CHAPTER 02

Project Rationale

GOWRIE TO HELIDON ENVIRONMENTAL IMPACT STATEMENT

INLAND RAIL

ARTC

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

IR_1536

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2. Project Rationale

2.1 Introduction

This chapter describes the rationale for the Gowrie to Helidon (G2H) Project (the Project) and the broader Inland Rail Program. The chapter provides:

- The justification for the Inland Rail Program, including the Project, namely:
  - Description of the existing freight network between Melbourne and Brisbane and the future demands that are forecast to be placed on this network
  - History of Inland Rail
  - Comparison of freight movement alternatives as a solution to the projected freight network capacity constraints
- The benefits of proceeding with Inland Rail and the Project
- The consequences of not proceeding with Inland Rail and the Project
- Alternative locations and route options for Inland Rail and the Project
- Relationship to other projects.

2.2 Terms of Reference

The Terms of Reference (ToR) describe the matters the proponent must address in the Environmental Impact Statement (EIS) for the Project. This chapter addresses the items of the ToR outlined in Table 2.1. Appendix B: Terms of Reference Compliance Table provides a cross-reference for each ToR against relevant sections in this EIS.

TABLE 2.1: COMPLIANCE WITH TERMS OF REFERENCE REQUIREMENTS

Project Rationale Terms of Reference requirements		Where addressed in EIS
6.7.	Present feasible alternatives of the Project's configuration (including individual elements) that may improve environmental outcomes. Discuss the consequences of not proceeding with the Project.	Sections 2.3.4, 2.6 and 2.7 (feasible alternatives) and Section 2.5 (consequences of not proceeding with the Project).
7.6.	An EIS should also describe the expected benefits and opportunities associated with the Project.	Section 2.4
10.1.	The EIS must describe and illustrate at least the following specific information about the proposed Project. a) Rationale for the Project b) Relationship to other projects for the proposed Inland Rail Program between Melbourne and Brisbane c) Relationship to other coordinated projects, major projects and/or developments (which are progressing through planning and approval processes and public information is available)	a) Sections 2.3, 2.4 and 2.5 b) Section 2.8 and Section 6.2.2 c) Section 2.9
10.11.	Describe the following information about the proposed project: a) Any infrastructure alternatives, justified in terms of ecologically sustainable development (including energy, water conservation and wastewater management)	Sections 2.6 and 2.7
11.18.	In accordance with Schedule 4 of the EPBC Regulations, feasible project alternatives must be discussed, including: a) If relevant, the alternative of taking no action b) A comparative description of the impacts of each alternative on the triggered MNES protected by the controlling provision c) Sufficient detail to make clear why any alternative or option is preferred to another.	Sections 2.5, 2.6 and 2.7 Matters of National Environmental Significance are discussed in detail in Appendix J: Matters of National Environmental Significance
11.19.	Short, medium and long-term advantages and disadvantages of the alternatives or options must be discussed.	Sections 2.6 and 2.7

Project Rationale Terms of Reference requirements		Where addressed in EIS
11.21.	The economic and social impacts of the action, both positive and negative, must be summarised. Matters of interest should include: a) Consideration at the local, regional and national levels b) Any public consultation activities undertaken, and their outcomes c) Any consultation with indigenous stakeholders d) Identification of affected parties and communities that may be affected and a description of the views of those parties and communities e) Project economic costs and benefits of the project and project alternatives, including the basis for their estimation through cost/benefit analysis or similar studies, and f) Employment and other opportunities expected to be generated by the project in each of the construction and operational phases.	Chapter 2: Project Rationale, Sections 2.4 and 2.5 Chapter 16: Social, Sections 16.8 and 16.10 Chapter 17: Economics, Sections 17.5, 17.6 and 17.7 Appendix R: Economic Impact Assessment, Sections 4 to 6
11.105.	Describe and map where the project's preferred alignment differs from the State's strategic rail corridor and the reasons for any such deviation.	Chapter 2: Project Rationale, Sections 2.6 and 2.7 Chapter 6: Project Description, Section 6.2.3 Chapter 19: Traffic, Transport and Access, Section 19.5

2.3 Justification for Inland Rail

2.3.1 Existing rail network constraints between Melbourne and Brisbane

At present, there is no continuous inland rail link between Melbourne and Brisbane. Interstate rail freight travels between Melbourne and Sydney via Albury, and then between Sydney and Brisbane, generally along the coast. Long transit times are experienced and the existing network cannot accommodate highly efficient, long double-stacked trains. In addition, the existing route relies on rail that is also used by passenger trains in metropolitan areas, which are typically given right-of-way during daily peak travel times.

The existing north–south rail corridor between Melbourne and Brisbane does not provide a potential level of service that is competitive with road transport. This is largely the result of 19th century alignments leading to low travel speeds, poor reliability and major bottlenecks, most notably in the Sydney metropolitan area.

Infrastructure Australia (2016) notes that '*…the demand for urban transport infrastructure is projected to increase significantly. Without implementation of key infrastructure projects, congestion on urban roads is expected to exceed $50 billion per annum by 2031*'. Demand for key urban road and rail corridors across Australia, including between Melbourne and Brisbane, is projected to significantly exceed current capacity by 2031. This projection is supported by findings published in the 2019 edition of the *Household, Income and Labour Dynamics in Australia Survey* (Wilkins et al., 2019), which found that the mean daily commute times of employed persons in mainland capital cities increased by 19.5 per cent between 2002 and 2017. This trend would continue, and potentially worsen, with increased trucking movements on metropolitan roads.

The *National Land Freight Strategy* (Standing Council on Transport and Infrastructure, 2013) identifies a number of existing challenges facing road and rail freight in general, including:

- Congestion from increasing numbers of passenger vehicles and the priority given to passenger vehicles over freight vehicles in urban transport, which can adversely impact on the efficiency of freight vehicle movement
- The encroachment of urban development on freight routes and precincts as cities grow in size and density, which can lead to an increased potential for amenity, environmental and interface issues.

The Melbourne–Brisbane Inland Rail Alignment Study (Australian Rail Track Corporation (ARTC), 2010a) indicated that:

- There are likely to be capacity constraints (in regard to freight haulage) on the existing coastal railway unless significant capital works are undertaken
- The coastal railway between Sydney and Brisbane would reach capacity around 2052.

Much of the infrastructure on the existing regional rail systems is old, and has maintenance and renewal issues, and, as such, has restrictions on axle loads and tonnages that can be transported. Poor maintenance of rail lines leads to network availability issues and speed constraints.

For example, the Toowoomba to Helidon section of the existing Queensland Rail West Moreton System rail corridor through the Toowoomba Range opened to traffic in May 1867, with the alignment and grade remaining much the same as when it was opened, which is considered to be substandard for modern railway operations (Queensland Rail and Queensland Transport, 2003). Queensland Rail (QR) has undertaken works to upgrade the Toowoomba Range section of the West Moreton System to alleviate some of the constraints associated with the age and design of the railway (refer Section 2.4.1.3).

When these existing rail network constraints are combined, they result in an increasing reliance on freight transportation by road, thereby imposing additional maintenance burdens on the affected local councils (Infrastructure Australia, 2015).

The Inland Rail Program will include approximately 1,100 kilometres (km) of major upgrades and enhancements and 600 km of new tracks. Use of existing tracks or preserved rail corridors, where feasible, is expected to represent the lowest capital expenditure option that meets the program specification (ARTC, 2010a).

2.3.2 Future freight demand

In 2011–12, the Bureau of Infrastructure, Transport and Regional Economics estimated that the Australian domestic freight task totalled almost 600 billion tonne kilometres—equivalent to about 26,000 tonne kilometres of freight moved for every person in Australia (ACIL Allen Consulting, 2014). Of this volume, the Australian domestic rail freight task totalled 261.4 billion tonne kilometres, accounting for approximately 46 per cent of total domestic freight. This represents an increase of 91 per cent since 2000–2001 (Infrastructure Australia, 2015).

The Australian Infrastructure Audit (Infrastructure Australia, 2015) notes that:

- The national land freight task is expected to grow by 80 per cent between 2011 and 2031
- Demand for freight rail infrastructure is expected to grow, particularly for resource bulk commodity haulage in Western Australia, Queensland and New South Wales (NSW)
- Freight rail will need to play a growing role in the movement of goods between ports and Inland Rail freight terminals, and in the movement of containerised and general freight over longer distances.

The Melbourne to Brisbane corridor is one of the most important general freight routes in Australia, supporting key population and employment precincts along the east coast and inland NSW. The current volume of non-bulk and complementary freight moving within the corridor is approximately 21 million tonnes per annum. This is expected to increase to 40 million tonnes per annum by 2050, consisting of manufactured (non-bulk) products, bulk steel, paper, agricultural and mining products (Infrastructure Australia, 2016).

Rail has been losing mode share to road freight since 2003 on shorter hauls, such as Melbourne to Sydney and Sydney to Brisbane (ACIL Allen Consulting, 2014). Inland Rail would help to ease the burden on roads as a result of this additional volume of freight by providing an alternative measure for transporting the equivalent of more than 200,000 trucks movements annually (ARTC, 2015a).

The eastern states of Australia comprise 18 million residents (79 per cent of Australia's population), 9 million jobs (78 per cent of Australia's national employment) and contributes $1.1 trillion in gross state product (75 per cent of gross domestic product). Interstate freight transport is projected to increase by 70 per cent between 2015 and 2030, to 140 billion tonne kilometres. The Melbourne to Brisbane corridor already supports 17 per cent of these interstate movements (ARTC, 2015a).

With the population of the eastern states forecast to increase by 60 per cent over the next 40 years, the need for efficient and effective freight transport will continue to increase. Strong forecast population growth, accompanied by comparable employment growth, is likely to place significant pressure on existing infrastructure and services (ARTC, 2015a). Without the increased use of rail, the growth in freight demand is likely to increase pressure on the road network, resulting in increased freight costs and lost economic opportunities, along with increased frequency of safety incidents, road maintenance and pressure to expand the road network.

Inland Rail will intersect the east–west rail corridor at Parkes, better connecting all state mainland capitals, and will serve a variety of freight markets, not just Melbourne to Brisbane, with significant demand from regional commodities and interstate freight. Inland Rail will also be a catalyst for other complementary investments in the supply chain, including new multimodal terminals, processing facilities and distribution centres along the supply chain (ARTC, 2015a).

2.3.3 History of Inland Rail

The development of an inland railway between Melbourne and Brisbane has been considered for more than 100 years—first being formally considered in 1902 (ARTC, 2015a). The current Inland Rail Program was initiated in 2006 as a safe, sustainable solution to the freight challenge, which will transform the way freight is moved around the country. The Inland Rail Program has been the subject of significant analysis for the following reasons:

- The existing north–south coastal railway is expected to reach capacity in the next three decades (ARTC, 2015a). Additional capacity is required to accommodate increasing demand for interstate and regional rail freight.
- The quality of service (specifically regarding scheduling reliability) currently provided by the existing coastal rail route is adversely impacting on freight productivity and transport costs.
- The existing north–south coastal railway is trafficked by both passenger and freight trains. This is impacting on the reliability of rail freight and is constraining opportunities for the expansion of passenger services.
- In the absence of a continuous inland rail link between Melbourne and Brisbane, transporting freight by road has a competitive advantage over rail, with margins associated with the operating characteristics of the coastal rail route. This indicates a clear constraint on increasing rail freight market share.
- Transporting freight by road has associated safety, congestion and environmental risks.

Since 2006, two major studies have been commissioned in relation to the development of an inland rail route between Melbourne and Brisbane. The first study, the *North–South Rail Corridor Study* (Ernst & Young, 2006) examined the adequacy of the existing Melbourne to Sydney to Brisbane rail corridor to meet future freight demand. The study also examined different options for an enhanced, existing coastal route or alternative inland routes. The outcomes of this study are discussed in Section 2.6.1.

In 2008, the then Federal Minister for Infrastructure, Transport, Regional Development and Local Government announced a second study—the *Melbourne–Brisbane Inland Rail Alignment Study* (ARTC, 2010a). The purpose of this study was to analyse the likely economic and commercial benefits of an inland rail route between Melbourne and Brisbane, such as reducing the supply chain costs by a reported $10/tonne. The outcome was a determination of a preferred alignment, based on consideration of the economic benefits and key commercial considerations. It provided the government and private sector with information that would help guide future investment decisions, including likely demand, estimated construction costs, and a range of possible private financing options. The report recommended that Inland Rail should be considered again in the future as new details became available of the cost of coastal railway upgrade proposals, the capacity and reliability improvements they provide, and/or demand achieved. This study is discussed further in Section 2.6.2.

In November 2013, the then Australian Government Minister for Infrastructure and Regional Development announced $300 million in funding for Inland Rail, to be used for pre-construction activities such as detailed corridor planning, environmental assessment and community consultation. The Minister also announced that a high-level Implementation Group would be formed to drive Inland Rail.

In 2015, ARTC developed a Concept Business Case (ARTC, 2015a) as a precursor to a more detailed Program Business Case. The Concept Business Case outlined key scope and scheduling assumptions, identified key risks and environmental and planning considerations, and preliminary updates to demand, economic and financial analysis.

The Concept Business Case identified key areas for further consideration and/or analysis. These areas included demand, costs, risks, technical and operational requirements, and refined financial and economic analysis, which were subsequently addressed within the *Inland Rail Programme Business Case* (ARTC, 2015a).

The *Inland Rail Programme Business Case* was developed in 2015 to provide a detailed assessment of why Inland Rail is needed and how it could be delivered. The viability, benefits, costs and risks associated with the Program were all assessed (ARTC, 2015a). This study is discussed further in Section 2.4.

2.3.4 Comparison of alternatives to rail freight

Alternative freight transport solutions with the potential to address Australia's current and future freight challenges were considered by the *Inland Rail Programme Business Case* (ARTC, 2015a) and *Inland Rail Implementation Group Report* (Inland Rail Implementation Group, 2015).

Three capital investment options were assessed by the business case (ARTC, 2015a):

- Progressive road upgrades
- Upgrading the existing east coast railway
- An inland railway.

These capital investment options were subjected to a rigorous assessment consistent with *Infrastructure Australia's Reform and Investment Framework Guidelines 2014* (ARTC, 2015a).

The options were assessed against seven equally weighted criteria:

1. Capacity to serve future inter-capital and regional/bulk freight market needs on the east coast
2. Foster economic growth through improved freight productivity and service quality (including improved reliability and resilience)
3. Optimise environmental outcomes
4. Alleviate urban constraints
5. Enable regional development
6. Ease of implementation
7. Cost-effectiveness.

Overall, constructing an inland railway was found to be the preferred option, with an average 'high likelihood' of improving outcomes across all criteria. Progressive road upgrades and upgrading the existing east coast railway both had an average 'medium likelihood' of improving outcomes across all criteria.

In relation to individual criteria, progressive road upgrades outranked an inland railway only in relation to ease of implementation and ranked equally with an inland railway in relation to enabling regional development outcomes. An inland railway was found to be the best option across all other criteria.

The following alternatives were reviewed by the Inland Rail Implementation Group:

- Maritime shipping
- Air freight
- Road freight
- Rail solutions.

The results of the review of alternatives undertaken by the Inland Rail Implementation Group are summarised below.

2.3.4.1 Maritime shipping

Maritime freight was examined as a potential alternative to Inland Rail based on two types of services, including:

- A dedicated service between Melbourne and Brisbane (coastal shipping)
- Using spare capacity on vessels calling at Melbourne and Brisbane as part of an international voyage.
- The Inland Rail Implementation Group Report (Inland Rail Implementation Group, 2015) concluded that:
  - Shipping is unlikely to be a strong alternative to Inland Rail, as it does not provide the level of service (transit time and service availability) required by the majority of the Melbourne to Brisbane interstate market
  - Shipping still has a role to play, especially due to its strengths in transporting high volume and long-distance cargo around the coast. Shipping can be used in conjunction with other modes, such as an inland railway, to meet Australia's future transport needs.

Additionally, a maritime freight solution would not provide the same potential economic benefits and opportunities to inland communities that can be provided by Inland Rail.

