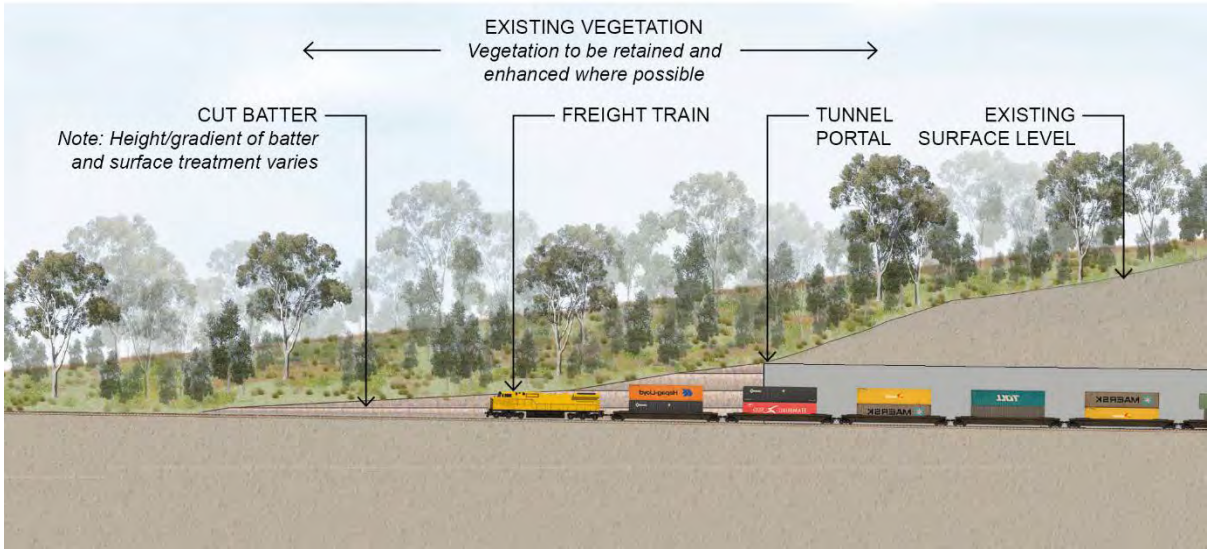


Figure 23: Typical tunnel portal

7. Landscape Impact Assessment

7.1. Landscape character impact assessment

Eight LCTs have been identified within the LVIA study area. These are identified in **Figure 7: Landscape character assessment** (refer Appendices). Seven of these LCTs are directly intersected by the Project alignment, as follows:

- 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: Rural Living
- LCT H: Forested Uplands

One other LCT is present in the wider LVIA study area but as this is not intersected by the alignment any impacts would be indirect and is not assessed in detail:

- LCT A: Vegetated Watercourses - Rivers

The seven LCTs and associated LCAs intersected by the Project are described in **Table 22** to **Table 28**. 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 landscape character impact 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.

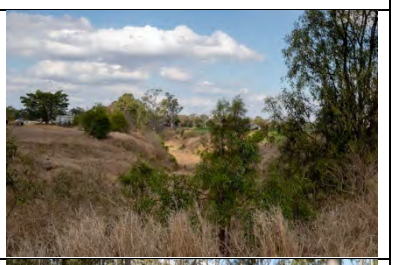
7.1.1 Landscape character type A

This LCT falls within the LVIA study area and comprises the river corridor and riparian vegetation associated with the Bremer River. As this LCT is not affected by the Project alignment it is not considered further.

7.1.2 Landscape character type B

Table 22: Summary description 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 the LVIA study area, associated with the many small tributaries of the Brisbane River (to the west of Little Liverpool Range) and Bremer River (to the east of Little Liverpool Range). There are nine LCAs of this type in the LVIA study area – the *Lockyer Creek Vegetated Watercourse* (LCA B1), *Gatton Creek Vegetated Watercourse* (LCA B2), *Soda Spring Creek Vegetated Watercourse* (LCA B3), *Flagstone Creek Vegetated Watercourse* (LCA B4), *Sandy Creek Vegetated Watercourse (LCA B5), Ma Creek Vegetated Watercourse* (LCA B6), *Tenthill Creek Vegetated*

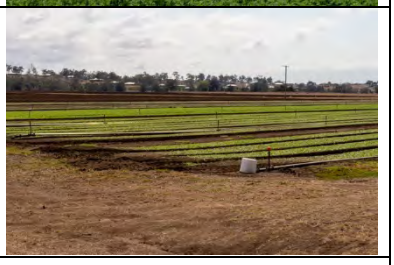
	Watercourse (LCA B7), *Laidley Creek Vegetated Watercourse* (LCA B8) and the *Western Creek Vegetated Watercourse* (LCA B9).
Typical character images:	
     	
Key characteristics	• Includes creeks and low-lying effluent channels that form part of Brisbane River and Bremer River catchments, conveying large amounts of runoff away from the steep surrounding ranges in rainfall events • Remnant areas of flood-dependent forest/woodlands and wetlands • Natural landscape with few built infrastructure elements.
Precedent modifications and infrastructure elements	• Relatively natural landscape with minimal infrastructure, comprising existing road and rail bridges over the main creek channels within the LVIA study area • Generally fringing vegetation has been retained and creates a buffer between adjacent land uses • Telecommunication infrastructure including telegraph poles typically follows the road alignment.
Landscape character sensitivity assessment	• Moderate degree of perceived naturalness, with some instances of evidence of human uses and modifications to the waterways • Areas of fringing vegetation in some locations contain views to and from creek lines, reducing the sensitivity. Vegetation is sparser in low lying agricultural areas. • 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 is already affected by the presence of road and rail infrastructure (albeit some of which is disused) so it has capacity to accommodate further change.
Impact Assessment	
Magnitude of change assessment	• The proposed alignment typically follows the existing West Moreton System rail corridor. Where it deviates from the existing alignment, it traverses a variety of landscapes and land uses, including the vegetated undulating foothills of the Great Dividing and Little Liverpool ranges rural landscapes, intensive agricultural areas and the urban areas fringing existing townships. • The introduction of new rail infrastructure into the rural and urban setting will include nineteen waterway crossings, where the alignment crosses the upper tributary of Sandy Creek, Sandy Creek, Lockyer Creek, upper tributaries of Laidley Creek, Laidley Creek, Lagoon Cree, upper tributaries of Western Creek and Western Creek

	• LCTB1: Lockyer Creek, B5: Sandy Creek, B8: Laidley Creek and B9: Western Creek would be traversed by the alignment • New bridge and rail way infrastructure, as well as associated drainage infrastructure (e.g. culverts) will result in localised removal of vegetation and will affect the natural and rural character of this landscape type • Changes to the landscape character associated with creek and floodplain infrastructure will be evident from the Warrego Highway, Sandy Creek Road, Old Laidley Forest Hill Road, Grandchester-Mt Mort Road, Stokes Road, Rosewood-Laidley Road, Calvert Station Road, Marin Road, Bugeja Road, Hiddenvale Road and Neumann Road • The overall magnitude of change is predicted to be ***Moderate***.
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 23: Summary description 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 Brisbane River and Bremer River catchments. There are 36 LCAs of this type in the LVIA study area – the *Upper Lockyer Irrigated Croplands* (LCA C1), *Murphys Creek Road Irrigated Croplands* (LCA C2), *Lockyer Irrigated Croplands* (LCA C3), *Airforce Road Irrigated Croplands* (LCA C4), *Helidon Irrigated Croplands* (LCA C5), *Flagstone Creek West Irrigated Croplan*ds (LCA C6), *Flagstone Creek Irrigated Croplands* (LCA C7), *Flagstone Creek East Irrigated Croplands* (LCA C8), *Grantham North Irrigated Croplands* (LCA C9), *Sandy Creek Road Irrigated Croplands* (LCA C10), *Grantham South Irrigated Croplands* (LCA C11), *Placid Hills Croplands* (LCA 12), *McLucas Road Irrigated Croplands* (LCA 13), *Winwill Irrigated Croplands* (LCA 14), *Ma Ma Creek Irrigated Croplands* (LCA 15), *Gatton North Irrigated Croplands* (LCA 16), *Gillespies Road Irrigated Croplands* (LCA 17), *Gatton West Irrigated Croplands* (LCA 18), *Tenthill Creek Irrigated Croplands* (LCA 19), *Lockyer Creek North Irrigated Croplands* (LCA 20), *Lockyer Creek South Irrigated Croplands* (LCA 21), *Sandy Creek Irrigated Croplands* (LCA 22), *Forest Hill Irrigated Croplands (*LCA 23), *Woodlands Road Irrigated Croplands* (LCA 24), *Blenheim Irrigated Croplands* (LCA 25), *Glenore Grove Irrigated Croplands* (LCA 26), *Laidley Irrigated Croplands* (LCA 27), *Laidley Heights Irrigated Croplands* (LCA 28), *Laidley Creek West Irrigated Croplands* (LCA 29), *Laidley Creek East Irrigated Croplands* (LCA 30), *Lanefield Irrigated Croplands* (LCA 31), *Rosewood Irrigated Croplands* (LCA 32), *Ebenezer Irrigated Croplands (*LCA 33), *Thagoona Irrigated Croplands* (LCA 34), *Mt Walker Irrigated Croplands* (LCA 35) and the *Mt Forbes Irrigated Croplands (*LCA 36). These 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 Helidon, Gatton, Forest Hill and Laidley North • Typically located in areas with highly fertile vertosol soils • The vertosols, are typically cracking clay soils with high nutrients capable of supporting agriculture • Extensive large and relatively flat open fields of irrigated cropland • Landscape substantially cleared of vegetation, except at the periphery, along creek-lines (LCT A and LCT B) on the skyline and local roads • In addition to irrigated production, current land use activities include grazing and dryland farming with localised recreation.
Precedent modifications and infrastructure elements	• To enhance agricultural productivity, modifications have been made to 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 near Helidon, Gatton, Forest Hill and Laidley North. • Diverted flows from creeks within the catchment supply water to Lake Atkinson, Lake Clarendon and Lake Dyer, and to off-stream storage facilities providing recreational opportunities, and to supplying water to the Central Lockyer irrigation scheme.
Landscape character sensitivity assessment	• The Irrigated Croplands landscape type is predominantly visually open, with a sparsely settled rural character 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 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 will be on private land where new rail infrastructure is being introduced • Typically, the alignment follows the existing rail corridor when passing through this landscape character type • LCA C4: Airforce Road, C16: Gatton North, C21: Lockyer Creek, C23: Sandy Creek and C27: Laidley would be directly affected

	• The impact on private land and valuable irrigated areas will be most evident to the west of Laidley (LCA C27 and C28), where the alignment deviates from the existing railway corridor • New earthwork infrastructure within this landscape will not be inconsistent with the current landscape character • The overall magnitude of change is predicted to be ***Low***.
Significance of effect	• The effect of the Project on LCT C: Irrigated Croplands is ***Negligible***.

7.1.4 Landscape Character Type D

Table 24: Summary description of LCT D: Dry Croplands and Pastures

Type D: Dry Croplands and Pastures	
Landscape Baseline Assessment	
Location and boundaries	This landscape extends across a considerable part of the LVIA study area and is largely defined by extensively cleared, often undulating, open rural properties utilised for agriculture and livestock production. There are 28 LCAs of this type in the LVIA study area – the *Black Flagstone Road Dry Croplands and Pastures* (LCA D1), *Helidon Croplands and Pastures* (LCA D2), *Verdilla Dry Croplands and Pastures* (LCA D3), *Ma Ma Creek Dry Croplands and Pastures* (LCA D4), *Grantham Dry Croplands and Pastures* (LCA D5), *Placid Hills Dry Croplands and Pastures* (LCA D6), *Old Toowoomba Road Dry Croplands and Pastures* (LCA D7), *Lower Tenthill Dry Croplands and Pastures* (LCA D8), *Gatton North Dry Croplands and Pastures* (LCA D9), *Morton Vale Dry Croplands and Pastures* (LCA D10), *Gatton South Dry Croplands and Pastures* (LCA D11), *Glenore Grove Dry Croplands and Pastures* (LCA D12), *Hatton Vale Dry Croplands and Pastures* (LCA D13), *Plainland Dry Croplands and Pastures* (LCA D14), *Laidley Dry Croplands and Pastures* (LCA D15), *Forest Hill Dry Croplands and Pastures* (LCA D16), *Blenheim Dry Croplands and Pastures* (LCA D17), *Laidley South Dry Croplands and Pastures* (LCA D18), *Grandchester Dry Croplands and Pastures* (LCA D19), *Calvert Dry Croplands and Pastures* (LCA D20), *Marburg Dry Croplands and Pastures* (LCA D21), *Rosewood Dry Croplands and Pastures* (LCA D22), *Lower Mount Walker Dry Croplands and Pastures* (LCA D23), *Mount Walker Dry Croplands and Pastures* (LCA D24), *Ebenezer Dry Croplands and Pastures* (LCA D25), *Thagoona Dry Croplands and Pastures* (LCA D26), *Jeebropilly Dry Croplands and Pastures* (LCA D27) and the *Mutdapilly Dry Croplands and Pastures* (LCA D28).
Typical character images:	
	 

  	
Key characteristics	• The landscape is typically found on the undulating, poorer foothills of the LVIA study area surrounding the low-lying alluvial floodplains (LCT C – Irrigated Croplands) • Soils typically comprise sodosols, dermosols, tenosols and kurosols • The sodosols have a gravelly, sandy character, often exposed in areas and vulnerable to tunnel and gully erosion • Dermosols are associated with previous volcanic activity and are found in higher rainfall coastal regions. They are used for intensive crop production. • Tenosols have generally shallow, stony soils with low fertility and low water-holding capacity • Kurosols are strongly acid and occur predominately in upland regions with higher rainfall • Land use is predominately rural, characterised by dryland cropping and pastoral properties for livestock production • Vegetation comprises native roadside shelter belts and sporadic riparian vegetation associated with creek lines • Transport corridors are typically straight in character reflecting the flat topography, with subtle kinks associated with topographic variation that connect the key settlements and rural properties. State-controlled roads are sealed but other roads are typically unsealed gravel. • Open and exposed character with long distant views and strong skylines, except where views are contained by roadside or creek-side vegetation • Sparsely settled landscape, with only property homesteads and cottages, and small rural 'villages' such as Grantham and Calvert. Farmsteads are typically located on gently elevated areas. • 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 • Construction of roads, railways and bridges • Telecommunication infrastructure including telegraph poles.
Landscape character sensitivity assessment	• The Dry Croplands and Pastures LCT 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	• Parts of LCA D2: Helidon, D5: Grantham, D6: Placid Hills, D11: Gatton South, D16: Forest Hill, D19: Grandchester, D20: Calvert, D22: Rosewood and D23: Lower Mount Walker would be directly affected • Impact on private land, including agricultural and pastoral areas will be evident in the vicinity of Grantham and Laidley (LCA D5 and D15), where the proposed alignment deviates from the existing railway corridor

	• The Project will be introducing new infrastructure into what is a relatively intact rural environment • Impacts within this LCA 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 ***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 25: Summary description 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 16 LCAs of this type in the LVIA study area – the *Murphys Creek Vegetated Grazing* (LCA E1), *Upper Lockyer Vegetated Grazing* (LCA E2), *Postmans Ridge Vegetated Grazing* (LCA E3), *Derrymore Vegetated Grazing* (LCA E4), *Gatton Vegetated Grazing* (LCA E5), *Lilydale Vegetated Grazing* (LCA E6), *Upper Tenthill Vegetated Grazing* (LCA E7), *Ingoldsby Vegetated Grazing* (LCA E8), *Ropeley Vegetated Grazing* (LCA E9), *Laidley North Vegetated Grazing* (LCA E10), *Sommerholm Vegetated Grazing* (LCA E11), *Tallegalla Vegetated Grazing* (LCA E12), *Calvert Vegetated Grazing* (LCA E13), *Lower Mount Walker Vegetated Grazing* (LCA E14), *Mount Mort Vegetated Grazing* (LCA E15) and *Mount Forbes Vegetated Grazing* (LCA E16).
Typical character images:	
  	
Key characteristics	• Very sparsely settled landscape with large land holdings (stations) and scattered farmsteads • Pastureland with broad areas of open wooded remnant vegetation, typically denser along creek and drainage lines and hill tops • Roads are typically straight in character and unsealed gravel. Views in most instances are 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	• The Vegetated Grazing landscape type is predominantly visually contained, with a sparsely settled rural character and little large-scale infrastructure. Long distant 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	• Very small parts of LCA E5: Gatton, E10: Laidley North and E13: Calvert would be directly affected • Impact on private land, including vegetated pastoral areas will be most evident near Grantham in LCA E5 and E10: Summerholm • The Project will introduce new infrastructure into what is a relatively intact rural environment • Impacts within this LCT will be due to localised vegetation removal, major earthworks including large cuts and embankments in places and proposed road and creek bridges • Overall, the impact on this LCT is ***Moderate***.
Significance of effect	• The effect of the Project on LCT E: Vegetated Grazing is ***Low***.

7.1.6 Landscape character type F

Table 26: Summary description of LCT F: Rural Settlement

Type F: Rural Settlement	
Landscape Baseline Assessment	
Location and boundaries	Twelve 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 Amberly Air Base. Accordingly, there are 12 LCAs in the LVIA study area: *Murphys Creek* (LCA F1), *Withcott* (LCA F2), *Helidon* (LCA F3), *Grantham* (LCA F4), *Gatton* (LCA F5), *UQ Gatton Campus* (LCA F6), *Forest Hill* (LCA F7), *Plainland* (LCA F8), *Laidley* (LCA F9), *Grandchester* (LCA F110), *Calvert* (LCA F11) and *Rosewood* (LCA F12).
Typical character images:	
     	
Key characteristics	• Small rural towns, villages and communities are low-scale built form with limited services • Typically, single storey buildings of varying age and condition

	• The larger settlements of Murphys Creek, Withcott, Helidon, Grantham, Gatton, Forest Hill, Plainland, Laidley, Grandchester and Rosewood have social infrastructure including parks, public schools and sport facilities • The alignment typically follows the alignment of the existing Main Line railway, while remnants of the historic branch railway lines are located throughout the corridor • Murphys Creek (LCA F1) is a small town located at the foot of the Great Dividing Range, 22 km from Toowoomba. The existing Main Line runs through the centre of the town and the decommissioned Murphys Creek railway complex is heritage listed. • Withcott (LCA F2) is a small town located on the Warrego Highway, 10 km east of Toowoomba at the base of the Great Dividing Range • Helidon (LCA F3) is a small town situated on Lockyer Creek, 21 km east of Toowoomba. The Warrego Highway runs through the centre of the town. To the north of the town, sandstone mining operations are discreetly tucked into the undulating and forested foothills of the Great Dividing Range, large extents of which are part of Lockyer National Park. • Grantham (LCA F4) is a small rural town 28 km east of Toowoomba and 9 km west of Gatton. Surrounded by premier agricultural land, Grantham is one of the largest producers of vegetables in Australia. • Gatton (LCA F5) is a town and the administrative centre of the Lockyer Valley LGA. The Warrego Highway runs east-west to the north of the town. • The UQ Gatton Campus (LCA F6) is a heritage-listed university campus located at Lawes, on the Warrego Highway, approximately 6 km east of Gatton • Forest Hill (LCA F7) is a picturesque rural village and part of the Cobb & Co. tourist route, 5 km south of the Warrego Highway to the west of Laidley. The existing Main Line runs through the centre of the town. • Plainland (LCA F8) is a locality in the Locker Valley, north of Laidley and 75 km west of Brisbane. A service centre and Woolworths are situated on the Warrego Highway. • Laidley (LCA F9) is a town situated 83 km west of Brisbane. The existing Main Line runs through the centre of the town. • Grandchester (LCA F10) is a small rural town located southwest of Rosewood. The existing Main Line runs through the centre of town. The historic Grandchester Station is a local tourist destination. • Calvert (LCA F11) is a small rural community. The existing Main Line runs alongside the town the north of the rural residential properties. • Rosewood (LCA F12) 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.
Precedent modifications and infrastructure elements	• Highly modified for urban land uses, including clearing of remnant vegetation and levelling of land for construction • Presence of roads, railways and bridges • Telecommunication infrastructure including telegraph poles.
Landscape character sensitivity assessment	• The Rural Settlements landscape type has a settled rural character. Smaller rural communities such as Calvert are very sparsely settled. • Buildings, street trees and remnant vegetation are of local value • The sensitivity of these settlements is considered to be ***Moderate***. While not valued within planning schemes, these settlements have a distinctive character with some elements of interest (such as heritage buildings and silos) and are also likely to be valued by the people that reside in or visit them.

Impact Assessment	
Magnitude of change assessment	• The Project alignment passes directly through the towns of Gatton, Forest Hill and Grandchester, and adjacent to the edge of the towns of Helidon, Laidley and Calvert to the north • While Rosewood is within the LVIA study area, the impact of the C2K project is closer and would have a potentially greater influence than this Project, so Project impacts on Rosewood are considered in the C2K LVIA • The UQ Gatton Campus is approximately 3 km north of the alignment and will experience elevated views towards the alignment, however, it is noted that the proposed rail line is situated within the existing railway corridor in this area • Similarly, Murphys Creek is situated approximately 5.3 km from the alignment, therefore, the G2H alignment is closest so impacts are considered in the G2H LVIA • Grantham is 4 km south of the proposed alignment, and residents of the town will not be impacted, however residents in the newer parts of Grantham to the north of the town will have elevated views towards the alignment • The alignment would directly affect parts of LCA F3: Helidon, F5: Gatton, F7: Forest Hill, F9: Laidley and F10: Grandchester • Residents of Helidon, Gatton, Forest Hill, Laidley, Grandchester and Calvert are situated close to existing railway infrastructure and will be affected by the proposed Project alignment • In Gatton, Forest Hill and Calvert the alignment follows the existing railway corridor and would be consistent with the current landscape character • In Helidon, Laidley and Grandchester the alignment deviates from the existing railway corridor so would contrast more markedly with the existing character • The primary impact will be in residential areas where new rail infrastructure is being introduced. This will be particularly evident in the vicinity of Helidon and Laidley (LCA F3 and F9). • The alignment passes to the north of Helidon, deviating from the existing railway. As such, rural residents to the north of the town will be directly affected by the introduction of rail infrastructure along the proposed alignment. • The Project alignment passes through Gatton, following the existing railway corridor. Residents of Gatton experience close views towards the alignment. Key impacts of the Project in Gatton will be associated with the duplication of the Eastern Drive road bridge and the replacement of the existing Gatton Station pedestrian bridge. • The Project alignment passes through Forest Hill, following the existing railway corridor. Residents of Forest Hill experience close views towards the alignment and the existing level crossing will be relocated. • Plainland is approximately 6.3 km northeast of the proposed alignment, and residents of the locality will not be impacted • The alignment passes to the north of Laidley, deviating from the existing railway corridor and passing through growing residential areas and existing rural residential communities. Residents of Valley Vista and Cunningham Park residential estates will experience very close views of the proposed alignment and embankments, while residents of McInnes Field at Laidley residential estate and nearby rural residents will experience close views towards the alignment and large cuts. • The alignment passes through the centre of Grandchester to the south of Western Creek and the existing railway and heritage listed Grandchester Railway Station. Typically views to the alignment for residents of Grandchester will be screened by vegetation along Western Creek. Nearby

	rural residents to the south of the town will be affected by the proposed alignment. Impacts on these rural residents are discussed below in LCT G. • The Project alignment passes to the north of Calvert, following the existing railway corridor. Residents of Calvert will experience close views towards the alignment. • Rosewood is approximately 4 km from the alignment and will not be impacted. While Rosewood is located within the LVIA study area, it has been assessed in the C2K study, due to its distance from the Project alignment. • Overall, the impact on this LCT is considered to be ***Moderate*** as there would be limited loss of features of value, although in places, such as Laidley the introduction of embankments will change the perception of character.
Significance of effect	• The effect of the Project on LCT F: Rural Settlement is ***Moderate.***

7.1.7 Landscape character type G

Table 27: Summary description of LCT G: Rural Living

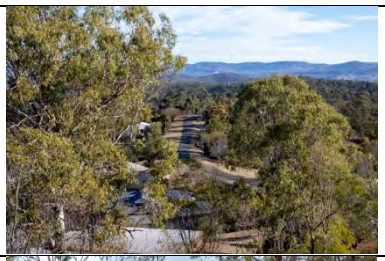
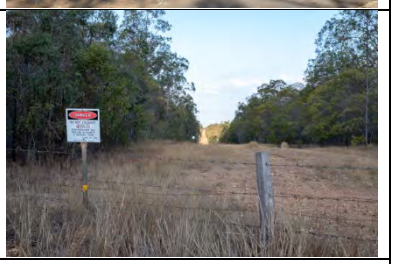
Type G: Rural Living	
Landscape Baseline Assessment	
Location and boundaries	This landscape type is typically located in elevated parts of the LVIA study area, near major transport infrastructure with access to towns and services, and is characterised by large lot rural residential development, and is typically somewhat vegetated. There are 21 LCAs of this type in the LVIA study area – the *Upper Lockyer Rural Living* (LCA G1), *Withcott Rural Living* (LCA G2), *Postmans Ridge Rural Living* (LCA G3), *Helidon Spa Rural Living* (LCA G4), *Helidon Rural Living* (LCA G5), *Grantham Rural Living* (LCA G6), *Placid Hills Rural Living* (LCA G7), *Veradilla Rural Living* (LCA G8), *Adare North Rural Living* (LCA G9), *Adare South Rural Living* (LCA G10), *Gatton Rural Living* (LCA G11), *Regency Downs Rural Living* (LCA G12), *Laidley Heights Rural Living* (LCA G13), *Laidley Rural Living* (LCA G14), *Cunninghams Crest Rural Living* (LCA G15), *Laidley South Rural Living* (LCA G16), *Grandchester Rural Living* (LCA G17), *Grandchester South Rural Living* (LCA G18), *Calvert Rural Living* (LCA G19), *Thagoona Rural Living* (LCA G20) and the *Ebenezer Rural Living* (LCA G21).
Typical character images:	
	
	
	
	

Key characteristics	• Private residential dwellings on large lots, typically on elevated and undulating topography, with low-scale built form and limited local services • Typically, single storey buildings of varying age and condition • Typically views from low lying rural residential areas are limited, due to the presence of screening remnant vegetation and local topography • Open and close views towards the alignment are possible for elevated properties in close proximity to the alignment, particularly those located in the newer residential areas of Grantham • Highly visible landscape type throughout the LVIA study area.
Precedent modifications and infrastructure elements	• Highly modified for urban land uses, including clearing of remnant vegetation and levelling of land for construction • Presence of roads, railways and bridges • Telecommunication infrastructure including telegraph poles.
Landscape character sensitivity assessment	• The Rural Living landscape type is predominantly visually closed, with a sparely settled rural character. Typically, services are limited. • Street trees and remnant vegetation provide some screening effect • The sensitivity of these rural residential areas is considered to be ***Moderate***. These areas have a distinctive character but is valued at the local level, principally by residents.
Impact Assessment	
Magnitude of change assessment	• The alignment directly affects LCA G5: Helidon, G6: Grantham G7: Placid Hills, G15: Cunninghams Crest, G17: Grandchester and G18: Grandchester South • The rural residential areas of Veradilla, Adare North, Adare and Laidley South (LCA G8, G9, G10 and G16) are at a significant distance from the alignment so there would be no direct impacts on landscape character • Due to the distance of residents of Upper Lockyer, Withcott, Postmans Ridge (LCA G1, G2 and G3) from the Project alignment, the impact of the Project on these rural residential areas will be discussed in G2H • Due to the distance of residents of Thagoona and Ebenezer (LCA G20 and G21) from the Project alignment, the impact of the Project on these rural residential areas will be discussed in C2K • Impacts within this LCA will be due to localised vegetation removal, major earthworks (e.g. cuts and embankments) and proposed road and creek bridges • It is considered that the impact on the proposed alignment will be most evident for rural residents of Grantham, Laidley, Cunninghams Crest and Grandchester (G6, G14, G15 and G18), where new infrastructure is proposed within privately owned land, in close proximity to rural residential properties and social infrastructure • Residents in elevated rural residential areas of Grantham (G6) will have direct views to the proposed alignment and embankments but the LCT is only affected along the periphery of the area • Rural residential properties on the outskirts of Laidley (G14) will have close, direct views to the proposed alignment and major earthworks • Elevated rural residents of Cunninghams Crest (G15) will have elevated close views towards the alignment, including tunnel portals and ventilation buildings. However, most of the impact through this section is in tunnel, so will not affect the character at the surface level. • The alignment passes through Grandchester (G18) on low embankment, with the exception of the Western Creek 1 Rail Bridge, limiting the influence of the alignment on landscape character • While the rural residential areas of Helidon Spa, Helidon, Placid Hills, Gatton, Regency Downs, Laidley Heights and Grandchester (LCA G4, G5,

Type G: Rural Living	
	G7, G11, G12, G13 and G17) are within relatively close proximity to the alignment, the proposed alignment follows the existing railway corridor and the alignment is buffered by remnant vegetation • Overall, therefore, the impact on this LCT is at most ***Moderate***.
Significance of effect	• The effect of the Project on LCTG: Rural Living is ***Moderate***.

