CHAPTER 23

Conclusions

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

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23. Conclusions

This draft Environmental Impact Statement (EIS) considers the potential environmental, social and economic impacts and benefits resulting from construction and operation of the Inland Rail—Border to Gowrie Project (the Project). It has been prepared in accordance with the requirements of the *State Development and Public Works Organisation Act 1971* (Qld) (SDPWO Act) and the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act). It also addresses the Terms of Reference (ToR) for the EIS: Inland Rail—Border to Gowrie Project, dated November 2018.

23.1 Project overview

The Project consists of 216.2 km of single-track railway with five crossing loops. It is a key 'missing link' in the wider Inland Rail Program between Melbourne and Brisbane.

The Project consists of the key permanent and temporary features listed in Table 23.1.

TABLE 23.1 KEY FEATURES OF THE PROJECT

Aspect	Description
Permanent features	

New track	▸ Approximately 216.2 km of new single-track railway, consisting of:
	  ▸ 7 km of standard-gauge rail (1,435 millimetres (mm))
	  ▸ 209.2 km of dual-gauge rail (standard (1,435 mm) and narrow (1,067 mm) gauge).
	▸ Railway infrastructure and the corridor will initially be constructed for 1,800 m long trains, and future-proofed for operation of 3,600 m trains.

Rail corridor	▸ Establishment of approximately 145.0 km of new rail corridor and use of approximately 71.2 km of existing rail corridor ▸ The rail corridor is generally a minimum width of 40 m. There is one exception to this where the Project uses the existing rail corridor for the South Western Line parallel to Yelarbon–Kurumbul Road from Ch 7.5 km to Ch 10.0 km. The rail corridor may be as narrow as 25 m through that section, to minimise impacts to Yelarbon–Kurumbul Road, adjoining land uses and their access arrangements. ▸ The rail corridor would extend out to a maximum of 230 m. Wider sections of corridor are required to accommodate earthworks, drainage structures, rail infrastructure, access tracks and fencing. ▸ The rail corridor will be of sufficient width to accommodate all proposed railway infrastructure, including the crossing loops, as well as future expansion to accommodate the potential for 3,600 m long trains.
Crossing loops and turnouts	▸ Crossing loops are places on a single-line track where trains in opposing directions can pass each other. Five crossing loops will be constructed as part of the Project, at a minimum of 2,200 m in length for each loop. ▸ Turnouts allow the train to be guided from one section of track to another. Turnouts that connect in to crossing loops and Queensland Rail's (QR) existing South Western Line, Millmerran Branch Line and sidings have been incorporated into the reference design.
Bridges	▸ Bridges to accommodate topographical variation, crossings of waterways or other infrastructure.
Drainage	▸ Cross-drainage is provided by reinforced concrete pipe culverts and reinforced concrete-box culverts ▸ Scour protection measures will be installed around culverts and abutments to prevent erosion.
Rail crossings	▸ Rail crossings, including level crossings, grade separated crossings (rail or road overbridges) and occupational/private crossings.
Ancillary works	▸ The construction of associated railway infrastructure, including maintenance sidings and signalling infrastructure to support Advanced Train Management Systems (ATMS). ▸ Ancillary works, including works to level crossings, signalling and communications, signage and fencing, drainage works, and installation or modification of services and utilities within the rail corridor.

Aspect	Description
Construction features (temporary)	
Land	▸ Temporary access tracks will be used to access construction sites. Where possible, access tracks will be retained to serve as rail maintenance access road (RMAR) during the operation of the Project. ▸ Land requirements for construction will include temporary workspaces, site offices and laydown facilities. These requirements are encompassed within the nominated temporary construction footprint for the Project. ▸ Laydown areas will be located approximately every 5 km (avoiding 1% annual exceedance probability (AEP) floodplains, where possible). Larger sites will be located approximately every 2 km.
Embankments and cuttings	▸ Embankments and cuttings will be required along the length of the rail alignment.
Borrow pits	▸ Identification, establishment and lawful use of borrow pits for the sourcing of construction materials for the Project.
Non-resident workforce accommodation	▸ Construction, use, and decommissioning of up to three temporary non-resident workforce accommodation facilities.

Early works for the Project are planned to start in 2021, with construction scheduled to be completed by the beginning of 2026. Inland Rail, and the Project, are scheduled to be operational in 2026.

The Project will be operational when all 13 sections of Inland Rail are complete, which is estimated to be in 2026. The Project will be managed and maintained by the Australian Rail Track Corporation (ARTC); however, train services will be provided by a variety of operators. The trains will be a mix of grain, intermodal (freight) and other general transport trains.

The Project will be trafficked by a daily average of 14 trains in 2026, increasing to 20 trains by 2040, with peak operational train numbers projected to be 25 per day in 2040. Projected train numbers for the Project are summarised in Table 23.2. They are presented for the following sections of the Project:

- Between the NSW/QLD border and the South Western Line rail corridor, which will be used by trains running interstate on Inland Rail
- Between the South Western Line rail corridor and Gowrie, which will be used by interstate trains, in addition to those accessing Inland Rail from the existing QR network.

Annual freight tonnages will increase in parallel with train numbers, from approximately 14.2 million tonnes per year in 2026 to 21.8 million tonnes per year in 2040.

TABLE 23.2 DAILY AVERAGE TYPICAL (2026 AND 2040) AND PEAK (2040) TRAIN NUMBERS

Project section	Average 2026*	Average 2040*	Peak 2040*
NSW/QLD Border to South Western rail corridor	11	17	21
South Western rail corridor to Gowrie	14	20	25

Table note:
* Numbers rounded to nearest whole number

23.2 Project rationale

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 of freight per annum by 2050, consisting of manufactured (non-bulk) products, bulk steel, paper, agricultural and mining products (Infrastructure Australia, 2016a).

At present, however, 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. Transit times are long 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.

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. When combined, these existing rail network constraints result in an increasing reliance on transportation by road, thereby imposing additional maintenance and safety burdens on the affected road asset managers (Infrastructure Australia, 2015).

Inland Rail would help to ease the burden that this additional volume of freight places on roads by providing an alternative means for transporting the equivalent of more than 200,000 truck movements annually from 2049–50 (ARTC, 2015a).

Inland Rail will facilitate better connection between 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, 2018e).

In summary, Inland Rail is needed to respond to the growth in demand for freight transport and address existing freight capacity and infrastructure issues. The Project is a key missing link for Inland Rail, as it will provide inland connectivity between the existing NSW and Queensland freight rail networks, enabling the key technical characteristics of the Inland Rail service offering to be achieved.

The following section provides discussion of the direct and indirect benefits of Inland Rail and the Project.

23.2.1 Project benefits

Inland Rail presents a unique opportunity to establish a competitive freight system by providing a trunk rail infrastructure that supports a network of intermodal terminals and local sidings used to distribute commodities at the national, regional and local level.

As a component of the larger Inland Rail Program, the potential benefits of this Project are fully realised when considered with the benefits of the full Melbourne to Brisbane alignment. For this reason, the potential benefits of Inland Rail and of this Project, as documented in the *Inland Rail Programme Business Case* (ARTC, 2015a) are presented together in this section.

23.2.1.1 Direct benefits

Foreseeable direct benefits of Inland Rail and this Project:

- Improved access to and from regional markets:
  - Improved linkages to regional areas for intercapital freight, such as via the direct connectivity that would be provided between the existing QR South Western Line, Millmerran Branch Line and West Moreton Line. Inland Rail is expected to attract two 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.
  - Agricultural areas and regions, such as the Darling Downs, have improved access to key local and international markets and ability to move greater volumes of grain via rail.
- Reduced costs for the market:
  - Reduced intercapital 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 consumer households.
  - Inland Rail is likely to reduce lifecycle costs for infrastructure owners and operators on traditional road freight routes due to lower freight volumes on these assets. This would reduce maintenance costs and enable investments in capacity to be avoided or deferred.
  - Reduced transport costs may improve competitiveness of key markets and economic activity, particularly in the agricultural sector
  - Intercapital and agricultural freight currently travelling by road should benefit from reduced operating costs due to economies of scale in rail relative to road transport.

- Improved reliability and certainty of transit time:
  - Improved reliability and certainty of transit time would result in productivity and economic efficiency due to operating cost savings, shorter transit times, improved availability and avoided road incidents on the coastal route
  - Benefits associated with higher axle loads, longer trains, lower gradients and longer curves, resulting in shorter transit times
  - Inland Rail would provide linkages between existing rail networks, such as the existing QR South Western Line, Millmerran Branch Line and West Moreton Line. Additionally, railway infrastructure within existing corridors used by Inland Rail would be subject to replacement and upgrade. New linkages and upgraded infrastructure would combine to enable faster transit time on existing journeys.
- Increased capacity of the transport network:
  - Increased capacity would enable the opportunity to return unused freight routes to passengers in Sydney and Brisbane during off-peak periods (noting that passengers are already given absolute priority during peak periods on metropolitan networks)
  - Improved customer outcomes for rail passengers between Sydney and Brisbane, with unused freight schedule timeslots on the coastal route would be able to be returned to passenger services. The benefit of increased frequency of passenger services would reduce average wait time and provide greater reliability and certainty for passengers.
  - Increased freight capacity would enable greater volumes of intercapital 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.
- Reduced distances travelled:
  - Inland Rail will provide a shorter option for the transportation of freight, resulting in a reduced time between the point of source and the market for goods and produce
  - By providing new linkages between existing rail networks, such as those operated by QR, Inland Rail will provide a shorter route option for undertaking existing journeys.
- Improved safety:
  - Inland Rail has the potential to remove 200,000 long-haul truck movements from roads each year from 2049–50. It is expected that road transport will still be required for distribution from intermodal terminals.
  - Reduced congestion and created capacity on existing road and rail networks in metropolitan Sydney
  - Reduced burden on roads and improved safety
  - Reduced truck volumes in over 20 regional towns
  - Relocated 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
  - Modern global positioning system-controlled train movements through the Advanced Train Management System (ATMS). 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.
- Improved sustainability:
  - 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 tasks, resulting in reduced road congestion and fewer vehicular carbon emissions.
  - It is estimated that transportation of freight on Inland Rail is expected to use one-third of the fuel when compared to transporting the same volume of freight via the existing road route (ARTC, 2015a).