2.3.4.2 Air freight

Domestic air freight accounts for less than 0.01 per cent of total domestic freight movements in Australia by weight. The majority of these movements comprise newspapers and parcels between major cities, on either dedicated freight flights or on existing passenger flights. The *Inland Rail Implementation Group Report* (Inland Rail Implementation Group, 2015) concluded that:

- Air freight has a limited role to play in the transport of bulky or heavy goods on the Melbourne to Brisbane corridor, but will continue to play a crucial role for small, high-value and time-dependent goods
- Air freight is not a viable alternative for addressing Australia's freight requirements on the Melbourne to Brisbane corridor into the future.

2.3.4.3 Road freight

The role of road transport was considered as a potential alternative to Inland Rail. Road transport is the main mode of transport for the majority of commodities produced or consumed in Australia. Along the north–south corridor, the main routes for road freight are on the Hume Highway (between Sydney and Melbourne), the Pacific Highway (for coastal transport between Sydney and Brisbane) and the Newell Highway (between Melbourne and Brisbane).

The identified issues and considerations relevant to road freight on these corridors include:

- The north–south road corridor will face significant local and regional capacity constraints for road freight in the medium to longer term
- The mix of local traffic, private vehicles and freight vehicles on road transport corridors reduces reliability as a result of the different average travel speeds between cars and heavy vehicles, and increased accident rates
- Conflicts between local traffic, private vehicles and freight vehicles on these corridors will increase in line with significant forecast growth in population, employment and demands for freight transport
- Compared with rail, road freight results in additional environmental costs, including from air pollution, greenhouse gas emissions and water pollution. Rail is also likely to result in improved sustainability, with an expected production of 750,000 fewer tonnes of carbon and one-third of the fuel when compared to road transport (ARTC, 2015a). Approximately, 1,100 km, or 70 per cent, of Inland Rail will use existing rail lines and corridors, making the best possible use of previous investments and minimising the impact on the environment and the community (ARTC, 2015a)
- The cost to freight operators of congestion in urban areas as a result of reduced travel speeds and reliability for freight transport is estimated to be around $60 million per year for Melbourne to Brisbane inter-capital freight alone
- Australian Government and state governments are investing in road infrastructure along the north–south corridor; however, this investment will be insufficient to remove all the existing and predicted future issues along the full length of the corridor, leaving trucking productivity exposed to the cumulative effects of the remaining deficiencies.

The *Melbourne–Brisbane Inland Rail Report* (Inland Rail Implementation Group, 2015) concluded that:

- While road transport will continue to contribute to Australia's freight task, unless substantial additional investment is made, a significant operational cost is expected to be incurred considering future road freight growth exceeding current capacity
- Should the Australian Government decide not to proceed with a rail solution, further investigation of road transport is required to determine its capacity to manage the future north–south freight task.

2.3.4.4 Rail solutions

The two main rail solutions considered were enhancing the existing east coast railway and constructing a new inland railway.

The *Melbourne–Brisbane Inland Rail Report* (Inland Rail Implementation Group, 2015) noted a number of capacity, reliability and performance issues associated with the existing east coast railway. The performance issues mainly relate to constraints associated with moving freight trains through the Sydney metropolitan rail network. The service offering constraints of the existing coastal rail route compared to Inland Rail are summarised in Table 2.2.

TABLE 2.2: COMPARISON OF EXISTING MELBOURNE TO BRISBANE COASTAL ROUTE TO INLAND RAIL SERVICE OFFERING

Service offering	Coastal Rail (2014–15)	Inland Rail	Improvement with Inland Rail
Transit time	32–34 hours	Up to 24 hours	10 hours
Reliability[1]	83%	98%	15%
Availability[2]	61%	95%	34%
Relative price (compared to road)[3]	85%	57–65%	20–28%

Table notes:

1. Reliability is defined as the percentage of goods delivered on time by road freight, or available to be picked up at the rail terminal or port when promised
2. Availability refers to the percentage of available departure and arrival services that are convenient for customers, which depends on cut-off and transit times
3. Relative price is presented for non-bulk inter-capital freight (door to door) indicating the range over the period 2025–26 to 2049–50

Source: *Inland Rail Programme Business Case* (ARTC, 2015a)

As a sub-option of enhancing the existing east coast railway, the report noted that the proposed new Outer Sydney Orbital corridor would provide opportunities for a rail route that could ease freight congestion on Sydney freight networks; however, the main role of this corridor would be to address freight capacity constraints on other routes, such as those for intrastate and export freight. In addition, this option would not provide significant transit time savings for Melbourne to Brisbane freight, as the missing link between north-west NSW and southern Queensland would still be required, or the existing coastal line would need to be upgraded (Inland Rail Implementation Group, 2015).

The report concluded that:

- For Melbourne to Brisbane freight, the existing east coast railway would not be competitive with road in terms of cost or time, even with significant further investment. It is not a viable alternative to Inland Rail
- Inland Rail would meet Australia's future freight challenge and bring significant and positive national benefits by boosting national productivity and economic growth, while promoting better safety and environmental outcomes.

2.3.4.5 Summary of findings

Overall, in relation to the various alternatives to Inland Rail, the Inland Rail Implementation Group (2015) concluded that:

- While shipping and air will continue to play a role in the interstate freight market, they are not viable alternatives to rail
- Without Inland Rail, road is the only mode capable of addressing the majority of the future freight task, with associated direct and indirect costs.

2.3.5 Service offering

The Inland Rail Program, including this Project, will provide a significant opportunity to change the fundamentals of the freight logistics supply chain in Australia and deliver economic and social benefits long into the future.

The service offering is central to the delivery and competitiveness of Inland Rail and reflects the priorities of freight customers. It was developed in consultation with key market participants and stakeholders, and represents the key elements to be addressed by Inland Rail to enable a competitive and complementary service offering compared to other modes, including road transport.

The key characteristics of the Inland Rail service offering are:

- **Reliability**—98 per cent, defined as the percentage of goods delivered on time by road freight, or available to be picked up at the rail terminal or port when promised
- **Price**—cheaper relative to road transportation, as a combined cost of access to the rail network, rail haulage, and pick-up and delivery
- **Transit time**—24 hours or less from Melbourne to Brisbane
- **Availability**—services available with departure and arrival times that are convenient for customers, which depends on cut-off and transit times.

These are underpinned by the key technical characteristics that are particularly relevant to rail operators as these directly influence operating cost structures and their own service offerings to the market. The key technical characteristics of Inland Rail and the Project are discussed in Chapter 6: Project Description.

While the service offering is specific to the rail network, freight terminals (or intermodal hubs) are a critical element, and ARTC will work with terminal operators and proponents as the Inland Rail Program progresses, to enable connection opportunities.

2.4 Benefits of proceeding with Inland Rail

Inland Rail presents a unique opportunity to establish a competitive freight system through the provision of trunk rail infrastructure, supporting a network of intermodal terminals and local sidings for the distribution of commodities at the national, regional and local level.

As a component of the larger Inland Rail Program, the potential benefits of the Project cannot be separated from the benefits that are attributed to the full Melbourne to Brisbane alignment; therefore, the potential benefits of Inland Rail and this Project, as documented in the *Inland Rail Programme Business Case* (ARTC, 2015a), are presented together in this section.

2.4.1 Direct benefits

Foreseeable direct benefits of Inland Rail, as identified by the *Inland Rail Programme Business Case* (ARTC, 2015a), are as follows.

2.4.1.1 Improved access to and from regional markets

Inland Rail will improve access to and from regional markets through:

- Improved linkages to regional areas for inter-capital freight, such as a more efficient and direct route across the Toowoomba Range
- Improved mine-to-port accessibility between coal mines in the Surat and Clarence–Moreton Basins and the Port of Brisbane, which reduces operating costs and results in additional coal exports that would not have otherwise occurred
- Agricultural areas and regions, such as the Darling Downs, have improved access to key local and international markets, provide improved drought resilience and ability to move greater volumes of grain via rail (the preferred mode). Inland Rail is expected to attract 2 million tonnes of agricultural freight from road to rail, with a total of 8.9 million tonnes of agricultural freight expected to be carried in 2050.

2.4.1.2 Reduced costs for the market

Inland Rail will reduce costs to market through the efficiencies gained through the development of a dedicated freight rail system. Anticipated benefits include but are not necessarily limited to:

- Reduced inter-capital freight transport costs for the market are likely to result in lower prices for consumers (predominantly manufactured goods). This also presents an opportunity for flow-through of cost savings to reduce the cost of living for households
- Reduced lifecycle costs for infrastructure owners/operators on the coastal route and road network (i.e. Newell, Warrego and Pacific Highways) due to lower freight volumes on these assets. This reduces maintenance costs and enables investments in capacity to be avoided or deferred
- Reduced transport costs may improve competitiveness of key markets and economic activity, particularly in the agricultural and coal sectors
- Reduced operating costs may improve the viability of some mines, resulting in induced coal freight volumes that would not otherwise have occurred. There will be additional profits to mines, which Australian owners will retain, and additional taxes (company, royalties and payroll tax) for profits accruing to overseas owners.

- Coal freight in the Surat and Clarence–Moreton Basins should benefit from reduced above-rail operating costs as a result of:
  - Higher axle loads east of Oakey (21 tonne axle loads (TAL) compared to the current 15.75 TAL)
  - Longer trains (up to 1,000 m compared to the current ~900 m)
  - A more direct alignment in tunnel across the Toowoomba Range that avoids the current crossing, where operating speeds are constrained by high gradients and tight curves on a winding track
- Inter-capital and agricultural freight currently travelling by road should benefit from reduced operating costs due to economies of scale in rail relative to road transport.

2.4.1.3 Agriculture sector

The *Inland Rail Supply Chain Mapping, Parkes to Narromine Pilot* (CSIRO, 2019a) determined that shifting horticulture and processed agriculture from road to rail could provide the following benefits (based on the study area):

- A potential average transport cost saving of $76 per tonne for horticulture products and post-processed food road trips shifted to Inland Rail
- For horticulture products currently transported by rail on the coastal line, the modelling suggests a potential average transport cost saving of $31 per tonne by shifting to Inland Rail
- Up to 63,000 reduction in heavy vehicle trips per year along various segments of the Newell Highway (currently estimated to be 200,000 semi-trailer equivalents per year).

On 30 October 2013, the Queensland Parliament's Legislative Assembly agreed to a motion that the Transport, Housing and Local Government Committee inquire into and report on options to incentivise the agricultural and livestock industry use of rail, the *Rail freight use by the agriculture industry Report No. 45* (Transport, Housing and Local Government Committee, 2014).

The committee noted that there were significant benefits to the community and government in facilitating the use of rail by the agriculture industry, including:

- Cost efficiencies:
  - New energy-efficient locomotives use less fuel
  - Rail freight causes less damage to underlying infrastructure
- Taking traffic off our congested roads:
  - Congestion costs in Brisbane are estimated to be $6 billion by 2020 and up to $9 billion by 2055 if improvements to the transport system are not delivered
  - A single grain train carrying 2,000 tonnes can take 500 trucks off the road
- Being a safer mode of transport
- Being the cleanest and most environmentally sound way to move freight—every tonne of freight moved by rail rather than road reduces greenhouse emissions by two thirds.

The inquiry identified a number of constraints to the use of rail by the agriculture sector, including lack of transparency, ageing and outdated rail infrastructure; high cost of improving and maintaining infrastructure; and limited capacity (number of train paths and inflexibility of the train paths). One of the biggest issues identified by stakeholders was regarding the Toowoomba Range section of the West Moreton System, specifically:

- It takes 1.5 hours to traverse and has only two passing loops, which restricts rail capacity and efficiency
- The lack of passing loops at other points on either side of the range
- Train lengths being limited to 650 m by constricted sidings/passing loops and level crossing designs
- Height restrictions in the tunnels, which restrict the use of 9' 6" high containers and some non-containerised break bulk cargo, e.g. railway lines or material for the coal seam gas industry.

Upgrades been undertaken on the Toowoomba Range section of the West Moreton System since the committee's findings (e.g. tunnel lowering work). The upgrades were aimed at the agricultural sector in a bid to shift transport from road to rail to:

- Allow for up to 20 new train paths to take 25,000 trucks off South East Queensland (SEQ) roads per year
- Include more cattle services travelling between Winton and Cloncurry
- Include two new rail passing loops, about 1 km each, to be built at Harlaxton and Ballard.

Overall, stakeholders were united in their view that a dedicated freight corridor through the Toowoomba Range was required. A dedicated freight line has the potential for faster cycle times, higher axle mass limits and increased capacity (up to 20 new train paths), which would significantly increase rail competitiveness and the overall efficiency of the bulk and containerised agricultural transport task.

2.4.1.4 Improved reliability and certainty of transit time

Inland Rail will provide a long-haul freight solution that is time- and cost-competitive when compared to road freight. Consequently, Inland Rail will replace some of the long-haul road freight task, resulting in reduced road congestion, fewer vehicular carbon emissions and reduced noise. It is estimated that transportation of freight on Inland Rail will use up to two-thirds less fuel than what would be required to transport the same volume of freight via the existing road network.

2.4.1.5 Increased capacity of the transport network

The capacity of the overall transport network will be enhanced by the development of Inland Rail via:

- Increased capacity enabling the opportunity to return unused freight paths to passengers in Sydney and Brisbane during off peak periods (noting that passengers are already given absolute priority in peak periods)
- Improved customer outcomes for rail passengers between Sydney and Brisbane, with unused freight paths on the coastal route able to be returned to passenger services. The benefit of increased frequency of passenger services reduces average wait time and provides greater reliability and certainty for passengers
- Increased freight capacity enabling greater volumes of inter-capital freight to be moved via rail with a reduced reliance on existing State-controlled and local road networks
- By providing new linkages between existing rail networks, such as those operated by QR, Inland Rail would provide an option for alleviating future short- or long-term capacity constraints on these railways
- Road traffic through Sydney will be relieved by allowing greater capacity for public transport, avoiding the need for capacity augmentation on existing routes
- Greater volumes of inter-capital freight to be moved via rail with a reduced reliance on road
- Coal trains to use longer/heavier trains with better port access
- Agricultural freight, including grain, to use rail in accessing key local and international markets.

2.4.1.6 Reduced distances travelled

Inland Rail reduces the distance travelled by freight, which supports and enables other benefits, such as reducing costs, improving safety and sustainability. This should also provide benefits regarding shrinkage or damage to freight through reduced distances travelled. Through the provision of new linkages between existing rail networks, such as those operated by QR, Inland Rail will also provide a shorter route option for undertaking existing journeys. Inland Rail will divert existing rail freight between Adelaide or Perth and Brisbane from its current route (via Melbourne and Sydney) with an approximate 500-kilometre reduction in rail distance travelled and travel time savings of up to 10 hours. Between Melbourne and Brisbane, the route is reduced by approximately 200 km as a result of Inland Rail.

The Project also provides for a more direct route across the Toowoomba Range, compared to the existing QR alignment.

2.4.1.7 Improved safety

Benefits relating to road and rail safety through the development of Inland Rail are expected to:

- Remove 200,000 long-haul truck movements from roads each year. It is expected that road transport will still be required for distribution from intermodal terminals
- Reduce congestion and creates capacity on existing road and rail networks in metropolitan Sydney
- Reduce the burden on roads and improves safety
- Reduce truck volumes in over 20 regional towns
- Relocate mainline freight traffic from existing railways out of some town centres such as Inglewood, Pittsworth and Southbrook, providing for a safer environment with enhanced liveability.

Inland Rail will adopt a train control system that is part of a global positioning system for the control of train movements on the network. Each train 'knows' where it is on the network and can be automatically braked if it exceeds speed or does not have permission to be on a section of track.

The Project also aims to eliminate an existing level crossing on the Western Line at Gowrie, while also providing grade separation at all the relevant road–rail interfaces. As such, there are no level crossings proposed as part of the Project.

2.4.1.8 Improved sustainability and amenity for the community

There is potential for the Inland Rail Program to benefit sustainability in a number of ways, including:

- Sustainability benefits for the community by removing heavy vehicles from the road network and reducing the distance travelled for rail freight. This results in improved road congestion, fewer emissions and less noise.
- Improved sustainability and positive amenity impacts through the potential to provide rail lines away from housing or bypass towns, improving accessibility and amenity in regional areas
- Inland Rail will provide a long-haul freight solution that is time- and cost-competitive when compared to road freight; consequently, Inland Rail will replace some of the long-haul road freight task, resulting in reduced road congestion, fewer vehicular carbon emissions and reduced noise
- It is estimated that transportation of freight on Inland Rail will use up to two-thirds less fuel than what would be required to transport the same volume of freight via the existing road routes.