7.1.8 Landscape character type H

Table 28: Summary description of LCT H: Forested Uplands

Type H: Forested Uplands	
Landscape Baseline Assessment	
Location and boundaries	This landscape type is typically associated with elevated, undulating areas of the Great Dividing Range, Little Liverpool Range, Main Paradise Range, Mistake Mountains and Marburg Range. There are 11 LCAs of this type in the LVIA study area – the *Murphys Creek Forested Uplands* (LCA H1), *Redwood Forested Uplands* (LCA H2), *Mount Davidson Forested Uplands* (LCA H3), *Stringybark Mountain Forested Uplands* (LCA H4), *Lockyer National Park Forested Uplands* (LCA H5), *Gatton National Park Forested Uplands* (LCA H6), *Mantheys Knob Forested Uplands* (LCA H7), *Laidley Forested Uplands* (LCA H8), *Sommerholm Forested Uplands* (LCA H9), *Little Liverpool Range Forested Uplands* (LCA H10) and the *Perrys Knob Forested Uplands* (LCA H11).
Typical character images:	
     	
Key characteristics	• Elevated and undulating topography, typically above 100 m AHD • Areas of very steep slopes • Distinctive landform including mountain peaks and prominent ridgelines, such as those of the Great Dividing Range and Little Liverpool Range • Incised dry creek valleys where waterways drain the elevated area • Typically, eucalyptus woodland or forest but microclimatic variation includes areas of other vegetation including fragment rainforest • Generally, an enclosed landscape with limited public access and limited views • Highly visible landscape type throughout the LVIA study area • Most elevated areas of this type, including peaks of the Great Dividing Range, Little Liverpool Range, Main Paradise Range, Mistake Mountains

	and Marburg Range, 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**).
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 (some rural residential properties along prominent ridgelines near Laidley) and little large-scale infrastructure elements • Cunningham's Crest scenic lookout is located within the Little Liverpool Range • The existing West Moreton System rail corridor transects both the Great Dividing Range and Little Liverpool Range • Some telecommunications towers and powerlines in elevated locations • Extensive sandstone quarry operations, both historic and present near Helidon. Typically, these operations are screened by dense native vegetation.
Landscape character sensitivity assessment	• This landscape character type has little capacity to accommodate development as this would require vegetation clearance which would be visually intrusive in this elevated and undulating landscape • Key areas of this LCT are also protected for their scenic qualities and are of state significance (e.g. Peaks of the Great Dividing Range, Little Liverpool Range, Main Paradise Range, Mistake Mountains and Marburg Range) • Therefore, the landscape sensitivity of this landscape type is considered to be ***High***.
Impact Assessment	
Magnitude of change assessment	• The alignment directly transects LCA H5: Lockyer National Park and H10: Little Liverpool Range • Within LCA H5, the alignment passes through privately owned land. The alignment is approximately 2 km south of the Lockyer National Park boundary. The key impact within this area will be due to extensive clearing due to proposed earth works to facilitate the construction of the railway corridor, embankments and new road infrastructure. • Within LCA H10, the alignment deviates from the existing railway corridor, passing through privately owned land located within the Little Liverpool Range. The key impact within this area will be as a result of the extensive clearing due to proposed earth works to facilitate the construction of the railway corridor, embankments, large cuts and tunnels, which may be visible from Cunninghams Crest Lookout and elevated residential properties on Range Crescent and Kessling Drive (discussed further in the Visual Impact Assessment). • A portion of the alignment within the Little Liverpool Range will be tunnelled, reducing the surface impact of the Project on landscape values • Elsewhere this landscape type is not within proximity to the alignment, therefore the impacts on this landscape type would be indirect • The impact will fundamentally change the character of the landscape from natural and rural landscape (of regional significance) to a landscape dominated by infrastructure. However, this effects only a small area of this Landscape Type which results in an overall ***Moderate*** magnitude of change.
Significance of effect	• The effect of the Project on LCT H: Forested Uplands is ***High***.

8. Visual Impact Assessment

Seventeen viewpoints have been selected within the LVIA study area to represent potential visual impacts across the LVIA study area. These are identified in **Figure 9: Key visual receptors and location of representative viewpoints** (refer Appendix 1) and described in **Table 29** to **Table 45**.

8.1. Viewpoint Assessment

8.1.1 Viewpoint 1

Table 29: Likely visual effect of the Project on Viewpoint 1

VP1: Airforce Road near 45 and 47 Airforce Road, looking northwest	
Visual Baseline Assessment	
 **Existing view from Viewpoint 1 (VP1)** *Refer* ***to*** **Figure 24: Viewpoint 1: Air Force Road looking northwest and visualisation** *in Appendix 2 for appropriate scaled image.*	
Location and description	• GPS Location: 27°32'25.446" S 152°7'20.34" E • Elevation: 160.0 m • North-westerly view from Airforce Road towards proposed road over rail bridge and future access road to Lockyer National Park • Proposed alignment is approximately 190 m north of this viewpoint, while proposed road over rail bridge is approximately 300 m northwest of this viewpoint • Represents typical and accessible views of nearby rural residents and of travellers travelling along Airforce Road • Due to road realignment works associated with the Project, this viewpoint is also representative of future views that will be experienced by visitors to Lockyer National Park • Relatively dense vegetated shelter belt along Airforce Road and vegetation to the west of the existing rail line on private rural property contribute to rural character of this viewpoint • Elevated areas to the north of this viewpoint are considered to have high scenic amenity and are included on the Regional Significant Scenic Amenity overlay; however, this particular viewpoint is not located in the overlay area • North-westerly views from this viewpoint provide views towards the proposed alignment, Airforce Road road-over-rail bridge, and landscapes typical of LCA H: Forested Uplands (LCA H5: Lockyer National Park Forested Uplands).
Key visual sensitivities	• Receptors include a small number of rural residents, workers and other travellers experiencing transient views along Airforce Road (AADT around 567 per day, of which up to 9 per cent are heavy vehicles)

	• The presence of the existing rail line and existing infrastructure (power poles and powerlines) and reduces the overall sensitivity of this view • This viewpoint is considered to have a ***Low*** sensitivity overall to the change proposed, due to the low number and interest of viewers (i.e. small numbers of nearby rural residents and travellers along Airforce Road).
Visual Evaluation	
 **Visualisation from Viewpoint 1 (VP1)** *Refer to* **Figure 24: Viewpoint 1: Air Force Road looking northwest and visualisation** *in Appendix 2 for appropriate scaled image.*	
Construction	
Magnitude of change assessment	• The proposed alignment, realignment of Airforce Road, Warrigal Road, Seventeen Mile Road and associated earthworks will introduce considerable construction works into the view. This change will be exacerbated by the proximity of the isolated rural residences to the works in this location. • The key impacts will relate to the presence of construction plant and disturbance due to the construction of the alignment, Airforce Road Bridge (minimum 7.1 m clearance over road), realignment of local roads, associated embankments and laydown area in the vicinity of this viewpoint. • The construction of the proposed alignment will require the resumption and demolition of a nearby property situated on Warrigal Road (close to but not visible in this viewpoint) • The proposed location of a laydown area northwest of this viewpoint would cause a temporary reduction in visual amenity • 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 rural properties near this viewpoint • Earthworks associated with the proposed alignment will require large volumes of material to be imported • While construction works will be clearly evident and occupy a large proportion of the view from this vantage point 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 ***Low***.
Operation	
Magnitude of change assessment - Permanent Infrastructure	• The nearest section of the alignment is approximately 190 m to the north of this viewpoint. The skyline is already affected by the presence of powerlines and the existing operational rail line is seen within the view.

	• The magnitude of change on this receptor is anticipated to be dominant, therefore high, due to the following factors: o Widespread change in the view due to the introduction of new rail infrastructure to the north of the existing rail line, realignment of Airforce Road, Warrigal Road and Seventeen Mile Road, construction of the Airforce Road Bridge (approximately 7.5 m clearance over rail with associated anti-throw barriers), and associated extensive vegetation removal o Vegetation clearing for the construction of the proposed alignment, service road and laydown area will reduce the density of screening vegetation upon completion of the works and open views to the alignment, existing railway line and permanent infrastructure o Close views to the Project alignment and new road infrastructure from local rural properties (the key visual receptor audience in this location) will be possible, due to the extensive embankments and earthworks required to facilitate the road over rail bridge (heights of up to 22 m) o 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. o At this close distance, the proposed alignment will be highly evident and will change the fundamental visual character of the landscape as currently experienced, as it will be introducing additional rail and road infrastructure into what is a relatively intact natural/rural setting. This represents a ***High*** magnitude of change.
Magnitude of change assessment - Train	• Movement of double stacked freight trains up to 1.8 km long with a height of up to 6.5 m will be clearly evident due to the elevated level of the railway track. Trains will be evident to travellers passing over Airforce 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 VP1 during operation is considered to be ***Moderate.***

8.1.2 Viewpoint 2

Table 30: Likely visual effect of the Project on Viewpoint 2

VP2: Seventeen Mile Road looking north	
Visual Baseline Assessment	
 **Existing view from Viewpoint 2 (VP1)** *Refer to* **Figure 25: Viewpoint 2** *in Appendix 2 for appropriate scaled image.*	
Location and description	• GPS Location: 27°32'29.657" S 152°8'12.485" E • Elevation: 185.0 m • North-easterly view from Seventeen Mile Road, the access road to Lockyer National Park • Proposed alignment is approximately 120 m north of this viewpoint • Represents typical and accessible views of rural residents and of visitors travelling along Seventeen Mile Road towards Lockyer National Park • Dense vegetated areas beyond private residential property, including sections of Lockyer National Park, contribute to large remnant tracts of vegetation in this part of the LVIA study area • Elevated areas associated with Lockyer National Park in close proximity to this viewpoint are considered to have high scenic amenity and are included on the Regional Significant Scenic Amenity overlay and also acknowledged in the Scenic Amenity of the Lockyer study; however, this particular viewpoint is not located in the overlay area. • North-easterly views from this viewpoint provide views towards the proposed alignment including landscapes typical of LCA H: Forested Uplands (LCA H5: Lockyer National Park Forested Uplands.
Key visual sensitivities	• Receptors include a small number of rural residents, workers and other travellers experiencing transient views along Seventeen Mile Road (AADT around 220 per day, of which up to 24 per cent are heavy vehicles • The presence of existing infrastructure (power poles and powerlines) and housing reduces the overall sensitivity of this view. • This viewpoint is considered to have a **Low** sensitivity overall to the change proposed, due to the low number and interest of viewers (i.e. small numbers of nearby rural residents and travellers along Seventeen Mile Road).
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 proposed alignment and associated earthworks will introduce considerable construction works into the view. This change will be exacerbated by the proximity of the isolated rural residences to the works in this location.

	• The key impacts will relate to the presence of construction plant and disturbance due to the construction of the alignment, associated cuts and the close proximity of a laydown area to this viewpoint. • The construction of the proposed alignment will require the resumption and demolition of a nearby property situated at 133 Seventeen Mile Road (close to but not visible in this viewpoint) • The proposed location of a laydown area immediately west of this viewpoint (left hand side of the view) would cause a temporary reduction in visual amenity. • 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 rural properties near this viewpoint as well as glimpsed longer distance views from the Warrego Highway. • Earthworks associated with the proposed alignment will require large volumes of material and vegetation to be removed. • While construction works will be clearly evident and occupy a large proportion of the view from this vantage point 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 VP2 during construction is considered to be ***Low***.
Operation	
Magnitude of change assessment - Permanent Infrastructure	• The nearest section of the alignment is approximately 120 m to the north 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: o Widespread change in the view due to the introduction of new rail infrastructure into the rural landscape within a large cut, including the Seventeen Mile Road Bridge (approximately 22 m clearance over rail with associated anti-throw barriers), and associated extensive vegetation removal o Vegetation clearing for the construction of the proposed alignment, service road and laydown area will reduce the density of screening vegetation upon completion of the works and open views to the cut and permanent infrastructure o However, views to the Project 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 22 m) o 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 o At this close distance, the proposed alignment will be highly evident and will change the fundamental visual character of the landscape as currently experienced, as it will be introducing new rail infrastructure into what is a relatively intact natural/rural residential setting. This represents a ***High*** magnitude of change.
Magnitude of change assessment - Train	• Movement of double stacked freight trains up to 1.8 km long with a height of up to 6.5 m will be predominately screened due to the lower design level of the railway track. The realignment of Seventeen Mile Road will further limit viewing opportunities in this location, and it is anticipated that this view will

	only be experienced by nearby isolated rural residential residents. It is noted that views may be possible from the realigned Seventeen Mile Road (to the north of this viewpoint and the Project alignment), however these views will be transient and only experienced by a low number 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 ***Moderate.***

8.1.3 Viewpoint 3

Table 31: Likely visual effect of the Project on Viewpoint 3

VP3: Warrego Highway looking east	
Visual Baseline Assessment	
 **Existing view from Viewpoint 3 (VP3)** *Refer to* **Figure 26: Viewpoint 3: Warrego Highway looking east and visualisation** *in Appendix 2 for appropriate scaled image.*	
Location and description	• GPS Location: 27°33'12.731" S 152°11'5.693" E • Elevation: 141.0 m • Easterly view in the direction of Gatton from the Warrego Highway • Proposed alignment is approximately 140 m to the northeast of this viewpoint • Represents typical (and safely accessible) views of those travelling along the Warrego Highway towards Brisbane and Ipswich • Location is a stopping bay and help phone location but is intended to represent more generally the views from the Warrego Highway towards the alignment • Easterly views from this viewpoint provide close views towards the proposed alignment, Sandy Creek Rail Bridge and Warrego Highway Rail Bridge, including landscapes typical of LCT E: Vegetated Grazing (E5: Gatton Vegetated Grazing) landscape type and close to LCT B: Vegetated Watercourse – Creeks (B5: Sandy Creek) • Views are partially screened by existing roadside vegetation.
Key visual sensitivities	• A high number of receptors travel along the Cunningham Highway (AADT around 15,138 per day, of which up to 15 per cent are heavy vehicles) and would experience changes to the view. However, it is noted that these viewers are passing at speed and would only experience transient views. • 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.

Visual Evaluation	
 **Photomontage view from Viewpoint 3 (VP3)** *Refer to* **Figure 26: Viewpoint 3: Warrego Highway looking east and 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 • 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 Warrego Highway and surrounding rural properties • Earthworks associated with the proposed alignment will require the movement of large volumes of material • The presence of plant constructing the alignment, Sandy Creek Rail Bridge (12.8 m clearance) and Warrego Highway Rail Bridge (8.1 m clearance), service road, cuts and embankments will temporarily change the character of the landscape, creating a considerable change in the landscape character of this viewpoint • While construction works will be clearly evident from this vantage point 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 VP3 during construction is considered to be ***Moderate***.
Operation	
Magnitude of change assessment - Permanent Infrastructure	• The nearest section of the alignment is approximately 135 m to the northeast of this viewpoint, while the proposed Warrego Highway Rail Bridge is approximately 260 m to the east. The infrastructure is anticipated to be dominant, therefore a high magnitude of change, due to the following factors: o Change due to the provision of new rail infrastructure, including Sandy Creek Rail Bridge, large embankments and the Warrego Highway Rail Bridge (6.5 m minimum clearance over road) with associated anti-throw barriers in the central right-hand side of the view o Vegetation clearing for the construction of the proposed alignment, Sandy Creek Rail Bridge, Warrego Highway Rail Bridge and laydown area will reduce the density of screening vegetation, increasing the visibility of the alignment from the Warrego Highway and surrounding rural properties

	○ 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, Sandy Creek Rail Bridge and Warrego Highway Rail Bridge will be highly evident and will have a dominant impact on the character of the landscape as it will be introducing new rail infrastructure into what is currently a relatively intact and vegetated rural setting as experienced from the highway. This represents a ***High*** magnitude of change.
Magnitude of change assessment - Train	• Movement of double stacked freight trains up to 1.80 km long with a height of 6.50 m will be highly evident from the Warrego Highway due to the elevated design level of the railway track. While experienced by a large number of motorists, these views are of transient nature and will be only occasional. 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 32: Likely visual effect of the Project on Viewpoint 4

VP4: Beavan Street looking southwest towards existing Lockyer Creek rail bridge	
Visual Baseline Assessment	
 **Existing view from Viewpoint 4 (VP4)** *Refer to* **Figure 27: Viewpoint 4: Beavan Street looking southwest towards existing Lockyer Creek rail bridge and visualisation** *in Appendix 2 for appropriate scaled image.*	
Location and description	• GPS Location: 27°33'5.747" S 152°16'40.704" E • Elevation: 100.0 m • South-westerly view towards Lockyer Creek, Gatton Railway Bridge and William Kemp Park beyond • Proposed alignment is approximately 250 m to the southwest of this viewpoint • Represents typical views of residents located on the western edge of Gatton and of visitors, workers and tourists travelling along Beavan Street. This viewpoint is also representative of views obtained from William Kemp Park.

	• South-westerly views from this viewpoint provide open views towards the existing Lockyer Creek Rail Bridge and the proposed alignment, as well as landscapes typical of LCT B: Vegetated Watercourse – Creek (B1: Lockyer Creek), LCT F: Rural Settlement (F5: Gatton) and LCT C: Irrigated Cropland (C16: Gatton North).
Key visual sensitivities	• Receptors, including a relatively high number of nearby residents, visitors to William Kemp Park and workers and travellers along Beavan Street • The presence of existing infrastructure (power poles, powerlines, and existing road and rail bridge structures) 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 relatively large number of nearby residential viewers with a specific interest in this view and the proximity of this viewpoint to William Kemp Park, which accommodates overnight caravan parking.
Visual Evaluation	
 **Photomontage view from Viewpoint 4 (VP4)** *Refer to* **Figure 27: Viewpoint 4: Beavan Street looking southwest towards existing Lockyer Creek rail bridge and visualisation** *in Appendix 2 for appropriate scaled image.*	
Construction	
Magnitude of change assessment	• The construction of the alignment and construction of Lockyer Creek Rail Bridge will result in extensive disturbance, creating a considerable temporary change in the landscape character of this viewpoint • Vegetation clearing for the construction of the proposed alignment, bridge structures, laydown area, and realignment of Smithfield Road reduce the density of screening vegetation, increasing the visibility of the alignment from nearby residential properties and Beavan Road • 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 250 m to the southwest of this viewpoint. The skyline is already affected by the presence of powerlines, power poles and the existing Lockyer Creek Rail Bridge and Smithfield Road Bridge. The magnitude of change on this receptor is anticipated to be considerable, therefore **Moderate**, due to the following factors: ○ Vegetation clearing for the construction of the proposed alignment, bridge structures, laydown area, and realignment of Smithfield Road

	○ Introduction of new infrastructure, including the realignment of Smithfield Road, and the provision of a new road and road bridge between Beavan Street and Beavan Street, the Smithfield Road Bridge (approximately 4.7 m clearance) with associated anti-throw barriers, which will be a new element in the view ○ Duplication of the Lockyer Creek Rail Bridge (approximately 4.7 m clearance) which will also be a new element in the view ○ Provision of the new road bridge will provide elevated views over the general landscape and alignment, increasing the visibility of the Project ○ 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 Smithfield Road Bridge and Lockyer Creek Rail Bridge will be highly evident and will have a considerable impact on the character of the landscape as it will be replacing the existing Smithfield Road Bridge with a much larger structure and introducing new modern rail bridge infrastructure into the current view. This represents a ***Moderate*** magnitude of change.
Magnitude of change assessment - Train	• Movement of double stacked freight trains up to 1.80 km long with a height of 6.50 m will be highly evident due to the elevated situation of the railway track and Lockyer Creek Rail Bridge. While anticipated to be experienced by numerous motorists, these views are of a transient nature, and the key visual receptors will be nearby residents. It is noted that the existing rail line and rail bridge currently facilitate freight train movements, albeit single stacked. Therefore, the magnitude of change is considered to be ***Low***.
Significance of effect (Operation)	The effect of the Project on VP4 during operation is considered to be ***Moderate.***

8.1.5 Viewpoint 5

Table 33: Likely visual effect of the Project on Viewpoint 5

VP5: Gatton RSL car park looking northwest towards existing Railway Station and pedestrian crossing	
Visual Baseline Assessment	
 **Existing view from Viewpoint 5 (VP5)** *Refer to* **Figure 28: Viewpoint 5** *in Appendix 2 for appropriate scaled image.*	
Location and description	• GPS Location: 27°33'19.787" S 152°16'45.198" E • Elevation: 107.0 m

	• North-easterly view towards Gatton Rail Station and pedestrian bridge from the Gatton RSL car park off Crescent Street • Proposed alignment is approximately 20 m to the north of this viewpoint • Represents typical and accessible views of visitors, workers and tourists visiting the Gatton CBD and Gatton RSL • North-easterly views from this viewpoint provide open views towards the proposed alignment, existing Gatton Station and pedestrian bridge, therefore are considered to be partially representative of views from Gatton Station • Views encompass LCT F: Rural Settlement (F5: Gatton).
Key visual sensitivities	• Receptors, including a relatively high number of nearby residents, workers and travellers driving along Crescent Street and visitors to Gatton RSL • The presence of existing infrastructure (power poles, powerlines, lights and rail infrastructure) 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 Gatton CBD location with a high number of receptors, most of whom would have an interest in views from this location e.g. nearby residents and members and visitors of Gatton RSL and nearby residents, albeit that this is not a particularly scenic viewpoint which includes existing railway infrastructure and is not specifically visited for its scenic amenity value.
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 activities associated with the proposed alignment within the existing rail corridor will result in disturbance which will create a noticeable change in the landscape character of this viewpoint • The lack of existing vegetation enables open views to be obtained from nearby residential properties to the proposed alignment and laydown areas located to both the north and south of the alignment • The presence of plant constructing the alignment, Gatton Station Pedestrian Bridge, and realignment of Hickey Street will temporarily change the character of the landscape during construction, creating a noticeable change in the landscape character of this viewpoint • This represents a ***Low*** 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 20 m to the north of this viewpoint • The skyline is already affected by the presence of power poles, powerlines, lights and rail infrastructure. The change in view will be noticeable, due to the following factors: o Noticeable change due to the introduction of a new single track dual-gauge railway to the north of the existing rail line, in low cut through most of this section and consistent with the existing visual character of the landscape o Realignment of Hickey Street o Replacement of the existing pedestrian bridge (timber structure) with the proposed Gatton Station Pedestrian Bridge (approximately 7.1 m

	clearance over rail and 12.5 m height above rail level), which will include perforated mesh anti-throw screens ○ The proposed bridge structure will be a significantly larger and more visually dominant than the existing timber structure, due to requirements to comply with QR pedestrian overbridge design specifications and disability requirements ○ The extension of the existing station platforms will be required to provide a connection to proposed lift and stairs structures ○ Due to the sparse nature of existing vegetation, vegetation clearing for the construction of the proposed alignment, and laydown areas will not have an impact of the visibility of the permanent rail infrastructure ○ Fencing is to be provided for the extent of the rail corridor, typically located on the corridor boundary. Fencing will comprise standard QR station fencing unless otherwise designed during detailed design. ○ At this distance, the alignment will be noticeable, however, it will not change the fundamental visual character of the landscape, as it will be introducing new rail infrastructure into an existing rail corridor. This represents a ***Low*** magnitude of change. ○ Options for noise attenuation are currently being explored, including an option that includes the provision of noise barriers within the vicinity of this location (to the northern side of the railway line adjacent Hickey Street). It is noted that if noise barriers were installed in this location, the magnitude of change would be increased and considered to be up to ***High***.
Magnitude of change assessment - Train	• Movement of double stacked freight trains up to 1.80 km long with a height of 6.50 m will be highly evident due to the open views of the railway track from this viewpoint. Close views to the alignment will be possible for travellers along Hickey Street and Crescent Street and those parking in the Gatton RSL carpark, as well as pedestrians passing over the new Gatton Station Pedestrian Bridge. While experienced by a relatively high number of motorists and pedestrians, these views are of transient nature, and the key visual receptors will be nearby residents. It is noted that the existing rail line and rail bridge currently facilitate freight train movements, albeit single stacked. Therefore, the magnitude of change is considered to be ***Low***.
Significance of effect (Operation)	The effect of the Project on VP5 during operation is considered to be ***Moderate.*** It is noted that if noise barriers are installed in this location, the effect of the Project during operation would be increased and would be considered to be ***Major***.

8.1.6 Viewpoint 6

Table 34: Likely visual effect of the Project on Viewpoint 6

VP6: Spencer Street looking northeast near Gatton Showgrounds	
Visual Baseline Assessment	
 **Existing view from Viewpoint 6 (VP6)** *Refer to* **Figure 29: Viewpoint 6: Spencer Street looking northeast near Gatton Showgrounds – (base case) and visualisation (initial mitigation)** *in Appendix 2 for appropriate scaled image.*	
Location and description	• GPS Location: 27°33'30.371" S 152°16'55.673" E • Elevation: 103.0 m • North-easterly view towards Eastern Drive road bridge from Spencer Street looking northeast near Gatton Showgrounds • Proposed alignment is located approximately 250 m to the north of this viewpoint • Represents typical views of visitors, workers and tourists travelling along Eastern Drive/Spencer Street and is also representative of viewers visiting Gatton Showgrounds and the Lockyer Valley Sports and Aquatic Centre • North-easterly views from this viewpoint provide open views towards the proposed Eastern Drive Road Bridge within LCT F: Rural Settlement (F5: Gatton).
Key visual sensitivities	• Relatively high number of receptors include nearby residents, visitors to Gatton Showgrounds, Gatton Indoor Equestrian Centre and Lockyer Valley Sports and Aquatic Centre, as well as workers and travellers along Eastern Drive (AADT around 11,941 per day, of which up to around 11 per cent are heavy vehicles) • The urban character including the presence of industrial properties and existing infrastructure (power poles, powerlines, and street lights) reduces the overall sensitivity of this view • This viewpoint is considered to have a ***Moderate*** sensitivity overall to the change proposed, due to the relatively high number and sensitivity of viewers (e.g. large numbers of travellers on Eastern Drive and nearby residents) but recognising that this is not a scenic viewpoint specifically visited for the purposes of appreciating visual amenity.

VP6: Spencer Street looking northeast near Gatton Showgrounds	
Visual Evaluation	
 **Photomontage view from Viewpoint 6 (VP6) (initial mitigation)** *Refer to* Figure 29: Viewpoint 6: Spencer Street looking northeast near Gatton Showgrounds – (base case) and visualisation (initial mitigation) *in Appendix 2 for appropriate scaled image.*	
 **Photomontage view from Viewpoint 6 (VP6) (value-add 1 mitigation)** *Refer to* Figure 30: Viewpoint 6 Spencer Street looking northeast near Gatton Showgrounds - visualisation (value-add 1 and value-add 2 mitigation) *in Appendix 2 for appropriate scaled image.*	
 **Photomontage view from Viewpoint 6 (VP6) (value add-2 mitigation)** *Refer to* **Figure 30: Viewpoint 6 Spencer Street looking northeast near Gatton Showgrounds - visualisation (value-add 1 and value-add 2 mitigation)** *in Appendix 2 for appropriate scaled image.*	
Construction	
Magnitude of change assessment	• Significant construction areas proposed within this viewpoint • Removal of vegetation within the disturbance area to facilitate development will be clearly evident; including existing mature vegetation located within the

	disturbance area that are likely to be removed to facilitate the reconfiguratio of the bridge and road alignment • Construction of proposed embankments, cuts, rail, Eastern Drive Road Bridge infrastructure and the realignment of Chadwick Road, Golf Links Drive and Crescent Street will cause disturbance within the landscape • The construction of the proposed realignment of Chadwick Road will require the resumption of the Christian Life Centre facility located on the corner of Golf Links Drive and Woodlands Road (right hand side of view) • At this close distance, construction works and laydown areas will be highly evident and change the visual character of the landscape. As this change will be temporary, this is considered to be a ***Moderate*** magnitude of change.
Significance of effect (Construction)	The effect of the Project on VP6 during construction is considered to be ***Moderate***.
Operation	
Magnitude of change assessment - Permanent Infrastructure	• The Eastern Drive Road Bridges (7.5 m clearance over rail) are the main permanent infrastructure, which are located approximately 300 m to the northeast of this viewpoint. Other visible changes include local road realignments of Golf Links Drive, Chadwick Road and Crescent Street. • The magnitude of change on this receptor is anticipated to be considerable, due to the following factors: o There is already a road bridge present over the railway in this location o The skyline is already affected by the presence of power poles and street lighting o Proposed earthworks including a new road bridge (clearance of around 7.9 m) with associated anti-throw barriers, with the Project alignment passing beneath this approximately parallel to the existing rail line o Height of proposed embankments varies, with the maximum proposed height being approximately 8.70 m above natural ground, and the deepest cut being approximately -8.70 m below existing surveyed level o Due to the relatively sparse nature of existing vegetation, vegetation clearance will have minimal impact on the screening of the alignment o 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. o At this distance, the alignment and associated infrastructure will be clearly evident, and represent a considerable change to the view, although will largely accord with the existing character of the landscape. Therefore, it is considered to be up to ***Moderate*** magnitude of change.
Magnitude of change assessment - Train	• Movement of double stacked freight trains up to 1.80 km long with a height of 6.50 m will be partially screened from this vantage point, because the Project alignment will be below the rail bridge, behind abutments. However, views of passing freight trains will be possible from the new Eastern Drive road bridges. It is noted that the existing rail line and rail bridge currently facilitate freight train movements, albeit single stacked. As these would be glimpsed transient views, 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 ***Moderate.***

8.1.7 Viewpoint 7

Table 35: Likely visual effect of the Project on Viewpoint 7

VP7: Gordon Street looking northwest towards level crossing	
Visual Baseline Assessment	
 **Existing view from Viewpoint 7 (VP7)** *Refer to* **Figure 31: Viewpoint 7: Gordon Street looking northwest towards level crossing (base case) and visualisation** *in Appendix 2 for appropriate scaled image*.	
Location and description	• GPS Location: 27°35'24.167" S 152°21'30.395" E • Elevation: 91.0 m • North-westerly view towards Anzac Park, and the existing controlled level crossing • Proposed alignment is approximately 40 m to the northeast of this viewpoint • Represents typical views of residents of Forest Hill and of visitors, workers and tourists travelling along Gordon Street • North-westerly views from this viewpoint provide open views towards the proposed alignment, including landscapes typical of LCT F: Rural Settlement (F7: Forest Hill).
Key visual sensitivities	• High sensitivity of receptors, including nearby residents of Forest Hill and visitors to the town (which includes travellers using the Cobb and Co scenic drive staging post at Forest Hill), as well as travellers driving along Forest Hill-Fernvale Road, Railway Street, Glenore Grove Road and Gordon Street • The presence of existing infrastructure (power poles, powerlines, rail lines and a controlled level crossing) 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 type of viewers in close proximity to the Project alignment (local residents and tourists visiting Forest Hill).
Visual Evaluation	
 **Photomontage view from Viewpoint 7 (VP7) (without concept noise barriers)**	

VP7: Gordon Street looking northwest towards level crossing

Refer to **Figure 31: Viewpoint 7: Gordon Street looking northwest towards level crossing (base case) and visualisation** *in Appendix 2 for appropriate scaled image.*

Photomontage view from Viewpoint 7 (VP7) (with 5 m concept noise barriers, concrete only – option 1)
Refer to **Figure 32: Viewpoint 7: Gordon Street looking northwest towards level crossing visualisation (with noise barriers)** *in Appendix 2 for appropriate scaled image.*

Photomontage view from Viewpoint 7 (VP7) (with 5 m concept noise barriers, top edge treatment and soft finishing – option 2)
Refer to **Figure 32: Viewpoint 7: Gordon Street looking northwest towards level crossing visualisation (with noise barriers)** *in Appendix 2 for appropriate scaled image.*

Photomontage view from Viewpoint 7 (VP7) (with 5 m concept noise barriers, soft finishing and barrier segments offset – option 3)
Refer ***to*** **Figure 32: Viewpoint 7: Gordon Street looking northwest towards level crossing visualisation (with noise barriers)** *in Appendix 2 for appropriate scaled image.*

Construction	
Magnitude of change assessment	• Construction works for the realignment of Gordon Street, Glenore Grove Road, and the relocation of the controlled level crossing will have a temporary impact on nearby residents and commercial buildings • At this distance, views towards construction works from surrounding properties and Gordon Street will be close and will 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 40 m to the northeast of this viewpoint • The existing residential properties will not be directly affected by the Project • The skyline is already affected by the presence of powerlines, power poles and existing rail infrastructure • The permanent infrastructure is anticipated to be noticeable, due to the following factors: o Noticeable change due to the provision of a new single track dual-gauge railway to the north of the existing rail line o New level crossing will be visible but is a replacement of the existing controlled level crossing infrastructure o 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. o At this distance, the alignment will be noticeable however it will not change the fundamental visual character of the landscape, as it will be introducing new rail infrastructure into the existing rail corridor. This represents a ***Moderate*** magnitude of change. o Options for noise attenuation are currently being explored, including an option that includes the provision of noise barriers within the vicinity of this location (to the east of the level crossing along Railway Street and Gordon street). It is noted that if noise barriers were installed in this location, the magnitude of change would be increased and considered to be up to ***High***.
Magnitude of change assessment - Train	• Movement of double stacked freight trains up to 1.80 km long with a height of 6.50 m will be evident due to the open views of the railway track from this viewpoint and surrounding residential properties. Close views to the alignment will be possible for travellers along Forest Hill-Fernvale Road, Railway Street, Glenore Grove Road and Gordon Street, as well as patrons of the Lockyer Hotel and people visiting Anzac Park, part of the Cobb and Co tourist drive. This view will be experienced by a relatively high number of residents and visitors to Forest Hill, however it is noted that the existing rail line currently facilitates freight train movements, albeit single stacked. Therefore, the magnitude of change is considered to be ***Low***.
Significance of effect (Operation)	The effect of the Project on VP7 during operation is considered to be ***High***. It is noted that if noise barriers are installed in this location, the effect of the Project during operation would be increased and would be considered to be ***Major***.