23.2.1.2 Indirect benefits

In addition to the direct benefits, the Project, and Inland Rail as a whole, has the potential to result in, or facilitate, a number of indirect benefits, as follows:

Create a step change in the Australian freight network

Inland Rail offers significant performance advantages over the existing coastal rail 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. It will provide direct linkage to other ports, such as Sydney, through the East–West Line at Parkes as well as across to Perth, and Newcastle via Moree.

Be a catalyst for growth

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

Inland Rail is expected to deliver 16,000 new jobs at the peak of construction, and an average of 700 additional jobs per year over the entire period. It is expected to increase Australia's gross domestic product (GDP) by $16 billion during its construction and first 50 years of operation.

It will improve the safety of the network, with separation of freight and passenger modes in urban and regional environments. 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 regional level, the Project has the potential to catalyse development through:

- Opportunities to encourage, develop and grow Indigenous, local, and regional businesses through the supply of resources and materials for the construction and operation of the Project (e.g. borrow and ballast materials, fencing, electrical installation (excluding rail systems) and instrumentation, rehabilitation and landscaping, cleaning and maintenance of construction and accommodation facilities).
- Opportunities in secondary service and supply industries (such as retail, hospitality and other support services) for businesses in proximity to the construction footprint (including opportunities to supply the three proposed non-resident workforce accommodation facilities near Millmerran, Inglewood and Yelarbon. The expansion in construction activity is also likely to support additional temporary flow-on demand and additional spending by the construction workforce in the local community.
- As part of Inland Rail, the Project has the potential to stimulate business and industry development at the Toowoomba Enterprise Hub in Wellcamp. By providing efficient transport access to intrastate and interstate markets, the Project may act as a catalyst for further private sector investment in this area, particularly for freight and logistics operations. The further development of the Toowoomba Enterprise Hub has the potential to unlock greater economic activity in the region, such as through promoting greater international export opportunities via Wellcamp Airport.
- As a greenfield/brownfield development, the Project comprises upgrades and new dual-gauge track to create a more direct rail freight corridor for freight operators. As a critical link of the broader Inland Rail, the Project offers opportunities to support the local agricultural industry by driving savings in freight costs, improving market access, and reducing the volume of freight vehicles on the region's road network.

Be a facilitator of training and skills development

ARTC has a strong commitment to training local and Indigenous people. Training pathways and the creation of opportunities for the development of skilled local and Indigenous workers through the Project's construction and operation will be achieved by:

- 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
- Working with Indigenous community networks to encourage applications and increase the number of Indigenous people applying for jobs
- Establishing key partners, to link training and development programs with other projects and local industries to provide the greatest regional benefit
- Collaborating with the Queensland State Government and Australian Government to provide long-term outcomes through training, mentoring and other support programs.

ARTC is also establishing the Inland Rail Skills Academy, which is a collection of projects and partnerships with the aim to:

- Facilitate local employment and procurement opportunities regionally by 'priming the market' in each region in which Inland Rail would be constructed
- Make it easy for Inland Rail contractors to employ and procure trained and competent people locally
- Use the opportunity created by the Project to provide medium- to long-term local and regional community benefits.

The Inland Rail Skills Academy comprises four pillars, including:

- Education: science, technology, engineering and maths (STEM), 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 individuals to increase skills in a range of areas, including safety and sustainability.

The partnerships and projects that make up the Academy are in progress, with a comprehensive program already being delivered.

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 projects. It will also result in an increase in the skilled labour force in the proposal region.

Be an enabler of complementary market-driven investments

The ultimate benefits of Inland Rail require interdependent and complementary investment in several other development opportunities and initiatives, and these will be coordinated across Inland Rail, including:

- Intermodal terminals, loading facilities and sidings for regional and agricultural 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 existing rail lines and rail sidings in south-west Queensland to the Port of Brisbane, e.g. the South Western Line, the Millmerran Branch Line, the West Moreton Line and metropolitan Brisbane lines.

23.2.2 Consequences of not proceeding with the Project

Not progressing with Inland Rail would potentially constrain the future growth potential of the national economy. Without the increased rail efficiency and performance provided by Inland Rail, pressure on the road networks 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 will increasingly become the dominant freight transport 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 projected population growth that is, even today, driving shortages of long-distance truck drivers and increasing costs. Providing customer choice between competitive transportation modes will build resilience into the national freight network.

More specifically, if investment in the east coast/Inland Rail 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
- 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
- Fuel used and emissions discharged from an increased number and size of heavy road vehicles will have greater environmental impacts when compared to rail
- 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.

23.3 Assessment approach

23.3.1 Assessment methodology

For each of the specific matters identified in Section 11 of the ToR:

- The impact assessment area was defined. The impact assessment area defines the geographical extent of the impact assessment for each specific matter. The impact assessment area is defined based on the nature of the specific matter, and the scale, type and duration of Project elements that may impact on that matter.
- The impact assessment method was selected depending on the specific matter being considered and the potential impacts being assessed. Three methods were used to assess potential impacts and opportunities for the Project:
  - Compliance assessment (quantitative)
  - Risk assessment (qualitative)
  - Significance assessment (qualitative).
- A desktop review of existing reports, studies and spatial datasets was undertaken to establish existing conditions and sensitive receptors relevant to the specific matters being assessed
- Fieldwork was undertaken to identify and/or ground truth existing environmental conditions and sensitive receptors

- Potential impacts and opportunities were identified in accordance with the selected impact assessment method and assessed using criteria set out in legislation, statutes, guidelines or policies. Where such criteria does not exist, the assessment was based on industry standards and professional judgement. In each instance, the impact assessment was conducted as follows:
  - The impact assessment considered the construction and operation phases of the Project. The decommissioning of the Project cannot be foreseen at this point in time and, therefore, has not been considered as a Project phase in this draft EIS
  - The impact assessment considered short-term, long-term and cumulative impacts
  - Reference design phase mitigation measures were factored into the initial impact assessment
  - Additional mitigation and management measures were proposed to further avoid or minimise impacts and enhance potential benefits. These measures were factored into the assessment of residual impacts.
- The need for offsets to compensate for significant adverse residual impacts were assessed.

Development of the reference design for the Project has progressed in parallel with the impact assessment process. As a result, design solutions for avoiding, minimising or mitigating impacts have been incorporated into the reference design as appropriate and where possible. These design considerations are proposed to minimise the environmental impacts of the Project and therefore contribute to a lowering of the initial risk for each potential impact.

In order to manage and mitigate Project risks, several mitigation measures have been proposed for implementation in future phases of Project delivery. These proposed mitigation measures have been identified to address Project-specific issues and opportunities. These proposed mitigation and management measures were nominated to:

- Achieve compliance with the adopted performance criteria, if required
- Demonstrate ARTC's commitment to avoiding or minimising potential impacts, as far as is reasonably practicable.

23.3.2 Community and stakeholder consultation

A project of this size and significance requires a far-reaching communication and stakeholder engagement approach. The planning phase provides numerous opportunities for involvement at many levels and requires inputs from a variety of key stakeholders and community members to understand constraints, values and impacts.

The overarching purpose of the community and stakeholder engagement program is to:

- Raise awareness about the Project, including the need for the Project, its benefits, and the process undertaken to develop the reference design and draft EIS
- Verify the appropriateness of assessment methodologies adopted for the draft EIS (refer Chapter 4: Assessment Methodology, Section 4.2.2)
- Provide stakeholders with opportunities to inform investigations being undertaken for the reference design and draft EIS about local values and issues
- Inform government agencies, stakeholders and the community about the progress of the Project and to seek their input into the development of the reference design and draft EIS
- Understand stakeholder and community issues and, where possible, address any issues raised.

The assessment methodologies adopted for the purpose of this draft EIS have been presented to, and discussed with, relevant regulatory agencies. A summary of these consultations is presented in Table 23.3.

TABLE 23.3 SUMMARY OF ASSESSMENT METHODOLOGY CONSULTATIONS WITH REGULATORY AGENCIES

Subject	Government agencies	Location and date
Approach to the assessment of terrestrial and aquatic ecology	Department of Environment and Science (DES)	Toowoomba, 30 February 2019
Approach to the traffic impact assessment	Department of Transport and Main Roads (DTMR)	Toowoomba, 23 May 2019
Assessment of matter of national environmental significance (MNES)	Department of Agriculture, Water and the Environment (DAWE)	Canberra, 1 July 2019
Approach to the assessment of: ▸ Terrestrial and aquatic ecology ▸ Surface water ▸ Groundwater ▸ Land resources ▸ Landscape and visual amenity ▸ Air quality ▸ Noise and vibration ▸ Indigenous and non-Indigenous cultural heritage ▸ Land use and tenure ▸ Waste management ▸ Cumulative impact	Department of Natural Resources, Mines and Energy (DNRME) DTMR Department of Agriculture and Fisheries (DAF) Department of State Development, Tourism and Innovation (DSDTI) Department of Education and Training (DET)	Toowoomba, 15-16 August 2019
Approach to the assessment of: ▸ Terrestrial and aquatic ecology ▸ Surface water ▸ Groundwater ▸ Land resources ▸ Landscape and visual amenity ▸ Air quality ▸ Indigenous and non-Indigenous cultural heritage ▸ Land use and tenure ▸ Waste management ▸ Cumulative impact	DNRME DTMR DAF DSDTI DET	Brisbane, 9 October 2019
Assessment of MNES	DAWE	Teleconference, 18 March 2020

Stakeholder and community feedback and comments received from the consultation process has informed the preparation of the draft EIS, including:

- Identification of community values and local conditions in proximity to the Project
- Assessment of potential benefits and impacts of the Project's construction and operation
- Identification of strategies to minimise or avoid potential impacts and maximise or enhance potential Project benefits.

The consultation program was structured to inform individuals and groups directly and indirectly affected by the Project. The process was also structured to allow input from:

- Stakeholder groups with specific interests in the Project, such as Traditional Owners and industry associations
- Queensland Government agencies, Goondiwindi Regional Council (GRC) and Toowoomba Regional Council (TRC), including those with either a regulatory or an advisory role in the design, construction or operation of the Project.

Feedback and community enquiry channels established for the Project include:

- Free call 1800 number (1800 732 761)
- Project email (**inlandrailenquiries@artc.com.au**)
- Postal address:
  - Toowoomba:
    Australian Rail Track Corporation
    Inland Rail
    65–67 Neil Street,
    PO Box 3093,
    Toowoomba QLD 4350
  - Brisbane:
    Australian Rail Track Corporation
    Inland Rail
    GPO Box 2462,
    Brisbane, QLD, 4001.