2.4.2 Indirect benefits

Foreseeable benefits that cannot be directly attributed to the Program, but rather arise through intervening factors or influences, were also identified by the *Inland Rail Programme Business Case* (ARTC, 2015a). These are summarised below.

2.4.2.1 Create a step change in the Australian Freight Network

Inland Rail offers significant performance advantages over the existing coastal route, including:

- Faster and more reliable transit times
- Shorter alignments
- More optimal grades
- The potential for double stacking, and longer and heavier axle load trains.

Inland Rail will improve the reliability and resilience of the freight network and improve access to export ports and urban freight destinations. These operational efficiencies will increase the role rail plays in the broader freight network and will allow rail to compete in the market as a viable alternative to road, increasing the overall network capacity and freight mode options available to the market. The Project will provide direct linkage to other ports, sch as Sydney, through the East-West Line at Parkes as well as across to Perth, and Newcastle via Moree.

2.4.2.2 Act as a catalyst for growth

Inland Rail will future proof Australia's rail freight task against population growth and the projected increase in freight demand, allowing for increased productivity in major capital cities.

The Inland Rail Program is expected to deliver more than 21,500 jobs at the peak of construction. It is expected to increase Australia's gross domestic product by $18 billion during its construction and first 50 years of operation.

Inland Rail will improve the safety of the network with a better mix and separation of modes of transport in urban and regional environments, providing options for movement of goods that do not require larger vehicles than are currently used throughout the passenger vehicle network. This separation will result in improved network efficiency through shorter journeys, and lower fuel and maintenance costs, leading to supply chain efficiencies and reduced costs, which will ultimately benefit consumers.

At a local level, the Project has the potential to catalyse the development and growth of regional intermodal hubs, such as those associated with InterLinkSQ and the Toowoomba Enterprise Hub.

2.4.2.3 Facilitate training and skills development

ARTC has a strong commitment to training local and indigenous people and has consulted with Indigenous community members with respect to employment and training opportunities.

Training pathways and creation of opportunities for the development of skilled local and indigenous workers through the Project's construction and operation will be achieved through the Inland Rail Skills Academy and targeting skills programs. Of note is the Memorandum of Understanding, which has been signed with Construction Skills Queensland. Activities through the Academy include:

- Providing information about the nature of skills required, with sufficient lead-time to enable local training programs to be customised
- Cooperating with high schools in the region and training providers to provide appropriate training and skill development, and identify available employment pathways
- Establishing Indigenous community networks, to encourage applications and increase the number of Indigenous people applying for jobs
- Key partnerships, to link training and development programs with other projects and local industries to provide the greatest regional benefit
- Working with the Queensland Government and the Australian Government to provide long-term outcomes through training, mentoring and other support programs.

The partnerships and projects that make up the academy are in progress, with comprehensive programs delivered from 2020 with the aim to:

- Facilitate local employment and procurement opportunities regionally by 'priming the market' in each region in which rail would be constructed
- Make it easy for Inland Rail contractors to employ and procure trained and competent people locally
- Build Inland Rail's social licence to operate.

The Inland Rail Skills Academy comprises four pillars:

- Education: science, technology, engineering, and maths and trades education in schools and university scholarships into Inland Rail-related professions, e.g. engineering, project management
- Skills and training: apprenticeships and traineeships, and gaining industry accreditation to support employment into Inland Rail projects as well as other major regional industries
- Business capacity building: for small-to-medium enterprises to understand and meet major projects' supply chain requirements and enhance the value proposition of local business chambers and business groups
- Inland Rail staff training and inductions: opportunities for staff to increase skills in a range of areas including safety and sustainability.

ARTC's workforce development project, training partnerships and the Inland Rail Skills Academy will help to ensure that young people and Indigenous people in the region have the opportunity for skills training that will equip them for the construction industry and will be transferrable to future major projects. It will also result in an increase in the skilled labour force in the region.

2.4.2.4 Provide benefits for metropolitan and regional areas

The diversion of Melbourne to Brisbane and regional rail freight from the Sydney and Brisbane metropolitan rail networks and the transfer of road freight (which currently transits through the Newell Highway or regional towns in Victoria, NSW and Queensland) onto Inland Rail will reduce the competition for scarce capacity on the rail and road networks of these major cities.

It is predicted that the construction of Inland Rail will remove a significant number of trucks from roads on the east coast, resulting in improved environmental sustainability through reduced road congestion, fewer emissions and less noise. The 10-year delivery program will support economic activity in the regions and create regional jobs in Queensland, NSW and Victoria during construction, and longer-term economic opportunities for the regional areas through access to the new infrastructure and associated services.

2.4.2.5 Enable complementary market driven investments

The ultimate benefits of Inland Rail require interdependent and complementary investment in several other projects, policies and initiatives and these will be coordinated throughout the Program, including:

- Regional terminals and loading facilities for regional/agricultural/coal freight
- Rollingstock investment in longer, heavier trains along with supporting train operations to take advantage of the improved rail offering (e.g. determination of arrival, departure and transit times) by train operators
- Double stack terminal capacity in Melbourne and Brisbane and ability to accommodate 1,800 m trains initially and up to 3,600 m trains in the future
- Investment in connecting coal and agricultural rail lines and rail sidings from the Surat and Clarence–Moreton Basins in south-west Queensland to the Port of Brisbane (the Western Line and in metropolitan Brisbane).

2.4.2.6 Consistency with the Queensland Freight Strategy

The *Queensland Freight Strategy* (DTMR, 2019a) establishes a vision for the State's freight system, outlining a series of commitments that guide policy, planning and investment decision making in regard to Queensland's freight system. The strategy includes five commitments, shared by industry, customers and government, as follows:

- **Build effective partnerships:** We will work collaboratively to deliver a freight system that advances customer, industry and government interests, now and into the future
- **Unlock economic opportunity:** We will optimise the use of existing freight infrastructure and target investment towards creating economic opportunities
- **Smarter connectivity and access:** We will plan a freight system that provides Queensland businesses with smarter access to local, national and overseas markets
- **A resilient freight system:** We will support the adoption of sustainable freight practices and resilient infrastructure
- **Safer freight movements:** We will support safe freight movements across Queensland through technology and system planning.

The direct and indirect benefits provided in Sections 2.4.1, 2.4.2 and 2.4.3 demonstrate that the Project is consistent with the intent of the *Queensland Freight Strategy* (DTMR, 2019a)

2.4.2.7 Consistency with the Darling Downs Regional Transport Plan

The Darling Downs Regional Transport Plan (DTMR, 2019b) (the Plan) outlines a direction for shaping the region's transport system. The Plan has the purpose of setting out regional transport priorities and actions for developing the transport system in a way that supports regional goals for the community, economy and environment.

The four priorities established through the Plan development process are:

- **Priority 1:** Supporting economic growth—a transport system that supports economic growth through efficient access to local and global markets
- **Priority 2:** Enhancing liveability—a transport system that supports connected and liveable communities
- **Priority 3:** Transport safety—a safer transport system
- **Priority 4:** Network resilience—resilient and responsive transport system.

Inland Rail is recognised by the Plan as a national project with potential to support economic growth in the region through opportunities for connection into regional freight hubs and improving rail network efficiency.

The direct and indirect benefits presented in Sections 2.4.1, 2.4.2 and 2.4.3 provide further demonstration that the Project is consistent with the intent of the Plan.

2.4.3 Local community benefits

The development of the Gowrie to Helidon section of the Inland Rail Program will provide many benefits to the local community. Specific economic benefits to the local community, identified during economic impact assessments, include:

- **Employment**—The construction workforce is expected to be drawn primarily from communities within the Project region, including the Toowoomba and Lockyer Valley local government areas (LGAs), and, therefore, employment and training benefits would extend to construction industry workers across the region. The availability of long periods of employment in Project construction is likely to be a strong positive opportunity for those personnel and their families.

  Employment opportunities in the Project's region during the construction stage will have positive mental health benefits for the individuals employed, particularly if they are exiting a period of unemployment or commencing their career. This would be particularly important in communities with high levels of unemployment, such as Mount Kynoch and Helidon, and for particular population groups where unemployment rates are high. Workforce onsite for the Project is estimated to peak at 596 full-time equivalents (FTEs). Throughout the course of the construction period, the average number of workers required will be approximately 264 FTEs.

- **Business opportunities**—Local and regional businesses will benefit from the construction phase. Opportunities to supply the Project may include supply of fuels, equipment, borrow and quarried material, and services including fencing, electrical installation, rehabilitation, landscaping, maintenance and trades services.

  Local transport or logistics businesses may also have significant opportunities to service the construction phase.

  Project's local supply arrangements will provide an opportunity to develop and grow local businesses.

  The expansion in construction activity in the vicinity of the Project will support additional flow-on demand and additional spending by the construction workforce and, therefore, business trading levels in the region.

  Project will improve the connection between local produce and markets to both the domestic markets in major cities and international markets via the Port of Brisbane. Local produce produced in the area includes bulk grain, containerised cotton, poultry production (the main agricultural product produced in the Toowoomba LGA) and fruits and vegetable agricultural production (the main products produced in the Lockyer Valley LGA).

- **Crash reduction**—Crash cost savings represent the reduced costs associated with fatal and serious injuries resulting from both road and rail incidents.

  Arterial roads surrounding the Project that experience higher-than-average crash volumes could benefit from reductions in freight traffic volumes through the implementation of the Inland Rail Program. Examples of these roads include Murphys Creek Road, Gatton–Helidon Road and major roads, including the Pacific Motorway, Warrego Highway and the New England Highway.

  The Project will not result in the addition of any new level crossings. The Project will result in the elimination of an existing level crossing and the closure of a rail over road underpass associated with the existing West Moreton System at Gowrie. The use of the Inland Rail alignment by existing rail traffic will also potentially reduce the rail traffic through Toowoomba and down the existing Toowoomba Range section of the West Moreton System.

- **Environmental externalities**—Reduced environmental externality costs represent reductions in air pollution and greenhouse gas emissions due to the Project; the majority of these benefits can be attributed to the mode shift from road freight to rail freight.

- **Road decongestion benefits**—As the Project encourages greater movement of freight by rail, the reduced truck movements that are projected upon completion of the Project result in reduced congestion in urban areas.

These benefits are discussed in more detail in Chapter 16: Social and Chapter 17: Economics.

2.5 Consequences of not proceeding with Inland Rail

Not progressing with Inland Rail would potentially have significant negative impacts on the future growth of the national economy. The continuing growth in freight demand described in Section 2.3.2 calls for urgent attention. Without a decision to make a step change in rail efficiency and performance, pressure on road networks due to freight movements will continue to increase, freight costs will continue to rise, consumers would pay more for products and productivity in important industrial sectors could decline.

Without Inland Rail, road would increasingly become the dominant mode, with rail becoming less relevant. A continued over-reliance on road transport to meet the future east coast freight task will increase the vulnerabilities to demographic changes that are, even today, driving shortages of long-distance truck drivers and increasing costs.

More specifically, if investment in the east coast freight corridor is not undertaken to increase capacity and minimise supply chain costs, the following risks are highly likely to eventuate:

- National productivity and economic growth will be constrained
- Freight companies and the consumers of products transported along the corridor are expected to experience excessive freight costs
- There will be an increase in congestion on both rail and road networks, given the reliance on shared freight/passenger corridors
- There will be an increase in the number of trucks on urban and regional roads required to move the rising freight volumes
- Larger trucks (i.e. B-doubles, B-triples) will be mixing with smaller passenger vehicles on major highways
- Governments will be required to make significant investments in major arterial and regional roads to ensure they can support the increase in the number and size of heavy vehicles
- There will be a deterioration of safety on the road network with existing infrastructure not supportive of changes in vehicle mix
- Ongoing fuel use and emissions discharged from an increased number and size of heavy vehicles will have environmental impacts
- An increase in freight road traffic will have major impacts on urban and regional communities on the freight route such as congestion, amenity and noise, resulting in safety and environmental issues
- Significant economic impacts associated with the inability of the freight network to meet the demand for goods and services.

2.5.1 Consequences of not proceeding with the Gowrie to Helidon Project

On a Project scale, the consequences of not proceeding with the Project, will require the upgrade of the existing QR rail network and/or alternative mechanisms (road transport) to move freight between Toowoomba and Brisbane. Both options would potentially impact on the Inland Rail Program's objective of providing a road-competitive service that will see freight delivered from Melbourne to Brisbane in less than 24 hours, with reliability, pricing and availability that is equal to, or better than, road.

QR has undertaken works to improve the efficiency and capacity of the Toowoomba Range section of the West Moreton System as per the W*est Moreton System Information Pack—Issue 3.1* (QR, 2016b); however, despite these works, additional upgrades of the existing rail network would be required to accommodate the rail traffic generated by Inland Rail because:

- The existing track is narrow gauge, which limits the type of locomotives and rollingstock that can be used
- The rollingstock planned for the Project will not be able to use the narrow-gauge track, as the Project design incorporates a dual-gauge track, which allows for connections between the Inland Rail and QR networks
- The existing West Moreton System supports low axle limits (15.75 TAL and less), with the Inland Rail Project catering for 25 TAL, with capacity to increase to 30 TAL
- The existing track has a maximum design speed of 80 kilometres per hour (km/hr) compared to 115 km/hr for the Project; though, it should be noted that the topography traversed by both alignments, limits the operating speeds
- The existing rail tunnels are of sufficient capacity to accommodate 40-foot containers but would not be able to accommodate double-stacked freight. In addition, the existing rail tunnels are heritage listed, having been constructed in the 1860s, which will also constrain any future upgrades
- The sidings and crossing loops associated with the existing rail network are designed for smaller train consists (~ 673 m) compared to the train consists proposed on Inland Rail (up to 1,800 m)
- The existing track was impacted by floods in 2011, which is one of the reasons the current alignment was adopted for the Project (Inland Rail Implementation Group, 2015).

The *Melbourne–Brisbane Inland Rail Alignment Study* (ARTC, 2010a) noted that the termination of Inland Rail at Toowoomba would require a longer pickup and delivery time by road from Toowoomba to Brisbane (approximately 125 km, or 2 to 3 hours) and would have a negative impact on estimated coal freight demand and a halving of the expected inter-capital tonnage. This resulted in a 60 per cent decrease in below rail revenue, while the economic benefit-cost ratio decreased by around 80 per cent relative to the full Melbourne–Brisbane scenario, indicating lower efficiency of expenditure.

2.6 Alternative locations and route options

Alternative routes for Inland Rail were considered through the following studies:

- *North–South Rail Corridor Study* (Ernst & Young, 2006)
- *Melbourne-Brisbane Inland Rail Alignment Study* (ARTC, 2010a)
- *The Inland Rail Implementation Group Report to the Australian Government August 2015* (Inland Rail Implementation Group, 2015).

The results of the studies are summarised below, with additional detail on the Project's corridor selection provided in Chapter 6: Project Description. It is noted that the Gowrie to Helidon section was also subject to studies undertaken by the Queensland Government in the period since January 1996, to identify and protect a future rail corridor across the Toowoomba Range, with the outcomes of the studies summarised in the *Gowrie to Grandchester Rail Corridor Study* (Queensland Rail and Queensland Transport, 2003) and with an overview provided in Section 2.7.1.

2.6.1 North–South Rail Corridor Study

The purposes of the *North–South Rail Corridor Study* (Ernst & Young, 2006) was to identity a route from Melbourne to Brisbane that would deliver the best overall economic outcome, with consideration for:

- Market demand
- Operating efficiency
- Infrastructure requirements
- Environmental constraints.
- The report considered:
- Route options (refer Section 2.6.1.1)
- Market assessment
- Project demand
- Environmental issues
- Other transport infrastructure requirements
- Financial and economic impacts.

2.6.1.1 Options identified

Potential route options were identified within a 'north–south rail corridor', which was an elliptically shaped area defined by the standard-gauge rail line along the NSW coast, and a broad arc west of Shepparton, Jerilderie, Coonamble, Burren Junction, Goondiwindi and Toowoomba (refer Figure 2.1). This area covers all sections of the existing rail network in Victoria, NSW and Queensland that currently form, or could potentially form, part of an inland freight route between Melbourne and Brisbane.