8.1.8 Viewpoint 8

Table 36: Likely visual effect of the Project on Viewpoint 8

VP8: Laidley-Plainlands Road looking north towards bridge crossing	
Visual Baseline Assessment	
 **Existing view from Viewpoint 8 (VP8)** *Refer to* Figure **33: Viewpoint 8: Laidley-Plainlands Road looking north towards bridge crossing** and visualisation *in Appendix 2 for appropriate scaled image.*	
Location and description	• GPS Location: 27°36'59.96"S 152°23'51.61"E • Elevation: 108 m • Northerly view towards intersection of Laidley-Plainlands Road and Old Laidley-Forest Hill Road. The Laidley Cultural Centre and Bichel Cricket Oval are immediately to the north of the existing residential property shown in the left-hand side of the view. • Proposed alignment is approximately 70 m to the north of this viewpoint • Represents typical views of travellers along Laidley-Plainlands Road and nearby residents on the northern outskirts of Laidley • Northerly views from this viewpoint provide views towards the proposed alignment, realignment of Old Laidley-Forest Hill Road, proposed rail over road bridge as well as including landscapes typical of LCT F: Rural Settlement (F9: Laidley), LCT C: Irrigated Croplands (C27: Laidley) and LCT D: Dry Croplands and Pastures (D15: Laidley).
Key visual sensitivities	• Moderate number of receptors, including travellers along Laidley-Plainlands Road (AADT around 5,632 per day, of which up to 6.10 per cent are heavy vehicles) and a small number of existing residential properties (existing properties shown within this view are within the temporary construction disturbance footprint therefore likely to be resumed). It is noted that this viewpoint is near the entrance to Valley Vista estate. • This viewpoint it is considered to have a ***Moderate*** sensitivity overall to the change proposed, due to the proximity of this viewpoint to the Laidley Cultural Centre, proximity to emerging residential areas of Valley Vista Estate and Cunningham Park, as well as the moderate number of travellers on Laidley-Plainlands Road with a lack of specific interest in the view experiencing transient views • This view is also representative of driver views experienced from Old Laidley-Forest Hill Road.

Visual Evaluation	
 **Photomontage view from Viewpoint 8 (VP8)** *Refer **to*** **Figure 33: Viewpoint 8: Laidley-Plainlands Road looking north towards bridge crossing and 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 proximity of the Laidley Cultural Centre, cricket oval and nearby residences within Valley Vista Estate and Cunningham Park estate to the works in this location. • The proposed location of a laydown immediately north of this viewpoint would cause a reduction in visual amenity from this viewpoint, however this would be temporary • Earthworks associated with the proposed alignment will require large volumes of material to be brought in for the construction of proposed embankments (heights up to approximately 8.6 m within this view) • Clearance of vegetation will be typically limited to existing vegetation within private residential properties due to the relatively open rural nature of this view • The key impacts will relate to the presence of construction plant and disturbance due to the construction of the alignment and embankments • While construction works will be clearly evident from this vantage point 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 VP8 during construction is considered to be ***Moderate***.
Operation	
Magnitude of change assessment - Permanent Infrastructure	• The nearest section of the alignment is approximately 70 m to the north of this viewpoint. The skyline is already affected by the presence of infrastructure (street lights, power poles and powerlines). • The magnitude of change on this receptor is anticipated to be dominant, therefore high, due to the following factors: o Introduction of new rail infrastructure within what is currently a relatively intact rural setting, including major earthworks and a rail over road bridge over Laidley-Plainlands Road o Resumption of existing residential properties shown within the view o Realignment of Old Laidley-Forest Hill Road o 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, bridge infrastructure and embankments (up to around 8.6 m high) 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 rural setting. This represents a ***High*** magnitude of change.
Magnitude of change assessment - Train	• Movement of double stacked freight trains up to 1.8 km long with a height of up to 6.5 m will be experienced by a moderate number of travellers along Laidley-Plainlands Road and Old Laidley-Forest Hill Road. Views to the train will also be experienced by nearby residents of Valley Vista Estate and Cunningham park estate. Therefore, the magnitude of impact is considered to be ***High***.
Significance of effect (Operation)	The effect of the Project on VP8 during operation is considered to be ***High***.

8.1.9 Viewpoint 9

Table 37: Likely visual effect of the Project on Viewpoint 9

VP9: Patrick Street Underpass looking northwest	
Visual Baseline Assessment	
 **Existing view from Viewpoint 9 (VP9)** *Refer to* **Figure 34: Viewpoint 9: Patrick Street Underpass looking northwest and visualisation** *in Appendix 2 for appropriate scaled image.*	
Location and description	• GPS Location: 27°37'11.28"S 152°24'11.79"E • Elevation: 102 m • North-westerly view towards residential properties within Valley Vista estate and the alignment from Hardy Drive • Proposed alignment is approximately 80 m to the northeast of this viewpoint, while the proposed rail over road bridge over Francis Road is approximately 115 m to the north of this viewpoint • Represents typical views of residents and visitors of the Valley Vista Estate. Is also representative of typical views from the nearby Cunningham Park residential estate • Elevated areas visible in the background of the view are considered to have high scenic amenity and are included on the Regional Significant Scenic Amenity overlay and also acknowledged in the Scenic Amenity of the Lockyer study; however, this particular viewpoint is not located in the overlay area

VP9: Patrick Street Underpass looking northwest	
	• North-westerly views from this viewpoint provide views towards the proposed alignment, as well as including landscapes typical of LCT F: Rural Settlement (F9: Laidley), LCT D: Dry Croplands and Pastures (D15: Laidley) and LCT E: Vegetated Grazing (E10: Laidley North).
Key visual sensitivities	• Relatively high number of receptors, including numerous residential properties and visitors of Valley Vista estate • Existing residential area set within a strongly rural context • This viewpoint it is considered to have a ***Moderate*** sensitivity overall to the change proposed, due to the relatively high number of nearby residential viewers with a specific interest in this view and the proximity of this viewpoint to proposed alignment.
Visual Evaluation	
 **Photomontage view from Viewpoint 9 (VP9)** *Refer to* **Figure 34: Viewpoint 9: Patrick Street Underpass looking northwest and 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 proximity of residences with Valley Vista estate to the works in this location. • The proposed location of a laydown immediately north of this viewpoint would cause a reduction in visual amenity from this viewpoint, however this would be temporary • Earthworks associated with the proposed alignment will require large volumes of material to be brought in • The key impacts will relate to the presence of construction plant and disturbance due to the construction of the alignment and embankments • Construction works will be clearly evident from this vantage point, and although the impact of these is temporary this would be a dominant change and ***High*** magnitude of change.
Significance of effect (Construction)	The effect of the Project on VP9 during construction is considered to be ***High***.
Operation	
Magnitude of change assessment - Permanent Infrastructure	• The nearest section of the alignment is approximately 80 m to the north of this viewpoint. The skyline is already affected by the presence of street lights.

VP9: Patrick Street Underpass looking northwest	
	• The magnitude of change on this receptor is anticipated to be dominant, therefore high, due to the following factors: o Introduction of new rail infrastructure within what is currently a relatively intact rural setting, including major earthworks o Provision of a road over rail bridge over Francis Road, a key access road within the residential development o 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. o At this distance, the alignment and embankments (up to around 8.7 m high within this view) 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 rural setting for the estate. This represents a ***High*** magnitude of change.
Magnitude of change assessment - Train	• Movement of double stacked freight trains up to 1.8 km long with a height of up to 6.5 m will be experienced by a large number of residents at close range. Therefore, the magnitude of impact is considered to be ***High***.
Significance of effect (Operation)	The effect of the Project on VP9 during operation is considered to be ***High***.

8.1.10 Viewpoint 10

Table 38: Likely visual effect of the Project on Viewpoint 10

VP10: Hardy Drive looking northeast down Rampton Street over new subdivision	
Visual Baseline Assessment	
 **Existing view from Viewpoint 10 (VP10)** *Refer to* **Figure 35: Viewpoint 10** *in Appendix 2 for appropriate scaled image.*	
Location and description	• GPS Location: 27°37'15.12" S 152°24'10.685" E • Elevation: 103 m • North-easterly view towards residential properties within Valley Vista estate and the alignment from Hardy Drive • Proposed alignment is approximately 220 m to the north of this viewpoint • Represents typical views of residents and visitors of the Valley Vista and Cunningham Park residential estates • Elevated areas visible in the background of the view are considered to have high scenic amenity and are included on the Regional Significant Scenic Amenity overlay and also acknowledged in the Scenic Amenity of the

VP10: Hardy Drive looking northeast down Rampton Street over new subdivision	
	Lockyer study; however, this particular viewpoint is not located in the overlay area • North-easterly views from this viewpoint provide views towards the proposed alignment, as well as including landscapes typical of LCT F: Rural Settlement (F9: Laidley), LCT D: Dry Croplands and Pastures (D16: Forest Hill) and LCT E: Vegetated Grazing (E10: Laidley North).
Key visual sensitivities	• Relatively high number of receptors, including numerous residential properties and visitors of Valley Vista estate • Existing residential area set within a strongly rural context • This viewpoint it is considered to have a ***Moderate*** sensitivity overall to the change proposed, due to the relatively high number of nearby residential viewers with a specific interest in this view and the proximity of this viewpoint to proposed alignment.
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 proposed alignment and associated earthworks will introduce considerable construction works into the view. This change will be exacerbated by proximity of residences with Valley Vista estate to the works in this location. • The proposed location of a laydown immediately north of this viewpoint would cause a reduction in visual amenity from this viewpoint, however this would be temporary • Earthworks associated with the proposed alignment will require large volumes of material to be brought in • The key impacts will relate to the presence of construction plant and disturbance due to the construction of the alignment and embankments • While construction works will be clearly evident from this vantage point the impact of these is temporary which represents a dominant change and ***Moderate*** 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 220 m to the north of this viewpoint. The skyline is already affected by the presence of street lights. • The magnitude of change on this receptor is anticipated to be dominant, therefore high, due to the following factors: o Introduction of new rail infrastructure within what is currently a relatively intact rural setting, including major earthworks o Grade separation of Francis Road, a key access road within the residential development o 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. o At this distance, the alignment and embankments (up to around 11.20 m high) 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 rural setting for the estate. This represents a ***High*** magnitude of change.

VP10: Hardy Drive looking northeast down Rampton Street over new subdivision	
Magnitude of change assessment - Train	• Movement of double stacked freight trains up to 1.8 km long with a height of up to 6.5 m will be experienced by a large number of residents at close range. Therefore, the magnitude of impact is considered to be ***High***.
Significance of effect (Operation)	The effect of the Project on VP10 during operation is considered to be ***High***.

8.1.11 Viewpoint 11

Table 39: Likely visual effect of the Project on Viewpoint 11

VP11: Branell Homestead Luxury Cabins on Paroz Road, looking west	
Visual Baseline Assessment	
 **Existing view from Viewpoint 11a (VP11a)** *Refer to* Figure **36: Viewpoint 11a** *in Appendix 2 for appropriate scaled image.*	
 **Existing view from Viewpoint 11b (VP11b)** *Refer to* **Figure 37: Viewpoint 11b: Branell Homestead Luxury Cabins on Paroz Road, looking west visualisation** *in Appendix 2 for appropriate scaled image.*	
Location and description	• GPS Location: 27°37'45.239" S 152°25'40.494" E • Elevation: 212.0 m • Westerly view towards Branell Homestead and the town of Laidley, with distant views to the Great Dividing Range • Proposed alignment is approximately 1.2 km to the west of this viewpoint • Represents publicly accessible views typical of nearby rural residents, those staying at Branell Homestead and visitors and tourists travelling along Paroz Road • Elevated and vegetated parts of this view are considered to have high scenic amenity and are included on the Regional Significant Scenic Amenity

VP11: Branell Homestead Luxury Cabins on Paroz Road, looking west	
	overlay and also acknowledged in the Scenic Amenity of the Lockyer study; and this particular viewpoint is located in the overlay area • Westerly views from this elevated point provide panoramic views towards the proposed alignment, as well as including landscapes typical of the LCT E: Vegetated Grazing (E10: Laidley North), LCT H: Forested Uplands (H10: Little Liverpool) and LCT D: Dry Croplands and Pastures (D15: Laidley) with LCT F: Rural Settlement (F9: Laidley) in the distance.
Key visual sensitivities	• Receptors include visitors staying at Branell Homestead who are likely to be interested in the views as well as relatively low number of receptors travelling down Paroz Road • This view comprises a strong character due to the views to the distant mountains beyond and forested and rural character in the foreground. However, the scenic amenity value is reduced by views to the residential area of Laidley beyond and cabins in the foreground. • Therefore, this viewpoint it is considered to have a ***Moderate*** sensitivity overall to the change proposed, due to the sensitivity of viewers but noting relatively few receptors are able to experience sustained views.
Visual Evaluation	
No visualisation has been produced for Viewpoint 11a.	
 **Photomontage view from Viewpoint 11b (VP11b)** *Refer to* **Figure 37: Viewpoint 11b: Branell Homestead Luxury Cabins on Paroz Road, looking west visualisation** *in Appendix 2 for appropriate scaled image.*	
Construction	
Magnitude of change assessment	• The major construction activities close to this vantage point are the formation of the proposed cuts located north of Railway Street. However, these are anticipated to be screened due to the intervening forested landform. • Other construction activities would comprise selective vegetation clearance and earthworks to construct embankment and the Paroz Road rail bridge in the north (right hand side of the view) • The construction laydown area between Paroz Road and Luck Road will also be visible from this vantage point • While construction works will be evident from this vantage point the impact of these is temporary which represents a noticeable change and ***Low*** magnitude of change.
Significance of effect (Construction)	The effect of the Project on VP11 during construction is considered to be ***Low***.

VP11: Branell Homestead Luxury Cabins on Paroz Road, looking west	
Operation	
Magnitude of change assessment - Permanent Infrastructure	• The nearest section of the alignment is approximately 1.2 km to the west of this viewpoint. The magnitude of change on this receptor is anticipated to be at greatest considerable, due to the following factors: ○ Limited vegetation clearing is required for the construction of the proposed alignment ○ Provision of a new single track dual-gauge railway to the north of the existing rail line through this section ○ Introduction of the Paroz Road rail bridge that will be approximately 7.3 m high, with associated anti-throw barriers, and adjoining embankments up to around 8 m high. These will introduce rail infrastructure into the rural landscape as viewed from this vantage point. ○ Standard rural fencing is proposed extending between the corridor and private land adjoining the railway that will be in keeping with the existing rural character ○ At this distance from this elevated vantage point, the alignment will be evident and will have a considerable impact on the character of the landscape as it will be introducing major cuts and embankments into this view. This represents a ***Moderate*** magnitude of change.
Magnitude of change assessment - Train	• Movement of double stacked freight trains up to 1.8 km long with a height of up to 6.5 m will be visible in the east of the view, crossing the Paroz Road Rail Bridge, due to the elevated views of the railway track from this viewpoint and cabins. This view will be experienced by a relatively low number of receptors and the impact will be occasional. Therefore, the magnitude of change is considered to be ***Low***.
Significance of effect (Operation)	The effect of the Project on VP11 during operation is considered to be ***Moderate.***

8.1.12 Viewpoint 12

Table 40: Likely visual effect of the Project on Viewpoint 12

VP12: Douglas McInnes Drive near existing rail line, looking northwest
Visual Baseline Assessment
 **Existing view from Viewpoint 12 (VP12)** *Refer to* **Figure 38: Viewpoint 12: McInnes Drive near existing rail line, looking northwest and visualisation** *in Appendix 2 for appropriate scaled image.*

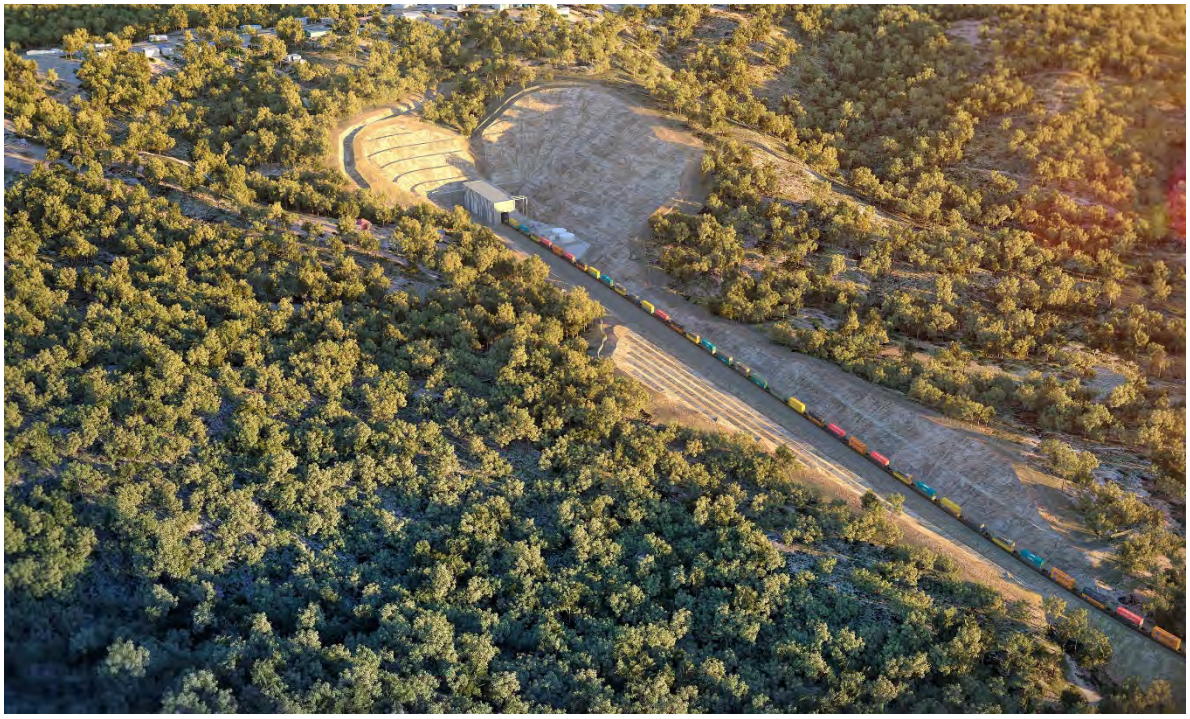
VP12: Douglas McInnes Drive near existing rail line, looking northwest	
Location and description	• GPS Location: 27°38'23.369" S 152°24'56.13" E • Elevation: 132.0 m • Northerly view towards Little Liverpool Range and the existing West Moreton System rail corridor • Proposed alignment is approximately 380 m to the northeast of this viewpoint • Represents typical and accessible views of nearby rural residents and of those travelling along Douglas McInnes Drive • Views towards the proposed alignment from LCT G: Rural Living (G14: Laidley), including landscapes typical of LCT D: Dry Croplands and Pastures (D15: Laidley) and LCT H: Forested Uplands (H10: Little Liverpool) • Elevated, vegetated areas visible in the background of the view are considered to have high scenic amenity and are included on the Regional Significant Scenic Amenity overlay and also acknowledged in the Scenic Amenity of the Lockyer study; however, this particular viewpoint is not located in the overlay area • It is noted that this viewpoint is selected to represent a range of views obtained from nearby properties, including residents and visitors of the nearby McInnes Field at Laidley residential estate.
Key visual sensitivities	• Receptors include residents and visitors of nearby rural residential properties and properties within McInnes Field residential estate • Although this view comprises a strong forested and rural character; the presence of the existing rural residential properties and the existing rail line detracts from the rural and natural qualities and sense of remoteness • This viewpoint it is considered to have a ***Moderate*** sensitivity overall to the change proposed, due to the relatively large number of potential viewers (e.g. local rural residents and residents of McInnes Field residential estate) but presence of existing rail infrastructure.
Visual Evaluation	
 **Photomontage view from Viewpoint 12 (VP12)** *Refer to* **Figure 38: Viewpoint 12: McInnes Drive near existing rail line, looking northwest and 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 proximity of residences to the works in this location. • This location is within close proximity to a laydown area that will be utilised for the construction of the western tunnel portal, bridge construction and is identified as a potential concrete batch plant • Views from this location will also provide close views to the western tunnel portal access track, therefore construction traffic will be evident

VP12: Douglas McInnes Drive near existing rail line, looking northwest	
	• Tunnel works and spoil haulage will occur seven days a week, 24 hours a day • This would cause a reduction, in visual amenity from this viewpoint, however this would be temporary • Earthworks associated with the proposed alignment will require large volumes of material and vegetation to be removed • The key impacts will relate to the presence of construction plant and disturbance due to the construction of the alignment and associated cuts and embankments • While construction works will be clearly evident from this vantage point the impact of these is largely temporary which represents a considerable change and ***High*** magnitude of change.
Significance of effect (Construction)	The effect of the Project on VP12 during construction is considered to be ***High***.
Operation	
Magnitude of change assessment - Permanent Infrastructure	• The nearest section of the alignment is approximately 380 m to the northeast of this viewpoint. The magnitude of change on this receptor is anticipated to be up to dominant due to the following factors: o Provision of a new single track dual-gauge railway to the north of the existing rail line. o At operational stage, the view will be affected by the removal of vegetation associated with cuts which will result in a loss of continuous cover in the foothills of the Little Liverpool Range. This will also reduce the density of screening vegetation. o From this - and other views in the locality (including private views that cannot be accessed for the purposes of this assessment) – views will be obtained to the deep rock cuts (up to around 20 m deep) and embankments of up to around 8 m. o 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. o At this distance, the alignment will be a highly evident feature of the landscape and, despite the presence of the existing rail that is largely at grade, will have a dominant impact on the character of the landscape. As it will be introducing major cuts and embankments this represents a ***High*** magnitude of change.
Magnitude of change assessment - Train	• Movement of double stacked freight trains up to 1.8 km long with a height of 6.50m will be highly evident due to the open views of the railway track from this viewpoint and surrounding residential properties. This view will be experienced by a relatively high number of residents; however, it is noted that the existing rail line currently facilitates freight train movements, albeit single stacked. Therefore, the magnitude of change is considered to be ***Low***.
Significance of effect (Operation)	The effect of the Project on VP12 during operation is considered to be ***High.***

8.1.13 Viewpoint 13

Table 41: Likely visual effect of the Project on Viewpoint 13

VP13: Kessling Drive, looking southwest towards western tunnel portal	
Visual Baseline Assessment	
 **Existing view from Viewpoint 13 (VP13)** *Refer to* **Figure 39: Viewpoint 13** *in Appendix 2 for appropriate scaled image*.	
Location and description	• GPS Location: 27°38'34.764" S 152°25'39.57" E • Elevation: 182.0 m • Southerly view towards private property • Proposed alignment is approximately 135 m to the southwest of this viewpoint • Represents accessible views of residents of 208-212 Kessling Drive • Southerly views from this viewpoint on the edge of LCT G: Rural Living (G15: Cunninghams Crest) towards the proposed alignment, western tunnel portal and ventilation building within LCT H: Forested Uplands (H10: Little Liverpool) • Vegetated areas visible in view are considered to have high scenic amenity and are included on the Regional Significant Scenic Amenity overlay and also acknowledged in the Scenic Amenity of the Lockyer study; and this viewpoint is located in the overlay area • Views are contained due to dense remnant vegetation
Key visual sensitivities	• Few receptors, namely residents and visitors of 208-212 Kessling Drive. As this is a cul-de-sac there will be no drivers using this road as a through route. • This view comprises a strong forested and rural character • This viewpoint it is considered to have a ***Low*** sensitivity overall to the change proposed, due to the very low number of viewers (e.g. very small number of local 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. However, a birds eye perspective visualisation (Viewpoint 13b) has been produced to illustrate the impact of the Project, in particular the western tunnel portal on Kessling Drive, Range Crescent and the Little Liverpool Range generally.	

VP13: Kessling Drive, looking southwest towards western tunnel portal	
 **Birds eye perspective view (Viewpoint 13b) from the vicinity of Viewpoint 13 (VP13)** *Refer to* **Figure 39: Viewpoint 13*b*** *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 dominant change in the landscape character of this viewpoint during construction • Due to the distance from the alignment, the most evident construction impact will be the extensive clearance of vegetation for the construction of the deep cut on the approach to the tunnel portal which will reduce the density of screening vegetation and increasing the visibility of the alignment as well as exposing rock faces • This represents a ***High*** magnitude of change.
Significance of effect (Construction)	The significance of the effect of the Project on VP13 during construction is considered to be ***Moderate***.
Operation	
Magnitude of change assessment - Permanent Infrastructure	• The viewpoint is on the edge of the temporary construction disturbance footprint, around 130 m from the alignment and 200 m from the Little Liverpool Range Tunnel portal. The magnitude of change on this receptor during operation is anticipated to be dominant, therefore high, due to the following factors: o Dominant change due to the provision of new rail infrastructure including steep deep cuts, ventilation building and tunnel portal. o Additionally, the consequence of vegetation clearing during bulk earthworks will be that views to the alignment will be more open. o At this distance, the alignment will have a dominant effect that will change the fundamental visual character of the landscape from a natural and rural landscape to a landscape characterised by the presence of railway infrastructure.