Full details of the community and stakeholder consultation that has occurred during the development of the reference design and the draft EIS have been documented and are presented in Appendix C: Stakeholder Engagement Report.

23.4 Assessment outcomes

The main environmental, social and economic outcomes of the Project as determined by the EIS are summarised below.

23.4.1 Land use and tenure

The land use and tenure aspects relevant to the Project have been assessed, including consistency with land-use planning instruments, compatibility with existing and proposed land uses, and implications for land characteristics including land tenure, agricultural land-use practices and resource licences. The construction and operation of the Project has the potential to result in direct and permanent impacts to land use and tenure, with the majority of impacts occurring immediately on commencement of land acquisition and construction of the Project. Potential impacts include:

- Change in tenure and loss of property. Specifically, acquisition of all or part of the following number of properties is expected to be required to accommodate the permanent footprint of the Project:
  - Freehold: 368
  - Leasehold: 3
  - Lands lease (State forest): 2
  - Reserve: 7
  - State land: 2
- Disruption to land over which native title claims have been made. The Project footprint traverses 10 properties where native title may continue to exist. This includes eight under reserve and two under State land tenure. Native title may also continue to exist in boundary watercourses.
- Temporary and permanent change in land use, including:
  - Loss of agricultural land. Approximately 1,860.83 ha of land within the permanent footprint (outside of existing rail and road corridors) is classified as Class A or Class B agricultural land and will be acquired for the Project
  - Land fragmentation and disruption to access and infrastructure
  - Alterations to stock routes, including realignments of:
    - Eukabilla Road Reserve
    - 811GWND at Yelarbon
    - 820GWD on Millmerran–Inglewood Road (two locations).
  - Alterations to the wild dog check fence and Darling Downs–Moreton Rabbit Board (DDMRB) fence
  - Other indirect impacts on agricultural land, without the implementation of appropriate environmental management controls, may occur as a result of:
    - Land contamination
    - Biosecurity risks
    - Changes in surface water hydrology
    - Erosion and sedimentation

- Impacts to accessibility, including impacts to the existing road network and to private property access. The reference design for the Project includes 53 crossing points of the public road network where the Project alignment and the road network interface. The reference design for the Project also includes 23 locations where a crossing is not provided at the location where the Project alignment and the road network interface.
- Disruption, relocation and modification to services and utilities
- Beneficial impacts, including supporting the agricultural industry, improving access to and from regional markets and acting as a catalyst for development in the area.

Where the Project requires the permanent acquisition of properties, this will be undertaken in accordance with the requirements of the *Acquisition of Land Act 1967* (Qld) (AL Act). Where land is acquired by the compulsory acquisition process in accordance with the AL Act, compensation will be able to be claimed by the landowner after the 'Taking of Land Notice' is published in the Queensland State Government Gazette. Compensation will be assessed on an individual basis based on the market value of the land as at the date of resumption. Additional compensation amounts for disturbance caused by the resumption of a property is also payable.

Mitigation measures for individual property treatments will be developed in consultation with landowners/occupants, with respect to the management of construction on, or immediately adjacent to, private properties.

During construction, land will be required temporarily. Purchasing or leasing arrangements for these properties will be investigated in consultation with relevant landowners.

Development approvals for activities in support of the Project that have not been assessed through the EIS will be obtained in accordance with the requirements of the *Planning Act 2016* (Qld) (Planning Act) and the *Environmental Protection Act 1994* (Qld) (EP Act).

23.4.2 Land resources

The assessment of land resources has included consideration of:

- Topography
- Geology
- Soils
- Acid sulfate soil (ASS)/acid rock
- Naturally occurring asbestos
- Saline, dispersive and reactive soils
- Erosion risk
- Contaminated land
- Agricultural land
- Soil conservation plans
- Unexploded ordnance (UXO).

The assessment of land-resource aspects identified the following potential impacts that may occur during construction or operation of the Project:

- Changes to landform and topography will be an unavoidable result of the Project, due to the need to achieve a 1:100 (target) maximum operation gradient for the railway. Achieving this operating grade will require a combination of cut (maximum depth of 29.7 m) and fill (maximum height of 24.5 m) across the undulating landscape. Alterations to landform may cause secondary impacts to surface water, in floodplain areas, and groundwater, where deep cuts intersect the groundwater table.
- The loss of soils as a resource from construction and operation of the Project may broadly arise due to:
  - Direct, permanent loss of productive soils due to change in land use from agriculture to rail corridor or road reserve
  - Reduced production value of soils that are subject to disturbance by construction activities
  - Indirect loss of soils due to erosion that is either caused or exacerbated by Project activities.
- If present, acid sulphate soils (ASS) would only be encountered during works that involve sub-surface disturbance within, or immediately adjacent to, permanent flowing waterways, such as the Macintyre River, Macintyre Brook, Condamine River and Oxley Creek. Additional geotechnical investigation undertaken during the detail design phase will target these locations in order to provide further details on the likelihood of occurrence of inland ASS in proximity to these waterways. Project activities may expose potential ASS to oxygen through soil disturbance, which, in turn, may result in the creation of sulfuric acid. In addition, acidic conditions have the potential to corrode infrastructure built from concrete, steel and other materials (Environment Protection and Heritage Council (EPHC) and Natural Resource Management Ministerial Council (NRMMC), 2011).

- Project activities have the potential to cause secondary salinisation, through processes such as the removal of vegetation, alteration of waterways, application of water (e.g. for material compaction) and general land-use changes (Department of Environment and Resource Management (DERM), 2011). Leakage from longitudinal drainage channels, if ponding were to occur, may also contribute to rising water tables and the vertical movement of salts in the soil profile.
- Potential impacts to each soil conservation plan traversed by the Project alignment have been established through consultation with DNRME. Some of the plans traversed by the Project alignment are more than 10 years old, and the soil conservation measures may not have been maintained during this period, or the agricultural land use may have changed. Consequently, the currency of all soil conservation plans within the Project footprint will need to be verified through detail design to confirm the likelihood of impacts.
- Project activities have the potential to disturb existing contaminated land resources, particularly during construction. The disturbance of contaminated soil or groundwater during Project activities has the potential to spread or exacerbate existing contamination, contaminate previously unaffected soil or groundwater and affect human health through ingestion as well as dermal contact with contaminants.

Additional geotechnical investigations will be undertaken to inform the design of earthworks and foundations for structures, suitability of borrow and quarry material, and construction planning for the Project.

In addition, detailed soil investigations will be undertaken at a suitable sampling intensity to inform the development of detail design. Subject to land access, the soil sampling will be of an intensity to enable mapping at a 1:10,000 scale. Detailed soil investigations will enable identification of potential/actual problematic soils, including: acid sulfate, reactive, erosive, dispersive, saline, acidic, alkaline and liberation of contaminants.

The methodology for the detailed soil investigation will be developed in consultation with DNRME and will be in accordance with the *Guidelines for surveying soil and land resources* (McKenzie et al., 2008), the *Australian soil and land survey field handbook* (National Committee on Soil and Terrain, 2009) and the *Guidelines for Soil Survey along Linear Features* (Soil Science Australia, 2015). Soil investigations will be conducted under the supervision of a suitably qualified soil practitioner.

Additional soil data will be incorporated into the final EIS and used to ensure that the design of structures, embankments, erosion control measures (temporary and permanent), soil treatment and management, and site rehabilitation planning are reflective of site-specific soil conditions.

Erosion and sediment controls will be developed as a component of the Construction Environmental Management Plan (CEMP). The erosion and sediment control measures will be developed by a certified practitioner in erosion and sediment control, in accordance with the *Best Practice Erosion and Sediment Control* (International Erosion Control Association, 2008) and will be implemented during construction of the Project.

If a soil conservation plan is found to be current and materially affected by the Project, ARTC will consider options for amending or modifying that plan in accordance with the *Soil Conservation Act 1986* (Qld). If required, this would be progressed in consultation with DNRME and the holder of the soil conservation plan.

23.4.3 Landscape and visual amenity

The landscape between Kurumbul near the NSW/QLD border and Gowrie Junction is typically a sparsely settled rural landscape, characterised by generally flat irrigated and non-irrigated croplands and undulating pastures, interspersed by a network of vegetated watercourses associated with the Dumaresq, Macintyre and Condamine Rivers and set against a backdrop of forested low hills and isolated volcanic peaks. It is, for the most part, a highly modified landscape as a result of historical clearing practices for agriculture and grazing, the establishment of linear infrastructure (railways, highways and powerlines) and other development activity (e.g. Commodore Mine, Toowoomba Wellcamp Airport and surrounds).

The key landscape and visual impacts of the Project relate to the introduction of rail infrastructure into relatively intact rural and natural settings, the removal of vegetation, along with the provision of new infrastructure elements, including embankments, deep cuts, viaducts and new road and rail bridges.

Twelve landscape character types (LCTs) were identified within the impact assessment area that are assessed to have a high sensitivity. Impacts of a high level of effect have been identified for two LCTs prior to the application of mitigation:

- LCT I: Settled Hills—which comprises landscapes of high local scenic value, as identified in the *Scenic Amenity study* (TRC, 2009)
- LCT F: Rural Settlement—which includes the landscapes around the settlements of Yelarbon, Brookstead and Pittsworth.

Visual impacts are often contained by the presence of vegetation and landform; however, there are localised elevated areas affording views over a wider area, including three scenic lookouts at varying distances to the alignment, which are located at Mount Basalt Reserve, Commodore Peak picnic area and Mount Kingsthorpe summit.

Twenty-two representative viewpoints have been assessed to represent impacts on these views. Of these, six visual impacts of up to a high level of effect were identified for the operation phase of the Project. These comprise:

- The impact of the Cunningham Highway road bridge on Viewpoint 2: Yelarbon rest area
- The impact of the bridge and embankments north of Brookstead (Viewpoint 15)
- The impacts of bridges and embankments on the northern edge of Pittsworth at Viewpoint 17
- The impact of the large cuts and embankments close to rural residential properties at Viewpoint 18: Gore Highway near Southbrook
- The impact of embankments and a proposed controlled level crossing in proximity to existing rural residential properties at Viewpoint 19: View from Athol
- The impact on views obtained from the summit of Mount Kingsthorpe at Viewpoint 22: Mount Kingsthorpe summit scenic lookout.