Within this corridor, four sub-corridors were identified, each of which could be combined with alternative routes between Melbourne and Junee, via Shepparton or via Albury. The four sub-corridors comprised:

- Far-Western Sub-Corridor—linking Junee to Brisbane via Parkes, Dubbo and/or Narromine, Coonamble, Burren Junction, Narrabri and/or Moree, North Star, Goondiwindi, Warwick and/or Toowoomba
- Central Inland Sub-Corridor—linking Junee to Brisbane via any inland route that includes the Werris Creek to Armidale to Tenterfield rail links

- Coastal Sub-Corridor—following the existing coastal route between Junee and Brisbane (via Goulburn), through Sydney
- Hybrid Sub-Corridor—combining elements of an inland and coastal route, linking Junee to Brisbane via Muswellbrook and Maitland.

Within each of these sub-corridors, the feasibility of 136 possible route options was investigated. These options involved different combinations of new track and the upgrading of existing track.

2.6.1.2 Analysis of options

The route options were compared using an optimisation model specifically developed for the study, based on the following criteria:

- Operating efficiency
- Infrastructure requirements
- Market demand
- Environmental constraints
- Financial and economic viability.

The study identified potential demand, financial issues, environmental issues and infrastructure costs relevant to the four sub-corridors. The analysis undertaken for the study, based on the above criteria, concluded that the Far-Western Sub-corridor was the best performing sub-corridor option based on the following:

- Shortest and fastest transit journey from north to south, while avoiding the impact of Sydney rail traffic congestion
- The option was projected to require the lowest level of capital expenditure of the four sub-corridors
- In addition to carrying Melbourne–Brisbane freight, the Far Western Sub-corridor had the potential to derive additional revenue from southern Queensland freight travelling to the western states and from Perth to the east coast. This additional revenue opportunity is specific to this sub-corridor.
- A rail freight line through the Far Western Sub-corridor is expected to divert some of the freight that moves between regional areas and ports.

FIGURE 2.1: STUDY AREA FOR THE NORTH–SOUTH RAIL CORRIDOR STUDY

2.6.2 Melbourne–Brisbane Inland Rail Alignment Study

In 2008, the Inland Rail study was announced by the Australian Government, to be led by ARTC. This resulted in the *Melbourne–Brisbane Inland Rail Alignment Study* (ARTC, 2010a), which identified the preferred corridor through central-west NSW and established the business case for the Inland Rail Program.

The purpose of the *Melbourne–Brisbane Inland Rail Alignment Study* (ARTC, 2010a) was to determine the optimum alignment, as well as the economic benefits and likely commercial success, of a new standard-gauge inland railway between Melbourne and Brisbane. The terms of reference for the study required the development of a detailed route alignment, generally following the Far Western Sub-corridor identified by the *North–South Rail Corridor Study* (Ernst & Young, 2006). The report considered:

- Market take-up
- Route development
- Capital cost vs transit time
- Financial and economic appraisal.

2.6.2.1 Options identified

The *Melbourne–Brisbane Inland Rail Alignment Study* (ARTC, 2010a) shortlisted and analysed a number of route options. The route analysis involved:

- Identification of the route—evaluation of the route options and preliminary analysis for the three main areas: Melbourne to Parkes; Parkes to Moree; and Moree to Brisbane
- Analysis of the route—the route was analysed in terms of capital cost, environmental impacts and journey time, as well as its preliminary economic and financial viability
- Development of the preferred alignment—the alignment was developed considering environmental and engineering factors.

The study noted that with the combination of numerous route options and sections there were over 50,000 possible options for the route between Melbourne and Brisbane. As it was not feasible to analyse each option, two key criteria (capital cost and journey time) were used to establish a shortlist of route options in each of the three main areas. The shortlist included:

- Melbourne to Parkes—two main options:
  - Via Albury, using existing track from Melbourne to Parkes (with a possible new direct line from Junee or Illabo to Stockinbingal, bypassing Cootamundra)
  - Via Shepparton, using the existing broad-gauge Mangalore–Tocumwal line via Shepparton, the disused standard-gauge line to Narrandera and a new direct connection through to near Caragabal, before re-joining the existing line to Parkes.
- Parks to Moree—four main options:
  - Parkes to Moree via Werris Creek, using existing track (with a new section of track at Binnaway and Werris Creek to avoid reversals)
  - Parkes to Moree via Binnaway and Narrabri, using existing track to Binnaway and then a new section connecting to the existing track near Emerald Hill or Baan Baa
  - Parkes to Moree via Curban, Gwabegar and Narrabri, using existing track to Narromine, predominately new track between Narromine and Narrabri, and existing track from Narrabri to Moree
  - Parkes to Moree via Burren Junction, using existing track to Narromine, and predominately new track via Coonamble and Burren Junction to Moree.

- Moree to Brisbane—two main options:
  - The Warwick route—a new 'greenfield' route via Warwick to the existing standard-gauge Sydney–Brisbane line
  - The Toowoomba route—a new corridor direct from Inglewood to Millmerran and Oakey, near Toowoomba and then a new alignment down the Toowoomba Range. It was then proposed to use the protected Gowrie to Grandchester future public passenger transport corridor (now known as Gowrie to Grandchester future state transport corridor), stretching east from Gowrie near Toowoomba through to Grandchester (near the town of Rosewood) and the Southern Freight Rail Corridor from Rosewood to Kagaru.

2.6.2.2 Analysis of options

The shortlist of route options was subjected to more detailed technical, financial and economic assessment. The option involving use of existing track towards Werris Creek was chosen to represent the option with the lowest capital expenditure meeting the performance specification. This option had a length of approximately 1,880 km. The option involving the more direct route between Narromine and Narrabri had the fastest transit time for a reasonable capital expenditure. This option, which had a length of about 1,731 km, became the focus for more detailed route, demand, economic and financial analysis.

Refining the proposed alignment involved an iterative process, with evaluation of the following:

- Environmental and land issues
- Railway operations considerations
- Engineering assessments
- Capital cost estimates.

The report found:

- Southern section offered the greatest opportunity to save money, as Shepparton route was estimated to cost $900 million more that the Albury routes (2010 dollars, not updated)
- Central section offered the greatest opportunity to save time, saving more than 5 hours and 30 minutes by not going via Dubbo and Werris Creek
- Northern section offered the greatest opportunity to use existing protected rail corridors in greenfield sections.

On this basis, the final preferred alignment, between South Dynon in Melbourne and Acacia Ridge in Brisbane, incorporated:

- Melbourne to Parkes—670 km of existing track and 37 km greenfield track from Illabo to Stockinbingal, bypassing Cootamundra and the Bethungra spiral
- Parkes to North Star—307 km of upgraded track and 291 km greenfield track from Narromine to Narrabri
- North Star to Acacia Ridge—271 km of greenfield track, 119 km of existing track upgraded from narrow gauge to dual gauge, and 36 km of the existing coastal route.

The North Star to Acacia Ridge alignment included the Toowoomba route, which was preferred to the routes via Warwick, with the Toowoomba route having stronger economic merit. Although the Warwick routes were shorter than the Toowoomba options, they were also significantly more expensive.

The study also concluded that the Gowrie to Grandchester future state transport corridor identified in 2003 and protected in 2005 under the *Transport Planning and Coordination Act 1994* (Qld) (TP C Act) as a future public passenger transport corridor was not the optimum solution for the inland railway (refer Section 2.7). The preferred route through the Toowoomba Range was via Murphys Creek, due to a shorter tunnel length and the preference of the study to follow existing rail corridors.

The Murphys Creek option design paralleled the existing West Moreton System rail corridor (to the north) and Gowrie Creek from the tie in the NSW/Queensland Border to Gowrie (B2G) project for approximately 4.2 km. The route then deviated to the north-east through a tunnel (at Birnam (East)), for approximately 4.5 km, under the localities of Birnam (East), Highfields, Ballard before exiting between the West Moreton System at Spring Bluff and Mt Ben Lomond in the locality of Murphys Creek. The route then followed Murphys Creek Road for approximately 4.8 km before tying into the existing West Moreton System to the north-west of Murphys Creek township. The route was generally co-located, for approximately 12 km, with the existing West Moreton System to Airforce Road where it tied into the Helidon to Calvert (H2C) project.

The Murphys Creek alignment and the Grandchester future state transport corridor are illustrated in Figure 2.2—noting that the Murphys Creek option is presented by the 2010 alignment and the Grandchester future state transport corridor by the 2003 alignment.

The study also noted that some QR maintenance costs could be avoided by closing the existing Toowoomba Range crossing. This is estimated to average $7.2 million per annum, covering routine maintenance for sleepers, ballast, track and structures but excluding one-off projects.

2.6.3 Inland Rail Implementation Group Report

To progress Inland Rail in late 2013, the Inland Rail Implementation Group (IRIG) was established. The IRIG prepared a report for the Australian Government in 2015, which set out a strategic analysis of the need for Inland Rail as one potential solution to the future freight task along the Melbourne–Brisbane corridor and included the main features of the *Inland Rail Programme Business Case* (ARTC, 2015a).

The report, *Melbourne–Brisbane Inland Rail Report* (IRIG, 2015), which was written to be read in conjunction with the *Inland Rail Programme Business Case* (ARTC, 2015a) recommended the adoption of the *Melbourne–Brisbane Inland Rail Alignment Study* (ARTC, 2010a) alignment, with some detailed consideration of three sections in further detail. These included:

- Albury vs Shepparton: The IRIG endorsed the route via Albury on the basis that potential freight values through Shepparton did not justify the significant additional capital cost ($1 to $2 billion (2015 dollars, not updated)).
- North Star to Toowoomba: The IRIG noted that further engineering, hydrological and geotechnical assessments were required between North Star and Toowoomba, which may result in a deviation of the alignment in this section.

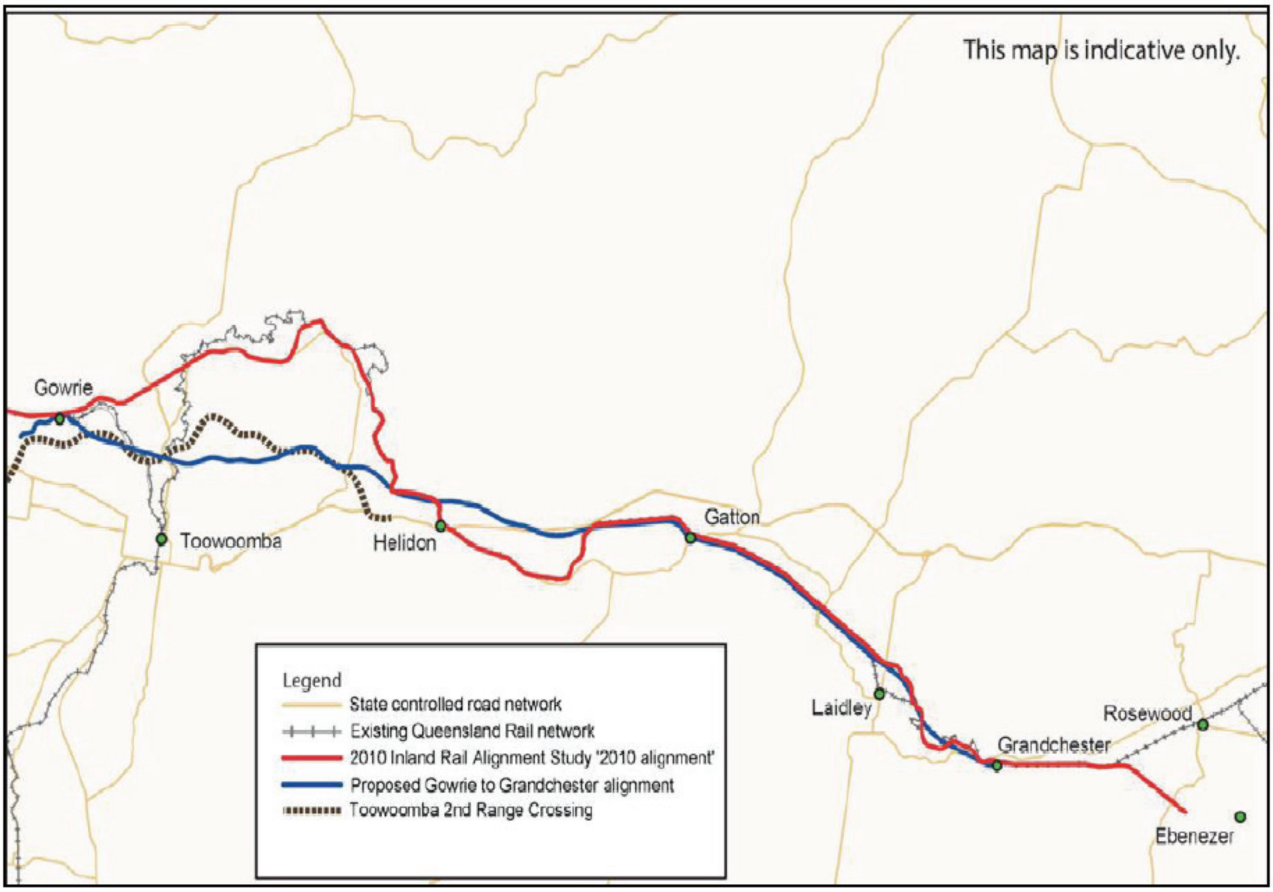

FIGURE 2.2: INLAND RAIL ALIGNMENT GOWRIE TO GRANDCHESTER—2003 AND 2010 OPTIONS

(**Source**: IRIG, 2015)

The 2015 base case Inland Rail alignment identified in the *Melbourne–Brisbane Inland Rail Report* (IRIG, 2015) is shown in Figure 2.3. The report endorsed the adoption of the Queensland Transport Gowrie to Grandchester corridor (i.e. Gowrie to Grandchester future state transport corridor) that was protected in 2005 under the TPC Act in preference to the Murphys Creek option. The Group found that in relation to capital costs, the two alignments were of comparable cost, with the Gowrie to Grandchester future state transport corridor (refer Section 2.7.1) preferred due to the following:

- Using the existing corridor would result in a significant time saving (around two years), relative to proceeding through the statutory processes, to formally identify a new corridor for the 2010 alignment and removes a significant element of planning risk
- Substantial elements of the 2003 alignment had already been acquired by the Queensland Government (33 out of 133 properties)
- Community severance and disruption, noise and dust through Helidon, Murphys Creek valley and in the vicinity of Gowrie Junction would be minimised by using the 2003 alignment
- The 2003 alignment was substantially a greenfield development that minimised impacts on the existing operating QR corridor.

In addition, the Murphys Creek alignment was significantly impacted by the 2011 floods through the Lockyer Valley and, to a lesser degree, in the Gowrie area.

Consultation undertaken with local communities as part of the optioneering is outlined in Appendix D: Community Consultation. A comparison of the Project alignment and the Gowrie to Grandchester future state transport corridor is shown in Figure 2.4.