VP13: Kessling Drive, looking southwest towards western tunnel portal	
	○ This represents a ***High*** magnitude of change.
Magnitude of change assessment - Train	• Movement of double stacked freight trains up to 1.8 km long with a height of up to 6.5 m will only be experienced occasionally but at close distance, albeit in cut. Therefore, the magnitude of impact is considered to be ***Moderate***.
Significance of effect (Operation)	The effect of the Project on VP13 during operation is considered to be ***Moderate.***

8.1.14 Viewpoint 14

Table 42: Likely visual effect of the Project on Viewpoint 14

VP14: Cunningham's Crest Lookout, looking southwest towards Laidley	
Visual Baseline Assessment	
 **Existing view from Viewpoint 14 (VP14)** *Refer to* **Figure 41: Viewpoint 14** *in Appendix 2 for appropriate scaled image.*	
Location and description	• GPS Location: 27°38'23.369" S 152°24'56.13" E • Elevation: 289.0 m • South-westerly view towards the Lockyer Valley, showing acreage properties of Range Crescent in the foreground • Proposed alignment is approximately 960 m to the southwest of this viewpoint • Represents typical and accessible views of visitors and tourists visiting Cunningham's Crest Lookout, a scenic viewpoint with picnic facilities, artwork and information signage on local heritage • South-westerly views from this elevated scenic viewpoint provide elevated panoramic views towards the proposed alignment, Little Liverpool Range Tunnel western portal and ventilation building, Lockyer Valley including landscapes typical of LCT G: Rural Living (G15: Cunninghams Crest) and LCT H: Forested Uplands (H10: Little Liverpool) • Elevated and vegetated areas visible in the view are considered to have high scenic amenity and are included on the Regional Significant Scenic Amenity overlay and also acknowledged in the Scenic Amenity of the Lockyer study; and this viewpoint is located in the overlay area • Distant views to the Great Dividing Range
Key visual sensitivities	• Moderate number of visitors to Cunningham Crest Lookout who have a high level of interest in this environment and views obtained from the lookout • Although this view comprises a strong forested and rural character; the presence of the existing rural residential properties detracts from the rural and natural qualities and sense of remoteness

VP14: Cunningham's Crest Lookout, looking southwest towards Laidley	
	• Lookout has views over the regional scenic amenity area as defined in ShapingSEQ (see **Table 3** in **Section 3: Legislation, Policies, Standards and Guidelines**) • This viewpoint it is considered to have a ***Moderate*** sensitivity overall to the change proposed, due to the medium number but high sensitivity of viewers (e.g. tourists visiting Cunningham Crest Lookout in the regionally significant scenic amenity area).
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 proposed alignment, laydown areas and associated earthworks will introduce new rail infrastructure into the existing rural landscape, resulting in considerable changes 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 and laydown areas • This represents a ***Moderate*** magnitude of change.
Significance of effect (Construction)	The effect of the Project on VP14 during construction is considered to be ***Moderate***.
Operation	
Magnitude of change assessment - Permanent Infrastructure	• The nearest section of the alignment and the western Little Liverpool Range Tunnel portal and ventilation building are approximately 960 m to the southwest of this viewpoint. The skyline is already affected by the presence of powerlines, power poles and mobile towers. The magnitude of change on this receptor is anticipated to be considerable, due to the following factors: o Considerable change due to the provision of new rail infrastructure, tunnel portal and ventilation building, which will cause a considerable change in the vegetated landscape character. o Vegetation clearing during bulk earthworks and for the construction of the proposed alignment, laydown areas and tunnel portal will be noticeable due to how dense vegetation is in this location. o This represents a ***Moderate*** magnitude of change.
Magnitude of change assessment - Train	• Movement of double stacked freight trains up to 1.8 km long with a height of up to 6.5 m will be typically screened by dense foreground vegetation. Therefore, the magnitude of impact is considered to be ***Negligible.***
Significance of effect (Operation)	The effect of the Project on VP14 during operation is considered to be ***Moderate.***

8.1.15 Viewpoint 15

Table 43: Likely visual effect of the Project on Viewpoint 15

VP15: Laidley-Rosewood Road near properties 113-117, looking east	
Visual Baseline Assessment	
 **Existing view from Viewpoint 15 (VP15)** Refer to **Figure 42: Viewpoint 15** *in Appendix 2 for appropriate scaled image.*	
Location and description	• GPS Location: 27°39'31.788" S 152°26'33.39" E • Elevation: 131.0 m • Easterly views towards Laidley-Rosewood Road and private rural properties access road • Proposed alignment is approximately 175 m to the northeast of this viewpoint • Represents typical and accessible views of nearby rural residents and of those travelling along Laidley-Rosewood Road towards Grandchester, Ipswich and Brisbane • Elevated areas associated with the Little Liverpool Range in close proximity to this viewpoint are considered to have high scenic amenity and are included on the Regional Significant Scenic Amenity overlay and also acknowledged in the Scenic Amenity of the Lockyer study; however, this particular viewpoint is not located in the overlay area. • Easterly views from this viewpoint at the edge of LCT H: Forested Uplands provide open views towards landscapes typical of LCT D: Dry Croplands and Pastures (D19: Grandchester) and the proposed Rosewood-Laidley Road Rail Bridge. Views to the north are somewhat screened by existing vegetation.
Key visual sensitivities	• Receptors include isolated rural residents, workers and travellers experiencing transient views at speed along Rosewood-Laidley Road (AADT around 2,591 per day, of which up to 11.24 per cent are heavy vehicles), albeit noting that the Cobb and Co tourist route passes along this section of road • Overall, this viewpoint is considered to have a ***Low*** sensitivity to the change proposed, due to the relatively low interest of viewers (i.e. small numbers of nearby rural residents and travellers passing at some speed along Rosewood-Laidley Road).
Visual Evaluation	
Please note that no visualisation has been provided for this viewpoint, as discussed in **Section 4.9: Visual impact assessment methodology**.	

VP15: Laidley-Rosewood Road near properties 113-117, looking east	
Construction	
Magnitude of change assessment	• The proposed alignment, realignment of Rosewood-Laidley Road and Doonan's Road and associated earthworks will introduce considerable construction works into the view. This change will be exacerbated by proximity of the isolated rural residences to the works in this location. • The proposed location of a laydown area (including site offices and fuel storage) 400 m to the east of this viewpoint would cause a temporary reduction in visual amenity from this viewpoint • Substantial vegetation clearing for the construction of the proposed alignment, service and access roads and realignment of Rosewood-Laidley Road will reduce the density of screening vegetation, increasing the visibility of the alignment from Rosewood-Laidley Road and surrounding rural properties • Earthworks associated with the proposed alignment and realignment of Rosewood-Laidley Road and Doonan's Road will require the movement of large volumes of material • While construction work and plant will be clearly evident from this vantage point, 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 VP15 during construction is considered to be ***Low***.
Operation	
Magnitude of change assessment - Permanent Infrastructure	• The nearest section of the alignment is approximately 170 m to the northeast of this viewpoint. The magnitude of change on this receptor is anticipated to be dominant due to the following factors: o Dominant change due to the provision of new rail infrastructure within what is currently a relatively intact rural setting, including the Rosewood-Laidley Road Rail Bridge (8.3 m clearance over road) with associated anti-throw barriers, realignment of Rosewood-Laidley Road and Doonan's Road and major earthworks o Vegetation clearing for the construction of the proposed alignment, service and access roads and realignment of Rosewood-Laidley Road and Doonan's Road will reduce the density of screening vegetation o 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 that will be in keeping with the existing rural character. o At this distance, the alignment and new Rosewood-Laidley Road Rail Bridge will be highly evident and will 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 ***High*** magnitude of change.
Magnitude of change assessment - Train	• Movement of double stacked freight trains up to 1.8 km long with a height of up to 6.5 m will be experienced by a small number of rural residents and by those travelling on Rosewood-Laidley Road. While experienced by a moderate 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 VP15 during operation is considered to be ***Moderate.***

8.1.16 Viewpoint 16

Table 44: Likely visual effect of the Project on Viewpoint 16

VP16: Grandchester State School looking north toward alignment and old railway station	
Visual Baseline Assessment	
 **Existing view from Viewpoint 16a (VP16a)** *Refer to* **Figure 43: Viewpoint 16a** *in Appendix 2 for appropriate scaled image.*	
Location and description	• GPS Location: 27°39'55.482" S 152°27'54.966" E • Elevation: 90.0 m • Northerly view towards Grandchester, Western Creek and the Little Liverpool Range from School Road • Proposed alignment is approximately 175 m to the northeast of this viewpoint • Represents typical and accessible views of residents of Grandchester and people driving down School Road • Elevated and vegetated areas associated with Little Liverpool Range, visible in the background of the view are considered to have high scenic amenity and are included on the Regional Significant Scenic Amenity overlay and also acknowledged in the Scenic Amenity of the Lockyer study; however, this particular viewpoint is not located in the overlay area • Northerly views from this viewpoint provide open views towards the proposed alignment, LCT B: Vegetated Watercourses – Creeks (B9: Western Creek) Western Creek as well as including landscapes typical of LCT D: Dry Croplands and Pastures (D20: Calvert).
Key visual sensitivities	• Receptors include residents of Grandchester, workers and students of Grandchester State School as well as people visiting School Road Reserve (including people waiting to pick up school children) and travellers along School 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 ***Moderate*** sensitivity overall to the change proposed, due to the relatively small number and types of viewers (e.g. travellers on School Road and visitors to School Road Reserve).
Visual Evaluation	
Please note that no visualisation has been provided for this viewpoint, as discussed in **Section 4.9: Visual impact assessment methodology**. However, a birds eye perspective visualisation has been produced to illustrate the impact of the Project on Grandchester more generally.	

VP16: Grandchester State School looking north toward alignment and old railway station	
 **Aerial visualisation from Viewpoint 16b (VP16b)** *Refer to* **Figure 44: Viewpoint 16b** *in Appendix 2 for appropriate scaled image.*	
Construction	
Magnitude of change assessment	• The construction of the alignment and embankments will introduce new rail infrastructure into and significantly modify the existing landscape, creating a noticeable change in the landscape character of this viewpoint • Due to the open nature of agricultural land the alignment passes through in this location, vegetation clearing for the construction of the proposed alignment is considered to have negligible impact upon screening vegetation • This temporary impact represents a ***Low*** magnitude of change.
Significance of effect (Construction)	The effect of the Project on VP16 during construction is considered to be ***Low***.
Operation	
Magnitude of change assessment - Permanent Infrastructure	• The nearest section of the alignment is approximately 175 m to the northeast of this viewpoint. Despite the close proximity, the magnitude of change on this receptor is anticipated to be considerable due to the following factors: o Provision of new rail infrastructure within what is currently a relatively intact rural setting, including earthworks. o Infrastructure at this location will be on a low embankment up to around 1 m high so will blend with the exiting rural view to some extent. It is noted that while there is currently no rail infrastructure in this particular view, other parts of Grandchester already have rail infrastructure present so, rail infrastructure is part of the existing visual character of the wider area. o Standard rural fencing is proposed and will be in keeping with the existing rural character.

VP16: Grandchester State School looking north toward alignment and old railway station	
	○ At this distance, the alignment will be clearly 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 ***Moderate*** magnitude of change.
Magnitude of change assessment - Train	• Movement of double stacked freight trains up to 1.8 km long with a height of up to 6.5 m will be experienced by nearby residents of Grandchester, people visiting School Road Reserve, visitors, students and staff of Grandchester State School and by those travelling on School Road. These views are however of transient nature; therefore, the magnitude of impact is considered to be ***Moderate***.
Significance of effect (Operation)	The effect of the Project on VP16 during operation is considered to be ***Moderate.***

8.1.17 Viewpoint 17

Table 45: Likely visual effect of the Project on Viewpoint 17

VP17: End of Calvert School Road, looking west near properties 917-923	
Visual Baseline Assessment	
 **Existing view from Viewpoint 17 (VP17)** Refer to **Figure 45: Viewpoint 17: End of Calvert School Road, looking west near properties 917-923 and Visualisation** *in Appendix 2 for appropriate scaled image.*	
Location and description	• GPS Location: 27°39'50.892" S 152°31'20.028" E • Elevation: 60.0 m • Westerly view towards properties of Calvert and the existing rail line. • Proposed alignment is approximately 15 m to the north of this viewpoint • Represents typical accessible views of residents, visitors, and workers in Calvert • Elevated and vegetated areas associated with Little Liverpool Range, visible in the background of the view are considered to have high scenic amenity and are included on the Regional Significant Scenic Amenity overlay and also acknowledged in the Scenic Amenity of the Lockyer study; however, this particular viewpoint is not located in the overlay area • Westerly views from this viewpoint provide open views from LCT F: Rural Settlement (F10: Calvert) across LCT D: Dry Croplands and Pastures towards the existing rail line and proposed alignment, and distant views to LCT H: Forested Uplands (H10: Little Liverpool Range).
Key visual sensitivities	• Moderate sensitivity of receptors, particularly relatively low number of residents of Calvert who are, however, located in very close proximity to the alignment

VP17: End of Calvert School Road, looking west near properties 917-923	
	• The presence of existing infrastructure (existing railway tracks) 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 relatively low number of nearby residential viewers with a specific interest in this view and the close proximity of this viewpoint to the alignment.
Visual Evaluation	
 **Photomontage view from Viewpoint 17: End of Calvert School Road, looking west near properties 917-923 (75º field of view) (VP7)** Refer to **Figure 45: Viewpoint 17: End of Calvert School Road, looking west near properties 917-923 and Visualisation** *in Appendix 2 for appropriate scaled image.*	
Construction	
Magnitude of change assessment	• The construction of the proposed alignment within the existing rail corridor will create a noticeable change in the landscape character of this viewpoint • The lack of existing vegetation provides open views from nearby residential properties to the proposed alignment • The presence of construction plant constructing the alignment will temporarily change the character of the landscape, creating a noticeable change in the landscape character of this viewpoint • This represents a ***Low*** magnitude of change.
Significance of effect (Construction)	The effect of the Project on VP17 during construction is considered to be ***Low.***
Operation	
Magnitude of change assessment - Permanent Infrastructure	• The nearest section of the alignment is approximately 15 m to the north of this viewpoint. The view is already affected by the presence of existing rail infrastructure. The magnitude of change on this receptor is anticipated to be noticeable due to the following factors: ○ Noticeable change due to the provision of a new single track dual-gauge railway to the south of the existing rail line with associated localised culverts. The rail line will be largely at grade so will be similar in appearance to the existing rail line. ○ Due to the sparse nature of existing vegetation within the rail corridor, the effect of vegetation clearing for the construction of the proposed alignment is considered to be negligible. ○ Fencing will 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.

VP17: End of Calvert School Road, looking west near properties 917-923	
	○ At this distance, the alignment will be noticeable however it will not change the fundamental visual character of the landscape, as it will be introducing new rail infrastructure into the existing rail corridor. This represents a ***Low*** magnitude of change.
Magnitude of change assessment - Train	• Movement of double stacked freight trains up to 1.8 km long with a height of up to 6.5 m will be highly evident due to the open views of the railway track from this viewpoint. Close views to the alignment will be possible for nearby residents of Calvert. While experienced by close residential properties these views are of transient nature. It is noted that the existing rail line currently facilitates freight train movements, albeit single stacked. Therefore, the magnitude of change is considered to be ***Low***.
Significance of effect (Operation)	The effect of the Project on VP17 during operation is considered to be ***Low.***

9. Lighting Impact Assessment

This section considers the impact of Project lighting during both construction and operation phases of the Project.

As described in **Section 6: Potential impacts**, lighting during construction will be associated with security lighting to site offices, fuel storage areas and bridge laydown areas as well as some night time construction works associated with bridge construction, tunnelling activities, rail possessions and other approved out of hours work. In terms of operational lighting, proposed permanent lighting for the Project is associated with safety lighting at the controlled active level crossing at the following locations:

- Connors Road, Helidon
- Jamiesons Road, Gatton
- Dodt Road, Forest Hill
- Glenore Grove Road, Forest Hill
- Grandchester Mount Mort Road, Grandchester
- Neumann Road, Calvert
- Calvert Station Road, Calvert.

There would also be minimal internal lighting within the tunnel, with only low-level and emergency lighting expected, and transient lighting associated with train headlights.

On this basis, some of the assessed viewpoints would not receive any lighting impacts during the construction or operation phases of the Project and have not been assessed in detail. The viewpoints listed below are expected to be impacted by either construction or operational lighting, or both, the impacts of which have been assessed in **Table 46** to **Table 59**:

- Viewpoint 1 (construction only) – bridge laydown (H2C-LDN027.3) security lighting and night time construction works
- Viewpoint 3 (construction only) – major bridge laydown (H2C-LDN-33.9) security lighting and night time construction works
- Viewpoint 4 (construction only) – bridge laydown (H2C-LDN043.4) security lighting and night time construction works
- Viewpoint 5 (construction only) – bridge laydown (H2C-LDN043.4) security lighting and weekend shutdown construction works
- Viewpoint 6 (operation and construction) – bridge laydown (H2C-LDN044.1) security lighting and night time construction works and reinstatement of street lighting
- Viewpoint 7 (operation only) – Glenore Grove Road active level crossing near existing level crossing
- Viewpoint 8 (operation and construction) – bridge laydown (H2C-LDN057.4) security lighting and night time construction works and reinstatement of street lighting
- Viewpoint 9 (operation and construction) – main construction compound (H2C-LDN058.0) security lighting and night time construction works
- Viewpoint 10 (construction only) – main construction compound (H2C-LDN-58.0) security lighting and night time construction works
- Viewpoint 11 (construction only) – bridge laydown (H2C-LDN-59.2) with security lighting and night time construction works
- Viewpoint 12 (construction and operation) – western tunnel portal laydown area (H2C-LDN-61.2) with security lighting and night time construction works.
- Viewpoint 13 (operation and construction) – night time construction works and lit tunnel portal

- Viewpoint 15 (construction only) – laydown with bridge, fuel storage and site offices (H2C-LDN-64.3) with security lighting and night time construction works
- Viewpoint 16 (operation only) – Grandchester Mount Mort Road level crossing close to viewpoint (no fuel storage, bridge or site office proposed in LDN-066.8 close to viewpoint).

9.1. Lighting assessment

9.1.1 Viewpoint 1

Table 46: Likely visual effect of the Project lighting on Viewpoint 1

VP1: Airforce Road near 45 and 47 Airforce Road, looking northwest	
Lighting Assessment	
Visual Evaluation	
Sensitivity assessment	• ***Low*** as described for daytime assessment. There will still be receptors in this location at night who will be interested in the view and presence of lighting, including nearby isolated rural residents.
Magnitude of change assessment (construction)	• This location is within close proximity to a bridge construction laydown area. Therefore, during construction it is anticipated that night time works will be undertaken. Additionally, the laydown area proposed would be lit with security lighting. • Occasional work on Saturdays to construct bridges is likely, therefore more intense lighting is probable during this period. • Airforce Road is not lit with permanent street lighting in this location. However, existing road and rail traffic introduces transient light. Therefore, the current light levels are assumed to be 'predominantly dark' and it is assumed that, with careful planning of light spill (i.e. the selection of luminaries that direct light downwards below the horizontal to avoid lateral glare and the potential installation of additional shielding to further control light spill), the levels would be up to 'predominantly lit' representing a noticeable ***Low*** magnitude of change.
Significance of effect (construction)	• ***Negligible.***
Magnitude of change assessment (operation)	• No permanent lighting near this viewpoint.
Level of Effect (operation)	• ***No Impact.***

9.1.2 Viewpoint 3

Table 47: Likely visual effect of the Project lighting on Viewpoint 3

VP3: Warrego Highway looking east	
Lighting Assessment	
Visual Evaluation	
Sensitivity assessment	• ***Moderate*** as described for daytime assessment. However, somewhat fewer receptors are anticipated in this location at night as compared to the daytime view. Although travellers will still be passing along the Warrego Highway at night, their interest in the transient views obtained is expected to be low, even compared to daytime interest.
Magnitude of change assessment (construction)	• This location is adjacent to a major bridge construction laydown area. Therefore, during construction it is anticipated that night time works will be undertaken. Additionally, the laydown area proposed would be lit with security lighting.

VP3: Warrego Highway looking east	
	• Occasional work on Saturdays to construct bridges is likely, therefore more intense lighting is probable during this period. • The Warrego Highway is not lit with permanent street lighting in this location. However, existing traffic on the highway introduces transient light. Therefore, the current light levels are assumed to be 'predominantly dark' and it is assumed that, with careful planning of light spill (i.e. the selection of luminaries that direct light downwards below the horizontal to avoid lateral glare and the potential installation of additional shielding to further control light spill), the levels would be up to 'predominantly lit' representing a noticeable ***Low*** magnitude of change.
Significance of effect (construction)	• ***Low.***
Magnitude of change assessment (operation)	• No permanent lighting near this viewpoint.
Level of Effect (operation)	• ***No Impact.***

9.1.3 Viewpoint 4

Table 48: Likely visual effect of the Project lighting on Viewpoint 4

VP4: Beavan Street looking southwest towards existing Lockyer Creek rail bridge	
Lighting Assessment	
Visual Evaluation	
Sensitivity assessment	• ***Moderate*** as described for daytime assessment. There will still be receptors in this location at night who will be interested in the view and presence of lighting, including nearby residents and travellers on local roads.
Magnitude of change assessment (construction)	• This location is within close proximity to two laydown areas, including a bridge construction laydown area is situated on the northern side of Gatton Station (predominately screened by existing vegetation and residential properties). Therefore, during construction it is anticipated that night time works will be undertaken. Additionally, the proposed bridge construction laydown area to the left-hand side of this view would be lit with security lighting. • Occasional work on Saturdays to construct bridges is likely, therefore more intense lighting is probable during this period. • The current light levels on the edge of the town are assumed to be 'predominantly dark' and it is assumed that the levels would be up to 'predominately lit' representing a noticeable ***Moderate*** magnitude of change.
Significance of effect (construction)	• ***Moderate.***
Magnitude of change assessment (operation)	• No permanent lighting near this viewpoint.
Level of Effect (operation)	• ***No Impact.***

9.1.4 Viewpoint 5

Table 49: Likely visual effect of the Project lighting on Viewpoint 5

VP5: Gatton RSL car park looking northwest towards existing Railway Station and pedestrian crossing	
Lighting Assessment	
Visual Evaluation	
Sensitivity assessment	• ***High*** as described for daytime assessment. There will still be receptors in this area after dark, for example visiting restaurants and bars in the CBD including the adjacent RSL.
Magnitude of change assessment (construction)	• This location is within close proximity to two laydown areas. An additional bridge construction laydown area is situated at a further distance from this viewpoint on the northern side of Gatton Station. Therefore, during construction it is anticipated that night time works will be undertaken***.*** Additionally, the proposed bridge construction laydown area within this view would be lit with security lighting. • Occasional work on Saturdays to construct bridges is likely, therefore more intense lighting is probable during this period. • The current light levels are assumed to be 'predominantly lit' and it is assumed that the levels would be up to 'brightly lit' representing a noticeable ***Low*** magnitude of change.
Significance of effect (construction)	• ***Moderate.***
Magnitude of change assessment (operation)	• No permanent lighting near this viewpoint.
Level of Effect (operation)	• ***No Impact***

9.1.5 Viewpoint 6

Table 50: Likely visual effect of the Project lighting on Viewpoint 6

VP6: Spencer Street looking northeast near Gatton Showgrounds	
Lighting Assessment	
Visual Evaluation	
Sensitivity assessment	• ***Moderate*** as described for daytime assessment. There will still be receptors in this location at night who will be interested in the view and presence of lighting, including nearby residents, and travellers on Eastern Drive/Spencer Street and local roads.
Magnitude of change assessment (construction)	• This location is within close proximity to a bridge construction laydown area. Therefore, during construction it is anticipated that night time works will be undertaken***.*** Additionally, the proposed laydown area within this view would be lit with security lighting. • Occasional work on Saturdays to construct bridges is likely, therefore more intense lighting is probable during this period. • The current light levels are assumed to be 'predominantly lit' and it is assumed that the levels would be up to 'brightly lit' representing a noticeable ***Low*** magnitude of change.
Significance of effect (construction)	• ***Low.***
Magnitude of change assessment (operation)	• Existing street lighting along Eastern Drive will be reinstated. • At this stage of the Project, it is anticipated that replacement lighting will be of a similar level to the existing lighting. However, this will need to be

VP6: Spencer Street looking northeast near Gatton Showgrounds	
	assessed at detail design phase to ensure lighting is compliant with relevant DTMR standards. • It is anticipated that a 'predominantly lit' landscape would remain as a 'predominantly lit' landscape representing no noticeable change considered to have a ***Negligible*** magnitude of change.
Level of Effect (operation)	• ***Low***.

9.1.6 Viewpoint 7

Table 51: Likely visual effect of the Project lighting on Viewpoint 7

VP7: Gordon Street looking northwest towards level crossing	
Lighting Assessment	
Visual Evaluation	
Sensitivity assessment	• ***Moderate,*** due to fewer receptors in this location at night. There will still be receptors in this location at night who will be interested in the view and presence of lighting – including residents of Gordon Street and nearby streets and travellers on local roads.
Magnitude of change assessment (construction)	• No temporary construction lighting near this viewpoint.
Significance of effect (construction)	• ***No Impact.***
Magnitude of change assessment (operation)	• The active level crossing proposed at Glenore Grove Road would be controlled by automatic warning systems including flashing lights and would be visible to residents along Gordon Street and nearby streets, as well as those travelling on local roads. • However, there is an existing active level crossing approximately 120 m to the west of the proposed active level crossing location. • Existing street lighting along Eastern Drive will be reinstated. • It is anticipated that replacement lighting will be of a similar level to existing. • It is anticipated that a 'predominantly dark' landscape would remain as a 'predominantly dark' landscape representing no noticeable change considered to have a ***Negligible*** magnitude of change.
Level of Effect (operation)	• ***Negligible.***

9.1.7 Viewpoint 8

Table 52: Likely visual effect of the Project lighting on Viewpoint 8

VP8: Laidley-Plainlands Road looking north towards bridge crossing	
Lighting Assessment	
Visual Evaluation	
Sensitivity assessment	• ***Moderate*** as described for daytime assessment. However, somewhat fewer receptors are anticipated in this location at night as compared to the daytime view. Although travellers will still be passing along the Laidley-Plainlands Road at night, their interest in the transient views obtained at night is expected to be low even compared to daytime interest.

VP8: Laidley-Plainlands Road looking north towards bridge crossing	
Magnitude of change assessment (construction)	• This location is within close proximity to a bridge construction laydown area. Therefore, during construction it is anticipated that night time works will be undertaken. Additionally, the proposed laydown area within this view would be lit with security lighting. • Occasional work on Saturdays to construct bridges is likely, therefore more intense lighting is probable during this period. • The current light levels are assumed to be 'predominantly dark' and it is assumed that with careful planning of light spill (i.e. the selection of luminaries that direct light downwards below the horizontal to avoid lateral glare and the potential installation of additional shielding to further control light spill), the levels would be up to 'predominantly lit' representing a noticeable ***Low*** magnitude of change.
Significance of effect (construction)	• ***Low.***
Magnitude of change assessment (operation)	• Existing street lighting along Laidley-Plainlands Road will be reinstated. • At this stage of the Project, it is anticipated that replacement lighting will be of a similar level to the existing lighting. However, this will need to be assessed at detail design phase to ensure lighting is compliant with relevant DTMR standards. • It is anticipated that a 'predominantly dark' landscape would remain as a 'predominantly dark' landscape representing no noticeable change considered to have a ***Negligible*** magnitude of change.
Level of Effect (operation)	• ***Negligible***.

9.1.8 Viewpoint 9

Table 53: Likely visual effect of the Project lighting on Viewpoint 9

VP9: Patrick Street Underpass looking northwest	
Lighting Assessment	
Visual Evaluation	
Sensitivity assessment	• ***Moderate*** as described for daytime assessment. There will be residential receptors in this location at night – who will be interested in the view including the impact of any lighting.
Magnitude of change assessment (construction)	• This location is within close proximity to a main construction compound/hub, including fuel storage and a bridge construction site. Therefore, during construction it is anticipated that night time works will be undertaken***.*** Additionally, the proposed laydown area within this view would be lit with security lighting. • Occasional work on Saturdays to construct bridges is likely, therefore more intense lighting is probable during this period. • The current light levels are assumed to be 'predominantly dark' and it is assumed that with careful planning of light spill (i.e. the selection of luminaries that direct light downwards below the horizontal to avoid lateral glare and the potential installation of additional shielding to further control light spill), the levels would be up to 'predominantly lit' representing a noticeable ***Low*** magnitude of change.
Significance of effect (construction)	• ***Low.***
Magnitude of change assessment (operation)	• It is anticipated that safety lighting will be required at Francis Road Rail Bridge***.***

VP9: Patrick Street Underpass looking northwest	
	• The current light levels are assumed to be 'predominantly dark' and it is assumed that the levels would be up to 'predominately lit' representing a noticeable ***Low*** magnitude of change.
Level of Effect (operation)	• ***Low.***

9.1.9 Viewpoint 10

Table 54: Likely visual effect of the Project lighting on Viewpoint 10

VP10: Hardy Drive looking northeast down Rampton Street over new subdivision	
Lighting Assessment	
Visual Evaluation	
Sensitivity assessment	• ***Moderate*** as described for daytime assessment. There will be residential receptors in this location at night – who will be interested in the view including the impact of any lighting.
Magnitude of change assessment (construction)	• During construction it is not anticipated that works will be undertaken at night in this location. However, a main construction compound/hub, including fuel storage and a bridge construction site is situated approximately 250 m to the north of this viewpoint. This laydown area would be lit with security lighting, which is anticipated to be visible from this viewpoint. • The current light levels are assumed to be 'predominantly dark' and it is assumed that, with careful planning, the levels would remain up to 'predominantly dark' representing a ***Negligible*** (temporary) magnitude of change.
Significance of effect (construction)	• ***Low***.
Magnitude of change assessment (operation)	• No permanent lighting near this viewpoint
Level of Effect (operation)	• ***No Impact***

9.1.10 Viewpoint 11

Table 55: Likely visual effect of the Project lighting on Viewpoint 11

VP11: Branell Homestead Luxury Cabins on Paroz Road, looking west	
Lighting Assessment	
Visual Evaluation	
Sensitivity assessment	• ***Moderate*** as described for daytime assessment. There will be tourists staying overnight in cabins as well as other local residents and travellers on local roads in this location at night.
Magnitude of change assessment (construction)	• During construction it is not anticipated that works will be undertaken at night in this location. However, distant views to the bridge construction laydown area proposed along Paroz Road would be possible. This laydown area would be lit with security lighting. • Occasional work on Saturdays to construct bridges is likely, therefore more intense lighting is probable during this period. • While this viewpoint is located around 1.4 km from any light source the impact of lighting this compound have been considered with respect to the residential receptors located on Luck Road adjacent to the laydown area.