Concern has been raised through stakeholder engagement regarding the potential for lighting from the construction and operation of the Project to impact on the operations of the University of Southern Queensland's Mt Kent Observatory. The observatory is located approximately 21 km southeast of the Project (closest Project point is Southbrook), beyond the extent of the impact assessment area. The Project will not result in lighting impacts at the Mt Kent Observatory for the following reasons:

- The substantial distance between the Project and the observatory
- The limited lighting associated with the construction (flashing beacons and temporary spotlights in support of short-duration night works, if required) and operation (head lamp on rollingstock and safety lighting at road–rail interfaces) of the Project
- The presence of several more substantial light sources that are located closer, or equally distant to, the observatory.

Rehabilitation will be undertaken in accordance with the Project's Rehabilitation and Landscaping Management Sub-plan as a component of the CEMP that is consistent with ARTC's Landscape and Rehabilitation Strategy.

23.4.4 Flora and fauna

The impact assessment area provides suitable habitat for matters of MNES-threatened ecological communities and fauna/flora species (controlling provisions under the EPBC Act), non-threatened MNES species (migratory birds), State-listed threatened species and 'special least concern' species (listed under the *Nature Conservation Act 1992* (Qld) (NC Act)). In addition, a number of 'endangered', 'of concern' and 'least concern' regional ecosystems (REs) are also present within the impact assessment area that are protected under the *Vegetation Management Act 1999* (Qld). The impact assessment area contains a suite of other terrestrial ecological values, including protected areas (e.g. Whetstone State Forest and Bringalily State Forest), High Value Regrowth (HVR) vegetation, conservation-significant flora and fauna species, and regionally significant species, as well as bioregional corridors (local, regional and State significant).

Eighty-nine sensitive environmental receptors were identified within the impact assessment area for the purposes of this assessment. These varied from broad-scale sensitive environmental receptors, such as protected areas and bioregional corridors, down to finer species-scale sensitive environmental receptors, including conservation-significant and migratory species. These sensitive environmental receptors were grouped into high, moderate and low sensitivity categories based on factors including, conservation status, exposure to threatening processes, resilience and representation in the broader landscape.

It has been established through assessment that the construction and operation of the Project has the potential to impact on ecological receptors through:

- Habitat loss and degradation from vegetation clearing/removal
- Fauna species injury or mortality
- Reduction in biological viability of soil to support growth, due to soil compaction
- Displacement of flora and fauna species from invasion of weed and pest species
- Reduction in the connectivity of biodiversity corridors
- Edge effects
- Habitat fragmentation
- Barrier effects
- Noise, dust and light
- Increase in litter (waste)
- Aquatic habitat degradation
- Erosion and sedimentation
- Flooding.

In accordance with the outcomes of the MNES-significant impact guideline, potential significant impacts are predicted for the following threatened EPBC Act threatened species/communities (i.e. Project controlling provisions under the EPBC Act):

- Brigalow (*Acacia harpophylla* dominant and co-dominant) Threatened Ecological Community (TEC): 62.89 ha (potential extent)
- Weeping Myall Woodlands TEC: 39.72 ha (potential extent)
- Poplar Box Grassy Woodland on Alluvial Plains TEC: 39.72 ha (potential extent)
- *Dichanthium queenslandicum* (King blue-grass): 5.29 ha
- *Lepidium monoplocoides* (Winged peppercress): 40.91 ha
- *Homopholis belsonii* (Belson's panic): 3.19 ha
- *Picris evae* (Hawkweed): 18.68 ha
- *Rhaponticum australe* (Austral cornflower): 2.29 ha
- Spotted-tail quoll (mainland) (*Dasyurus maculatus maculatus*): 15.49 ha
- Condamine earless dragon (*Tympanocryptis condaminensis*): 17.93 ha
- Five-clawed worm-skink (*Anomalopus mackayi*): 16.68 ha
- Collared delma (*Delma torquata*): 295.76 ha
- Dunmall's snake (*Furina dunmalli*): 298.85 ha
- Swift parrot (*Lathamus discolor*): 243.54 ha
- Koala (*Phascolarctos cinereus*): 481.05 ha.

Significant residual impact assessment of prescribed environmental matters (matter of State environmental significance (MSES)) was undertaken in accordance with the MSES-significant impact criteria. This analysis indicated that the Project is likely to result in significant residual impacts to the following MSES:

- 'Endangered' or 'of concern' REs: 214.24 ha
- Regulated vegetation (Category B (other than grassland) within a defined distance from the defining banks of a relevant watercourse or relevant drainage feature): 43.88 ha
- Essential habitat: 117.31 ha
- Connectivity areas:
  - Regional terrestrial corridors: 235.37 ha
  - State riparian corridors: 37.42 ha
  - State terrestrial corridors :161.39 ha.
- Protected wildlife habitat for the following species:
  - Flora:
    - *Cyperus clarus* (A sedge): 106.0 ha
    - *Digitaria porrecta* (Finger panic): 455.61 ha
    - *Picris barbarorum* (Tall hawkweed): 567.49 ha.
  - Fauna:
    - Common death adder (*Acanthophis antarcticus*): 540.87 ha
    - Glossy black-cockatoo (*Calyptorhynchus lathami lathami*): 480.86 ha
    - *Nature Conservation (Koala) Conservation Plan 2017* (Queensland Government, 2017b) mapping (Koala Habitat Areas): 81.73 ha.

Detailed ecological surveys of the Project footprint will be undertaken in parallel to the development of the detail design. These surveys will be in accordance with the relevant survey guidelines for nationally threatened species, published in accordance with the EPBC Act. Where TECs are found to occur, condition assessment will be undertaken (using BioCondition assessment). Data obtained from these detailed surveys will be used to refine the quantification of ecological impacts and revise the calculation of offset requirements for the Project. Remnant and regrowth vegetation communities and habitats retained within the Project footprint will be monitored annually during construction against the initial BioCondition assessment. Corrective actions will be implemented where Project-associated impacts are identified.

Biosecurity controls, including weed management procedures and protocols, will be developed and incorporated into the CEMP.

ARTC is committed to implementing ongoing monitoring of the effectiveness of the measures with contingency (under an adaptive management framework) to change/improve management strategies where deleterious impacts to the identified environmental values are observed, or are not minimised, as per the objectives of the proposed mitigation measures.

The Project will result in significant residual adverse impacts, even after the implementation of all mitigation measures, including rehabilitation. As such, the provisions of offsets for the MNES and prescribed matters presented above will be required under the EPBC Act Offsets Policy and delivered consistent with the *Queensland Environmental Offsets Policy 2017*.

ARTC's *Environmental Offset Delivery Strategy—Qld* (Strategy) (refer Appendix N: Draft Offset Strategy) will inform the development of offset delivery components including an Environmental Offset Delivery Plan and Offset Area Management Plans. A Detailed Environmental Offset Delivery Plan and Offset Area Management Plans will be developed and implemented by ARTC prior to construction commencement.

23.4.5 Air quality

The assessment of air-quality impacts included establishment of background air quality and existing emission sources in the regional airshed of relevance to the Project, a qualitative assessment of construction-phase impacts and a quantitative dispersion modelling assessment of operational-phase impacts.

The air-quality assessment considered the emission of particulates during construction, predominantly airborne PM_{10} (particulate matter less than 10 microns) and deposited dust. The construction emission assessment concluded that surrounding sensitive receptors are expected to have a medium sensitivity to dust soiling and a low sensitivity to human health impacts. The result of the qualitative air-quality risk assessment concluded that the unmitigated air emissions from the construction of the Project poses a 'low' risk of human health impacts but a 'medium' risk of dust soiling.

Dispersion modelling of operational line-source emissions (i.e., emissions from freight trains travelling along the railway) was undertaken to assess the Project's compliance with the adopted air-quality goals at sensitive receptor locations. The dispersion modelling concluded that compliance would be achieved for all pollutants at all averaging periods for peak operation train volumes, with the exception of 24-hour average PM_{10}. Exceedance of the 24-hour average PM_{10} air-quality goal is predicted at one sensitive receptor, located approximately 1.1 km to the north of the existing Commodore Mine and to the north of the Project alignment. The predicted PM_{10} 24-hour cumulative concentration at this sensitive receptor is 50.1 $\mu g/m^3$, which represents a 0.1 $\mu g/m^3$ exceedance of the air-quality goal of 50 $\mu g/m^3$.

Investigation into the deposition of dust emissions at sensitive receptor water tank locations showed that predicted pollutant water concentrations would be significantly lower than those prescribed in the *Australian Drinking Water Guidelines* (NHMRC & NRMMC, 2011).

An air-quality monitoring station has been installed at a residential dwelling on Millmerran–Inglewood Road, Millmerran. Monitoring data from this location will improve understanding of ambient air quality and emissions from the mine and will be used to guide the detail design and finalisation of the construction approach for the Project.

Baseline dust deposition data will be established prior to construction in proximity to Commodore Mine (e.g. from Ch 120.0 km to Ch 128.0 km). This baseline data will enable comparison with dust deposition data during construction of the Project. Dust deposition monitoring will be undertaken during the active period of construction in proximity to the Commodore Mine (e.g. from Ch 120.0 km to Ch 128.0 km), at locations where baseline data was collected, to determine if construction results in significant dust impacts.

There is presently no foreseeable market-driven demand for coal to be transported on the Inland Rail network, between the NSW/QLD border and Gowrie; however, the transportation of coal on this section of the network cannot be precluded in future operation years. If coal is to be transported in future operation years, the potential for coal-dust generation will require management via a Coal Dust Management Plan. The measures included in the Coal Dust Management Plan will aim to minimise surface lift-off of materials in transit and establish protocols to minimise spillage onto external areas of wagons. The plan will be prepared in consultation with the relevant regulatory agency at the time.

23.4.6 Surface water

Water-quality conditions observed within the impact assessment area were considered to be consistent with, and typical of, those expected during a period of extended dry conditions. Water-quality impacts due to the diminished flow conditions were observed throughout the assessment. The existing water quality within the impact assessment area is considered average, with expectation of a period of poorer water quality coinciding with an initial return to base flow, due to catchment run-off after an extended drier period.