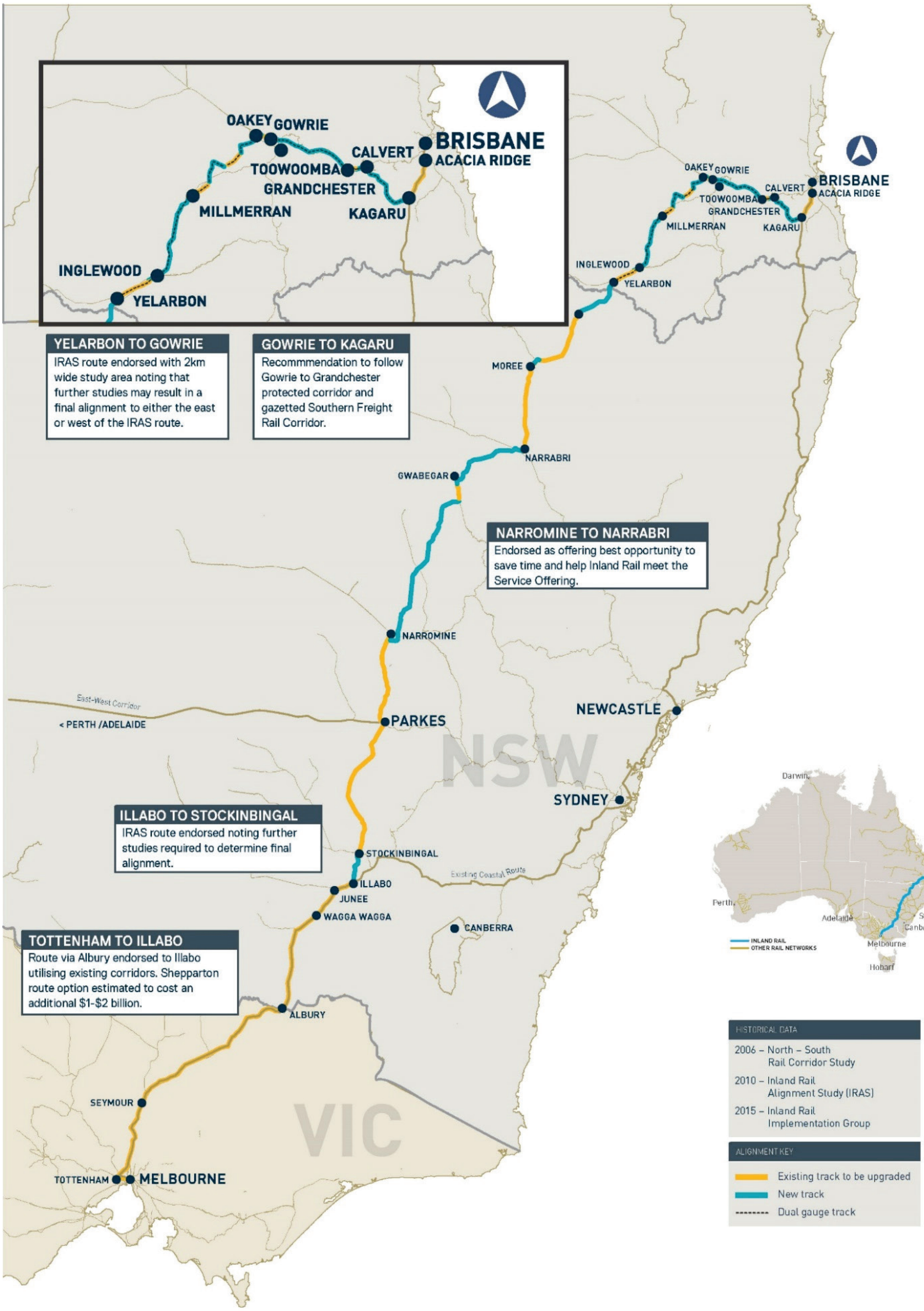

FIGURE 2.3: ALIGNMENT FOR INLAND RAIL

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

INLAND RAIL ARTC

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

GOWRIE TO HELIDON

Figure 2.4: Project comparison with the Gowrie to Grandchester future State transport corridor

LEGEND

- 5 Chainage (km)
- Localities
- Existing rail
- B2G project alignment
- G2H project alignment
- H2C project alignment
- Gowrie to Grandchester corridor
- Tunnel
- Watercourses
- Major roads
- Minor roads
- EIS investigation corridor
- Local Government Areas

0 3 6 km

Coordinate System: GDA 1994 MGA Zone 56

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Author: FFJV GIS Scale: 1:140,000
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2.7 Gowrie to Helidon alignment options

2.7.1 Queensland Rail options

Queensland Rail commenced investigations to identify a future rail corridor across the Toowoomba Range in 1996 (i.e. the Toowoomba Range Rail Corridor Study) (Queensland Rail and Queensland Transport, 2003). The options investigated are shown in Figure 2.5. The initial route was based on the outcomes of the Toowoomba Region Network Transport Study, which was initiated in 1994 by Queensland Transport to identify an alignment for the second road crossing of the Toowoomba Range (Queensland Rail and Queensland Transport, 2003). The Toowoomba Region Network Transport Study concluded that a consolidated road–rail corridor was not feasible due to the steep terrain and environmental constraints, noting that road and rail requirements are different (with rail requiring flat grades and large radius curves), with the study identifying a potential rail route described as:

> *The route diverted from the existing railway near Gowrie, before crossing Gowrie Creek and entering tunnel near Wetalla. After exiting the tunnel below Ballard on the eastern side of the range, the route traversed country on the northern side of Murphys Creek and the eastern side of Lockyer Creek before re-joining the existing railway at the western end of the straight on the western side of Helidon. (Queensland Rail and Queensland Transport, 2003)*

This route was abandoned in August 1997 in preference to alignments closer to the proposed second range road crossing of the Toowoomba Range. The revised options are outlined below, noting that a more direct route closer to the second range road corridor was abandoned due to likely impacts on Aboriginal sites in the Upper Rocky Creek area:

- A new rail extending from the existing railway near Gowrie and entering a tunnel near Wetalla
- A new rail extending from the existing railway near Gowrie and entering a tunnel near Hermitage Road
- Both options exited the tunnel below Mt Kynoch and then followed the same corridor to the south of Murphys Creek, before paralleling the Toowoomba Range second crossing road alignment north of Postmans Ridge, crossing Lockyer Creek and re-joining the existing railway at the western end of the straight on the western side of Helidon
- Some additional optioneering was undertaken around the Withcott Seedlings site to minimise impacts on this facility.

The Hermitage Road option was abandoned in August 1998 due to a number of social issues, in preference for an alignment that entered the tunnel near the proposed Boundary Street interchange. The work on the Toowoomba Range Rail Corridor Study ceased in August 1999 and was replaced by the *Gowrie to Grandchester Rail Corridor Study* (Queensland Rail and Queensland Transport, 2003).

The *Gowrie to Grandchester Rail Corridor Study* (Queensland Rail and Queensland Transport, 2003) aimed to build on the works undertaken as part of the Toowoomba Region Transport Network Study and the Toowoomba Range Rail Corridor Study, with the principal objective being:

- To define a corridor between Gowrie and Helidon for a possible future high-speed (200 km/hr where feasible) railway that catered for the essential current rail planning criteria of duplicated track, dual-gauge and double-stacked containers.
- To undertake effective public consultation
- To undertake strategic environmental and cultural heritage assessments to determine a corridor with minimal impacts that could be managed with further detailed design prior to construction.
- The study initially investigated three options for the Gowrie to Helidon section:
  - Option A1, which entered tunnel near Boundary Road, exited tunnel on the eastern side of the range, then continued in a generally north-easterly direction towards Murphys Creek, before turning southeast to link with the existing railway west of Helidon. This option was identified during the Toowoomba Range Rail Corridor Study.
  - Option A2, which entered tunnel in approximately the same location near Boundary Road, and then continued in a generally easterly direction before linking with option A1 near Postmans Ridge. This option was developed in consultation with the local Aboriginal parties to minimise impacts on Aboriginal sites associated with the Upper Rocky Creek area.
  - Option A3, which entered tunnel near Wetalla, exited tunnel on the eastern side of the range, then generally followed the same alignment as option A1. This option was identified during the Toowoomba Range Rail Corridor Study.

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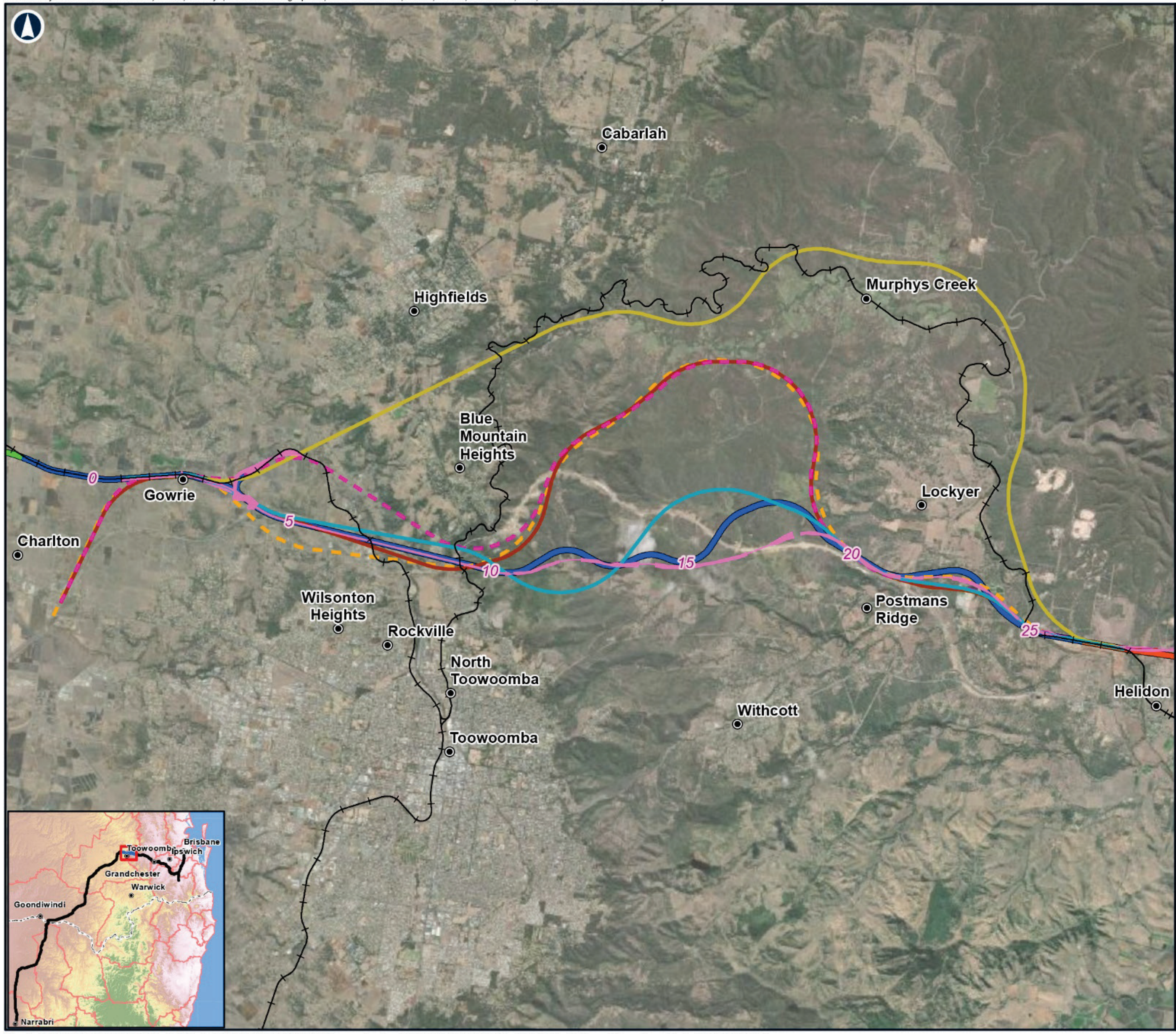

INLAND RAIL

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

GOWRIE TO HELIDON

Figure 2.5: Gowrie to Grandchester rail corridor study

LEGEND

- 5 Chainage (km)
- Localities
- Existing rail
- B2G project alignment
- G2H project alignment
- H2C project alignment
- Gowrie to Grandchester corridor

Historical route development

- Gowrie to Grandchester Study Option A1
- Gowrie to Grandchester Study Option A2
- Toowoomba Range Rail Corridor Study [Hermitage Road alignment]
- Toowoomba Range Rail Corridor Study [Wetalla alignment] Option A3
- Toowoomba Region Network Transport Study alignment

0 2.5 5 km

Coordinate System: GDA 1994 MGA Zone 56

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Author: FFJV GIS
Data Sources: FFJV
Paper: A4
Scale: 1:130,000

Map by: MEF/DTH Z:\GIS\GIS_3200_G2H\Tasks\320-EAP-202001141047_Alignment_options\320-EAP-202001141047_ARTC_A4L_G2G_evolution_v3.mxd Date: 19/02/2021 08:01

A modified alignment of option A2 (the preferred corridor) was developed to minimise the perceived impact on a vine forest, and had the added benefit of additional co-location with the second range crossing road alignment, plus use of the properties already owned by DTMR.

The study consulted with a range of stakeholders and the community to identify the preferred option. In addition, a number of technical assessments were also undertaken, including ecological assessments, air quality modelling, noise modelling, an assessment of the tunnelling requirements for a new rail corridor and an assessment of commuter station options (Toowoomba, Gowrie, Helidon and Withcott).

A Goal Achievement Matrix (GAM) analysis was undertaken, which considered criteria such as soils, geology/geomorphology, flora and fauna, air, noise, water, land use, socio-economics and visual/aesthetics. The analysis determined that the modified version of A2 would have the least potential impact, followed by option A3, option A1 and then option A2. Similarly, the A2 option was preferred when the study also considered design and engineering factors, including corridor length, tunnel length, grades, proximity to commuter stations and capital cost.

The primary goal of consultation in 2002 then became assessment of the suitability of the modified option, A2, through discussions with directly affected property owners and the relevant councils.

The Gowrie to Helidon section of the Gowrie to Grandchester future state transport corridor, which was protected under the TPC Act in 2005, can be described as follows:

> *'The corridor diverts from the existing Western Line near Gowrie and has been designed to link to the designated road/rail corridor running south from Charlton to the Gore Highway at Athol and provide for a connection to the existing Western Line into Toowoomba.*
>
> *After leaving the Western Line, the corridor passes through open undulating black soil country, before entering tunnel on the western side of the proposed Main Roads second range crossing interchange at Boundary Road. The proposed corridor will directly affect the place of residence on one property between the Western Line and the tunnel entrance. The proposed tunnel through the Toowoomba Range will be approximately 6.3 kilometres in length and will pass some 200 metres below the New England Highway on the crest of the range at Mt Kynoch.*
>
> *Ideally, a site on the new corridor near Gowrie for a possible future station facility to service both commuters and long distance passengers is preferable. However, this could not be achieved, as there is insufficient distance between the tunnel entrance near Boundary Road and the angle connecting the new corridor to the existing Western Line into Toowoomba. A site for a possible future commuter station facility has been located on the connection back to the Western Line.*
>
> *For a short distance after exiting tunnel on the eastern side of the escarpment, the corridor passes through the edge of an endangered vine forest before intersecting Department of Defence property containing an area defined as the Range Danger Area within the Mt Lofty Rifle Range. The Department of Defence have confirmed that, dependent on the status of the Rifle Range at the time of rail construction, there are options for construction of a tunnel or similar structure that would satisfy their safety requirements.*
>
> *Soon after exiting Department of Defence property the railway will cross Upper Rocky Creek on a 460 m long structure some 30 m above the valley floor. It then traverses the side of the Toowoomba Range foothills on an alignment that is close to the proposed second road crossing of the Range, before bridging over the proposed road via a 560 m long structure up to 50 m above the floor of the valley.*
>
> *Some 600 m after the bridge structure, the railway will enter a short 190 m long tunnel and then continue in close proximity to the proposed road alignment until bridging over Murphys Creek Road.*
>
> *The corridor then passes through generally undulating country before bridging Lockyer Creek and re-joining the existing railway at the western end of the straight to the west of Helidon. (Queensland Rail and Queensland Transport, 2003).*

The commuter facilities identified as part of this study were also subsequently protected under the TP and C Act.

As outlined in Section 2.6.3, this corridor was identified during the *Gowrie to Grandchester Rail Corridor Study* (Queensland Rail and Queensland Transport, 2003) as the preferred route for the Gowrie to Helidon section of the Inland Rail Program subject to minor amendments, which are discussed below.

A comparison of the Project alignment and the Gowrie to Grandchester future state transport corridor is shown in Figure 2.4.

2.7.2 Concept Planning 2016

Following from the IRIG Report (refer Section 2.6.3), ARTC's task as the delivery agent for Inland Rail was to examine whether there were cost-effective opportunities to improve on the 2015 IRIG alignment in order to improve outcomes beyond the Inland Rail Service Offering (refer Section 2.3.5). An option was assessed to the point where it was determined that it was either too expensive or degraded the service offering.

ARTC classified the Inland Rail route into 13 sections (projects) that could be described broadly as either brownfield (using existing rail track or corridors) or greenfield (sections requiring completely new corridors or track). The greenfield sections required assessment of options to determine alignment study areas within which the final rail corridor will be located. As a result, the alignment included in the IRIG Report has undergone further refinement in a number of sections since 2015, including Gowrie to Helidon.

There are three key considerations in selecting any route:

- Ability to enhance the Inland Rail Service Offering
- Construction and operating costs
- Multi-Criteria Analysis (MCA).

The MCA framework, shown in Figure 2.6, seeks to ensure recommendations consider a wide range of criteria, including:

- Engineering and technical factors
- Social and community impacts
- Number of properties directly impacted
- Environmental impacts
- Geotechnical and constructability related issues.