VP11: Branell Homestead Luxury Cabins on Paroz Road, looking west	
	• 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.
Significance of effect (construction)	• ***Low***.
Magnitude of change assessment (operation)	• No permanent lighting near this viewpoint
Level of Effect (operation)	• ***No Impact***

9.1.11 Viewpoint 12

Table 56: Likely visual effect of the Project lighting on Viewpoint 12

VP12: McInnes Drive near existing rail line	
Lighting Assessment	
Visual Evaluation	
Sensitivity assessment	• ***Moderate*** as described for daytime assessment. There will be residential receptors in this location at night – the residents of rural residential properties on McInnes Drive (and other roads in this part of Laidley) are the key night-time viewers.
Magnitude of change assessment (construction)	• This location is within close proximity to a laydown area that will be utilised for the construction of the western tunnel portal, bridge construction and is identified as a potential concrete batch plant. Therefore, during construction it is anticipated that night time works will be undertaken. Additionally, the proposed laydown area within this view would be lit with security lighting. • Views from this location will also provide close views to the western tunnel portal access track, therefore construction traffic will introduce additional transient light. • Tunnel works and spoil haulage will occur seven days a week, 24 hours a day therefore this viewpoint is likely to experience more considerable construction lighting impacts due to its proximity to the western tunnel access track. • The current light levels on the edge of the town are assumed to be 'predominantly dark' and it is assumed that the levels would be up to 'predominately lit' representing a noticeable ***Moderate*** magnitude of change.
Significance of effect (construction)	• ***Low***
Magnitude of change assessment (operation)	• No permanent lighting near this viewpoint.
Level of Effect (operation)	• ***No Impact.***

9.1.12 Viewpoint 13

Table 57: Likely visual effect of the Project lighting on Viewpoint 10

VP13: Kessling Drive, looking southwest towards western tunnel portal	
Lighting Assessment	
Visual Evaluation	
Sensitivity assessment	• ***Low*** as described for daytime assessment. There are few residential properties in this area.
Magnitude of change assessment (construction)	• This location is within close proximity to the western tunnel portal. Therefore, during construction it is anticipated that night time works will be undertaken. • Tunnel works and spoil haulage will occur seven days a week, 24 hours a day therefore this viewpoint is likely to experience considerable construction lighting impacts due to its proximity to the western tunnel portal. • Construction traffic will introduce additional transient light. • The current light levels are assumed to be 'intrinsically dark' and it is assumed that the levels would be up to 'predominately lit' representing a noticeable ***Low*** magnitude of change.
Significance of effect (construction)	• ***Negligible.***
Magnitude of change assessment (operation)	• The tunnel portal would be lit with low level security lighting. • It is anticipated that an 'intrinsically dark' landscape would become, at greatest, as a 'predominantly dark' landscape representing a noticeable ***Low*** level of change.
Level of Effect (operation)	• ***Negligible***.

9.1.13 Viewpoint 15

Table 58: Likely visual effect of the Project lighting on Viewpoint 15

VP15: Laidley-Rosewood Road near properties 113-117, looking east	
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 rural properties located off Rosewood-Laidley Road will be the key potential night-time viewers concerned with lighting amenity with less interest from passing traffic experience transient views along the road.
Magnitude of change assessment (construction)	• This location is within close proximity to a laydown area, including bridge construction site, fuel storage, road realignment site and site offices. Therefore, during construction it is anticipated that night time works will be undertaken. Additionally, the laydown area proposed would be lit with security lighting. • Occasional work on Saturdays to construct bridges is likely, therefore more intense lighting is probable during this period. • The current light levels are assumed to be 'intrinsically dark' and it is assumed that, with careful planning, the levels would be at greatest 'predominantly dark' representing a noticeable ***Low*** magnitude of change.
Significance of effect (construction)	• ***Negligible***.
Magnitude of change assessment (operation)	• No permanent lighting near this viewpoint.

VP15: Laidley-Rosewood Road near properties 113-117, looking east	
Level of Effect (operation)	• ***No Impact***.

9.1.14 Viewpoint 16

Table 59: Likely visual effect of the Project lighting on Viewpoint 16

VP16: Grandchester State School looking north toward alignment and old railway station	
Lighting Assessment	
Visual Evaluation	
Sensitivity assessment	• ***Moderate*** as described for daytime assessment. There will be few receptors in this specific location at night as the school will not be in use. However, there are several rural residential properties nearby (including on Grandchester Mt Mort Road) who are likely to be concerned about night time lighting.
Magnitude of change assessment (construction)	• No temporary construction lighting near this viewpoint.
Significance of effect (construction)	• ***No Impact***.
Magnitude of change assessment (operation)	• The new active crossing proposed on Grandchester Mount Mort Road would be controlled by automatic warning systems including flashing lights and would be visible to people travelling along Grandchester Mount Mort Road as well as the local rural residents in this area. • This would, at worst, change an 'intrinsically dark' landscape into a 'predominantly dark' landscape representing a noticeable change considered to have a ***Low*** magnitude of change.
Level of Effect (operation)	• ***Low***.

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 field of view
- 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 60** and impact significance assessment matrix set out in **Table 61**.

Table 60: 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 61: 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 Area of Influence (AOI) than the LVIA study area was considered, extending 50 km (approximately 30 mins 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 Project cumulative assessment but were discounted on the basis of location (i.e. outside the AOI) or lack of available information. Projects not included within the LVIA cumulative impact assessment on this basis include:

- Ebenezer Regional Industrial Area
- Willowbank Raceway Upgrade
- Bus and Passenger Rail Connection to Brisbane
- Brisbane Valley Highway Interchange.

Based on this assessment, the potential projects considered to have potential cumulative landscape and123 visual impacts are shown on **Figure 13: Cumulative LVIA**. **Table 62** sets out the key criteria for inclusion of a project. The selected projects are then described in **Table 63**:

Table 62: 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* (Qld) (EP Act) and, as a minimum, have an initial advice statement (IAS) available on the QLD 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) (now Department of State Development, Infrastructure, Local Government and Planning) 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.

Table 63: Projects included in the LVIA cumulative impact assessment

Project and Proponent	Location	Description	Project status	Lifespan (years)	Relationship to the Project	Selection criteria[1]
Calvert to Kagaru (C2K) (ARTC)	Project alignment from Calvert to Kagaru	53 km single-track dual-gauge freight rail line as part of the ARTC Inland Rail Project. Construction of rail infrastructure, culverts, bridges, viaducts and crossing loops Ancillary works including road and public utility crossings and realignments	Draft EIS being prepared by ARTC	>50 years	Potential overlap of construction finalisation for the Project and commencement for C2K. Potential for cumulative landscape and visual effects.	b) and c)
Gowrie to Helidon (G2H)(ARTC)	Project alignment from Gowrie to Helidon.	26 km single-track dual-gauge freight railway. Construction of rail infrastructure, culverts, bridges, viaducts, tunnels and crossing loops Ancillary works including road and public utility crossings and realignments.	Draft EIS being prepared by ARTC	>50 years	Potential overlap of construction finalisation for the Project and commencement for G2H	b) and c)
Bromelton State Development Area	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	Ongoing development approximately 55 km at the Bromelton SDA could require deconfliction of construction resources. There may also be an increase of heavy vehicles using the surrounding highways	c) and d)
Ipswich Motorway Upgrade Rocklea to Darra (Remaining sections)	Western Brisbane, QLD	Addressing of congestion and extensive delays in the Ipswich Motorway corridor by a range of road upgrades along 7 km of Ipswich Motorway between Rocklea and Darra.	Project listed on QLD Infrastructure Initiative List – EIS not yet initiated	2016/17 to 2020-2021	Construction periods may overlap resulting in conflict in demand for construction resources and traffic volumes on Highways	c)

Project and Proponent	Location	Description	Project status	Lifespan (years)	Relationship to the Project	Selection criteria[1]
RAAF Base Amberley future works	RAAF Base Amberley	White paper dedicated future upgrades to RAAF Base Amberley at a cost of $1 billion	N/A	2016 - 2022	Ongoing development at RAAF Base Amberley may see increase in road traffic with heavy vehicles and further increase as the Project construction occurs	c)
Gatton West Industrial Zone (GWIZ)	3 km north west Gatton	Industrial development including a transport and logistics hub on the Warrego highway	N/A	2019-2024	May increase road traffic. Need for rail resources.	c)
InterlinkSQ	13 km west of Toowoomba	200 ha of new transport, logistics and business hubs. Located on the narrow gauge regional rail network and interstate network. Located at the junction of the Gore, Warrego and New England Highways.		2017-2037	Ongoing development could require deconfliction of construction resources. There may also be an increase of heavy vehicles using the surrounding highways	c)

Table note: [1] Refer to Table 62 for project inclusion criteria.

10.3. Cumulative impact assessment

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

- Temporary 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 temporary (construction) impacts, it appears likely that the ARTC C2K, ARTC G2H, Ipswich Motorway Upgrade Rocklea to Darra, GWIZ, Bromelton SDA, InterlinkSQ 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 and views of the movement of heavy vehicles and plant within the AOI.

Areas within the LVIA study area likely to be most affected by this cumulative activity is the Warrego Highway (A2) and the areas at the easternmost and westernmost section of the alignment. The western area will be affected simultaneously by G2H and the Project construction. The eastern area will potentially (depending upon specific Project phasing) be affected simultaneously by C2K, and RAAF Base Amberley upgrade as well, further afield, the Bromelton SDA. As large vehicles on the highway would not be unexpected from a visual perspective and the construction impacts are temporary, the consequence of this cumulative impact during construction in the Project LVIA study area is considered to be ***Low***.

In terms of spatial (operational) impacts of other linear transport infrastructure projects, the G2H and C2K projects immediately adjoins the Project and will for operations be a component of the Inland Rail Program. Some receptors will experience views of both G2H/the Project or The Project/C2K but the Project will, in practice, be viewed as part of the same integrated activity (Inland Rail Program). The Ipswich Motorway Upgrade is over 40 km from the Project alignment, so no cumulative impacts are anticipated.

With regards to the other land development projects, InterlinkSQ is closest to G2H, being located around 25 km west of the Project from which it is separated by landform associated with Toowoomba and the Great Dividing Range. Consequently, there would be no combined or successive impacts and the potential for sequential impacts is highly limited. Similarly, RAAF Base Amberley is over 15 km from the Project alignment so there would be no combined or successive impacts and the potential for meaningful sequential impacts is limited.

The Bromelton SDA is a large-scale major land development Project that will affect many hectares of land with associated landscape and visual impacts. This Project will also potentially introduce additional visual receptors (residents and workers) into the wider landscape of the LVIA study area. It directly adjoins the eastern end of the C2K alignment. This development 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. However, combined or successive impacts of the Project are unlikely.

The GWIZ is considered to have the greatest potential for cumulative impacts when considered with the Project alignment. The area north of Placid Hills, North Gatton, is currently highly natural and rural in character and the clearance of vegetation and intensification of built and transportation infrastructure development throughout this zone would result in a considerable change to the landscape character and visual amenity that is likely to be perceived by users of the Warrego Highway as well as some residents living in the acreage properties of Placid Hills.

In the context of these projects, the cumulative landscape and visual impact of the Project alignment, which occupies a narrow, linear corridor, is considered to be generally very modest. The significance of the contribution of the Project to cumulative impact is considered to be ***Low*** for both landscape and visual values for most of the projects identified, with the exception of GWIZ that would have up to ***Medium*** cumulative impacts. Mitigation to address this impact will generally be as described for the standalone Project (and C2K/G2H) Project. However, specific mitigation is likely to be required associated with the Project alignment through Placid Hills to minimise potential cumulative impacts of the GWIZ and the Project on views from acreage properties.

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 LVIA in the region is likely to be up to ***Low***. This is summarised in Table 64.

Table 64: 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	*(up to)* **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, and construction and operational phases of the Project.

11.2. Initial mitigation – design measures

The mitigation measures presented in **Table 65** 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 65: Initial mitigation measures relevant to landscape and visual amenity

Aspect	Initial Mitigation
Landscape and visual issues	• The horizontal alignment of the Project has avoided direct impacts on nationally or regionally protected landscape areas such as the Lockyer National Park and Gatton National Park. • The Project has minimised direct impacts on areas noted as being of regional landscape significance as defined by the regional scenic amenity methodology (*ShapingSEQ*), to the greatest extent possible; including avoiding impacts on the mountain ranges of the Great Dividing Range, Marburg Range, Main Paradise Range, and elevated areas around Beins Mountain, and the northern extent of the Mistake Mountains range. While the Little Liverpool Range is affected the design affects the minimum area of this zone possible, is largely in tunnel and traverses an area already affected by existing rail infrastructure. • Much of the Project is located along or close to the existing West Moreton System rail corridor and has been aligned to be co-located with existing road infrastructure where possible. • The alignment has sought to reduce the extent of impact on watercourses. • The disturbance footprint defined in Project design has aimed to minimise vegetation clearing extents to that required to construct and operate the works. • 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, including Helidon, Grantham, Placid Hills and Laidley North. Where the alignment passes near settlements it has been designed to either follow the edge of the settlement to minimise impacts on viewers, e.g. through Laidley, or to follow the West Moreton System rail corridor to the greatest extent possible e.g. through Gatton, Forest Hill, Grandchester and Calvert.

11.3. Proposed mitigation measures

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

Table 66 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 66: Proposed mitigation measures relevant to landscape and visual amenity

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. Particular locations include the forested areas: o Within Little Liverpool Range Forested Uplands (LCA H10) (approximately Ch 60.4 km to Ch 64.4 km) o Associated with Lockyer National Park Forested Uplands (LCA H5) (approximately Ch 27.3 km to Ch 35.4 km). • Develop a Rehabilitation and Reinstatement 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). The Plan will include and clearly specify: o Location of areas subject to rehabilitation and/or reinstatement/stabilisation, in accordance with the landscape and rehabilitation design developed during detailed design o Objectives and timeframes for rehabilitation and/or reinstatement /stabilisation works (including the biodiversity, vegetation establishment and erosion and sediment control outcomes to be achieved) o 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 o Details of the actions and responsibilities to progressively rehabilitate, regenerate, and/or revegetate areas, consistent with the agreed objectives o Native flora species endemic to the Scenic Rim and Ipswich regions or other suitable species appropriate to the landscape context o and nursery/seed stock sources o Procedures, timeframes, measurable performance objectives and responsibilities for monitoring the success of rehabilitation and/or reinstatement/stabilisation areas o 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 Lockyer Creek (LCA B1), Sandy Creek (LCA B5), Laidley Creek (LCA B8) and Western Creek (LCA B9) i.e. associated with the corridors of Sandy Creek, Lockyer Creek, an upper tributary of Laidley Creek, Laidley Creek, Lagoon Creek and Western Creek. Aim to avoid, then minimise the extent of waterway diversions.

Delivery Phase	Aspect	Proposed mitigation measures
Detailed design (continued)	Visual impact of rail infrastructure	Infrastructure (such as structures, embankments/cuttings, tunnel portals, tunnel control centre and bridges) will 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 Inland Rail alignment to enhance the overall recognition and legacy of the Project. • ***Bridges***: Bridge design considers appropriate design principles at key viewpoints, including the following opportunities: o Airforce Road Bridge and road realignment works associated with Air Force Road and Warrigal Road (near Viewpoint 1), Helidon (approximately Ch 26.80 km to Ch 27.5 km): Consider sensitive landscape design input to the bridge structure and embankments associated with road realignments, including buffer planting adjacent the embankments to assist in sympathetically integrating the new embankments and bridge into the landscape and minimise the impact on views from nearby isolated rural residential properties and drivers accessing Lockyer National park via the realigned Seventeen Mile Road. This includes the replacement of existing roadside vegetation impacted by the construction of the Project that provides a visual buffer to the existing rail line. o Warrego Highway Rail Bridge (near Viewpoint 3), Grantham (approximately Ch 34.0 km to Ch 34.2 km): Consider urban design input into bridge structure to minimise the impact on views from the Warrego Highway, part of the Warrego Way and Adventure Way Tourist Drive o Philps Road Rail Bridge, Grantham (approximately Ch 36.7 km to Ch 36.9 km): Consider urban design input into bridge structure to minimise the impact on views from Philps Road and the Warrego Highway, part of the Warrego Way and Adventure Way Tourist Drive o Lockyer Creek Rail Bridge and Lockyer Creek QR Rail Bridge (near Viewpoint 4), Gatton (approximately Ch 43.1 km to Ch 43.3 km): Consider urban design input into bridge structure to minimise the impact on views from nearby residential properties, local roads and views from William Kemp Park o Gatton Station Pedestrian Bridge (near Viewpoint 5), Gatton (approximately Ch 43.5 km): Consider sensitive urban design inputs into the new pedestrian bridge structure, including associated stairs, throw screens and lifts to assist in sympathetically integrating the new rail bridge into its setting (i.e. respecting the existing visual character of the Gatton Station) o Eastern Drive Bridge Northbound and Southbound (near Viewpoint 6), Gatton (approximately Ch 43.9 km to Ch 44.6 km): Consider sensitive urban design inputs into bridge structures and embankments associated with road realignments to minimise the impact on views from Eastern Drive, nearby residential properties, local roads and views from Gatton Caravan Park and Gatton Jubilee Golf Club o Laidley Plainlands Road (near Viewpoint 8), Laidley North (approximately Ch 57.2 km to Ch 57.4 km): Consider sensitive urban design inputs into bridge structure and embankments associated with road realignments to minimise the impact on views from Laidley-Plainlands Road, nearby residents of Valley Vista estate, local roads and views from Laidley Cultural Centre and the Bichel Cricket Oval

Delivery Phase	Aspect	Proposed mitigation measures
Detailed design (continued	Visual impact of rail infrastructure	○ Francis Road Rail Bridge (near Viewpoint 10), Laidley North (approximately Ch 57.9 km to Ch 58.0 km): Consider sensitive urban design inputs into bridge structure to minimise the impact on views from nearby residents of Valley Vista estate ○ Luck Road Rail Bridge, Laidley (approximately Ch 58.8 to Ch 58.9 km): Consider sensitive urban design inputs into bridge structure to minimise the impact on views from nearby rural residential properties and distant views from Paroz Road and Branell Homestead ○ Paroz Road Rail Bridge (near Viewpoint 11), Laidley (approximately Ch 59.3 km to Ch 59.5 km): Consider sensitive urban design inputs into bridge structure to minimise the impact on views from Paroz Road, nearby rural residential properties (including Branell Homestead and luxury cabins). It is noted that Paroz Road provides access to Cunningham Crest Lookout which is a marketed tourist viewpoint ○ Rosewood-Laidley Road Rail Bridge (near Viewpoint 15) (approximately Ch 64.2 km to Ch 64.5 km): Consider urban design input into bridge structure to minimise the impact on views from the Rosewood-Laidley Road, part of the Cobb and Co Tourist Drive and views from nearby isolated rural residents. • ***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, including through sensitive stabilisation, revegetation or – where appropriate – screen planting. In particular, These locations may include: ○ Warrego Highway embankments adjacent bridge structure (near Viewpoint 3), Grantham (approximately Ch 33.7 km to Ch 34.5 km): Sensitive landscape design input to the embankments in this area including buffer planting adjacent to the embankment to assist in sympathetically integrating the new embankment and bridge into the landscape and minimise the impact on views from the Warrego Highway, part of the Warrego Way and Adventure Way Tourist Drive ○ Embankments to the south of the Warrego Highway, Grantham (approximately Ch 35.1 km to Ch 37.0 km): Sensitive landscape design input to the embankments in this area including tree planting to assist in sympathetically integrating the new embankment into the landscape to minimise the impact on views from the Warrego Highway, part of the Warrego Way and Adventure Way Tourist Drive and views from nearby elevated residential properties within Grantham ○ Valley Vista Estate (near Viewpoint 10), Laidley East (approximately Ch 57.3 km to Ch 58.5 km): Sensitive landscape design input to the embankments in this area including tree planting to assist in sympathetically integrating the new embankment into the estate landscape and minimise the impact on resident's views from the streets in Valley Vista Estate surrounding this structure ○ Paroz Road embankment and bridge (near Viewpoint 11), Laidley (approximately Ch 58.5 km to Ch 59.8 km): Sensitive landscape design input to the embankment including buffer planting adjacent to the embankment where it crosses Paroz Road to assist in sympathetically integrating the new embankment and bridge into the landscape and minimise the impact on views to the Project from Branell Homestead Luxury Cabins and resident's views from the streets in Valley Vista Estate surrounding this structure

Delivery Phase	Aspect	Proposed mitigation measures
Detailed design	Visual impact of rail infrastructure	○ Railway Street (near Viewpoint 12), Laidley East (approximately Ch 60.5 km to Ch 61.2 km): Sensitive landscape design input to the embankments in this area including tree planting to assist in sympathetically integrating the new embankment into the landscape and minimise the impact on resident's views from the streets surrounding this area including Douglas McInnes Drive ○ Embankments adjacent the Rosewood-Laidley Road Rail Bridge structure (near Viewpoint 15), Grandchester (approximately Ch 64.0 km to 65.3 km): Sensitive landscape design input to the embankments in this area including buffer planting adjacent to the embankment to assist in sympathetically integrating the new embankment and bridge into the landscape and minimise the impact on views from the Warrego Highway, part of the Cobb and Co Tourist Drive ○ Embankments in the vicinity of Grandchester-Mt Mort Road and School Road (near Viewpoint 16), Grandchester (approximately Ch 65.8 km to 67.6 km): Sensitive landscape design input to the embankments in this area including tree planting to assist in sympathetically integrating the new embankment into the landscape and minimise the impact on views from nearby residential properties, Grandchester State School, School Road Reserve and nearby roads such as Grandchester-Mt Mort Road and School Road. • ***Cuttings***: Where practicable inimise 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). Locations to, consider include: ○ Railway Street (near Viewpoint 12) (approximately Ch 59.8 km to Ch 60.5 km), Laidley East: Sensitive landscape design input to the embankment and cuts in this area including extensive tree planting to the greatest extent possible along the realigned Railway Street and in wider corridor to assist in integrating the new landforms into the landscape and minimise the impact on resident's views from the streets surrounding this area including Douglas McInnes Drive. • ***Tunnels***: Consider cuts on the approach to tunnels as described above and give consideration to the detailed design of tunnel portals. In particular, consider the following opportunity: ○ Landscape and Urban Design input to Little Liverpool Range tunnel approach (within LCT H: Forested Uplands and visible in Viewpoints 13 and 14): opportunity for review of treatment of cut batters and surrounding landscape to minimise impacts on landscape (approximately Ch 61.2 km to Ch 62.8 km). • ***Concept Noise Barriers***: Minimise the use of noise barriers to the greatest extent possible. Where these are or may be required in the future, particularly in towns and urban areas to ensure they are designed sympathetically to their surroundings and consider CPTED and graffiti issues, where appropriate considering the inclusion of community artwork and urban design. This strategy will be applied to any noise barriers required within Gatton (approximately Ch 43.5 km to Ch 44.8 km) or Forest Hill (approximately Ch 51.7 km to Ch 52.7 km), and Valley Vista Estate at Laidley (approximately Ch 57.0 km to Ch 58.2 km).

Delivery Phase	Aspect	Proposed mitigation measures

Detailed design	Landscape design treatments	Develop a Project landscape design with landscaping treatments determined with 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 *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:
		  ○ 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:
		  – Near Paroz Road in Laidley to screen potential views from adjacent properties and in recognition that Paroz Road is utilised to access to Cunninghams Crest Lookout.
		  – Adjacent Laidley-Plainlands Road in Laidley, to screen the alignment and bridge abutments.
		  ○ The landscape design will 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.
		  ○ Where appropriate consult with local stakeholders and landowners during design (and construction) 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:
		  ○ Development of diverse planting and seed mixes to maximise and connect habitat types for ecological gain.
		  ○ Enhancement of landscape corridors and ecological links across the landscape by, where possible, joining or re-joining fragmented areas of habitat.
		  ○ Landscape design and planting to incorporate ecological requirements to benefit the characteristic and visual amenity of local landscapes including revegetation with locally indigenous species.
		• ***Townships***: Seek to create landscape settings that enhance or complement the local context for the social, environmental and economic benefit of local communities. This includes:
		  ○ All components in an urban context to consider the appearance and careful integration of new structures, fencing and noise barriers

Delivery Phase	Aspect	Proposed mitigation measures
Detailed design	Landscape design treatments	○ Undertake local community collaboration in the land management and restoration of footpath and cycle route connections; maintaining and, where possible, improving connectivity to provide access to open spaces including recreational areas ○ Provide enhanced planting and habitat creation to benefit the local community and support health and well-being, for example streetscape strategies within the vicinity of the Project alignment and street tree planting within Gatton, Forest Hill and Calvert and measures to enhance the setting of the Laidley Cultural Centre: – Gatton Railway Station (near Viewpoint 5) (approximately Ch 43.3 km to Ch 43.5 km): Landscape and urban design input to the setting of the Gatton Railway Station including the replacement of 2 no. ex ground palms (thought to be Phoenix canariensis) if they are removed by the realignment works; urban design input into the new pedestrian overpass that will replace the existing 'heritage' wooden structure, landscape connectivity legibility enhancements through station from CBD to Littleton Park on Hickey Street and general streetscape enhancements and rehabilitation adjacent to the rail corridor – Eastern Drive/Western Drive (near Viewpoint 6), Gatton (approximately Ch 43.9 km to Ch 44.6 km): Consider undertaking rehabilitation associated with the Eastern Drive Road Bridges to create a positive gateway legacy on the approach to Gatton from the A2/eastern approach e.g. through street tree planting, reinstatement of existing pocket park, rehabilitation and artwork – Shared User Path (near Viewpoint 6), Gatton (approximately Ch 43.7 km to Ch 51.1km): Opportunity to provide shade tree planting along the proposed new path to improve the amenity – Laidley Cultural Centre: Undertake careful design of screen planting and oval landscaping adjacent to the alignment where it deviates adjacent to Old Laidley-Forest Hill Road and Laidley-Plainlands Road (between approximately Ch 56.8 km to Ch 57.3 km) – Gordon Street/Glenore Grove Road (near Viewpoint 7), Forest Hill (approximately Ch 52.3 km to Ch 52.7 km): Careful streetscape design to enhance the legacy of Inland Rail associated with the level crossing realignment including provision of new street trees and enhancing the approach to the Cobb and Co Staging Post – Grandchester/Mount Mort Road (near Viewpoint 16), Grandchester (approximately Ch 65.8 km to Ch 66.1 km): Leverage rehabilitation to create a positive gateway legacy on the approach to Grandchester e.g. through street tree planting and vegetation rehabilitation – Hiddenvale Road, Calvert (approximately Ch 71.2 km to Ch 71.3 km): Leverage rehabilitation associated with the laydown area and level crossing to create a positive gateway legacy on the approach to Calvert e.g. through enhancement of existing pocket park adjacent to LCTB9: Western Creek Vegetated Watercourse in this area.

Delivery Phase	Aspect	Proposed mitigation measures
		Heritage landscapes: Through detailed design: • Seek to further limit direct impacts or impacts to the setting of identified items of Aboriginal, historic or natural heritage significance including Non-Indigenous heritage places (comprising local heritage places and other areas of interest as identified in EIS Chapter 18: Cultural heritage) and Indigenous Heritage places (to be identified through the Cultural Heritage Management Plans (CHMPs)). Consider the development of interpretation strategy and wayfinding to assist in the interpretation of visual elements of heritage significance such as old rail lines, bridges, buildings or other items of visual value.
Detailed design	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; as well as maintain soil viability and avoid heat sterilisation of seed bank Cover stockpiles with temporary vegetative cover (such as mulch, grass seeding/hyrdo-mulch, soil binder) Temporary treatments (such as hoardings and shade-cloth screens) to site compound fencing Will be considered to assist in reducing visual impacts of temporary infrastructure and sun glare within close proximity of sensitive receptors. This may include art-based treatments to assist with screening the works from the public and using information boards (or similar) to inform the public about the construction works.
	Lighting impacts of construction activities	Implement attenuation measures in discussion with potentially affected landholders.
	Reinstatement/ rehabilitation	Implement the landscape design and the Reinstatement and Rehabilitation Plan until performance criteria are satisfactorily achieved.

Delivery Phase	Aspect	Proposed mitigation measures
Operation	Visual impact of disturbed areas	As required, implement the relevant requirements of the Reinstatement and Rehabilitation 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) detailed in **Table 65** have been incorporated into the Project design.

Proposed mitigation measures, described in **Table 66,** were then applied as appropriate to the phase of the Project to reduce the level of potential impact.

The residual risk 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 to assess the effectiveness of the proposed mitigation measures.

In conclusion, the Project is assessed to have the following impacts, shown in **Table 67**, on landscape and visual values.