Based on the existing surface water conditions, the main potential impacts to surface water as a result of construction of the Project are expected to be as follows:

- Increased debris load in waterways, thereby reducing the aesthetic quality of downstream waterway systems. Debris may also impact on the health of aquatic and terrestrial fauna, particularly if ingested.
- Altered water quality, principally from increased water turbidity and sedimentation. Suspended sediments can clog fish and invertebrate gills, decrease light availability for aquatic plants and reduce visibility for fish. Furthermore, localised high sediment contamination can become a barrier to migration of some species that then decline in abundance due to restriction in range or loss of seasonal habitat above the contaminated reach (Australian and New Zealand Environment and Conservation Council (ANZECC) and Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ), 2018).
- Altered water chemistry, including an increase in salinity. Alterations to water chemistry may impact on the aquatic ecosystem condition of the downstream waterway system, as well as affect the useability of downstream waters for purposes such as irrigation, farm supply, stock use, recreation, etc.

The main potential impacts to surface water as a result of operation of the Project are expected to be as follows:

- Increased debris due to rubbish and debris from operations blown off or washed away from the rail corridor into proximal watercourses
- Introduction of contaminants from a variety of sources during operation and maintenance
- Increase in rates of erosion and resultant sedimentation of waterways, due where soils are exposed as a result of unsuccessful site rehabilitation.

Baseline water-quality conditions will be established through water-quality monitoring, preferably at sites previously monitored for development of the draft EIS. These will be monitored at quarterly intervals (minimum), for a period of 12 months prior to commencement of construction, as per the *Queensland Water Quality Guidelines* (Department of Environment and Heritage Protection (DEHP), 2009). Additional monitoring and sampling may also be undertaken in response to large rain events.

The scope and frequency of surface water monitoring during construction will be established prior to the commencement of construction, once the baseline conditions have been established. The scope of the surface water monitoring framework for construction will be documented as a component of the CEMP.

23.4.7 Hydrology and flooding

The hydrology and flooding assessment of the Project used a quantitative approach to impact assessment and has involved the following activities:

- Collation and review of available background information, including existing hydrologic and hydraulic models, survey, rainfall and streamflow data, calibration information and anecdotal flood-related data. This review established which datasets were suitable to use for the draft EIS.
- Determination of critical flooding mechanisms for waterways and drainage paths in the impact assessment area (i.e. regional flooding versus local catchment flooding)
- Determination of high-risk watercourses, that the alignment crosses, qualitatively considering:
  - The catchment size, resulting flood flows and velocities
  - The land use in the vicinity of the rail alignment
  - The extent and depth of flood inundation
  - The duration of flood events and catchment response time
  - The proximity to and nature of flood sensitive receptors (e.g. houses, sheds, roads, etc.).
- Development of tailored hydrologic and hydraulic models for key waterways as base modelling (Existing Case) for the assessment
- Validation of the hydrologic models and hydraulic models against available recorded data for historical flood events
- Community and stakeholder engagement to validate model performance, in an effort to gain acceptance of modelling and calibration outcomes
- Update of hydrologic and hydraulic models to include *Australian Rainfall and Runoff 2016* (ARR 2016) (Ball et al., 2016) design event methodology
- Simulation of ARR 2016 design events for the Existing Case and comparison to previous studies to confirm drainage paths, waterways, and associated floodplain areas, and establish the existing flood regime in the vicinity of the Project. The range of flood event magnitudes assessed included the 20%, 10%, 5%, 2%, 1% events, extreme events including the 1 in 2,000 and 1 in 10,000 AEP events and the probable maximum flood (PMF).
- Inclusion of Project elements (proposed rail alignment, road reconfigurations and associated drainage structures) (Developed Case) into the hydraulic models and simulation of ARR 2016 design events. The Developed Case also includes the North Star to NSW/QLD Border and the Gowrie to Helidon Inland Rail projects, which are being concurrently developed. The North Star to NSW/Queensland Border and the Gowrie to Helidon Inland Rail projects have been included in the Developed Case for this Project to enable cumulative impacts to be considered and addressed.
- Assessment of impacts of the Project, using the suite of design floods, including consideration of change in flood levels, flow distributions, velocities and duration of inundation
- Determination of appropriate mitigation measures to manage potential impacts, including refinement of location and dimensions of drainage structures under the Project alignment and for road reconfigurations. Iterations undertaken in the hydraulic models to achieve a design that meets the flood impact objectives.

Flood-impact objectives were established for the Inland Rail Program and used to guide the Project design, including mitigation of impacts through refinement of the hydraulic design, including adjustment of the numbers, dimensions and location of major drainage structures. Table 23.4 summarises the adopted flood-impact objectives and how the Project design performs against each of the objectives.

TABLE 23.4 FLOOD-IMPACT OBJECTIVES AND OUTCOMES

Parameter	Objectives and outcomes					
Change in peak water levels	Existing habitable and/or commercial and industrial buildings/ premises (e.g. dwellings, schools, hospitals, shops)	Residential or commercial/industrial properties/lots where flooding does not impact dwellings/ buildings (e.g. yards, gardens)	Existing non-habitable structures (e.g. agricultural sheds, pump-houses)	Roadways Rail lines	Agricultural (cropping) land	Agricultural (grazing) land/forest areas and other non-agricultural land
	⩽ 10 mm	⩽ 50 mm	⩽ 100 mm	⩽ 100 mm	⩽ 100 mm with localised areas up to 400 mm	⩽ 200 mm with localised areas up to 400 mm
	Objective: Changes in peak water levels are to be assessed against the above proposed limits. **Outcome:** Generally, the Project design meets the above limits with the exception of a few localised areas along the Project alignment where these limits are exceeded. These areas are generally on agricultural land. Flood-sensitive receptors that are impacted by changes in peak water levels under the 1% AEP event, that exceed the flood-impact objectives, include: ▸ Nine dwellings (five between Pampas and Yandilla, and four at Yelarbon) ▸ One shed at Pampas ▸ Three commercial buildings (grain silos) at Yandilla ▸ One State-controlled road (Cunningham Highway at Yelarbon) ▸ One local public road (Leesons Road between Kingsthorpe and Gowrie Junction).					
Change in duration of inundation	**Objective:** Identify changes to duration of inundation through determination of Time of Submergence (ToS). For roads, determine Average Annual Time of Submergence (AAToS) (if applicable) and consider impacts on accessibility during flood events. **Outcome:** There are localised increases in ToS at the same locations where peak water levels are increased. These changes in inundation duration do not affect flood-sensitive receptors except for one local public road—Draper Road—and one State-controlled road—the Cunningham Highway. The Cunningham Highway has a +0.8 hours per year increase in AAToS, which is a negligible change, with Draper Road experiencing an even lower impact.					
Flood flow distribution	**Objective:** Aim to minimise changes in natural flow patterns and minimise changes to flood flow distribution across floodplain areas. Identify any changes and justify acceptability of changes through assessment of risk, with a focus on land use and flood-sensitive receptors. **Outcome:** The Project has minimal impacts on flood flows and floodplain conveyance/storage, with significant floodplain structures included to maintain the existing flood regime.					
Velocities	**Objective:** Maintain existing velocities, where practical. Identify changes to velocities and impacts on external properties. Determine appropriate scour mitigation measures, taking into account existing soil conditions. **Outcome:** In general, changes in velocities are minor, with most changes in velocities experienced immediately adjacent to the Project alignment and no flood-sensitive receptors impacted. Scour protection has been specified where the outlet velocities for the 1% AEP event exceed the allowable soil velocities for the particular soil type for each location, which was identified from published soil mapping.					
Extreme event risk management	**Objective:** Consider the risks posed to neighbouring properties for events larger than the 1% AEP event, to ensure no unexpected or unacceptable impacts. **Outcome:** A review of impacts under the 1 in 2,000 AEP, 1 in 10,000 AEP and PMF events has been undertaken with the existing flood depths and increase in peak water levels at flood-sensitive receptors identified on each floodplain. Considering the flood depths that occur, particularly under the PMF event, indicates that the changes in peak water levels would be unlikely to exacerbate flood conditions during extreme events.					

Parameter	Objectives and outcomes
Sensitivity testing	**Objective:** Consider risks posed by climate change and blockage in accordance with ARR 2016. Undertake assessment of impacts associated with Project alignment for both scenarios. **Outcomes:** Climate change—climate change has been assessed in accordance with ARR 2016 requirements, with the RCP8.5 (2090 horizon) scenario adopted. The impacts resulting from changes in peak water levels under the 1% AEP event with climate change are generally similar to those seen under the 1% AEP event, with some additional impacts on flood-sensitive receptors. Blockage—blockage of drainage structures has been assessed in accordance with ARR 2016 requirements. The blockage assessment resulted in no blockage factor being applied to bridges and a blockage factor of 25 per cent being applied to culverts. Two blockage sensitivity scenarios were tested, with both 0 per cent and 50 per cent blockage of all culverts assessed. The resulting changes in peak water levels associated with the Project alignment are localised but impact on some flood-sensitive receptors. During detail design, the blockage factors will be reviewed in line with the final design and local catchment conditions. This may result in a varied and/or lower blockage factors being applied along the Project alignment.

Design modifications during the detail design phase will be subject to re-runs of the existing flood models to demonstrate continued compliance with the design objectives of the Project, including for extent and time of inundation, afflux and flow velocities.

Consultation with impacted stakeholders will continue through detail design to ensure that alterations to the design and its impacts are communicated back to landowners.

The design requirements for modifying the existing Yelarbon levee will be confirmed through further consultation with the GRC and incorporated into the detail design. It is anticipated that the modified levee would be considered a Category 2 levee (Schedule 10 of the *Water Regulation 2016* (Qld)). This is Code Assessable development, with local government (GRC) as the assessment manager. Development approval for the modification of Yelarbon levee will be obtained prior to the commencement of any modification works.

The hydrologic and flooding assessment undertaken has demonstrated that the Project is predicted to result in impacts on the existing flooding regime that generally comply with the flood-impact objectives that have been adopted for the Project. A comprehensive consultation exercise has been undertaken to provide the community with detailed information and certainty around the flood modelling and the Project design. In future stages, ARTC will continue to work with:

- Landowners concerned with hydrology and flooding throughout the detail design, construction and operation phases of the Project
- Directly impacted landowners affected by the alignment throughout the detail design, construction and operation phases of the Project
- Local governments, State government agencies and local flood specialists throughout the detail design, construction and operation phases of the Project.

23.4.8 Groundwater

Numerical predictive models were developed to support the hydrogeological design and assessment of impacts for the Project. These local-scale groundwater models were developed as 2–D cross-sectional models oriented perpendicular to the Project alignment.