Within a particular MCA workshop, the agreed weightings for each criteria are applied uniformly across all options considered in that workshop. The outcome of any MCA workshop is just one factor in choosing between competing route options and not a determining factor in its own right.

An MCA indicates whether a route option warrants further consideration, which is then assessed for its ability to enhance the Service Offering and whether its estimated construction and operating costs are appropriate for any perceived benefits. This route evaluation process is represented in Figure 2.7.

The section below provides a summary of the main corridor assessment that was completed during the concept assessment phase of the Project in 2016.

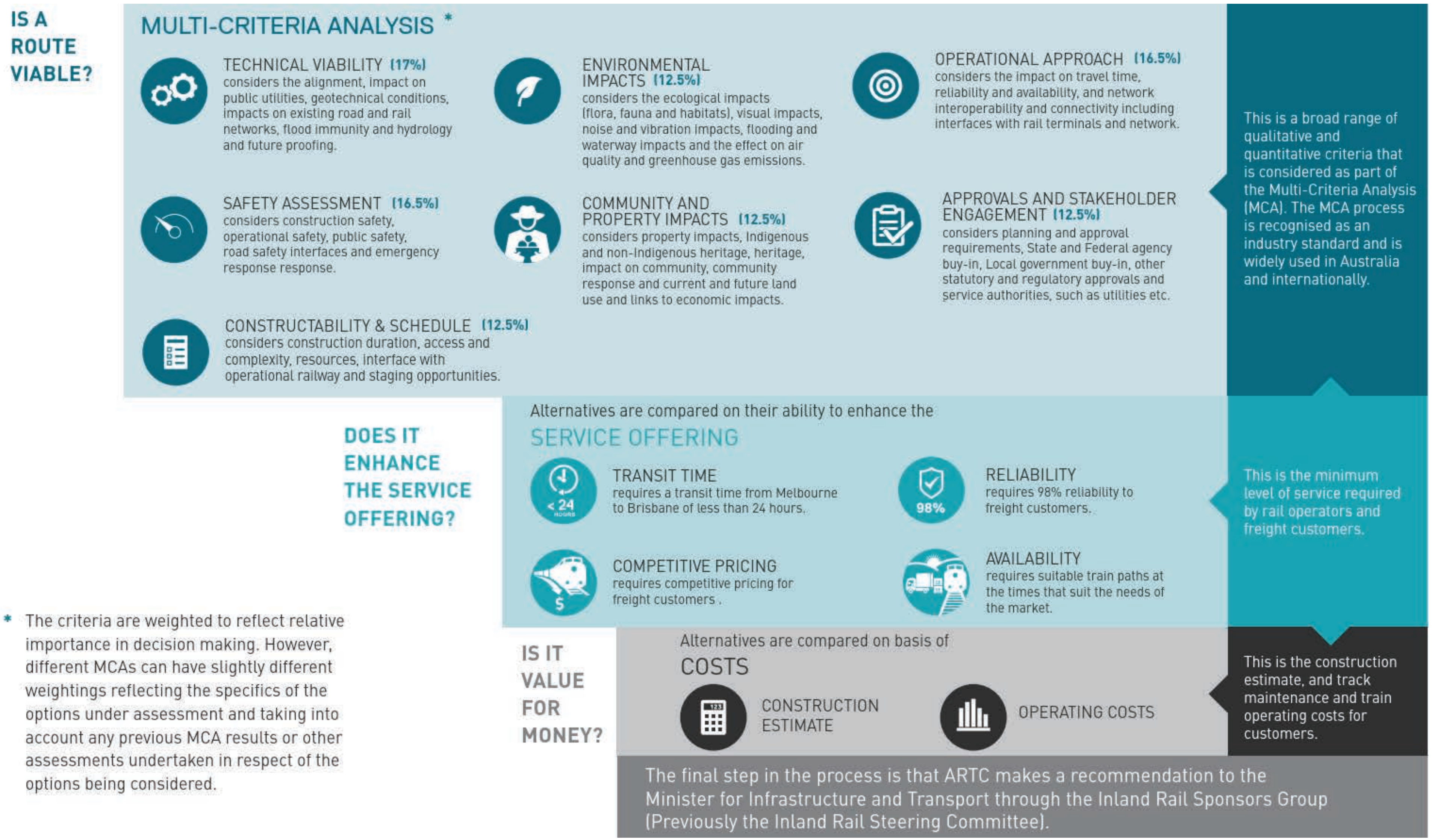

FIGURE 2.6: FACTORS AFFECTING ROUTE SELECTION SINCE 2016

(**Source**: ARTC, 2020b)

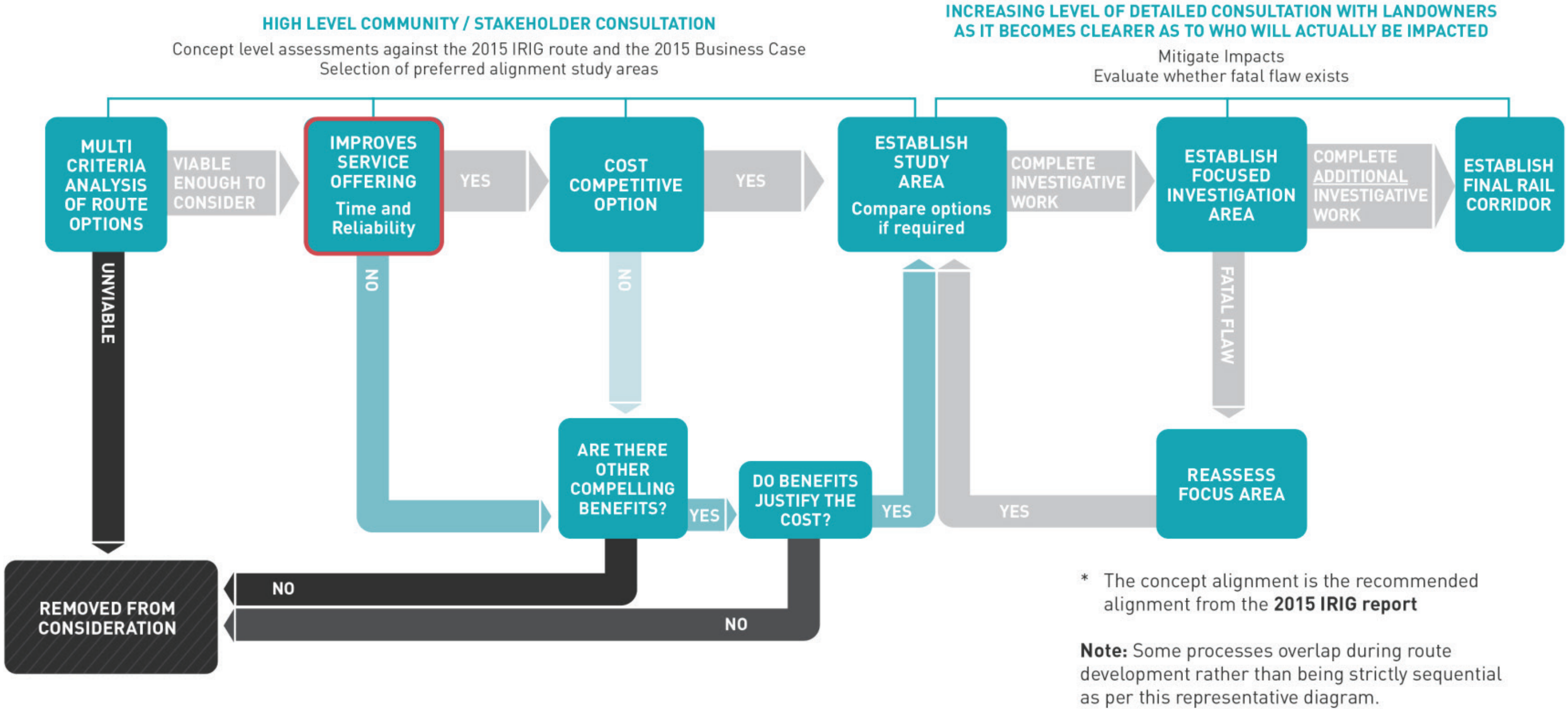

FIGURE 2.7: PROCESS FOR ASSESSING ROUTE OPTIONS LEADING TO A FINAL RAIL CORRIDOR

(**Source**: ARTC, 2020b)

2.7.2.1 Deviation at Wards Hill

As described above, the IRIG recommended adopting the Gowrie to Grandchester future state transport corridor as the preferred route across the Toowoomba Range due, in part, to the protected corridor status, which would provide more certainty over approvals and program compared to the largely unprotected Murphys Creek corridor.

In 2016, a robust MCA process was undertaken to provide a preferred alignment and an associated study area for Gowrie to Helidon. The objectives of the assessment were to:

- Evaluate options to select a preferred route option to progress to the next stage of design
- Assess the technical viability of the options against the agreed Inland Rail performance specifications
- Define a preferred route for G2H to be taken through the formal planning and environmental approvals process, recognising that it may be necessary to identify a wider study area (as narrow as practicable) to assess further refinements and sub options
- Use the MCA preferred alignment to progress to a concept level of engineering design.

The MCA process also provided an opportunity to re-assess the Gowrie to Grandchester future state transport corridor based on the following:

- Addressing business continuity/flood immunity challenges
- Providing route clearance for double-stack containers
- Changes in constraints
- Capital cost reduction
- Refining the route for improved outcomes
- Amending the alignment to reduce environmental and other impacts.

The MCA was undertaken in consultation with DTMR, Toowoomba Regional Council (TRC) and Lockyer Valley Regional Council (LVRC) and was supported by technical assessments including noise monitoring and ecological investigations (refer Chapter 11: Flora and Fauna).

It was determined that the MCA would only consider the Helidon tunnel through Wards Hill between the Toowoomba tunnel and Helidon where the alignment was proposed to be 1-in-60 grade—noting that there were no critical drivers to assess the western tunnel portal or the tunnel alignment.

The Wards Hill area is characterised by undeveloped land within the Gowrie to Grandchester corridor alignment (approximately 4.5 km in length) running relatively straight with long and high (approximately 30–40 m) viaducts over the valley. The alignment interfaces with the Toowoomba Range second crossing, with undesirable angle crossing locations, high embankments, deep cuttings and a short length of tunnel.

The alignment review process involved the investigation of alignment options designed to test Project opportunities and confirm that no significant opportunities were missed by limiting the investigation to the ridges, hill/s and topography generally used by the Gowrie to Grandchester future state transport corridor (i.e. the Base Case route).

The key drivers for change to the Base Case through this area included:

- Long and high viaducts over a valley associated with Six Mile Creek, which are high capital cost items
- The opportunity to reduce costs and improve constructability by:
  - Removing undesirable skew angles at crossing locations where the alignment interfaced with the TSRC road project
  - Improving ruling grades in this location and/or enable changes to vertical track levels in other alignment sections.
  - Endangered and of-concern regional ecosystems are present; the majority of which are also mapped as essential habitat. The options considered, allow for a potential reduction in environmental impact and impact on program time and costs due to the likely reduction in clearing and approvals complexity
  - Using the natural topography to decrease the main viaduct length over Six Mile Creek, thereby reducing costs

- This alignment does require an additional viaduct/bridge but, in total, the length of the two structures is slightly less than the single viaduct required by the Base Case
- Reduce the overall earthworks requirements
- In the case of replacing the tunnel with cut, the acquisition of significant additional high-quality fill for use in adjacent sections.

The four options are illustrated in Figure 2.8 and are discussed below:

- **Option 1:** This option is the Base Case, Gowrie to Grandchester future state transport corridor as described in Section 2.7.1. The alignment is 4.5 km in length, all of which is greenfield, and includes a short tunnel (190 m).
- **Option 2:** This route uses the natural terrain on the northern side of the ridge near Howmans Road and provides the opportunity to flatten the 1-in-60 grade. Following the natural topography around Wards Hill, north of the Base Case, allows for the reduction in the viaduct length across Six Mile Creek. Importantly, it also allows the rail line to cross over the Toowoomba Bypass close to perpendicular, rather than on an acute skew angle; this may provide improved design and installation of piers near the Toowoomba Bypass if required. The viaduct length reduces by almost half, from approximately 600 m long down to 330 m; however, this route also introduces the need for a second short viaduct (approximately 200 m long) further to the east. There is also a short (170 m) tunnel required, which was also a requirement for the Base Case.
- **Option 3:** This alignment is similar to option 1 Base Case; however, this option removes the tunnel and replaces it with a large cut (41 m deep). This allows for less specialist construction equipment/personnel in an area with difficult access, while also providing additional high-quality fill for use in adjacent sections.
- **Option 4:** This route uses the natural terrain on the northern side of the ridge near Howmans Road—the same as the option 2; however, this option removes the tunnel and replaces it with a large cut (21 m deep). This allows for less specialist construction equipment/personnel in an area with difficult access, while also providing additional high-quality fill for use in adjacent sections.

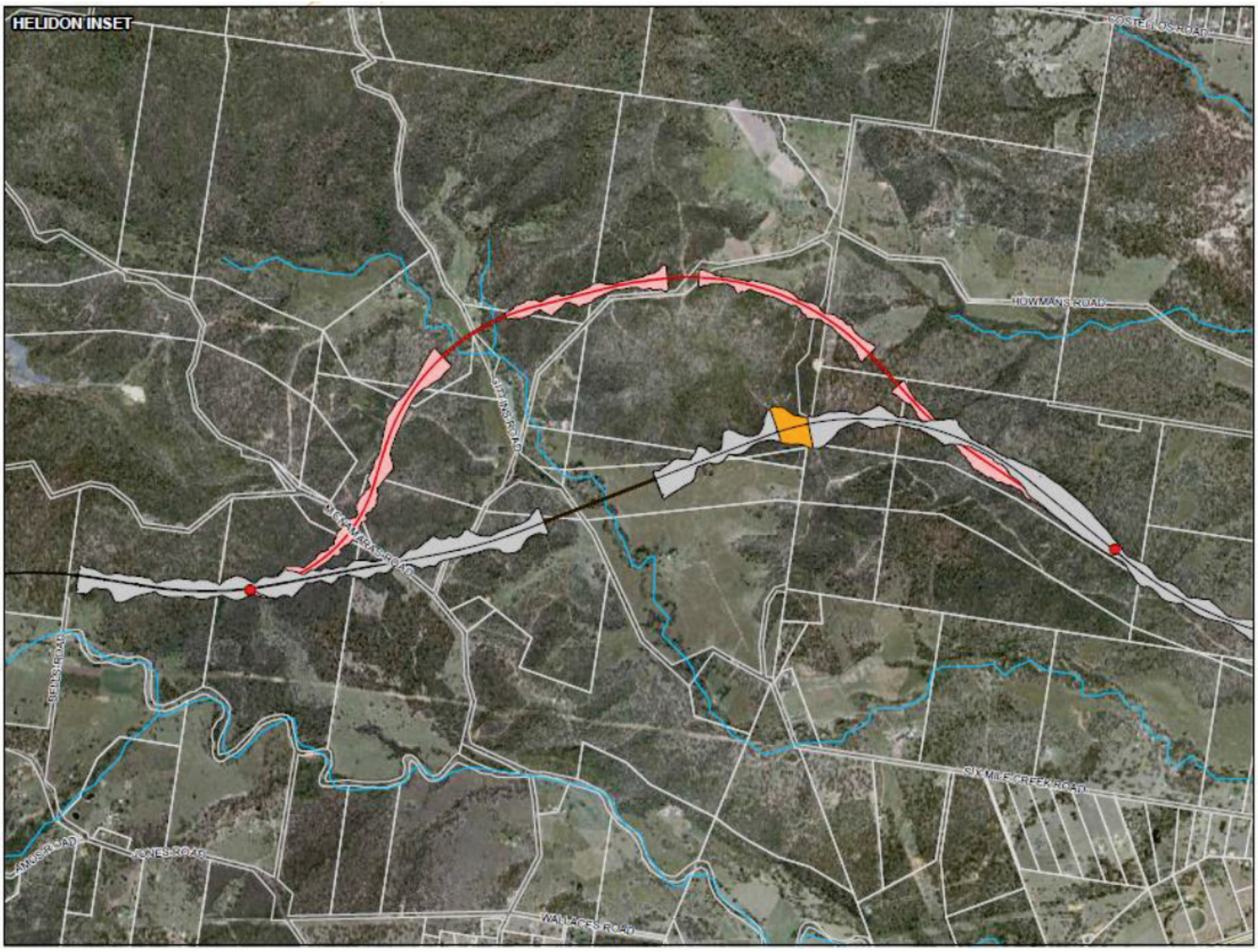

FIGURE 2.8: OPTIONS DEVELOPED FOR THE DEVIATION AT WARDS HILL WITH BASE CASE ALIGNMENT IN GREY AND ALTERNATIVE ALIGNMENT IN RED

These options were comparatively assessed using an MCA (refer Figure 2.9) with the following outcomes:

- Technical viability: The alternative route presented in options 2 and 4 limited the speed of passenger train services and, as such, option 3 was the preferred option from a technical viability viewpoint. Additionally, the cutting design in option 3 and option 4 allow future proofing and widening of the corridor for a second track that would be difficult with the tunnel options.
- Safety assessment: All options were considered to be the same in terms of public safety and emergency response. The alternative route presented in options 2 and 4 resulted in a negative score due to the tight geometry of the railway; otherwise, the options were similar to the Base Case.
- Operational approach: Options 2 and 4 are the least preferred due to the marginally longer route (5.0 km) to maintain the 1-in-60 grade, increasing the travel time. In terms of reliability and network interoperability, all options were considered the same and no notable difference from the Base Case.
- Constructability and schedule: Overall, all 3 alternative options were preferred to the Base Case and all received the same total weighted score for constructability and schedule. Without the tunnel, options 3 and 4 requires less specialist input and construction methods; however, option 2 had less earthwork requirements.
- Environmental impact: All three options had similar environmental impacts, including noise and vibration levels affecting nearby sensitive receptors. Option 3 was least preferred due to the location of the cutting having a greater impact on essential habitat for the koala.
- Community, property and heritage: Options 2 and 4 result in an additional two rural properties being intercepted by the corridor footprint (13 as opposed to 11 rural properties in options 1 and 3). In terms of heritage, land use and community impacts, all options were considered similar.
- Approvals and stakeholders: Options 2 and 4 deviated from the Gowrie to Grandchester future state transport corridor and, as such, option 3 was the preferred option as it was the DTMR-supported alignment.