Table 67: Impact Assessment summary

Aspect	Phase	Landscape character type/Viewpoint	Sensitivity	Initial Significance[#1]		Residual Significance[#2]	
				Magnitude	Significance	Magnitude	Significance
Landscape impacts	**Construction/ Operation**	LCT A: Vegetated Watercourses - Rivers	No impact	No impact	No impact	No impact	No impact
		LCT B: Vegetated Watercourses – Creeks and Channels	Low	Moderate	Low	Moderate	Low
		LCT C: Irrigated Croplands	Low	Low	Negligible	Low	Negligible
		LCT D: Dry Croplands and Pastures	Low	High	Moderate	High	Moderate
		LCT E: Vegetated Grazing	Low	Moderate	Low	Moderate	Low
		LCT F: Rural Settlement	Moderate	Moderate	Moderate	Moderate	Moderate
		LCT G: Rural Living	Moderate	Moderate	Moderate	Low	Low
		LCT H: Forested Uplands	High	Moderate	High	Moderate	High
Visual impacts	**Construction**	Viewpoint 1: Airforce Road near 45 and 47 Airforce Road, looking northwest	Low	Moderate	Low	Moderate	Low
		Viewpoint 2: Seventeen Mile Road looking north	Low	Moderate	Low	Moderate	Low
		Viewpoint 3: Warrego Highway looking east	Moderate	Moderate	Moderate	Moderate	Moderate
		Viewpoint 4: Beavan Street looking southwest towards existing Lockyer Creek rail bridge	Moderate	Moderate	Moderate	Moderate	Moderate
		Viewpoint 5: Gatton RSL car park looking northwest towards existing Railway Station and pedestrian crossing	High	Low	Moderate	Low	Moderate

Aspect	Phase	Landscape character type/Viewpoint	Sensitivity	Initial Significance[#1]		Residual Significance[#2]	
				Magnitude	Significance	Magnitude	Significance
		Viewpoint 6: Spencer Street looking northeast near Gatton Showgrounds	Moderate	Moderate	Moderate	Moderate	Moderate
		Viewpoint 7: Gordon Street looking northwest towards level crossing	Moderate	Low	Low	Low	Low
		Viewpoint 8: Laidley-Plainlands Road looking north towards bridge crossing	Moderate	Moderate	Moderate	Moderate	Moderate
		Viewpoint 9: Patrick Street underpass looking northwest	Moderate	High	High	High	High
		Viewpoint 10: Hardy Drive looking northeast down Rampton Street over new subdivision	Moderate	Moderate	Moderate	Moderate	Moderate
		Viewpoint 11: Branell Homestead Luxury Cabins on Paroz Road, looking west	Moderate	Low	Low	Low	Low
		Viewpoint 12: Douglas McInnes Drive near existing rail line, looking northwest	Moderate	High	High	High	High
		Viewpoint 13: Kessling Drive, looking southwest towards western tunnel portal	Low	High	Low	High	Low
		Viewpoint 14: Cunningham's Crest Lookout, looking southwest towards Laidley	Moderate	Moderate	Moderate	Moderate	Moderate
		Viewpoint 15: Laidley-Rosewood Road near properties 113-117, looking east	Low	Moderate	Low	Moderate	Low
		Viewpoint 16: Grandchester State School looking north toward alignment and old railway station	Moderate	Low	Low	Low	Low
		Viewpoint 17: End of Calvert School Road, looking west near properties 917-923	Moderate	Low	Low	Low	Low

Aspect	Phase	Landscape character type/Viewpoint	Sensitivity	Initial Significance[#1]		Residual Significance[#2]	
				Magnitude	Significance	Magnitude	Significance
Visual impacts	**Operation**	Viewpoint 1: Airforce Road near 45 and 47 Airforce Road, looking northwest	Low	High	Moderate	Moderate	Low
		Viewpoint 2: Seventeen Mile Road looking north	Low	High	Moderate	High	Moderate
		Viewpoint 3: Warrego Highway looking east	Moderate	High	High	Moderate	Moderate
		Viewpoint 4: Beavan Street looking southwest towards existing Lockyer Creek rail bridge	Moderate	Moderate	Moderate	Moderate	Moderate
		Viewpoint 5: Gatton RSL car park looking northwest towards existing Railway Station and pedestrian crossing	High	Low (current design)	Moderate	Low (current design)	Moderate
				High (provision of noise barriers)	Major	Moderate (provision of noise barriers)	High
		Viewpoint 6: Spencer Street looking northeast near Gatton Showgrounds	Moderate	Moderate	Moderate	Low	Low
		Viewpoint 7: Gordon Street looking northwest towards level crossing	High	Moderate (current design)	High	Low (current design)	Moderate
				High (provision of noise barriers)	Major	Moderate (provision of noise barriers)	High
		Viewpoint 8: Laidley-Plainlands Road looking north towards bridge crossing	Moderate	High	High	Moderate	Moderate
		Viewpoint 9: Patrick Street underpass looking northwest	Moderate	High	High	High	High
		Viewpoint 10: Hardy Drive looking northeast down Rampton Street over new subdivision	Moderate	High	High	High	High
		Viewpoint 11: Branell Homestead Luxury Cabins on Paroz Road, looking west	Moderate	Moderate	Moderate	Low	Low

Aspect	Phase	Landscape character type/Viewpoint	Sensitivity	Initial Significance[#1]		Residual Significance[#2]	
				Magnitude	Significance	Magnitude	Significance
		Viewpoint 12: Douglas McInnes Drive near existing rail line, looking northwest	Moderate	High	High	Moderate	Moderate
		Viewpoint 13: Kessling Drive, looking southwest towards western tunnel portal	Low	High	Moderate	High	Moderate
		Viewpoint 14: Cunningham's Crest Lookout, looking southwest towards Laidley	Moderate	Moderate	Moderate	Moderate	Moderate
		Viewpoint 15: Laidley-Rosewood Road near properties 113-117, looking east	Low	High	Moderate	Moderate	Low
		Viewpoint 16: Grandchester State School looking north toward alignment and old railway station	Moderate	Moderate	Moderate	Moderate	Moderate
		Viewpoint 17: End of Calvert School Road, looking west near properties 917-923	Moderate	Low	Low	Low	Low
Lighting impacts	**Construction/ Operation**	Viewpoint 1: Airforce Road near 45 and 47 Airforce Road, looking northwest	Low	Low (construction only)	Negligible (construction only)	Low (construction only)	Negligible (construction only)
		Viewpoint 2: Seventeen Mile Road looking north	Low	No impact	No impact	No impact	No impact
		Viewpoint 3: Warrego Highway looking east	Moderate	Low (construction only)	Low (construction only)	Low (construction only)	Low (construction only)
		Viewpoint 4: Beavan Street looking southwest towards existing Lockyer Creek rail bridge	Moderate	Moderate (construction only)	Moderate (construction only)	Moderate (construction only)	Moderate (construction only)
		Viewpoint 5: Gatton RSL car park looking northwest towards existing Railway Station and pedestrian crossing	High	Low (construction only)	Moderate (construction only)	Low (construction only)	Moderate (construction only)
		Viewpoint 6: Spencer Street looking northeast near Gatton Showgrounds	Moderate	Low (construction)	Moderate (construction)	Low (construction)	Moderate (construction)

Aspect	Phase	Landscape character type/Viewpoint	Sensitivity	Initial Significance[#1]		Residual Significance[#2]	
				Magnitude	Significance	Magnitude	Significance
				Negligible (operation)	Low (operation)	Negligible (operation)	Low (operation)
		Viewpoint 7: Gordon Street looking northwest towards level crossing	Moderate	Negligible (operation only)	Low (operation only)	Negligible (operation only)	Low (operation only)
		Viewpoint 8: Laidley-Plainlands Road looking north towards bridge crossing	Moderate	Low (construction)	Low (construction)	Low (construction)	Low (construction)
				Negligible (operation)	Low(operation)	Negligible (operation)	Low(operation)
		Viewpoint 9: Patrick Street underpass looking northwest	Moderate	Low (construction and operation)	Low (construction and operation)	Low (construction and operation)	Low (construction and operation)
		Viewpoint 10: Hardy Drive looking northeast down Rampton Street over new subdivision	Moderate	Negligible (construction only)	Low (construction only)	Negligible (construction only)	Low (construction only)
		Viewpoint 11: Branell Homestead Luxury Cabins on Paroz Road, looking west	Moderate	Negligible (construction only)	Low (construction only)	Negligible (construction only)	Low (construction only)
		Viewpoint 12: Douglas McInnes Drive near existing rail line, looking northwest	Moderate	Moderate (construction only)	Low (construction only)	Moderate (construction only)	Low (construction only)
		Viewpoint 13: Kessling Drive, looking southwest towards western tunnel portal	Low	Low (construction and operation)	Negligible (construction and operation)	Low (construction and operation)	Negligible (construction and operation)
		Viewpoint 14: Cunningham's Crest Lookout, looking southwest towards Laidley	Moderate	No impact	No impact	No impact	No impact
		Viewpoint 15: Laidley-Rosewood Road near properties 113-117, looking east	Low	Low (construction only)	Negligible (construction only)	Low (construction only)	Negligible (construction only)

Aspect	Phase	Landscape character type/Viewpoint	Sensitivity	Initial Significance[#1]		Residual Significance[#2]	
				Magnitude	Significance	Magnitude	Significance
		Viewpoint 16: Grandchester State School looking north toward alignment and old railway station	Moderate	Low (operation only)	Low (operation only)	Low (operation only)	Low (operation only)
		Viewpoint 17: End of Calvert School Road, looking west near properties 917-923	Moderate	Low (operation only)	Low (operation only)	Low (operation only)	Low (operation only)

[#1] *Includes implementation of initial mitigation specified in* ***Table 65****.*

[#2] *Includes implementation of additional mitigation and controls as identified in* ***Table 66****.*

12. Conclusions and recommendations

12.1. Summary of landscape impacts

Eight LCTs with associated LCAs were identified through the landscape assessment process. A summary of the overall likely landscape impact anticipated during the construction and operation of the Project for each LCT is presented in Table 68.

Table 68: Summary landscape assessment (construction and operation)

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

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

This shows that the Project is considered likely to result in significant impacts of up to high significance on the landscape character and amenity of LCT H: Forested Uplands, during construction and operation. This principally relates to the impacts associated with clearance of vegetation and the construction of extensive cuts and embankments through landscapes of up to regional landscape significance in H10: Little Liverpool Range and H5: Teviot Range.

These impacts will be managed through the implementation of the mitigation measures described in **Section 11: Mitigation and Residual Impact Assessment**.

12.2. Summary of visual impacts

Based on digital mapping (VAM) and the field survey, 17 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 69.

Table 69: Summary preliminary visual assessment (Construction)

Viewpoint name	Viewpoint Sensitivity	Magnitude of change	Potential Visual Effect
Viewpoint 1: Airforce Road near 45 and 47 Airforce Road, looking northwest	Low	Moderate	Low[1 and 2]
Viewpoint 2: Seventeen Mile Road looking north	Low	Moderate	Low[1 and 2]
Viewpoint 3: Warrego Highway looking east	Moderate	Moderate	Moderate[1 and 2]
Viewpoint 4: Beavan Street looking southwest towards existing Lockyer Creek rail bridge	Moderate	Moderate	Moderate[1 and 2]

Viewpoint name	Viewpoint Sensitivity	Magnitude of change	Potential Visual Effect
Viewpoint 5: Gatton RSL car park looking northwest towards existing Railway Station and pedestrian crossing	High	Low	Moderate[1 and 2]
Viewpoint 6: Spencer Street looking northeast near Gatton Showgrounds	Moderate	Moderate	Moderate[1 and 2]
Viewpoint 7: Gordon Street looking northwest towards level crossing	High	Moderate	High[1 and 2]
Viewpoint 8: Laidley-Plainlands Road looking north towards bridge crossing	Moderate	Moderate	Moderate[1 and 2]
Viewpoint 9: Patrick Street underpass looking northwest	Moderate	High	High[1 and 2]
Viewpoint 10: Hardy Drive looking northeast down Rampton Street over new subdivision	Moderate	Moderate	Moderate[1 and 2]
Viewpoint 11: Branell Homestead Luxury Cabins on Paroz Road, looking west	Moderate	Low	Low[1 and 2]
Viewpoint 12: Douglas McInnes Drive near existing rail line, looking northwest	Moderate	High	High[1 and 2]
Viewpoint 13: Kessling Drive, looking southwest towards western tunnel portal	Low	High	Low[1 and 2]
Viewpoint 14: Cunningham's Crest Lookout, looking southwest towards Laidley	Moderate	Moderate	Moderate[1 and 2]
Viewpoint 15: Laidley-Rosewood Road near properties 113-117, looking east	Low	Moderate	Low[1 and 2]
Viewpoint 16: Grandchester State School looking north toward alignment and old railway station	Moderate	Low	Low[1 and 2]
Viewpoint 17: End of Calvert School Road, looking west near properties 917-923	Moderate	Low	Low[1 and 2]

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

This shows that while construction impacts of up to a high magnitude of change are anticipated (Viewpoint 10), the sensitivity of the receptor at this location is low. Therefore, the Project is considered likely to result in visual impacts of up to moderate significance during construction.

A summary of the overall likely visual impact on the same representative viewpoints during the operation of the Project is summarised in Table 70.

Table 70: Summary preliminary visual assessment (Operation)

Viewpoint name	Viewpoint Sensitivity	Magnitude of change	Potential Visual Effect
Viewpoint 1: Airforce Road near 45 and 47 Airforce Road, looking northwest	Low	High	Moderate[1]
		Moderate	Low[2]
Viewpoint 2: Seventeen Mile Road looking north	Low	High	Moderate[1 and 2]
Viewpoint 3: Warrego Highway looking east	Moderate	High	High[1]
		Moderate	Moderate[2]
Viewpoint 4: Beavan Street looking southwest towards existing Lockyer Creek rail bridge	Moderate	Moderate	Moderate[1 and 2]

Viewpoint name	Viewpoint Sensitivity	Magnitude of change	Potential Visual Effect
Viewpoint 5: Gatton RSL car park looking northwest towards existing Railway Station and pedestrian crossing	High	Low (current design)	Moderate[1 and 2]
		High (provision of noise barriers)	Major[1]
		Moderate (provision of noise barriers)	High[2]
Viewpoint 6: Spencer Street looking northeast near Gatton Showgrounds	Moderate	Moderate	Moderate[1]
		Low	Low[2]
Viewpoint 7: Gordon Street looking northwest towards level crossing	High	Moderate (current design)	High[1 and 2]
		Low (current design)	Moderate[1]
		High (provision of noise barriers)	Major[1]
		Moderate (provision of noise barriers)	High[2]
Viewpoint 8: Laidley-Plainlands Road looking north towards bridge crossing	Moderate	High	High[1]
		Moderate	Moderate[2]
Viewpoint 9: Patrick Street underpass looking northwest	Moderate	High	High[1 and 2]
Viewpoint 10: Hardy Drive looking northeast down Rampton Street over new subdivision	Moderate	High	High[1 and 2]
Viewpoint 11: Branell Homestead Luxury Cabins on Paroz Road, looking west	Moderate	Moderate	Moderate[1]
		Low	Low[2]
Viewpoint 12: Douglas McInnes Drive near existing rail line, looking northwest	Moderate	High	High[1]
		Moderate	Moderate[2]
Viewpoint 13: Kessling Drive, looking southwest towards western tunnel portal	Low	High	Moderate[1 and 2]
Viewpoint 14: Cunningham's Crest Lookout, looking southwest towards Laidley	Moderate	Moderate	Moderate[1 and 2]
Viewpoint 15: Laidley-Rosewood Road near properties 113-117, looking east	Low	High	Moderate[1]
		Moderate	Low[2]
Viewpoint 16: Grandchester State School looking north toward alignment and old railway station	Moderate	Moderate	Moderate[1 and 2]
Viewpoint 17: End of Calvert School Road, looking west near properties 917-923	Moderate	Low	Low[1 and 2]

[1] *Initial mitigation only*

[2] *Assessment including additional mitigation measures*

This shows that the Project is considered likely to result in impacts of high significance on six representative views, relating to impacts on Viewpoint 3: Warrego Highway looking east, Viewpoint 7: Gordon Street looking northwest towards level crossing, Viewpoint 8: Laidley-Plainlands Road looking north towards bridge crossing, Viewpoint 9: Patrick Street underpass looking northwest, Viewpoint 10: Hardy Drive looking northeast down Rampton Street over new subdivision and Viewpoint 12: Douglas McInnes Drive near existing rail line, looking northwest.

An additional two representative viewpoints (Viewpoint 5: Gatton RSL car park looking northwest towards existing Railway Station and pedestrian crossing and Viewpoint 7: Gordon Street looking northwest towards level crossing) have the potential for the significance of impact during operation to increase from moderate and high respectively to major, should noise barriers be included at the detail design phase.

These impacts will be managed through the implementation of the mitigation measures described in **Section 11: Mitigation and Residual Impact Assessment**.

12.3. Summary of lighting impacts

As there is limited Project lighting proposed, many 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 (as described above) is presented in **Table 71.** The most significant effect during construction is up to Moderate (Viewpoint 5 – Gatton CBD) and the most significant effect for operation is Low (Viewpoint 16 – Grandchester).

These impacts will be managed through the implementation of the mitigation measures described in **Section 11: Mitigation and Residual Impact Assessment**.

Table 71: Summary lighting assessment (Construction and Operation)

Viewpoint name	Viewpoint Sensitivity	Magnitude of change	Potential Visual Effect
Viewpoint 1: Airforce Road near 45 and 47 Airforce Road, looking northwest	Low	Low (construction only)	Negligible (construction only) [1 and 2]
Viewpoint 2: Seventeen Mile Road looking north	Low	No impact	No impact [1 and 2]
Viewpoint 3: Warrego Highway looking east	Moderate	Low (construction only)	Low (construction only)
Viewpoint 4: Beavan Street looking southwest towards existing Lockyer Creek rail bridge	Moderate	Moderate (construction only)	Moderate (construction only) [1 and 2]
Viewpoint 5: Gatton RSL car park looking northwest towards existing Railway Station and pedestrian crossing	High	Low (construction only)	Moderate (construction only) [1 and 2]
Viewpoint 6: Spencer Street looking northeast near Gatton Showgrounds	Moderate	Low (construction)	Moderate (construction) [1 and 2]
		Negligible (operation)	Negligible (operation) [1 and 2]
Viewpoint 7: Gordon Street looking northwest towards level crossing	Moderate	Negligible (operation only)	Negligible (operation [1 and 2]only)
Viewpoint 8: Laidley-Plainlands Road looking north towards bridge crossing	Moderate	Low (construction)	Low (construction)
		Negligible (operation)	Negligible (operation) [1 and 2]
Viewpoint 9: Patrick Street underpass looking northwest	Moderate	Low (construction and operation)	Low (construction and operation) [1 and 2]
Viewpoint 10: Hardy Drive looking northeast down Rampton Street over new subdivision	Moderate	Negligible (construction only)	Low (construction only) [1 and 2]
Viewpoint 11: Branell Homestead Luxury Cabins on Paroz Road, looking west	Moderate	Negligible (construction only)	Low (construction only) [1 and 2]

Viewpoint name	Viewpoint Sensitivity	Magnitude of change	Potential Visual Effect
Viewpoint 12: Douglas McInnes Drive near existing rail line, looking northwest	Moderate	Moderate (construction only)	Low (construction only)
Viewpoint 13: Kessling Drive, looking southwest towards western tunnel portal	Low	Low (construction and operation)	Negligible (construction and operation)
Viewpoint 14: Cunningham's Crest Lookout, looking southwest towards Laidley	Moderate	No impact	No impact[1 and 2]
Viewpoint 15: Laidley-Rosewood Road near properties 113-117, looking east	Low	Low (construction only)	Negligible (construction only) [1 and 2]
Viewpoint 16: Grandchester State School looking north toward alignment and old railway station	Moderate	Low (operation only)	Low (operation only)
Viewpoint 17: End of Calvert School Road, looking west near properties 917-923	Moderate	Low (operation only)	Low (operation only)

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

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, shown in **Table 72,** on landscape and visual values.

Table 72: Impact Assessment summary

Impact	Significance
Landscape impacts during construction and operation	Impacts of up to ***High*** significance on LCT H: Forested Uplands. ***Nil*** to ***Moderate*** impact on all other LCT's.
Visual impacts during construction	Impacts up to ***High*** significance for two representative viewpoints (Viewpoint 9: Patrick Street underpass looking northwest and Viewpoint 12: Douglas McInnes Drive near existing rail line, looking northwest). Other impacts of up to ***Moderate*** significance for seven representative viewpoints (Viewpoint 3: Warrego Highway looking east; Viewpoint 4: Beavan Street looking southwest towards existing Lockyer Creek rail bridge; Viewpoint 5: Gatton RSL car park looking northwest towards existing Railway Station and pedestrian crossing; Viewpoint 6: Spencer Street looking northeast near Gatton Showgrounds; Viewpoint 8: Laidley-Plainlands Road looking north towards bridge crossing ; Viewpoint 10: Hardy Drive looking northeast down Rampton Street over new subdivision; and Viewpoint 14: Cunningham's Crest Lookout, looking southwest towards Laidley).
Visual impacts during operation	Impacts up to ***High*** significance for six representative viewpoints (Viewpoint 3: Warrego Highway looking east; Viewpoint 8: Laidley-Plainlands Road looking north towards bridge crossing; Viewpoint 7: Gordon Street looking northwest towards level crossing; Viewpoint 9: Patrick Street underpass looking northwest; Viewpoint 10: Hardy Drive

Impact	Significance
	looking northeast down Rampton Street over new subdivision and Viewpoint 12: Douglas McInnes Drive near existing rail line, looking northwest. An additional two representative viewpoints (Viewpoint 5: Gatton RSL car park looking northwest towards existing Railway Station and pedestrian crossing and Viewpoint 7: Gordon Street looking northwest towards level crossing) have the potential for the significance of impact during operation to increase from ***Moderate*** and ***High*** respectively to ***Major***, should noise barriers be included at the detail design phase. Nine other representative viewpoints have impacts of up to ***Moderate*** significance (Viewpoint 1: Airforce Road near 45 and 47 Airforce Road, looking northwest; Viewpoint 2: Seventeen Mile Road looking north; Viewpoint 4: Beavan Street looking southwest towards existing Lockyer Creek rail bridge; Viewpoint 6: Spencer Street looking northeast near Gatton Showgrounds; Viewpoint 11: Branell Homestead Luxury Cabins on Paroz Road, looking west; Viewpoint 13: Kessling Drive, looking southwest towards western tunnel portal; Viewpoint 14: Cunningham's Crest Lookout, looking southwest towards Laidley; Viewpoint 15: Laidley-Rosewood Road near properties 113-117, looking east and Viewpoint 16: Grandchester State School looking north toward alignment and old railway station).
Lighting impacts	Up to ***Moderate*** significance for three viewpoints during construction (Viewpoint 4: Beavan Street looking southwest towards existing Lockyer Creek rail bridge; Viewpoint 5: Gatton RSL car park looking northwest towards existing Railway Station and pedestrian crossing and Viewpoint 6: Spencer Street looking northeast near Gatton Showgrounds).
Cumulative impacts during construction	***Medium consequence*** primarily associated with lighting and visual impact of traffic on the Warrego Highway due to the simultaneous construction of G2H and C2K projects.
Cumulative impacts during operation	***Low consequence***
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.

12.5. Conclusions

The landscape between Helidon and Calvert is a populated working agricultural landscape characterised by generally flat irrigated and non-irrigated croplands and undulating pastures, interspersed by a network of vegetated watercourses associated with Lockyer Creek and the Bremer River and set against a backdrop of forested ranges. Historically, a freight railway has existed along much of the proposed alignment and there is a legacy of modern and heritage rail infrastructure throughout the landscape and visual study area.

The Project proposes to introduce 47 km of rail into the landscape, of which nearly half (approximately 24 km) would be along or adjacent to the existing rail corridor.

The key landscape and visual impacts of the Project relate to the removal of vegetation, along with the provision of new infrastructure elements including embankments, deep cuts, tunnels, and new road and rail bridges.

Eight LCTs have been identified within the LVIA study area that are assessed to have up to High sensitivity. Impacts on these LCTs of up to High significance have been identified for one character area, being Landscape Type H: Forested Uplands, which comprises the regionally-significant Teviot and Little Liverpool Range scenic amenity areas that are identified in *ShapingSEQ* (2017).

Throughout the LVIA Study Area there are high numbers of visual receptors including residents in the various population centres close to the alignment such as Murphys Creek (664 people), Withcott (1,000 people), Helidon Spa (538 people), Grantham (634 people), Gatton (7,101 people), Forest Hill (968 people), Laidley (3,808 people), Ma Ma Creek (394 people), Grandchester (444 people) and Calvert (310 people) as well as numerous rural living areas and the UQ Gatton Campus (ABS, 2016). Additionally, views can be obtained from roads throughout the area, including the Warrego Highway and tourist drives (including part of the Cobb and Co trail).

Visual impacts are often contained by the presence of vegetation and landform. However, there are localised elevated areas affording views over a wider area, including one scenic lookout close to the alignment – Cunninghams Crest.

Seventeen representative viewpoints have been assessed to represent impacts on these views. In addition, visualisations were prepared for selected viewpoints to illustrate the impact of key infrastructure elements likely to be of interest to the community and/or the most sensitive viewpoints. Of the viewpoints assessed, six visual impacts of up to High significance were identified for the operation phase of the Project. These comprise the impact of the Warrego Highway rail bridge on Viewpoint 3: Warrego Highway looking east; the impact on residents of Forest Hill represented by Viewpoint 7: Gordon Street looking northwest towards level crossing; the proposed rail over road bridge in Laidley North Viewpoint 8: Laidley-Plainlands Road looking north towards bridge crossing; impacts on residents of Valley Vista Estate represented by Viewpoint 9: Patrick Street underpass looking northwest and Viewpoint 10: Hardy Drive looking down Rampton Street in the new subdivision to the north of Laidley; and the impact of embankments and deep cuts at the foothills of the Little Liverpool Range at Viewpoint 12: Douglas McInnes Drive near existing rail line, looking northwest, also in Laidley.

An additional two representative viewpoints (Viewpoint 5: Gatton RSL car park looking northwest towards existing Railway Station and pedestrian crossing and Viewpoint 7: Gordon Street looking northwest towards level crossing) have the potential for the significance of impact during operation to increase from High to Major, should the current concept noise barriers be included at the detail design phase.

The most significant effect during construction is up to Moderate. This is due to the temporary nature of construction impacts.

The highest visual effect of lighting was identified of being up to Moderate significance during construction (Viewpoint 5: Gatton RSL car park looking northwest towards existing Railway Station and pedestrian crossing). The most significant effect during operation was assessed as Low (Viewpoint:16 Grandchester State School).

Cumulative impacts, particularly the effects in combination with the adjoining G2H and C2K Inland Rail projects and the GWIZ have been considered but it is considered that the consequence of these cumulative impacts is Low during construction and up to Medium during operation.

ARTC will develop an Rehabilitation and Reinstatement Plan which will include landscape objectives and principles, as well as outline landscape and rehabilitation treatments for various phases of Inland Rail. These will include reference to the mitigation measures described in **Table 66** 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
C2K	The Calvert to Kagaru alignment of the Inland Rail Program
CBD	Central Business District
Client	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
FFJV	Future Freight Joint Venture
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.
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.
Landscape character type	Distinct types of landscape that are relatively homogeneous in character. They are generic in nature in that they may occur in different areas in different parts of the country, but wherever they occur they share broadly similar combinations of geology, topography, drainage patterns, vegetation and historical land use and settlement pattern
Landscape character area	These are single unique areas and are the discrete geographical areas of a particular landscape character type.
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

Project 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.
Study Area	LVIA Study Area (discipline study area); comprising land within the potential viewshed of and forming the wider landscape context of the Project
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 (AILA 2009).