Five indicative cuts along the Project alignment were identified as best representing the local geological conditions and worst-case potential impacts on groundwater resources (deepest cuts into each stratigraphy), and were subsequently modelled to evaluate potential drawdown, changes to flow regime and estimate potential seepage rates.

Predictive simulation results indicate:

- Seepage is concentrated at the bottom of the cuts, on both sides of infill material
- Initial inflow of seepage will be higher than the average rate predicted for steady-state scenarios, then will plateau
- Seepage values simulated are considered to be low and attributed to the low hydraulic conductivity values applied, based on an average of site-specific data
- Temporary increases in seepage may be observed in cuts with sandy soil or weathered sandstone, following rainfall events
- Seepage of groundwater from bedrock is anticipated to be low except where enhanced by weathering of fractures.

Modelling results indicate that drawdown is only expected to occur at three of the five modelled locations. In these locations, there are no registered bores located outside of the Project footprint that are also within the extent of predicted drawdown. At the locations where drawdown is anticipated to occur, the maximum extent of drawdown is predicted to range from 15 m to 80 m from the centre of the Project alignment.

It was concluded that Project activities have potential to impact on groundwater resources via:

- Loss or damage to existing landowner bores. There are 30 registered bores within the Project footprint. These bores, plus unregistered bores that also occur within the Project footprint, are likely to be decommissioned for the progression of the Project.
- Temporary drawdown of localised groundwater levels with the potential to temporarily affect the availability of groundwater from bores (registered and unregistered) in proximity to the works, which are not otherwise decommissioned by the Project. Preliminary modelling results indicate that there are no registered bores located outside of the Project footprint that are also within the extent of predicted drawdown.
- Deep cuttings could create voids that intersect shallow groundwater and perturb the antecedent groundwater flow regime. Piles or other structures spaced closely together also have potential to influence the natural groundwater flow regime.
- Long-term dewatering is not considered to be required for the operation of the Project; however, long-term seepage is likely to occur at one cut location. Dewatering will be managed via engineering controls (e.g. drainage blankets, shotcrete). Seepage-prevention measures will be investigated through the detail design process for inclusion in the design, as appropriate.
- Reduced permeability of the substrate beneath embankments may modify the flow direction of shallow groundwater in portions of the alluvium and possibly the saturated portion of weathered bedrock
- Bridge and piling can cause alteration of aquifer parameters (lower permeability); altered groundwater flow patterns (mounding or drawdown up and down gradient of the piles; upward leakage along the pile/soil interface); and reduction in groundwater resources through extraction of wet soil/rock during piling.
- Subsidence/settlement of compressible substrates and possible damage to adjacent structures (i.e. proposed bridges or embankments can occur)
- Contamination/reduction of groundwater quality due to:
  - Unintended spills and leaks of hydrocarbons (i.e. oils, fuels and lubricants) and other chemicals related to use of heavy plant and equipment (accidental discharge)
  - Water mixtures and emulsions related to washdown areas (accidental discharge)
  - Upward seepage along piles/soil interfaces of saltier groundwater from the deeper confined aquifers into the fresher alluvium aquifers.

The majority of potential impacts related to groundwater are considered temporary in nature and primarily associated with the construction phase of the Project. Impacts that may occur through the operation phase are, in most instances, an extension of issues that will initially arise through the construction phase of the Project.

Predictive numerical modelling will be re-run using additional information obtained from further geotechnical and hydrogeological investigations, in addition to finalised cut dimensions. This revised modelling will be completed to better understand seepage estimates and groundwater level variation resultant from cuts. Seepage analysis will be used to advise drainage blanket specifications, or alternative design controls, for deep cuts into hard rock. If drawdown impacts are anticipated to extend to registered bores that would not otherwise be decommissioned by the Project, consultation will occur with each licensed user to determine and agree an appropriate mitigation approach (e.g. monitoring with bore-specific impact thresholds for intervention and 'make good' agreements).

Landowners affected by the Project will be consulted to confirm the location of registered bores and to establish the presence of any unregistered bores within the Project footprint that may be decommissioned, to enable construction and operation of the Project. Where a groundwater bore is expected to be decommissioned or have access to it impaired as result of the Project, 'make good' measures will be agreed in consultation with the affected landowner.

A Groundwater Management and Monitoring Plan will be developed to provide an on-going assessment of the Project impacts during construction. The Groundwater Management and Monitoring Plan will be developed using baseline groundwater data collected for the Project and will be subject to approval from the relevant regulatory agencies prior to implementation. Baseline groundwater monitoring data will be used to:

- Derive location/bore-specific groundwater monitoring procedures
- Establish location/bore-specific impact thresholds
- Establish responses to impact threshold exceedances, including 'make good' agreements.

23.4.9 Noise and vibration

23.4.9.1 Construction noise and vibration

The assessment of noise associated with the construction of the Project indicates a high number of exceedances against both the lower and upper external noise limits within the impact assessment area.

The 'earthworks' and 'rail civil works' construction stages are predicted to have the greatest impact from construction noise; however, this assessment is representative of the worst-case 15-minute period of construction activity, while the construction equipment is at the nearest location to each sensitive receiver location. The assessed scenario does not represent the ongoing day-to-day noise impact at noise-sensitive receptors for an extended period. Other construction stages may have greater overall impact depending on actual timing and duration of each construction stage.

Construction traffic noise is predicted to exceed the adopted criteria for 44 different roads within the impact assessment area across the full construction period, with a maximum predicted increase of 22 A-weighted decibel dB(A). The 44 roads on which the predicted increase in noise level is greater than the 3.0 dB(A) criterion are primarily in rural locations and the existing base traffic volumes quantities are insignificant. As such, the initial airborne road traffic noise levels are low before the addition of construction traffic and the criteria for these roads is stringent.

Vibration-intensive work is likely to be undertaken at times as part of the construction works. This may include the use of piling rigs and vibratory rolling activities. Minimum working distances for vibration-intensive construction work have been predicted for human comfort and structural damage limits. The potential for exceedances of the construction vibration criteria adopted from the *Road Traffic Noise Management: Code of Practice – Volume 2* (CoP Vol 2) (DTMR, 2016) have been predicted at several sensitive receptors. The primary form of mitigation of vibration would be ensuring vibration-intensive works do not occur within the minimum working distances. If vibration-intensive works are planned within the minimum working distances identified, alternative equipment would be identified or rescheduling of works would occur (i.e. to occur during the day), and vibration monitoring would be implemented. Further mitigation of vibration would not be required where the minimum working distances are adhered to.

Significant volumes of non-rippable rock are anticipated within some of the cuttings along the rail corridor, particularly in the northern part of the Project alignment. The extent to which drilling and blasting will be required will be confirmed through further geotechnical investigation. Maximum charge mass amounts, based on indicative setback distances of sensitive structures and heritage buildings, have been identified. A detailed blasting assessment will be completed once blasting locations have been finalised through detail design.

Measures have been proposed to mitigate construction noise impacts on nearby sensitive receptors. The final number, degree and nature of these measures would be selected by the Principal Contractor and be largely dependent on the construction strategy and work carried out. Specific noise management and mitigation measures will be detailed in the Principal Contractor's Noise and Vibration Management Sub-plan, as a component of the CEMP. The management and mitigation measures that will be considered in the plan include:

- Effective community consultation
- Training of construction site workers
- Use of temporary noise barriers
- Monitoring
- Appropriate selection and maintenance of equipment
- Scheduling of work for less sensitive time periods
- Situating plant in less noise-sensitive locations
- Construction traffic management
- Respite periods.

23.4.9.2 Operational rail noise

The assessment of noise and vibration considered the proposed day time and night-time railway operations for the Project. The predicted noise levels achieve the airborne noise assessment criteria from the *Policy for Development of Land Affected by Environmental Emission Transport and Transport Infrastructure: Version 2* (DTMR, 2013c) and *Operational Railway Noise and Vibration Interim Guideline—Government Supported Transport* Infrastructure (DTMR, 2019a) and ARTC's noise management criteria at the majority of sensitive receptors included in the noise prediction modelling.

At a total of 136 sensitive receptors (131 residential and 5 non-residential) noise levels are predicted to be above the noise assessment criteria adopted for the Project without the implementation of mitigation. To mitigate noise levels, where feasible and reasonable, to achieve the assessment criteria and ameliorate impacts, consideration has been given to noise-mitigation options for these receptors.

As many of the sensitive receptors are isolated and the criteria is exceeded by less than 5 dB(A), the feasible and practicable noise mitigation is likely to be architectural acoustic treatment of the properties to manage noise impacts within habitable rooms.

At the townships of Yelarbon, Brookstead and Pittsworth, the sensitive receptors are with more densely populated areas adjacent to the rail corridor. During detail design, noise-mitigation options at these towns will include investigation of infrastructure, such as noise barriers, earth mounds or track design measures, to control railway noise emissions and screen the propagation of railway noise. The specific location, extent and height of noise barriers, if implemented, will be subject to a detailed review of feasible and reasonable mitigation options during the detail design phase. Depending on the noise barrier design, there may be some sensitive receptors where the noise assessment criteria are not fully achieved, and these receptors may be considered for additional at-property mitigation.

The decisions to implement at-property treatments will be based on validated (measured) rollingstock noise levels and a survey of the property. Where sensitive receptors are isolated along the alignment it is usually not practicable to construct rail noise walls or noise barriers.

While treatment of property can ameliorate potential noise impacts within the internal environment of receptor buildings, the external rail noise levels have the potential to be clearly audible above the ambient noise environment in relatively close proximity to the rail corridor, such as the initial 300 m from the rail corridor.

23.4.9.3 Operational ground-borne noise and vibration

The assessment determined that the vibration criteria would be achieved where receptors are greater than 10 m from the closest rail. Acknowledging that some properties are within the Project footprint, there were no sensitive receptors triggering the ground-borne vibration criteria from railway operations.

The assessment also reviewed the potential for ground-borne vibration impacts to cultural areas of interest. The assessment of potential vibration-induced impacts to these cultural areas of interest identified seven areas of cultural interest that will need to be subject to a structural survey where the property and structures are determined to be within 15 m of the outer rail. The outcomes of the assessment will be confirmed during detail design, particularly as vibration dose value (VDV) levels within the assessment criteria do not eliminate the potential for perceptible vibration during train pass-by events.