The outcome of the MCA showed that option 3 received a marginally better score relative to all the other options, with a saving of $21 million compared to the Base Case, making it preferable to the Base Case.

Although option 4 scored lower in the MCA relative to the Base Case, it provides the opportunity for significant cost savings of the order of $46 million. The savings are a result of an improved earthworks balance, reduction in construction complexity by adopting a cut instead of a tunnel, and a reduction in major structure length.

The lower MCA score for option 4 resulted from the following key issues when compared to the Base Case:

- The alignment does not achieve the future-proofing requirement for horizontal geometry
- There is a small potential increased travel time due to the increased length
- The route has more direct property impacts
- The corridor deviates from the Base Case alignment, which will likely impact approvals timeframes and does not meet the specifications for a high-speed passenger (160 km/hr) service.

Option 4 scored higher than the Base Case in the following areas:

- Better constructability.

The significant potential cost savings achieved with option 4 when compared to the MCA score made this option the preferred. The conclusions of the MCA process for the 4 Options are summarised in Figure 2.9.

	Option 1 Base Case		Option 2 Alternative Route with Tunnel		Option 3 Base Case without Tunnel		Option 4 Alternative Route without Tunnel	
Compliance with Service Offering	Yes	Favourable	Yes	Favourable	Yes	Favourable	Yes	Favourable
Major Utility Crossings	1 electricity crossing	Neutral	1 electricity crossing	Neutral	1 electricity crossing	Neutral	1 electricity crossing	Neutral
No. of properties impacted	11	Neutral	13	Unfavourable	11	Neutral	13	Unfavourable
No. of properties anticipated to be impacted by air quality (within 50m of mainline and within 200m of tunnel portals)	13	Neutral	14	Neutral	11	Favourable	14	Neutral
MCA Technical Score	0	Neutral	- 0.09	Neutral	+ 0.46	Favourable	0	Neutral
MCA Non-technical Score	0	Neutral	- 0.59	Neutral	- 0.25	Neutral	- 0.84	Neutral
Overall MCA Score	0	Neutral	- 0.69	Unfavourable	+ 0.21	Favourable	- 0.84	Unfavourable
CAPEX Cost	$0MIL (for relativity)		- $25.5MIL	Favourable	- $21MIL	Favourable	- $46.5MIL	Favourable
Strategic Factors:								
Planning and approval timescale	Neutral		Unfavourable		Unfavourable		Unfavourable	
Construction Complexity	Neutral		Favourable		Favourable		Favourable	
Ecological Impacts (including essential koala habitat)	Neutral		Favourable		Unfavourable		Favourable	
Preferred Option							✓	

- Favourable ●
- Neutral ●
- Unfavourable ●
- Highly Unfavourable ●
- Preferred Option ✓

FIGURE 2.9: SUMMARY OF MULTI CRITERIA ASSESSMENT FOR THE DEVIATION AT WARDS HILL

2.7.3 Reference design options assessment

In 2016, a concept design was produced for the G2H Project alignment, which was generally within the Gowrie to Grandchester future state transport corridor, with the Project alignment deviating outside of the Gowrie to Grandchester future state transport corridor to the north of Wards Hill, while the Gowrie to Grandchester future state transport corridor is located to the south of Wards Hill (refer Section 2.7.2.1). This alignment was the subject of the Initial Advice Statement (IAS) and the EPBC Referral submitted for the G2H Project in early 2017 (ARTC, 2017b and ARTC, 2017a respectively).

ARTC has further advanced the rail alignment design between Gowrie and Helidon to satisfy the Inland Rail service offering and basis of design (refer Chapter 6: Project Description), along with minimising impacts to landholders and the environment.

This section provides a summary of the main alignment option assessments that were undertaken during the reference design and EIS development phase of the Project, from 2018 to 2020.

These changes (discussed in the following sections) have also resulted in a slight increase in the length of the Project from 26 km to 28 km and have resulted in the Project deviating outside of the Gowrie to Grandchester future state transport corridor at a number of locations. The Project alignment and deviations from the Gowrie to Grandchester future state transport corridor are discussed in Chapter 6: Project Description.

In all instances, the guiding principles of ecologically sustainable development (ESD) have been factored into the assessment and selection of corridor and alignment options for the Project. These guiding principles, as established in the *National Strategy for Ecologically Sustainable Development* (Ecologically Sustainable Development Steering Committee, 1992), are as follows:

- Decision-making processes should effectively integrate both long- and short-term economic, environmental, social and equity considerations
- Where there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation
- The global dimension of environmental impacts of actions and policies should be recognised and considered
- The need to develop a strong, growing and diversified economy that can enhance the capacity for environmental protection should be recognised
- The need to maintain and enhance international competitiveness in an environmentally sound manner should be recognised
- Cost-effective and flexible policy instruments should be adopted, such as improved valuation, pricing and incentive mechanisms.

Decisions and actions should provide for broad community involvement on issues that affect them.

2.7.3.1 Tunnel flood immunity

The significant vertical difference (350 m) between Gowrie at 500 m relative level (RL) and the base of the Toowoomba Range, at 150 m RL, created a significant challenge for the rail alignment design in producing a safe and efficient route for trains to traverse the range.

Further refinement and development of the design determined that the tunnel, in particular the western tunnel portal did not meet the 1-in-10,000 Annual Exceedance Probability (AEP) flood immunity design requirement. ARTC identified a number of alternative options, noting that the rail alignment could not be steepened (i.e. the rail alignment climbs for 22 km at a constant grade of 1 in 64 (or 1.55 per cent)). While it was possible to flatten the grade, this would significantly lengthen the tunnel and impact how the Project could tie into the existing QR West Moreton System at Gowrie and Helidon.

An MCA was undertaken to assess various options to overcome this constraint, with the MCA not only assessing the tunnel alignment but also the section of the Project alignment between the eastern tunnel portal and McNamaras Road, to identify any flow-on impacts from changes to the vertical and/or horizontal alignment of the tunnel. The MCA outcomes are discussed below.

The western tunnel portal location presented as option 1 below, was presented in the G2H IAS; however, it did not meet the required 1-in-10,000 AEP flood immunity requirement. Two further alignment options were investigated to meet the immunity requirement. These options are illustrated in Figure 2.10 and are discussed below:

- **Option 1:** This alignment was presented in the G2H IAS (ARTC, 2017) and follows the Gowrie to Grandchester corridor, except for the area around Wards Hill. The flood immunity of this alignment did not meet the required flood immunity at the western tunnel portal location. This alignment also had a 6.3 km tunnel at a 1-in-64 grade and approximately 5.1 km of rail viaduct.
- **Option 2:** This alignment was developed to resolve the flood immunity issue at the western tunnel portal. The horizontal and vertical alignment through the tunnel was different to option 1, with new portal locations, all outside the Gowrie to Grandchester future state transport corridor. The western tunnel portal location was shifted 600 m to the south-west and the eastern tunnel portal 100 m to the north, closer to the Roma Brisbane Gas Pipeline and in relatively similar vegetation to option 1 and option 3. The new tunnel portal locations achieved a flatter tunnel grade of approximately 1 in 74 and total tunnel length of approximately 6.4 km. The alignment required more earthworks and drainage works than option 1 at the eastern tunnel portal, while also having approximately 5.1 km of rail on viaduct. At Project chainage 13.80 km, the alignment tied back into the option 1 alignment and was then similar to option 1 through to Helidon.
- **Option 3:** This option was developed to resolve the flood immunity issue at the western tunnel portal, while also reducing tunnel length. The alignment followed the horizontal alignment of option 1 through the tunnel, but the western tunnel portal entrance was relocated to the east along the alignment to an existing high point to improve flood immunity. The vertical alignment was raised by approximately 7 m to meet this high point. East of the tunnel the alignment was refined to balance cut/fill, noting that the earthworks volumes were greater than option 1 to accommodate the change in the vertical alignment, which resulted in the alignment moving outside of the Gowrie to Grandchester future state transport corridor. For option 3, approximately 6 km of tunnel and 4.8 km of viaduct was proposed, with an alignment grade of 1 in 64.

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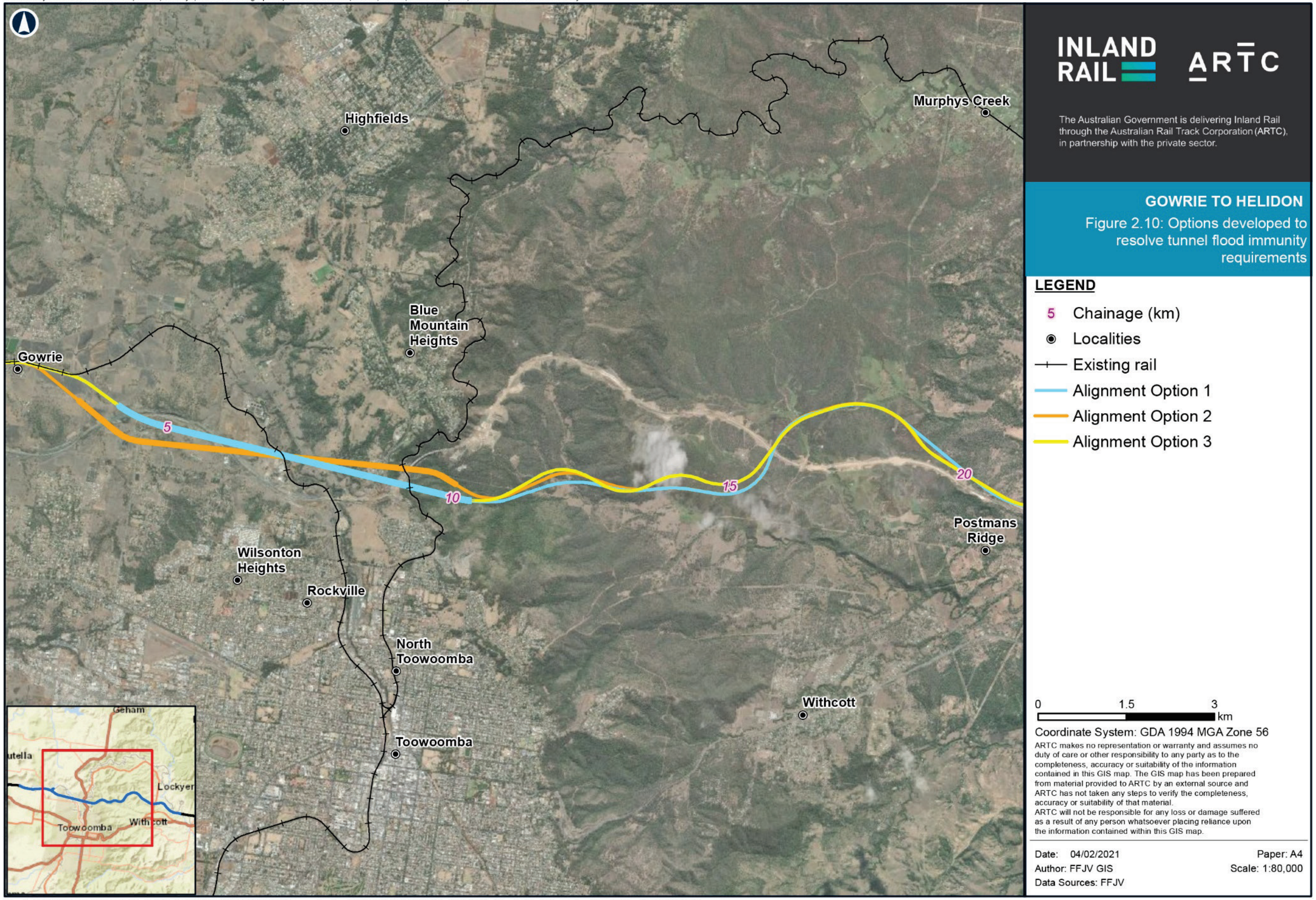

GOWRIE TO HELIDON

Figure 2.10: Options developed to resolve tunnel flood immunity requirements

Map by: MEF/DTH Z:\GIS\GIS_3200_G2H\Tasks\320-EAP-202001141047_Alignment_options\320-EAP-202001141047_ARTC_A4L_Tunnel_Flood_Immunity_v4.mxd Date: 4/02/2021 10:58

The MCA of the three options determined that option 3 was the preferred alignment based on the following:

- Technical viability: Options 2 and 3 both met the 1:10,000 year flood immunity, although option 2 would require an additional interaction with the Roma Brisbane Gas Pipeline and would intersect more colluvial material; as such, option 3 was preferred from a technical viability viewpoint
- Safety: Option 2 was least preferred due to the emergency access constraints, while option 3 was preferred due to the shorter tunnel and viaduct lengths compared to option 1 and option 2
- Operational approach: All options were considered to be the same in terms of travel time, reliability, and interoperability
- Constructability and schedule: Option 2 was least preferred due to the length of the tunnel, extent of earthworks and the proximity of the eastern tunnel portal to the Roma Brisbane Gas Pipeline. Option 3 was preferred given the shorter tunnel length, despite the earthworks requirements being greater than option 1.
- Environmental impact: All three options had similar environmental impacts, including impacts on the vine thicket on the eastern side of the Great Dividing Range. Option 2 was least preferred due to extensive drainage works to divert flows away from the western tunnel portal, with option 1 and option 3 each having similar, yet less impact than option 2.
- Community, property and heritage: Options 2 and 3 deviated from the Gowrie to Grandchester future state transport corridor, resulting in impacts to landholders outside of the corridor; however, the number of impacted landholders outside of the protected corridor was the same for option 1 and option 3 and, as such, all options were considered to have similar community, property and heritage impacts
- Approvals and stakeholders: Options 2 and 3 deviated from the Gowrie to Grandchester future state transport corridor and, as such, option 1 was the preferred option from an approvals and stakeholders viewpoint.

Overall, option 3 was determined as the optimal option for the future design of the tunnel due primarily to the alignment complying with the required 1-in-10,000 AEP flood immunity requirements, as well as requiring a shorter tunnel length. The outcomes of the MCA are summarised in Figure 2.11.