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APPENDIX H

Landscape and Visual Impact Assessment Technical Report

Appendix 1 Plans

HELIDON TO CALVERT ENVIRONMENTAL IMPACT STATEMENT

IR_1381

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: Landscape and visual impact assessment 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: Tourist drives and sensitive receptors

Figure 9: Key visual receptors and location of representative viewpoints

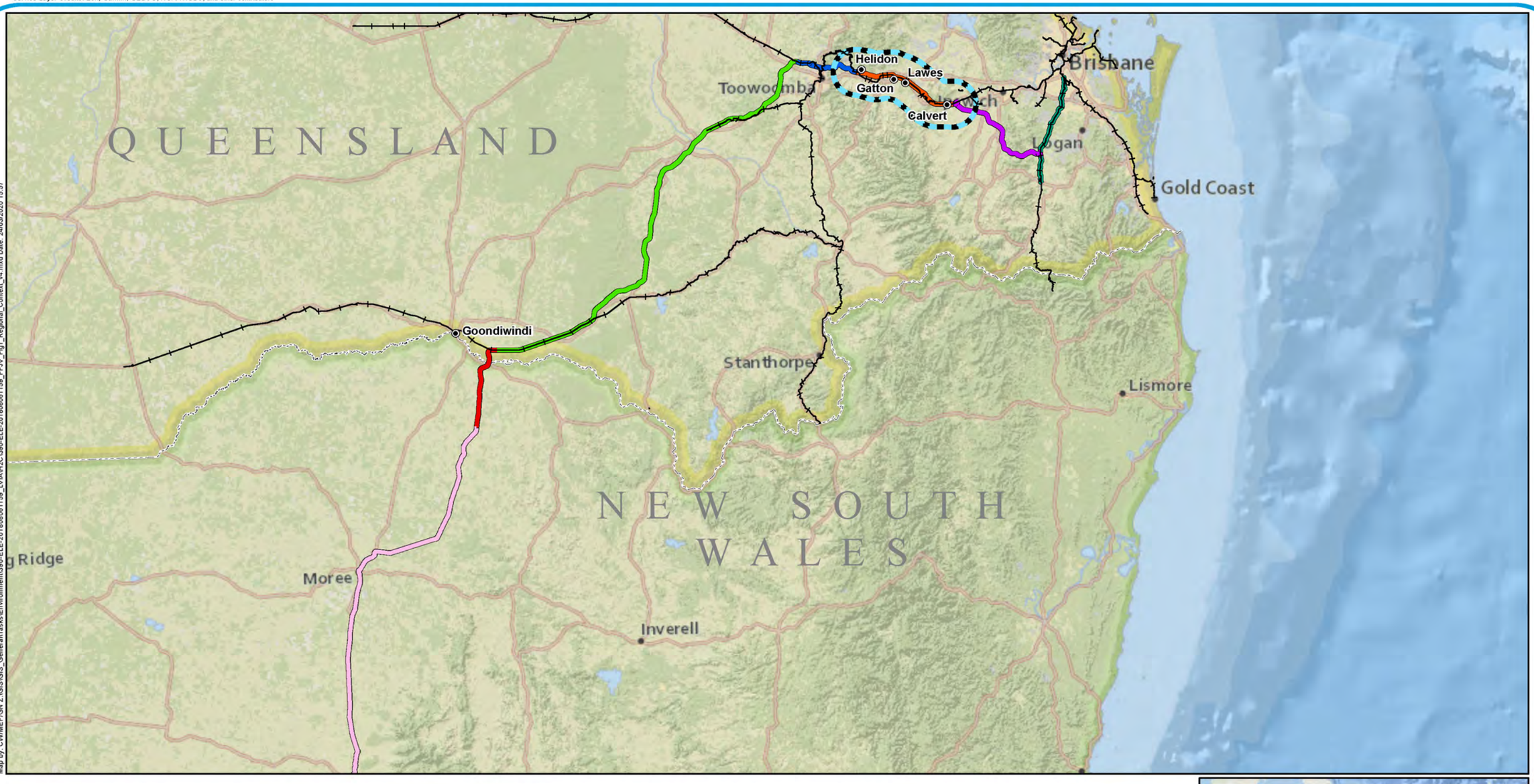
Figure 10: Visual analysis map – permanent infrastructure

Figure 11: Visual analysis map – rolling stock

Figure 12: Visual analysis map – difference analysis

Figure 13: Cumulative LVIA

Service Layer Credits: Esri, Garmin, GEBCO, NOAA NGDC, and other contributors



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Legend

- Localities
- Existing rail
- N2NS project alignment
- NS2B project alignment
- B2G project alignment
- G2H project alignment
- H2C project alignment
- C2K project alignment
- K2ARB project alignment
- NSW/QLD border
- LVIA study area (10 km from rail alignment)

A3 scale: 1:1,800,000

0 20 40 60 80 100 km

Future Freight
Integrating Community, Environment and Engineering

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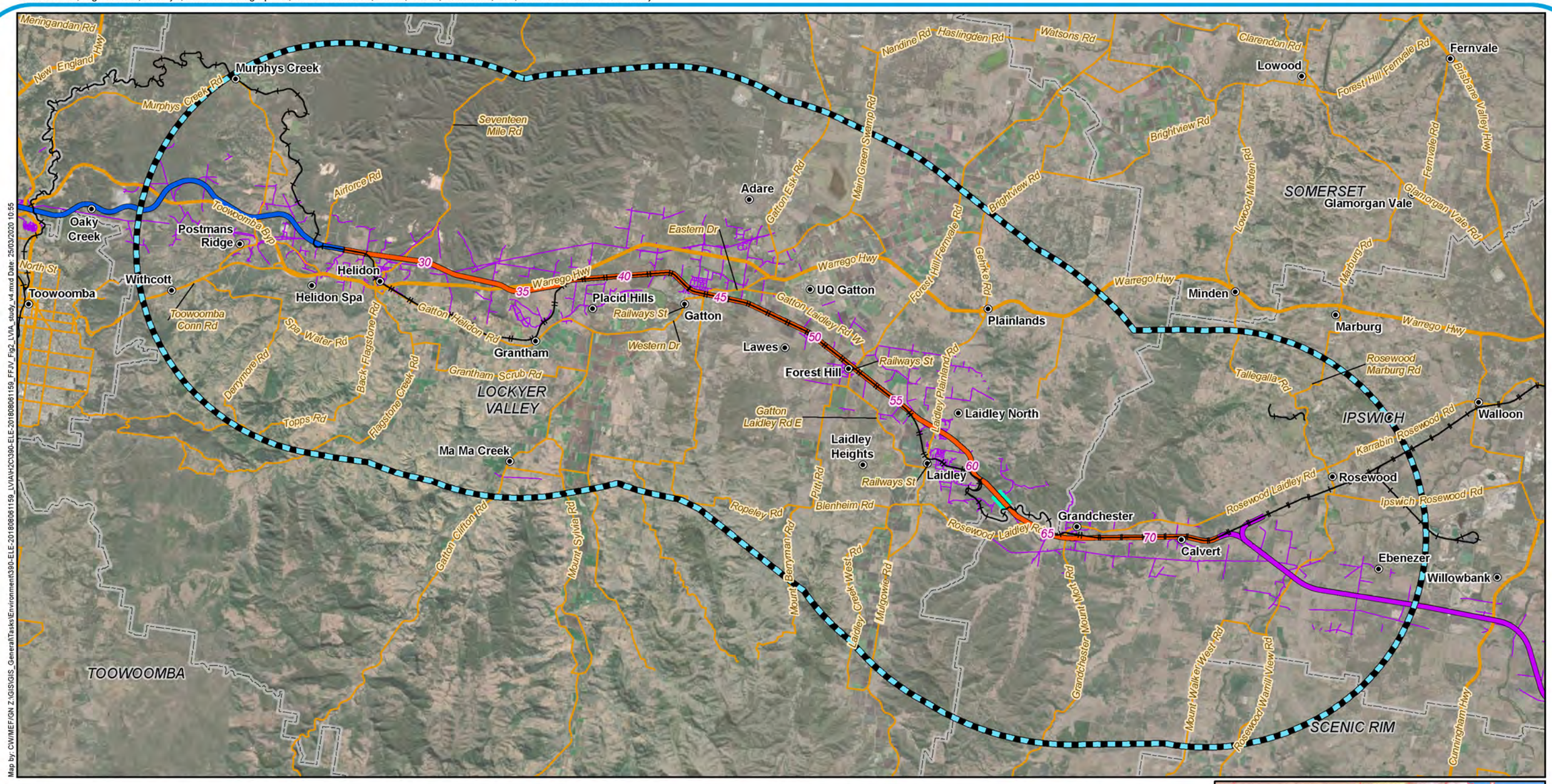
Helidon to Calvert
Figure 1: Inland rail regional context

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



Legend

- 5 Chainage (km)
- Localities
- Existing rail
- G2H project alignment
- H2C project alignment
- C2K project alignment
- Major roads
- Minor roads
- Powerlines (within 2km of the alignment)
- Tunnel
- Local Government Areas
- LVIA study area (10 km from rail alignment)

A3 scale: 1:200,000

0 2 4 6 8 10km

Future Freight
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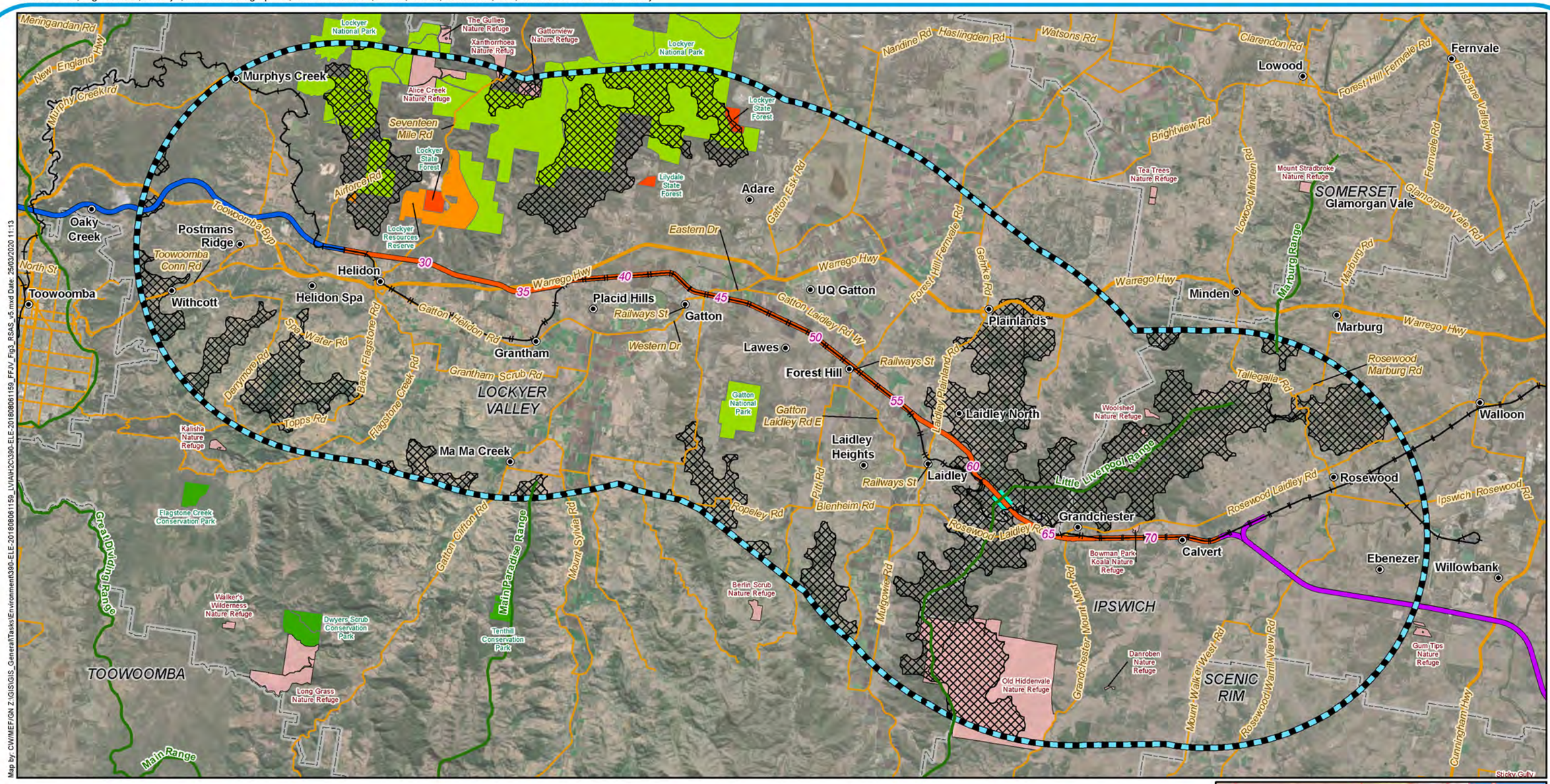
Coordinate System: GDA 1994 MGA Zone 56

Map by: CW/MEF/GN Z:\GIS\GIS_General\Tasks\Environment\390-ELE-20180806159_LVIA\H2C\390-ELE-20180806159_FFJV_Fig2_LVIA_study_v4.mxd Date: 25/03/2020 10:55

Helidon to Calvert
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

- 5 Chainage (km)
- Localities
- Existing rail
- G2H project alignment
- H2C project alignment
- C2K project alignment
- Major roads
- Minor roads
- Mountain ranges
- Tunnel
- Local Government Areas
- LVIA study area (10 km from rail alignment)

Protected areas

- Conservation Park
- National Park
- Resources Reserve
- State Forest
- Nature refuge
- Regionally significant scenic amenity (within LVIA study area)

A3 scale: 1:200,000

0 2 4 6 8 10km

Future Freight
Integrating Community, Environment and Engineering

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Coordinate System: GDA 1994 MGA Zone 56

Map by: CW/MEF/GN Z:\GIS\GIS_General\Tasks\Environment\390-ELE-20180806159_LVIA\H2C\390-ELE-20180806159_FFJV_Fig3_RSAS_v5.mxd Date: 25/03/2020 11:13

Helidon to Calvert

Figure 3: Regional scenic amenity and planning designations

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

Map by: CW/MEF/GN Z:\GIS\GIS_General\Tasks\Environment\390-ELE-20180806159_LVIA\H2C\390-ELE-20180806159_FFJV_Fig4_LandHydro_cont_v4.mxd Date: 25/03/2020 11:53

Legend

- Mountain
- Chainage (km)
- Localities
- Existing rail
- G2H project alignment
- H2C project alignment
- C2K project alignment
- Mountain ranges
- Major roads
- Minor roads
- Tunnel
- Lakes / Dams
- Local Government Areas
- LVIA study area (10 km from rail alignment)

Elevation (m AHD)

< 0	250 - 300	550 - 600
0 - 50	300 - 350	600 - 650
50 - 100	350 - 400	650 - 700
100 - 150	400 - 450	700 - 750
150 - 200	450 - 500	
200 - 250	500 - 550	

A3 scale: 1:200,000

0 2 4 6 8 10km

Future Freight
Integrating Community, Environment and Engineering

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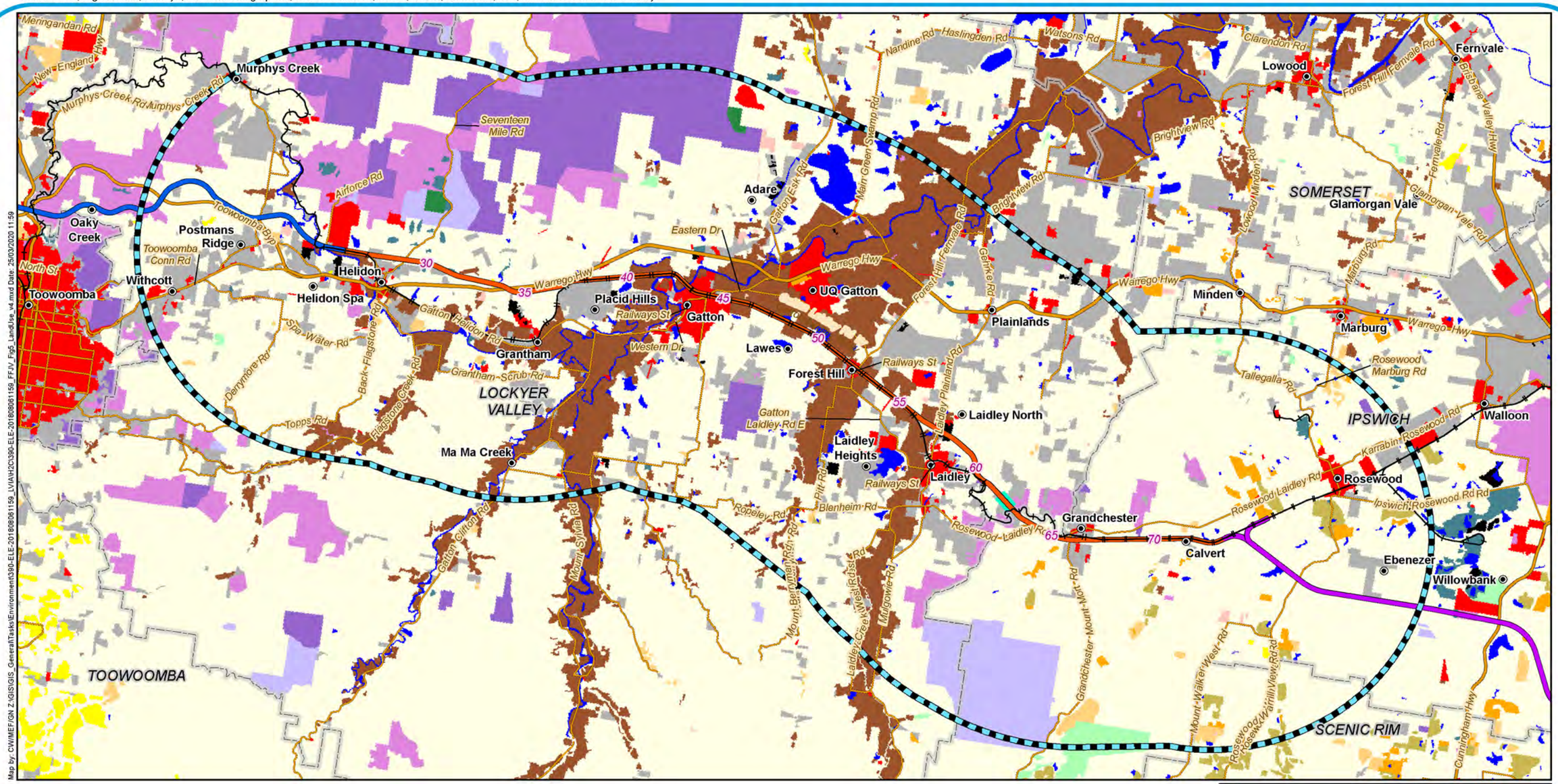
Coordinate System: GDA 1994 MGA Zone 56

Helidon to Calvert

Figure 4: Landform context and hydrological context

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



Map by: CWI/MEF/GN Z:\GIS\GIS_General\Tasks\Environment\390-ELE-20180806159_LVIA\H2C\390-ELE-20180806159_FFJV_Fig5_LandUse_v4.mxd Date: 25/03/2020 11:59

Legend

- 5 Chainage (km)
- Localities
- G2H project alignment
- H2C project alignment
- C2K project alignment
- Major roads
- Minor roads
- Existing rail
- Tunnel
- Local Government Areas
- LVIA study area (10 km from rail alignment)

Land use

- Nature conservation
- Managed resource protection
- Other minimal use
- Grazing native vegetation
- Production native forests
- Grazing modified pastures
- Plantation forests (commercial and other)
- Dryland cropping
- Dryland horticulture
- Land in transition
- Irrigated pastures
- Irrigated cropping
- Irrigated horticulture
- Urban intensive uses
- Intensive horticulture and animal production
- Rural residential and farm infrastructure
- Mining and waste
- Water

A3 scale: 1:200,000

0 2 4 6 8 10km

Future Freight
Integrating Community, Environment and Engineering

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Coordinate System: GDA 1994 MGA Zone 56

Helidon to Calvert
Figure 5: Land use context

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

Map by: CW/MEP/GN Z:\GIS\GIS_General\Tasks\Environment\390-ELE-20180806159_LVIA\H2C\390-ELE-20180806159_FFJV_Fig6_IBRA_v4.mxd Date: 25/03/2020 13:49

Legend

- 5 Chainage (km)
- Localities
- Existing rail
- G2H project alignment
- H2C project alignment
- C2K project alignment
- Major roads
- Minor roads
- Tunnel
- Local Government Areas
- LVIA study area (10 km from rail alignment)

IBRA Regions

- Brigalow Belt South
- South Eastern Queensland

IBRA Subregions

- BBS17 Eastern Darling Downs
- SEQ02 Moreton Basin
- SEQ06 South Burnett

A3 scale: 1:200,000

0 2 4 6 8 10km

Future Freight
Integrating Community, Environment and Engineering

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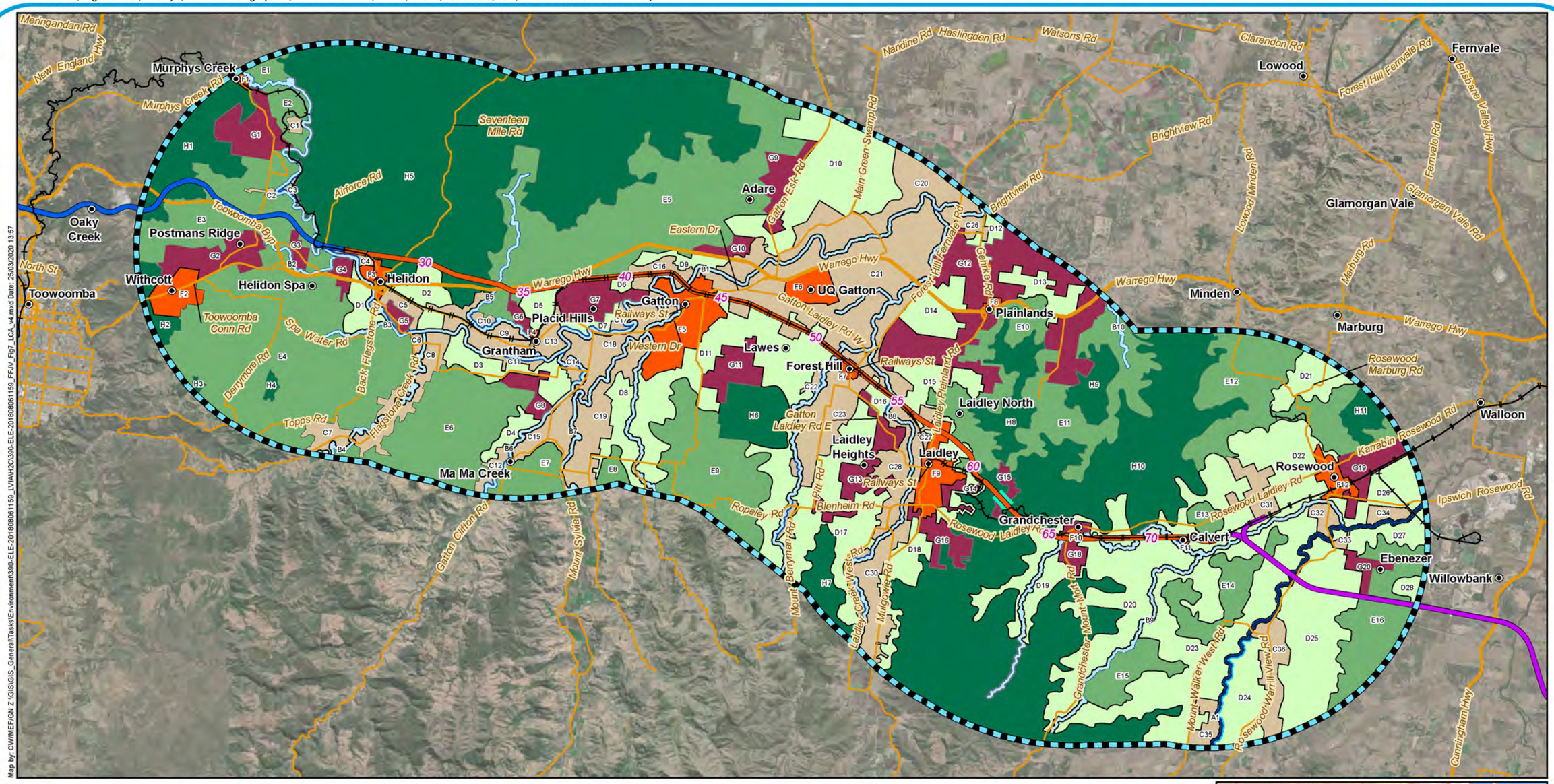
Helidon to Calvert

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: CW/MEP/GN Z:\GIS\GIS_GeneralTasks\Environment\3390-ELE-20180806159_LVIA\H2C\3390-ELE-20180806159_FFJV_Fig7_LCA_v4.mxd Date: 25/03/2020 13:57

Legend

- 5 Chainage (km)
- Localities
- Existing rail
- G2H project alignment
- H2C project alignment
- C2K project alignment
- Major roads
- Minor roads
- Tunnel
- 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: Rural Living
- LCTH: Forested Uplands

A3 scale: 1:200,000

0 2 4 6 8 10km

Future Freight
Integrating Community, Environment and Engineering

Issue date: 24/03/2020 Version: 4
Coordinate System: GDA 1994 MGA Zone 56

Helidon to Calvert

Figure 7: Landscape character assessment

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

Map by: CW/MEF/GN Z:\GIS\GIS_General\Tasks\Environment\390-ELE-20180806159_LVIA\H2C\390-ELE-20180806159_FFJV_Fig8_Tourist_v4.mxd Date: 25/03/2020 14:21

Meringandan Rd
New England Hwy
Murphys Creek
Murphys Creek Rd
Seventeen Mile Rd
Airforce Rd
Oaky Creek
Postmans Ridge
Toowoomba Bypass
Toowoomba Conn Rd
North St
Toowoomba
Withcott
Helidon
Helidon Spa
Spa Water Rd
Derrymore Rd
Back Flagstone Rd
Flagstone Creek Rd
Topps Rd
Ma Ma Creek
Gatton Clifton Rd
Mount Sylvia Rd
Eastern Dr
Warrego Hwy
Gatton Helidon Rd
Placid Hills
Railways St
Gatton
Grantham
Grantham Scrub Rd
Western Dr
Lawes
Adare
Gatton Esk Rd
UQ Gatton
Forest Hill
Gatton Laidley Rd W
Gatton Laidley Rd E
Laidley Plainland Rd
Laidley North
Laidley Heights
Laidley
Railways St
Pitt Rd
Blenheim Rd
Ropeley Rd
Schultz Lookout
Cunninghams Crest Lookout
Grandchester
Rosewood Laidley Rd
Calvert
Mount Berryman Rd
Laidley Creek West Rd
Mulgowie Rd
Grandchester Mount Mort Rd
Mount Walker West Rd
Rosewood Warrill View Rd
Nandine Rd
Haslingden Rd
Watsons Rd
Clarendon Rd
Lowood
Fernvale
Forest Hill Fernvale Rd
Brisbane Valley Hwy
Brightview Rd
Lowood Minden Rd
Fernvale Rd
Glamorgan Vale
Glamorgan Vale Rd
Marburg Rd
Minden
Plainlands
Gehrke Rd
Marburg
Warrego Hwy
Rosewood Marburg Rd
Tallegalla Rd
Walloon
Rosewood
Ipswich Rosewood Rd
Ebenezer
Willowbank
Cunningham Hwy

Legend

- Scenic outlooks
- Sensitive receptor
- 5 Chainage (km)
- Localities
- G2H project alignment
- H2C project alignment
- C2K project alignment
- Major roads
- Minor roads
- Existing rail
- Tunnel
- LVIA study area (10 km from rail alignment)

National Tourist Drives
- Warrego Way
- Australia's Country Way

Regional Tourist Drives
- Cobb & Co Tourist Drive

Local Tourist Drives
- Aratula to Flinders Peak Winery Drive
- Glen Rock Tourist Drive
- Open Plains Country Drive
- Spring Bluff Tourist Drive
- Farmers Country Drive
- Great Bunya Drive
- High Country Drive
- Steele Rudd Country Drive

Tourist drives shown as indicative routes and may be shown offset in cases of overlap.