The most stringent ground-borne noise criteria is calculated to be achieved at a distance of greater than 50 m from the rail line. Based on this 50 m off-set distance, there are approximately three sensitive receptors where the screening assessment has identified that ground-borne noise levels may be above the assessment criteria. While ground-borne noise levels at all other sensitive receptors were calculated to be within the assessment criteria and do not trigger investigation of mitigation, there can still be a risk of minor perceptible ground-borne noise at sensitive receptors. Consequently, the assessment outcomes will be reviewed during the detail design phase to verify any future requirements to mitigate ground-borne noise.

23.4.9.4 Operation road

A desktop assessment of 35 new road sections and 46 upgraded road sections was undertaken to predict the potential noise impacts associated with each road alteration. These roads were assessed against relevant criteria from the *Transport Noise Management Code of Practice Volume 1—Road Traffic Noise* (CoP Vol 1) (DTMR, 2013a). The desktop assessment considered the increase in traffic flows and relative distance to the nearest sensitive receptors for each road. Influence from other dominant noise sources has not been considered.

Operational noise from four new road sections and three upgraded road sections are predicted to exceed the relevant criteria at one or more sensitive receptors. Operational road traffic noise impacts will be iteratively re-assessed during the detail design process, in accordance with CoP Vol 1, to confirm the receptors at which noise criteria may be exceeded. Where criteria are expected to be exceeded, location-specific mitigation measures will be incorporated into the detail design, where possible.

23.4.10 Social

A social impact assessment (SIA) was undertaken to identify how the Project may affect local and regional communities, and inform how ARTC will work with stakeholders to manage and mitigate the identified social impacts, while enhancing Project benefits.

23.4.10.1 Social benefits

The SIA has identified that the Project would result in social benefits, primarily in relation to employment, training and business supply opportunities for residents in the SIA impact assessment area. Social benefits include:

- Employment opportunities in Project construction during 2021–2026 including employment for Goondiwindi and Toowoomba LGA residents and groups that are disadvantaged in the labour market, with a peak workforce of up to 950 personnel required
- Training and career pathway development for young people, Indigenous people and unemployed people in the SIA impact assessment area
- Significant opportunities for local, regional and Indigenous businesses (including construction, transport or logistics businesses) to participate in its construction supply chain. Transport, logistics and warehousing industries may be catalysed by the Project in Goondiwindi and Toowoomba.
- Local businesses would benefit from increased trade from workers residing at the non-resident workforce accommodation facilities and from supply opportunities offered by the accommodation provider
- Operations of the Project will provide direct permanent employment for approximately 15 people, some of whom may be drawn from the SIA impact assessment area. Indirect employment benefits are also likely as the result of the Project facilitating economic development.
- As part of the Inland Rail Program, the Project has potential to improve the agricultural industry's access to freight transportation and stimulate business and industry development, including at the Toowoomba Enterprise Hub.

23.4.10.2 Social impacts

Although the Project has been designed to minimise adverse social outcomes, not all impacts can be avoided. Without appropriate mitigation strategies, the Project has potential to result in the following social impacts:

Construction

- Potential to affect Aboriginal cultural landscapes or heritage values by adding additional infrastructure to the natural and rural landscapes, potentially affecting feelings of connection to Country
- Concern related to property acquisition discussions and/or fears about Project impacts on property use and amenity, environmental qualities, or potential for changes to flooding risks
- Impacts on the use and management of agricultural land, including severance of and between land parcels, intrusion on farm infrastructure, temporary disruptions to access to landholdings, and impacts on on-farm and off-farm movements including the ability to move machinery, stock and supplies across the corridor.
- Property owners have expressed concern about the potential for property values to decrease as a result of Project impacts, e.g. noise, severance and visual amenity factors. Individual properties values may be affected by a range of factors related and unrelated to the Project.
- Noise, dust and increased traffic related to construction activities and sites may affect residential amenity while works are near homes and businesses
- Community cohesion may be reduced through displacement of residents, physical severance between properties, disruption to the road network and/or, potentially, community conflict
- There is potential for noise from construction activities and/or Project traffic near the Brookstead, Southbrook and Yelarbon State Schools to impact on the learning environment of the schools
- Temporary non-resident workforce accommodation will be established near Millmerran/Turallin, Inglewood and Yelarbon, and while largely self-sufficient, there is potential for impacts on town character due to worker influxes to town facilities or businesses
- While non-resident workforce accommodation will include access to paramedic services, some additional demand is anticipated on local health and police services
- Potential for impacts on rental housing availability in Goondiwindi, Millmerran, Pittsworth and Inglewood
- Construction labour demand may contribute to shortages in specific trades and labour, particularly if a number of projects are constructed during the same period.

Operation

- Level crossings will result in periodic disruptions to traffic, including potential to delay emergency vehicles during operation
- The quiet rural amenity of properties near the Project may be impacted by rail freight noise during operations
- Property severance and changes to landowners' movements from one side of the rail corridor to the other
- There is potential for rail noise to affect the learning environments of the Brookstead and Yelarbon State Schools
- There is potential for rail noise to affect the amenity and use of the Pittsworth Assembly of God/Harvest Life Church
- The presence of a freight rail line may increase the risk of road/rail accidents and rail suicides, resulting in social impacts for individuals, families, communities and rail staff

Flood-sensitive receptors that are impacted by changes in peak water levels under the 1% AEP event that exceed the flood-impact objectives include nine dwellings (five between Pampas and Yandilla and four at Yelarbon), one shed at Pampas, three commercial buildings (grain silos) at Yandilla, one State-controlled road (Cunningham Highway at Yelarbon) and one local public road (Leesons Road between Kingsthorpe and Gowrie Junction).

Changes to flooding patterns may affect feelings of security, the amenity of homes, and the use and condition of sheds, silos and other infrastructure on affected properties.

23.4.10.3 Social impact management

The SIA includes a Social Impact Management Plan (SIMP), which outlines the objectives, outcomes and measures for mitigation of social impacts. Measures intended to enhance Project benefits and opportunities are also provided. Management sub-plans are provided for:

- Community and stakeholder engagement
- Workforce management
- Housing and accommodation
- Health and community wellbeing
- Local business and industry content.

The Community and Stakeholder Engagement Plan describes how the Project will communicate and engage with community members and other stakeholders throughout the pre-approval, detail design, pre-construction and construction phases of the Project. Upon the completion of the construction phase, the Project will be commissioned as part of the Inland Rail network. Before the completion of the construction phase, ARTC and/or its contractor will develop community and stakeholder engagement strategies for the commissioning phase and operations, in accordance with ARTC's established practices.

The Workforce Management sub-plan describes how ARTC will maximise training and employment opportunities for residents in the Goondiwindi and Toowoomba LGAs, manage the potential for impacts on other industries, and support workforce wellbeing. ARTC is establishing the Inland Rail Skills Academy, which is a collection of projects and partnerships to deliver targeted local training and business capacity building programs that are being developed in cooperation with community, council and government stakeholders.

The Housing and Accommodation Sub-plan describes the measures that ARTC will undertake to mitigate potential impacts on housing and accommodation access in the SIA impact assessment area, and support management of the Project's non-resident workforce accommodation. The Project proposes the provision of three non-resident workforce accommodation facilities, to be located near Yelarbon, Inglewood and Turallin (near Millmerran). This is expected to minimise the potential for Project personnel's housing demands to affect local housing access and also minimise demands on short-term accommodation, which could affect tourists' access.

The Health and Community Wellbeing Sub-plan addresses the potential for impacts on community facilities and services, community safety and mental health, and the potential for impacts on community wellbeing due to changes to local amenity, community cohesion or local character. The sub-plan includes measures for cooperation with community and government organisations to maintain the amenity of community facilities and local access to services, including emergency services and mental health services. A more detailed Community Wellbeing Plan will be developed in cooperation with key stakeholders during the detail design phase.

The Local Business and Industry Sub-plan addresses the potential for Project impacts on businesses, including farms, agribusinesses and tourism-related businesses, and describes ARTC's commitments to ensuring that local and regional businesses benefit from the Project.

ARTC is committed to providing full, fair and reasonable opportunities for capable local businesses (within the Goondiwindi and Toowoomba LGAs and nearby LGAs) and Indigenous businesses to compete and participate in the Project's supply chain. An Australian Industry Participation Plan (AIP Plan) will be prepared to support opportunities for businesses to supply the Project. This will include capacity building programs for local and Indigenous businesses to be delivered as part of the AIP Plan and within the Inland Rail Skills Academy.

A monitoring strategy that will enable the Project to report on the delivery and effectiveness of the SIMP is also provided.

23.4.11 Economics

At a local level, the Project is expected to promote community development by supporting local and regional employment, businesses and industries. The findings of the economic impact assessment suggest that the Project will support regional development through:

- Opportunities to encourage, develop and grow Indigenous, local, and regional businesses through the supply of resources and materials for the construction and operation of the Project
- Opportunities in secondary service and supply industries (such as retail, hospitality and other support services) for businesses in close proximity to the construction footprint. The expansion in construction activity is also likely to support additional temporary flow-on demand and additional spending by the construction workforce in the local community.
- As part of the Inland Rail Program, the Project has the potential to stimulate business and industry development at the Toowoomba Enterprise Hub in Wellcamp. By providing efficient transport access to intrastate and interstate markets, the Project may act as a catalyst for further private sector investment in this area, particularly for freight and logistics operations.

The Project alignment has been designed to minimise impacts to local business and industry; however, the Project may result in the disruption to the tourism and agriculture business through:

- The loss of agricultural land (through disturbance, acquisition, or sterilisation), disruption to farm management, or changes in accessibility or connectivity to market. Without appropriate ameliorative measures, this may negatively impact on the productive capacity and total economic value add from the local agricultural industry. ARTC will work with individual landowners to develop suitable management solutions based on individual farm management practices to mitigate and manage these impacts.
- Changes to the amenity of, or connectivity to, local attractions. The SIA concludes that a significant decrease in visitation as a result of this impact is unlikely. Nevertheless, ARTC will work with tourism associations so that impacts on tourism values are reduced wherever possible.

As a critical link of the broader Inland Rail Program, the Project offers opportunities to support the local agricultural industry by driving savings in freight costs, improving market access, and reducing the volume of freight vehicles on the region's road network.

The economic benefits assessment estimates that the Project is expected to provide a total ($2019 present value terms) of $674.36 million in incremental benefits (at a 7 per cent discount rate). These benefits would result from improvements in freight productivity, reliability and availability, and benefits to the community from crash reductions, reduced environmental externalities and road decongestion benefits.