	Option 1 Base Case		Option 2		Option 3	
Meets Flood Immunity Requirements	No	Highly Unfavourable	Yes	Favourable	Yes	Favourable
Tunnel Length	6.375 km	Neutral	6.45 km	Unfavourable	6.05 km	Favourable
Viaduct length	5.1 km	Neutral	5.1 km	Neutral	4.8 km	Favourable
Major Utility Crossings	2 gas pipeline 7 electricity line crossings	Neutral	3 gas pipeline 7 electricity line	Neutral	2 gas pipeline 7 electricity line	Neutral
No. of Properties impacted	Only properties within G2G Corridor impacted Rural properties = 12 Civic properties= 7 Severance of properties = 19	Neutral	33 properties outside G2G Corridor impacted Rural properties = 15 Civic properties= 7 Severance of properties = 22	Unfavourable	26 properties outside G2G Corridor impacted Rural properties = 12 Civic properties= 7 Severance of properties = 19	Unfavourable
No. of Road/Rail Interfaces	9	Neutral	10	Neutral	10	Neutral
No. of properties anticipated to be impacted by noise (within 200m of rail centreline)	7 residential receptors 2 commercial receptors	Neutral	No change from base case	Neutral	No change from base case	Neutral
MCA Technical Score	0	Neutral	- 0.433	Unfavourable	+ 0.702	Favourable
MCA Non-technical Score	0	Neutral	- 0.491	Unfavourable	- 0.156	Neutral
Overall MCA Score	0	Neutral	- 0.924	Neutral	+ 0.546	Favourable
CAPEX Cost	+ $0MIL ($711MIL)		+ $31MIL ($742MIL)	Highly Unfavourable	- $17.6MIL ($693MIL)	Favourable
Preferred Option					✓	

Favourable	● (green)
Neutral	● (dark grey)
Unfavourable	● (yellow)
Highly Unfavourable	● (red)
Preferred Option	✓

FIGURE 2.11: SUMMARY OF MULTI CRITERIA ASSESSMENT FOR TUNNEL FLOOD IMMUNITY ALIGNMENT OPTIONS

2.7.3.2 InterLinkSQ/Queensland Rail interaction

The InterLinkSQ project is a master-planned, intermodal freight terminal linking rail, road, air and sea in SEQ. The InterLinkSQ project abuts the existing West Moreton System rail corridor, west of Gowrie and, as such, the G2H Project alignment traverses the InterLinkSQ development area.

ARTC has been working with InterLinkSQ to minimise the impacts associated with both projects, with additional consideration to other stakeholders in the area (e.g. QR and TRC).

Two rail alignment options integrating connections to the InterLinkSQ facility were investigated during the early stages of the Project design. These options involved minimal visual or geographical variations and, therefore, cannot be effectively differentiated with a visualisation. The most significant selection criteria for this alignment option was based on the impacts to the existing infrastructure as well as environmental considerations through the area.

Option 1 slewed the existing QR track to the north and used the existing QR alignment for Inland Rail. The aim of this alignment was to avoid all possible conflicts with public utilities (e.g. sewer main line) that run parallel to the QR line on the southern side. An assessment was made on the anticipated earthworks for this alignment and it was determined that the slew option was not feasible due to the proximity of the track to Gowrie Creek.

Option 2 had Inland Rail offset 6.5 m to the south of the existing QR track. The earthworks batters on this alignment came closer to the existing public utilities and provided approximately 3m to 5 m clearance; the exception being a 150 m section in cut, which required a retaining wall or a steeper reinforced batter slope. Option 2 also met the 1% AEP preliminary flood levels and allowed for crossovers between Inland Rail and QR to provide connectivity between InterLinkSQ and the QR line. Option two was considered the preferred option in the early stages of the design.

Later in the design process, an alignment incorporating a slight slew of the QR track to the north was considered. The aim of this design was to avoid the existing public utilities south of the track as well as to further minimise impacts on Gowrie Creek to the north; however, the design still impacted the existing public utilities. It was therefore determined to locate the Project alignment at an optimal location, approximately 8 m from the existing QR track, and, where required, relocate the public utilities in consultation with the relevant stakeholders. This is the final arrangement that is the subject of this EIS and is proposed to be progressed into the detailed design phase.

2.7.3.3 Withcott Seedlings

The early design of the alignment (shown as option 1 in Figure 2.12), was based on the Gowrie to Grandchester future state transport corridor; however, it was found to conflict with the Withcott Seedling water supply dams and evaporation ponds, noting that Withcott Seedlings had expanded their operations since the original study in 2003, when the alignment was designed to minimise impacts on this facility (Queensland Rail and Queensland Transport, 2003).

Relocation of the dams and the evaporation ponds is not a viable option due to impacts to the seedling farm operations and environmental issues associated with this alternative; therefore, it was necessary to investigate alternative alignment options. Three additional alignment options were developed in accordance with ARTC's design standards, as shown in Figure 2.12 and described below:

- Option 1 (Base Case): Option 1 is the phase 1 concept design that goes directly through the Withcott Seedlings Facility pond. The alignment is within the Gowrie to Grandchester future state transport corridor. This option has 2.1 km of rail viaduct and requires 400,000 m^3 of fill earthworks.
- Option 2: Option 2 skews the Base Case alignment to thread between the two Withcott Seedlings ponds to avoid directly crossing either pond; thus, significantly reducing the impacts to the Withcott Seedlings facility operations. It includes 2.25 km of rail viaduct and requires 555,000 m^3 of fill earthworks. This option is slightly closer to the Ashford Drive residences.
- Option 3: Option 3 is relocated approximately 800 m to the south of the phase 1 alignment, to go around the Withcott Seedlings facility. It has 2.7 km of rail viaduct and requires 735,000 m^3 of fill earthworks—both figures significantly greater than the Base Case. While this option does not impact the Withcott Seedlings facility ponds, it directly impacts Ashlands Drive and further impacts the electrical lines.
- Option 4: Option 4 is relocated approximately 400 m to the north of the phase 1 alignment to go around both Withcott Seedlings ponds. It is significantly closer to Lockyer Creek, but further from the Ashlands Dr residences. It has 2.7 km of rail viaduct (a significant increase to the Base Case) and requires 465,000 m^3 of fill earthworks.

The MCA was undertaken in consultation with LVRC representatives, along with relevant technical specialists and considered the following parameters:

- Technical viability (i.e. alignment with regard to the Gowrie to Grandchester corridor, impact on public utility providers and other assets (e.g. Roma Brisbane Gas Pipeline), geotechnical conditions and earthworks volumes), impacts on existing road networks and flood immunity/hydrology of railway)
- Safety (not assessed, as no change from Base Case)
- Operational constraints (not assessed, as no change from Base Case)
- Constructability and schedule (i.e. staging opportunities)
- Environmental constraints (i.e. ecological impacts (flora, fauna and habitats), flooding and waterway impacts, visual impacts)
- Community and property issues (e.g. property impacts including severance and community response)
- Approvals and stakeholder concerns (not assessed, as no change from Base Case).

As shown in Figure 2.12, the alternative alignment options all successfully avoided the evaporation ponds. The main differences between the options were the length of viaducts, impacts to the seedlings farm and other environmental impacts. It was found that:

- Option 2 and option 4 had the least impacts to the seedlings farm, with option 4 providing the best solution as the alignment traversed around the edge of the dams
- Option 2 had the shortest length of viaducts and bridges of the alternative options
- Option 3 would have greater property impacts as the alignment cut through the southern section of the seedlings farm and two rural properties
- Option 4 passed through an area mapped as potentially containing protected plants pursuant to the *Nature Conservation Act 1992* (Qld) while option 1 had fewer environmental risks identified.

Based on this analysis of the advantages and disadvantages of the options, it was determined that option 2 was the preferred alignment option. The key determining factor for these options related to the length of the bridges and viaducts, avoiding land fragmentation and avoiding environmentally significant areas. The conclusions of the MCA process for the four options are summarised in Figure 2.13.

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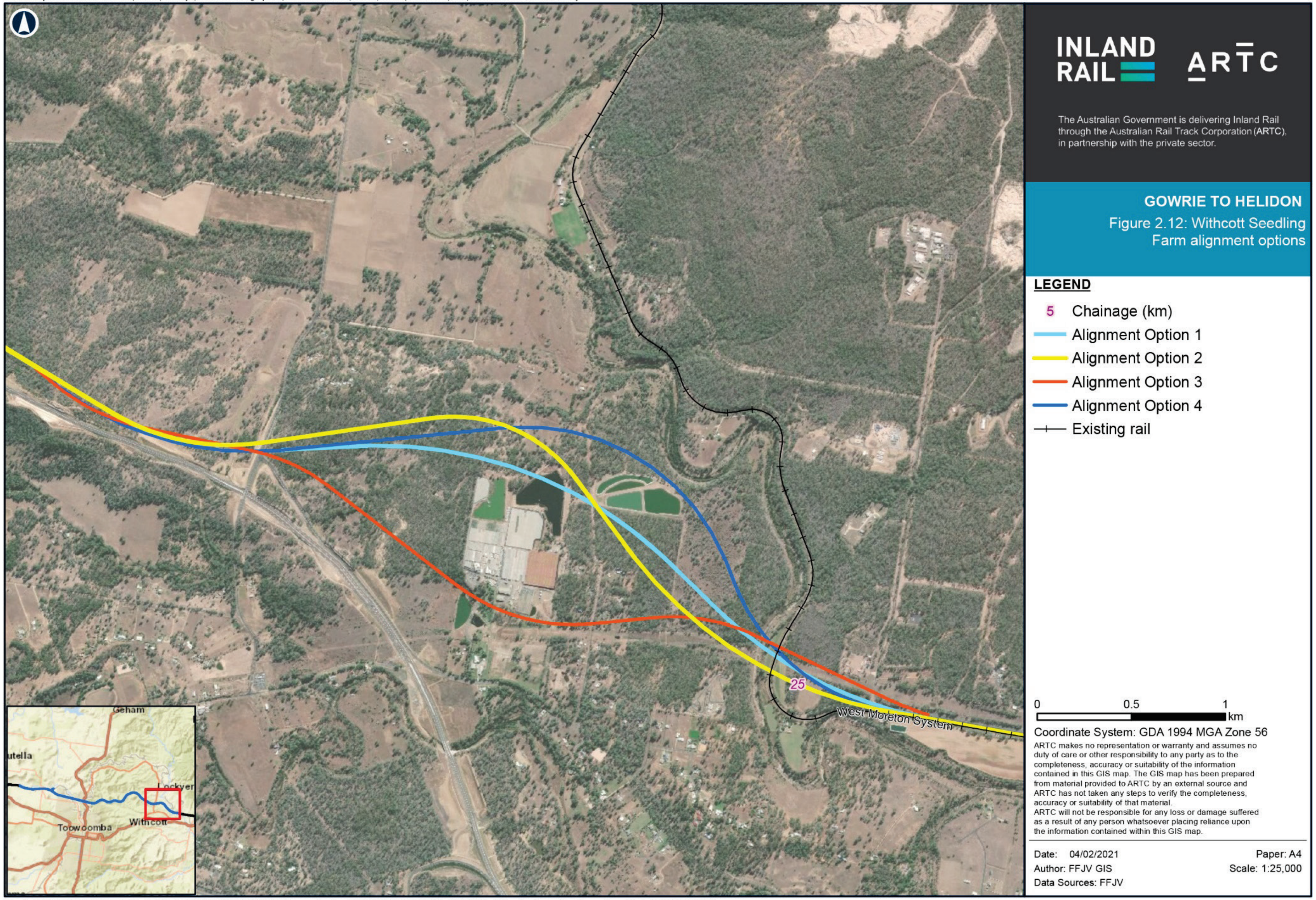

Map by: MEF/DTH Z:\GIS\GIS_3200_G2H\Tasks\320-EAP-202001141047_Alignment_options\320-EAP-202001141047_ARTC_A4L_Withcott_alignment_options_v4.mxd Date: 4/02/2021 10:59

	Option 1 Base Case		Option 2		Option 3		Option 4	
Relocation of Withcott Seedlings Pond	Yes	Highly Unfavourable	No	Favourable	No	Favourable	No	Favourable
Viaduct length (km)	2.1	Neutral	2.25	Neutral	2.7	Unfavourable	2.7	Unfavourable
Major Utility Crossings	1 gas pipeline 4 electricity line	Neutral	1 gas pipeline 4 electricity line	Neutral	1 gas pipeline 6 electricity line	Unfavourable	1 gas pipeline 5 electricity line	Unfavourable
No. of Properties impacted	Rural properties = 5 Commercial/ industrial properties = 1 Civic properties= 2 Severance of properties = 5	Neutral	Rural properties = 6 Commercial/ industrial properties = 1 Civic properties= 2 Severance of properties = 6	Neutral	Rural properties = 6 Commercial/ industrial properties = 2 Civic properties= 3 Severance of properties = 6	Unfavourable	Rural properties = 6 Commercial/ industrial properties = 1 Civic properties= 1 Severance of properties = 6	Neutral
No. of Road/Rail Interfaces	2	Neutral	2	Neutral	3	Neutral	2	Neutral
No. of properties anticipated to be impacted by noise (within 200m of rail centreline)	6	Neutral	6	Neutral	11	Unfavourable	4	Favourable
MCA Technical Score	0	Neutral	+ 0.254	Favourable	- 0.829	Unfavourable	- 0.396	Neutral
MCA Non-technical Score	0	Neutral	+ 0.201	Favourable	-1.183	Highly Unfavourable	+ 0.826	Favourable
Overall MCA Score	0	Neutral	+ 0.455	Favourable	-2.012	Highly Unfavourable	+ 0.430	Favourable
CAPEX Cost	+ $0 MIL ($122MIL)		+ $7MIL ($129MIL)	Neutral	+ $31MIL ($153MIL)	Highly Unfavourable	+ $21MIL ($143MIL)	Highly Unfavourable
Preferred Option			✓					

Favourable	● (green)
Neutral	● (dark grey)
Unfavourable	● (yellow)
Highly Unfavourable	● (red)
Preferred Option	✓

FIGURE 2.13: SUMMARY OF MULTI CRITERIA ASSESSMENT FOR WITHCOTT SEEDLING FARM ALIGNMENT OPTIONS

2.8 Relationship to other Inland Rail projects

The Inland Rail Program has been divided into 13 projects. Inland Rail will be operational once all 13 sections are complete, which is estimated to be in 2027; however, each of the sections of Inland Rail can be delivered independently, with tie-in points to the existing rail networks, noting that some of the projects in NSW have already commenced construction. The full suite of potential benefits associated with the Inland Rail Program, however, can only be realised when the whole Program is operational as discussed in Section 2.4.

The Project forms part of the overall Inland Rail Program and is one of five projects proposed within Queensland. At the western limit, the Project will connect and overlap with the B2G project. At its eastern limit, the Project will connect to the H2C project. The other Inland Rail projects in Queensland located further east are Calvert to Kagaru (C2K) and Kagaru to Acacia Ridge and Bromelton (K2ARB).

With the exception of K2ARB, these other Inland Rail projects have also been declared coordinated projects for which an EIS is required under the *State Development and Public Works Organisation Act 1971* (Qld) and determined to be 'controlled actions' under the *Environment Protection and Biodiversity Conservation Act 1999* (Cth). An EIS under a bilateral agreement is currently being prepared for each of these projects.

The Project is one of the missing links across the Program and, along with H2C and C2K, is considered one of the most technically complex sections of Inland Rail. It is expected that these projects will therefore be delivered using an innovative Public Private Partnership funding arrangement.

2.9 Relationship to other major projects

The Project does not have a direct relationship with any other coordinated projects, major projects and/or developments; however, the Project will provide more direct connectivity opportunities between the existing West Moreton System rail corridor and ARTC interstate lines, as well as being a potential catalyst for the development and growth of regional intermodal hubs, such as those associated with InterLinkSQ and the Toowoomba Enterprise Hub.

As discussed in Section 2.7.1, however, ARTC has been working with InterLinkSQ to minimise the impacts associated with both projects, with additional consideration to other stakeholders in the area (e.g. QR and TRC). This includes the Project design integrating connections to the InterLinkSQ facility and the existing West Moreton System rail corridor west of Gowrie.

The potential for cumulative impacts due to the Project in combination with other coordinated projects, major projects and/or developments has been assessed as part of this EIS and is presented in Chapter 22: Cumulative Impacts.