A3 scale: 1:200,000

0 2 4 6 8 10km

Future Freight
Integrating Community, Environment and Engineering

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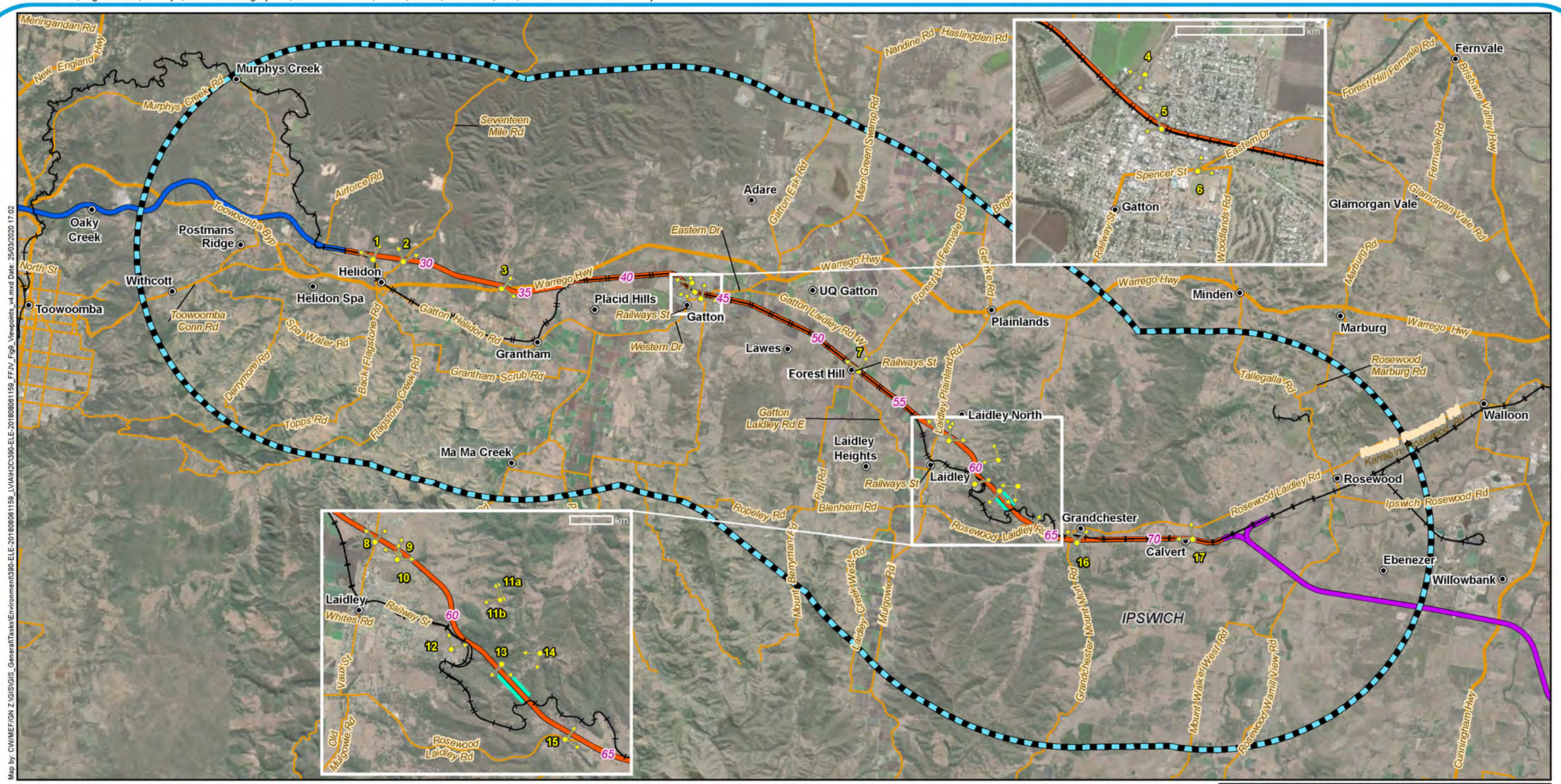
Coordinate System: GDA 1994 MGA Zone 56

Helidon to Calvert

Figure 8: Tourist drives and sensitive receptors

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

Map by: CW/MEP/GN Z:\GIS\GIS_General\Tasks\Environment\t390-ELE-20180806159_LVIA\H2C\390-ELE-20180806159_FFJV_Fig9_Viewpoints_v4.mxd Date: 25/03/2020 17:02



Legend

- Viewpoints
- 5 Chainage (km)
- Localities
- Existing rail
- G2H project alignment
- H2C project alignment
- C2K project alignment
- Major roads
- Minor roads
- Tunnel
- LVIA study area (10 km from rail alignment)

A3 scale: 1:200,000

0 2 4 6 8 10km

Future Freight
Integrating Community, Environment and Engineering

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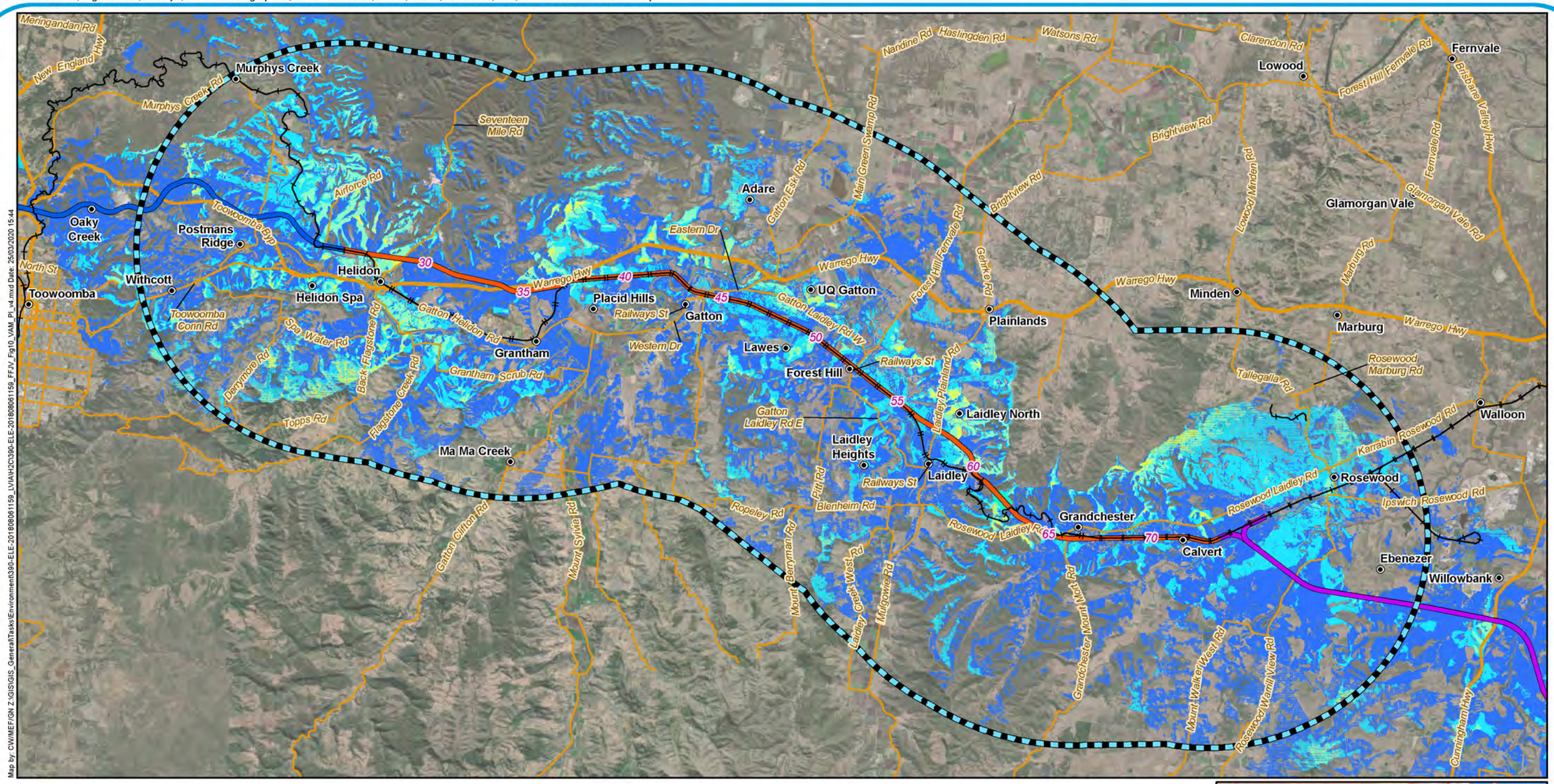
Coordinate System: GDA 1994 MGA Zone 56

Helidon to Calvert

Figure 9: Key visual receptors and location of representative viewpoints

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



Map by: CW/MEF/GN Z:\GIS\GIS_General\Tasks\Environment\t390-ELE-20180806159_LVIA\H2C390-ELE-20180806159_FFJV_Fig10_VAM_PI_v4.mxd Date: 25/03/2020 15:44

Legend

- 5 Chainage (km)
- Localities
- Existing rail
- G2H project alignment
- H2C project alignment
- C2K project alignment
- Major roads
- Minor roads
- Tunnel
- 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: 1:200,000

0 2 4 6 8 10km

Future Freight
Integrating Community, Environment and Engineering

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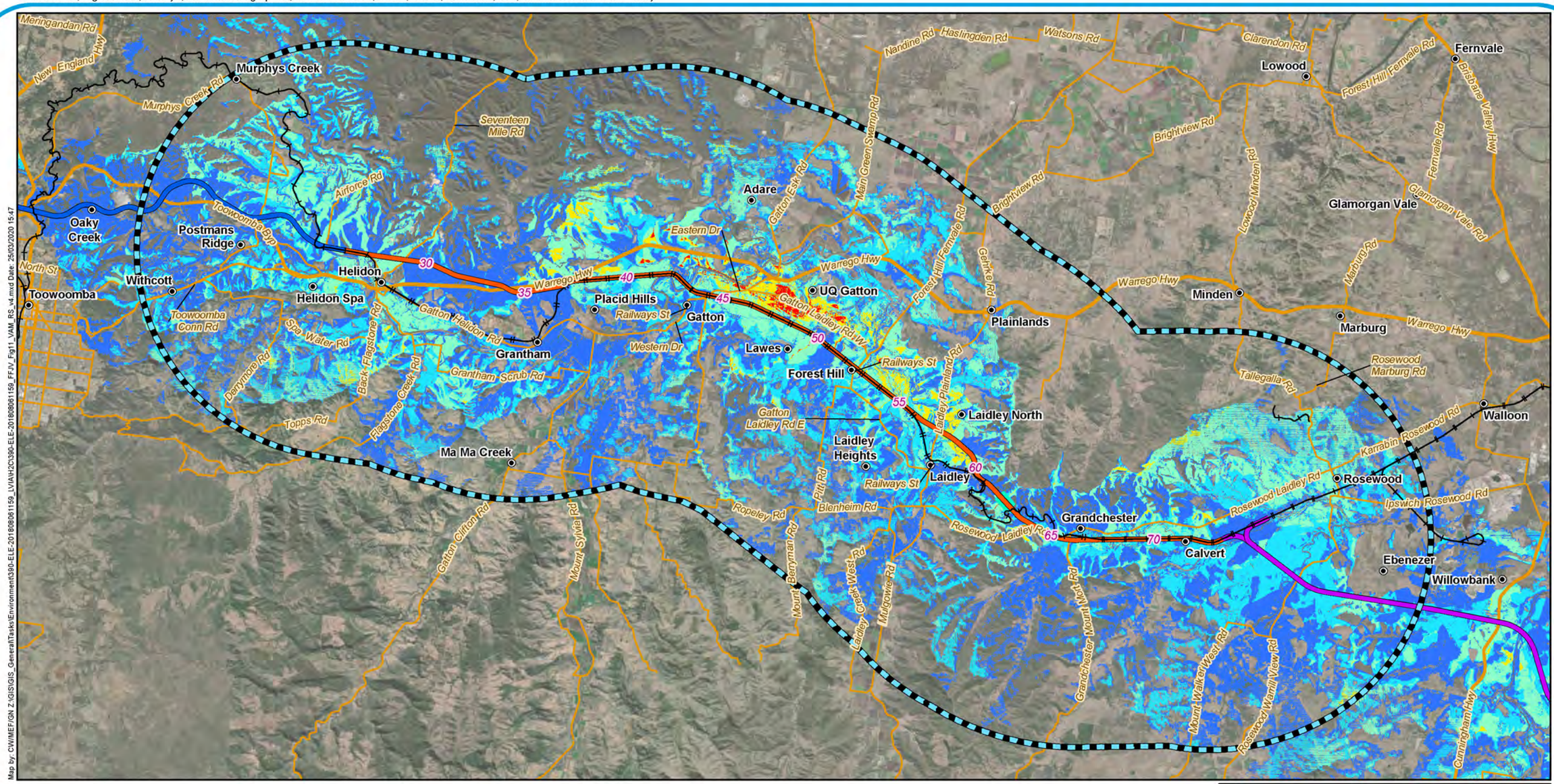
Coordinate System: GDA 1994 MGA Zone 56

Helidon to Calvert

Figure 10: 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/MEP/GN Z:\GIS\GIS_GeneralTasks\Environment\390-ELE-20180806159_LVIA\H2C\390-ELE-20180806159_FFJV_Fig11_VAM_RS_v4.mxd Date: 25/03/2020 15:47

Legend

- 5 Chainage (km)
- Localities
- Existing rail
- G2H project alignment
- H2C project alignment
- C2K project alignment
- Major roads
- Minor roads
- Tunnel
- 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: 1:200,000

0 2 4 6 8 10km

Future Freight
Integrating Community, Environment and Engineering

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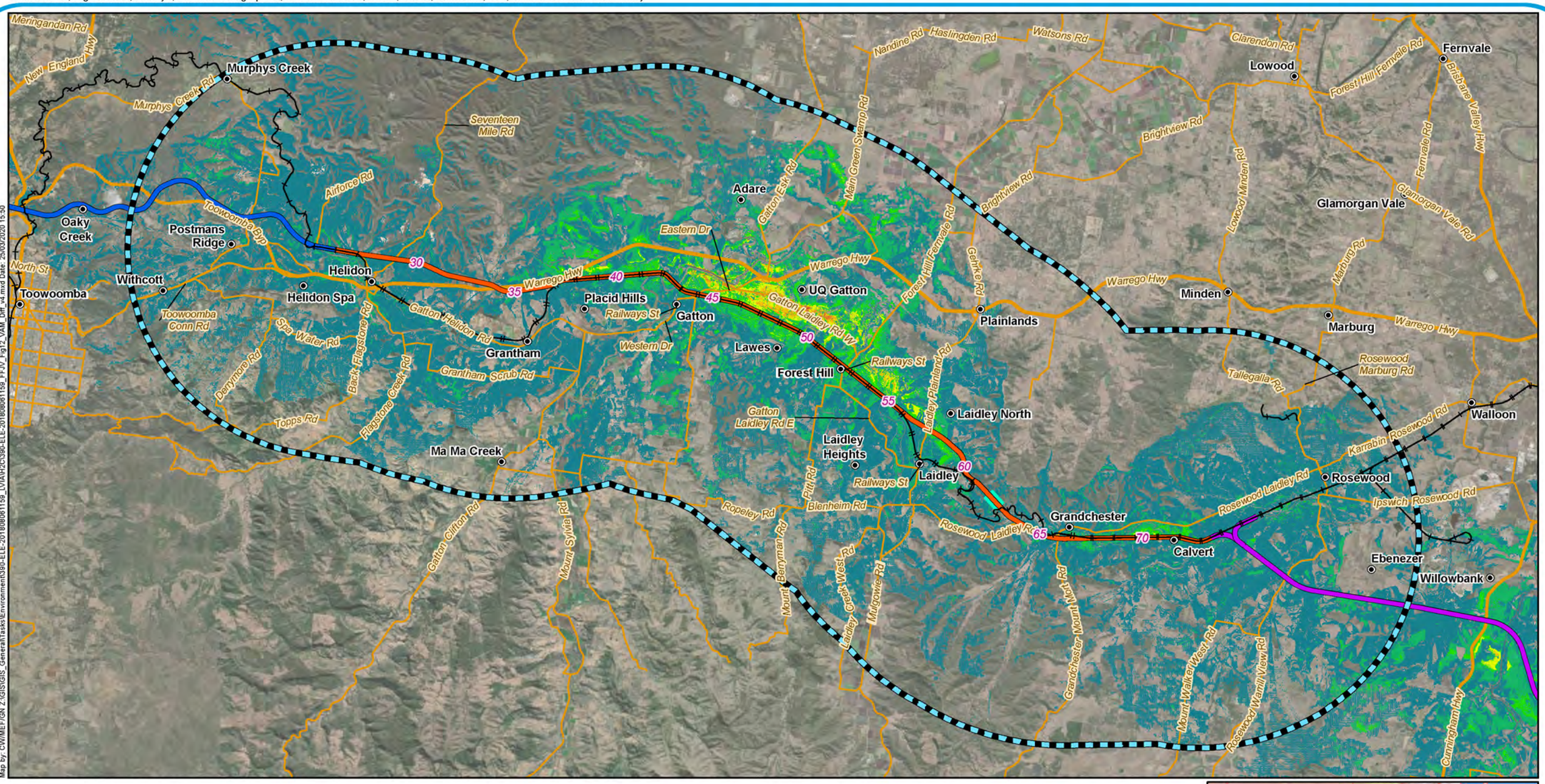
Helidon to Calvert

Figure 11: Visual analysis map – rolling stock

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



Map by: CW/MEF/GN Z:\GIS\GIS_GeneralTasks\Environment\t390-ELE-20180806159_LVIA\H2C\390-ELE-20180806159_FFJV_Fig12_VAM_Diff_v4.mxd Date: 25/03/2020 15:50

Legend

- 5 Chainage (km)
- Localities
- Existing rail
- G2H project alignment
- H2C project alignment
- C2K project alignment
- Major roads
- Minor roads
- Tunnel
- 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
- 26 - 30
- 31 - 45

A3 scale: 1:200,000

0 2 4 6 8 10km

Future Freight
Integrating Community, Environment and Engineering

Issue date: 24/03/2020 Version: 4
Coordinate System: GDA 1994 MGA Zone 56

Helidon to Calvert

Figure 12: Visual analysis map – difference analysis

Crows Nest
Acland
Goombungee
Hampton
Jondaryan
Samford
Coominya
Cabarlah
Oakey
Murphys Creek
Highfields
Lowood
Fernvale
Brisbane
Kingsthorpe
Gowrie
Glamorgan Vale
Aubigny
Helidon
Minden
Toowoomba
Withcott
Marburg
Chuwar
Biddeston
Grantham
Gatton
Forest Hill
Westbrook
Walloon
Ipswich
Laidley
Ma Ma Creek
Rosewood
Wyreema
Grandchester
Calvert
Southbrook
Cambooya
Pittsworth
Greenmount
East Greenmount
Harrisville
Warrill View
Jimboomba
Nobby
Pilton
Munbilla

Map by: <mxd author> Z:\GIS\GIS_General\Tasks\Environment\3960-ELE-20180806159_LVIA\H2C\3960-ELE-20180806159_Fig13_H2C_Cumulative_LVIA_rev2.mxd Date: 4/09/2019 08:59

Legend

- Localities
- LVIA study area (10 km from rail alignment)

Projects

- Helidon to Calvert (H2C)
- Gowrie to Helidon (G2H)
- Calvert to Kagaru (C2K)
- Bromelton State Development Area
- Gatton West Industrial Zone (GWIZ)
- Interlink SQ - Global Logistics Centre
- Ipswich Motorway Upgrade
- RAAF Amberley

A3 scale: 1:400,000

0 3 6 9 12 15km

Future Freight
Integrating Community, Environment and Engineering

Issue date: 04/09/2019 Version: 3
Coordinate System: GDA 1994 MGA Zone 56

Helidon to Calvert
Figure 13: Cumulative LVIA

APPENDIX H

Landscape and Visual Impact Assessment Technical Report

Appendix 2 Viewpoints

HELIDON TO CALVERT ENVIRONMENTAL IMPACT STATEMENT

IR_1381

APPENDIX 2: VIEWPOINTS

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

Figure 24: Viewpoint 1: Air Force Road looking northwest and visualisation

Figure 25: Viewpoint 2: Seventeen Mile Road looking north

Figure 26: Viewpoint 3: Warrego Highway looking east and visualisation

Figure 27: Viewpoint 4: Beavan Street looking southwest towards existing Lockyer Creek rail bridge and visualisation

Figure 28: Viewpoint 5: Gatton RSL car park looking northwest towards existing Railway Station and pedestrian crossing

Figure 29: Viewpoint 6: Spencer Street looking northeast near Gatton Showgrounds – (base case) and visualisation (initial mitigation)

Figure 30: Viewpoint 6 Spencer Street looking northeast near Gatton Showgrounds - visualisation (value-add 1 and value-add 2 mitigation)

Figure 31: Viewpoint 7: Gordon Street looking northwest towards level crossing (base case) and visualisation

Figure 32: Viewpoint 7: Gordon Street looking northwest towards level crossing visualisation (with noise barriers)

Figure 33: Viewpoint 8: Laidley-Plainlands Road looking north towards bridge crossing and visualisation

Figure 34: Viewpoint 9: Patrick Street Underpass looking northwest and visualisation

Figure 35: Viewpoint 10: Hardy Drive looking northeast down Rampton Street over new subdivision

Figure 36: Viewpoint 11a: Branell Homestead Luxury Cabins on Paroz Road, looking west

Figure 37: Viewpoint 11b: Branell Homestead Luxury Cabins on Paroz Road, looking west visualisation

Figure 38: Viewpoint 12: McInnes Drive near existing rail line, looking northwest and visualisation

Figure 39: Viewpoint 13: Kessling Drive, looking southwest towards western tunnel portal

Figure 40: Viewpoint 13b: Little Liverpool Range western tunnel portal aerial view visualisation

Figure 41: Viewpoint 14: Cunningham's Crest Lookout, looking southwest towards Laidley

Figure 42: Viewpoint 15: Laidley-Rosewood Road near properties 113-117, looking east

Figure 43: Viewpoint 16a: Grandchester State School looking north toward alignment and old railway station

Figure 44: Viewpoint 16b: Grandchester aerial view visualisation

Figure 45: Viewpoint 17: End of Calvert School Road, looking west near properties 917-923 and Visualisation

Figure 24: Viewpoint 1: Airforce Road near 45 and 47 Air Force Road, looking northwest

Figure 25: Viewpoint 2: Seventeen Mile Road looking north

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

Figure 26: Viewpoint 3: Warrego Highway looking east

Figure 27: Viewpoint 4: Beavan Street looking southwest towards existing Lockyer Creek rail bridge

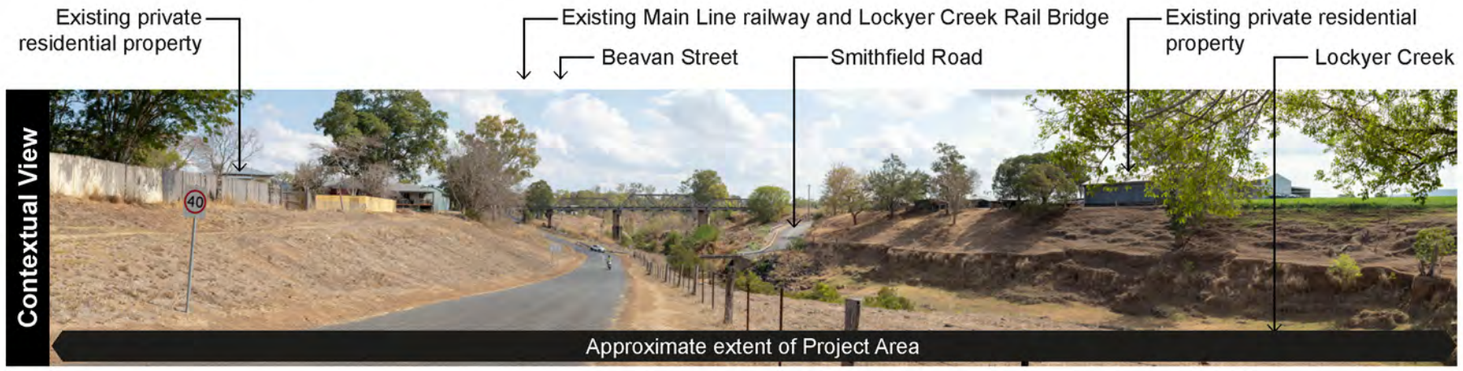


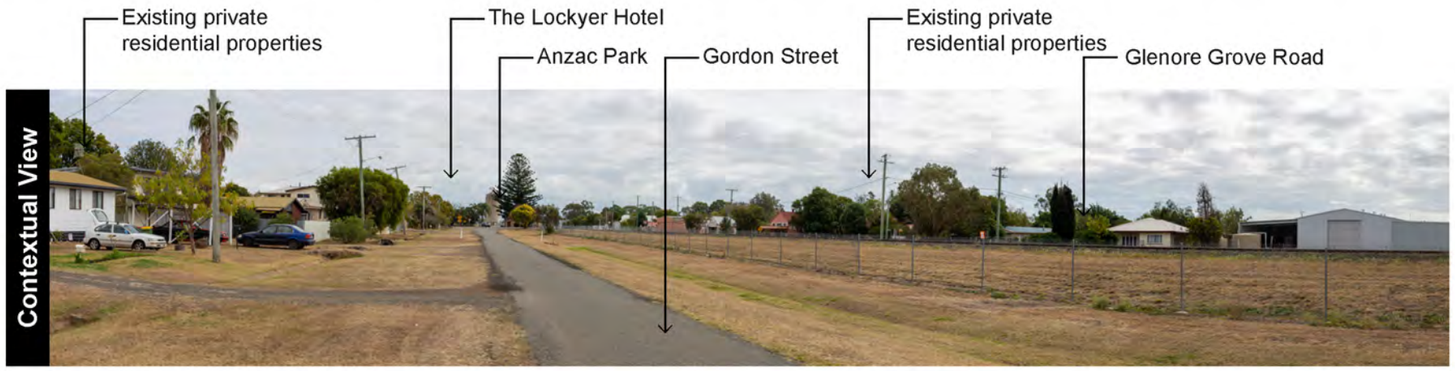
Figure 28: Viewpoint 5: Gatton RSL car park looking northwest towards existing Railway Station and pedestrian crossing

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

Figure 29: Viewpoint 6: Spencer Street looking northeast near Gatton Showgrounds - Base Case

Figure 30: Viewpoint 6: Spencer Street looking northeast near Gatton Showgrounds - Value Add Options

Figure 31: Viewpoint 7: Gordon Street looking northwest towards level crossing - Base Case



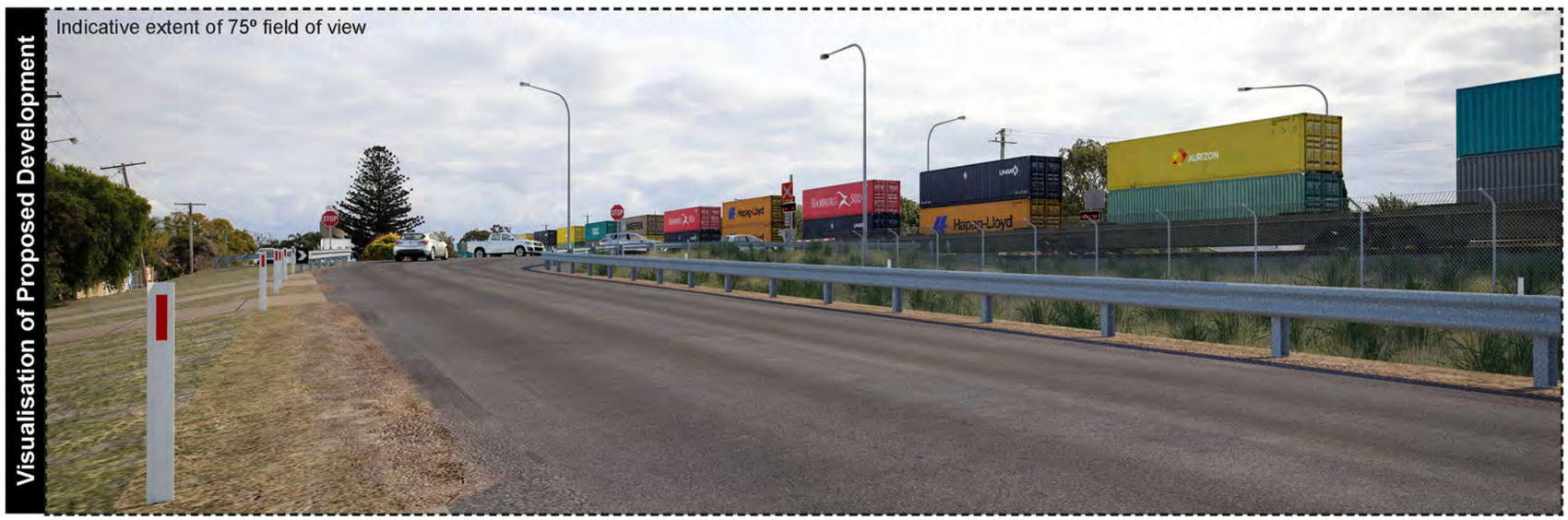
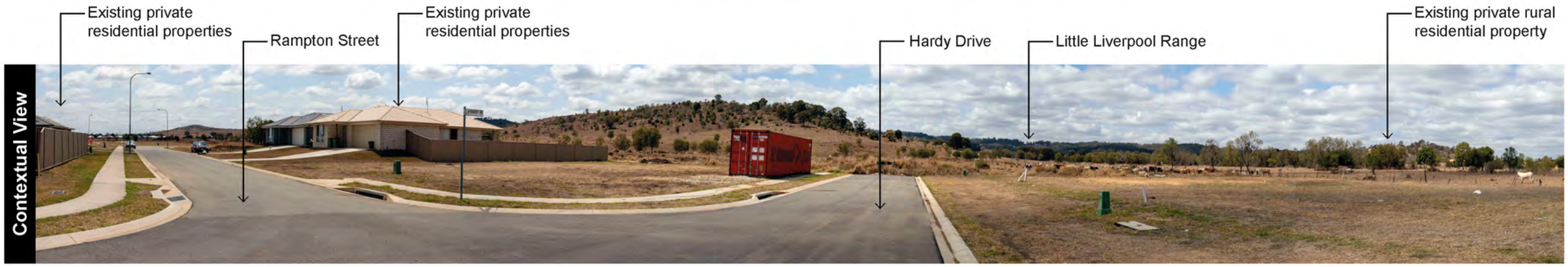


Figure 32: Viewpoint 7: Gordon Street looking northwest towards level crossing - With Noise Barriers

Figure 33: Viewpoint 8: Laidley-Plainlands Road looking north towards bridge crossing

Figure 34: Viewpoint 9: Patrick Street Underpass looking northwest

Figure 35: Viewpoint 10: Hardy Drive looking northeast down Rampton Street over new subdivision



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

Figure 36: Viewpoint 11a: Branell Homestead Luxury Cabins on Paroz Road, looking west

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

Figure 37: Viewpoint 11b: Branell Homestead Luxury Cabins on Paroz Road, looking west

Figure 38: Viewpoint 12: McInnes Drive near existing rail line, looking northwest

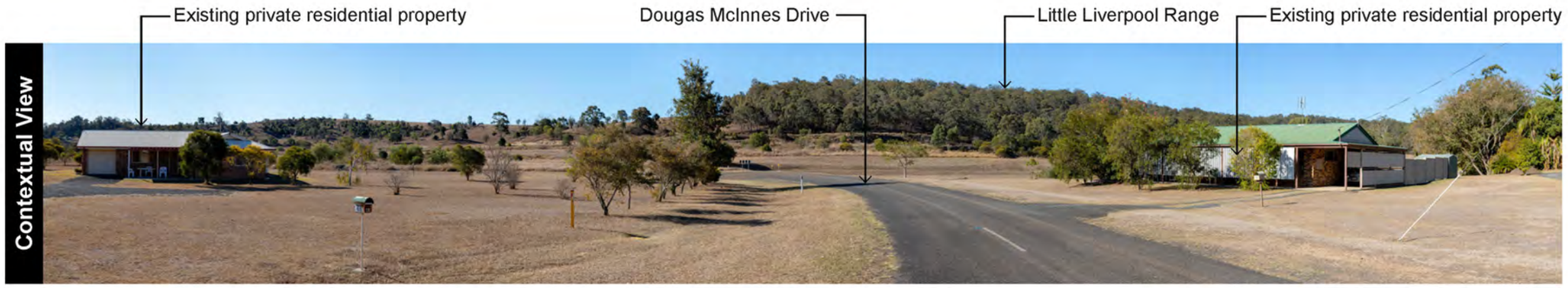


Figure 39: Viewpoint 13: Kessling Drive, looking southwest towards western tunnel portal

Note: Please note that no visualisation has been provided for this viewpoint, as dicussed in Section 4.9: Visual Impact Assessment Methodology of the Landscape and Visual Impact Assessment Technical Report. An aerial view has been prepared to demonstrate the impacts of the Western Tunnel Portal, refer Figure 40: Viewpoint 13b: Little Liverpool Range Western Tunnel Portal Aerial View.

Figure 40: Viewpoint 13b: Little Liverpool Range Western Tunnel Portal Aerial View

Figure 41: Viewpoint 14: Cunningham's Crest Lookout, looking southwest towards Laidley

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

Figure 42: Viewpoint 15: Laidley-Rosewood Road near properties 113-117, looking east

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

Figure 43: Viewpoint 16a: Grandchester State School looking north toward alignment and old railway station

Note: Please note that no visualisation has been provided for this viewpoint, as dicussed in Section 4.9: Visual Impact Assessment Methodology of the Landscape and Visual Impact Assessment Technical Report. An aerial view has been prepared to demonstrate the impacts of the Project on Grandchester, refer Figure 44: Viewpoint 16b: Grandchester Aerial View.

Figure 44: Viewpoint 16b: Grandchester Aerial View

Figure 45: Viewpoint 17: End of Calvert School Road, looking west near properties 917-923