Using recent labour market trends and projected construction sector activity to inform workforce capacity and capability within the local region, it has been concluded that it is likely that the labour market conditions that will prevail during the construction phase of the Project will most likely be closer to those characterised by the 'slack' labour market scenario. Under this scenario, over the construction phase, real gross regional product (GRP) is projected to be $334 million higher than the baseline level.

Under a slack labour market scenario, the Project is also expected to deliver an additional 344 jobs (direct and indirect) per year over the construction period.

The possibility of some tightness in the labour market cannot be completely dismissed. If the government's health and economic policy responses to the COVID-19 virus are highly effective the economy may grow much faster than expected, resulting in significantly more activity in the construction sector than anticipated. For example, the government may seek to bring forward projects to stimulate the economy. If this transpires, labour market conditions may tend towards somewhere between the slack and 'tight' scenarios.

23.4.12 Indigenous cultural heritage

The ToR requires that one or more Cultural Heritage Management Plans (CHMPs) be developed with the relevant Aboriginal party or parties for the Project area and be approved by the Chief Executive of the Department of Aboriginal and Torres Strait Islander Partnerships (DATSIP).

CHMPs for the Project were developed between ARTC and the relevant Aboriginal Parties in 2018 (CLH017009) in accordance with the requirements of Part 7 of the *Aboriginal Cultural Heritage Act 2003* (Qld) (ACH Act) and the *Cultural Heritage Management Plan Guidelines* (Department of Aboriginal and Torres Strait Islander Partnerships (DATSIP), 2015). The scope of the CHMPs only covers the construction of new rail transport infrastructure and associated structures as well as the corridor owned/managed by ARTC. Management of cultural heritage for QR maintenance of the existing rail corridor will be undertaken under separate agreement.

The CHMPs have been approved under the ACH Act and consequently meets all the requirements for the identification, assessment and management of Aboriginal heritage under the Project's ToR. Accordingly, the draft EIS defers to the CHMP in all matters related to the management of Aboriginal cultural heritage.

23.4.13 Non-Indigenous cultural heritage

Areas of cultural interest were identified through a review of statutory and non-statutory cultural heritage registers, historical aerial imagery and local historical archives. From this review, a total of 31 areas of interest (AOI) were identified for inspection. Following inspection, it was determined that 14 of the AOI meet the criteria for local heritage significance and one meets the criteria for State heritage significance, as defined in the *Queensland Heritage Act 1992* (Qld).

Likely impacts (direct or indirect) to each area of interest were identified based on proximity to the Project and concluded that eight of the AOIs may be subject to substantial ('major') impacts as a result of Project activities.

Potential impacts to each cultural area of interest will be verified through the detail design phase, once the Project footprint and construction methodology are confirmed. Location-specific mitigation measures will be established based on the anticipated impacts and included in the CEMP.

Archaeological survey of heritage sites that are complexes within the Project footprint will be undertaken to map elements and identify areas of possible subsurface deposit. These complexes are:

- Gibinbell shearing complex (413/SP119197)
- Yelarbon railway complex (20/SP120712 and 21/SP120712)
- Homestead complex (511/RP226715).

If warranted by results of archaeological survey, a two-stage archaeological excavation will be conducted of heritage sites that are complexes, including:

- Stage 1—Test excavation to confirm subsurface deposit
- Stage 2—Salvage excavation of subsurface deposits (if required).

Archival photographic recording of sites/places that will be directly impacted by the Project will be undertaken in accordance with the *Guideline: Archival Recording of Heritage Places* (DEHP, 2013b).

23.4.14 Traffic, transport and access

The traffic and transport assessment evaluated a comprehensive range of issues encompassing potential impacts of the construction and operation phases of the Project on the surrounding transport infrastructure and its users. The assessment has also examined the potential traffic and pavement impacts from the movement of materials, workforce and equipment during the construction phase of the Project on the surrounding road network.

Key findings of this assessment are as follows:

- The Project requires the crossing of State-controlled roads and local government (GRC and TRC) roads. Where grade separation has not been feasible, the design has been developed in accordance with the ARTC *Engineering Code of Practice—Level Crossings* (available on the ARTC extranet). Level crossings have been subject to safe design studies and risk assessments in accordance with the Australian Level Crossing Assessment Method (ALCAM) to identify and reduce the potential risks associated with these crossings, so far as is reasonably practicable (SFAIRP), in accordance with the Office of the National Safety Regulator (ONRSR) *Guideline: Meaning of duty to ensure safety so far as is reasonably practicable* (ONRSR, 2016b).
- Sixty-nine local government roads have been identified that are expected to experience construction traffic that exceeds 5 per cent of the background traffic. Twenty-five of these roads are in the GRC LGA and 38 of these roads are in the TRC LGA. Impacts to many of these roads are expected to be minimal as the high percentage of construction traffic is a function of low existing traffic volumes.

- The results of the level of service (LOS) comparison between the 'with' and 'without' Project scenarios indicate that the Project may potentially cause a minor change in LOS for some road sections during each year of construction. Based on the LOS comparison, it is not expected that the Project would generate the need to upgrade the road network for such a short duration of impact, but adequate traffic and road-use management strategies and mitigation measures would be required. The specific traffic and road-use management strategies will be subject to agreement with relevant local governments.
- Intersection analysis has identified 26 locations where the addition of construction traffic warrants additional turning treatments to be applied in order to maintain operational safety. These upgrades are required only temporarily for construction traffic; therefore, discussions will be required with DTMR and local governments during the Project design phase to determine the permanence of such upgrades. Given the short duration of construction-related traffic, traffic management strategies may be introduced as an alternative to more permanent treatments in order to mitigate construction-related traffic impacts at intersections.
- The findings of the pavement impact assessment show that several State-controlled roads are likely to cross the 5 per cent standard axle repetitions threshold, with several road segments exceeding this threshold by a significant margin. This analysis assumes fully loaded vehicles moving in each direction, which is conservative to ensure no underestimation of pavement impacts. Further road-specific analysis indicates that the State-controlled road segments located in Queensland and NSW would have a minimal pavement impact given the duration of construction activities and pavement loading. Detailed pavement design life assessments will be carried out prior to the commencement of construction, in consultation with DTMR, once specific construction routes are agreed in the next phase of the Project. Further detailed assessment will assist in identifying if contributions may be required towards the maintenance costs for the affected road sections as a result of additional pavement loading.
- Seventeen cycle routes are identified in Queensland and NSW that might be impacted by construction traffic. Some of the proposed construction routes are aligned through areas of moderate-to-high pedestrian activity through the areas surrounding the towns of Yelarbon, Inglewood, Millmerran, Brookstead, Pittsworth and Toowoomba. While increased heavy vehicle movements through these locations may adversely impact pedestrian movements, the majority of these routes currently facilitate a high proportion of heavy vehicle movements.
- Only one dedicated cycleway, along the Warrego Highway, (between Tor Street and Kingsthorpe–Haden Road, Charlton/Gowrie Mountain), is directly intersected by the Project alignment. A grade-separated, rail-over-road crossing is provided in the reference design at this location; therefore, there will be no connectivity impacts to this cycleway.
- Eleven public transport services in Queensland and NSW have been identified with routes that are proposed to be used, in part, by construction traffic for the Project. None of the 11 public transport routes traverse, or are in proximity to, the Project footprint. The closest route to the Project is for the Ipswich to Toogoolawah (529) route, approximately 70 km to the east of the Project at its closest point. While roads used by the 11 identified services may be used by construction vehicles, the roads will not require temporary traffic controls; therefore, driving conditions on roads used by public transport services will remain unchanged.
- One hundred and eighty-four existing school bus services share elements of proposed construction routes for the Project. Eleven of these bus services have upgraded or new road–rail intersections included in the reference design for the Project. These services may experience longer journey times due to temporary traffic-control measures, temporary or permanent road realignments and wait times at level crossings. Construction traffic on known school bus routes will be restricted to only essential movements during pick-up and set-down times on school days.
- Eleven existing long-distance coach services share elements of proposed construction routes for the Project; however, the impacts on these long-distance coach services are expected to be minimal due to the low frequency of the services
- The reference design for the Project interfaces with the State stock route network in 12 locations. The reference design for the Project has, in all instances, maintained access for stock route users. This has been provided through either:
  - The provision of a crossing point of the Project alignment in the location of the existing stock route
  - The provision of an alternative means of moving stock.
- In relation to rail operational traffic and maintenance processes, rail operational traffic volumes are likely to be negligible, with no envisaged impact to operational conditions of the surrounding road networks
- The Project alignment is approximately 1 km from the northern end of the runway for the Toowoomba Wellcamp Airport. The Project has been positioned to ensure that double-stacked freight trains will not extend vertically into the obstacle limitation surface for this airport.

The traffic impact assessment will be updated and finalised, in accordance with the process specified in the *Guideline to Traffic Impact Assessment* (GTIA) (DTMR, 2018b), to reflect the detail design, construction method (including material sources and quantities) and the finalised construction traffic routes.

A Traffic Management Sub-plan will be prepared prior to the commencement of construction, as a component of the CEMP, as a joint effort between the Principal Contractor, ARTC, DTMR, local governments and an accredited road-safety auditor, once preferred construction routes are confirmed. The purpose of this sub-plan will be to document the scope of the construction transportation task and to specify management measures and controls to minimise impacts to the existing road network and its users.

Works identified within the Traffic Management Sub-plan may require the preparation of Traffic Control Plans (TCPs), also referred to as Traffic Guidance Schemes. Specific TCPs are required for each separate element of the works identified to be undertaken within the Traffic Management Sub-plan. TCPs detail the traffic control signs, devices and measures to be applied at work sites to warn traffic and guide it through, or past, a work area or temporary hazard.

A Road Use Management Plan (RUMP) will be prepared for the Project in accordance with the GTIA to support works to the existing road network. The RUMP for the Project will identify appropriate traffic and transport management strategies for the use of the State-controlled roads and local government roads for each of the construction stages of the Project, where required.

The Project uses 71.2 km of existing rail corridor for the QR South Western Line and Millmerran Branch Line. The staging of the works, and their associated impacts will be the subject of an interface agreement between the Inland Rail Project and QR. It is currently assumed that proponents can occupy sections of existing corridor to avoid the need for constrained, short-term possession works. In accordance with section 255 of the *Transport Infrastructure Act 1994* (Qld) (TI Act), works cannot commence within the existing rail corridor without QR's written approval. If construction of Project components within existing rail corridor is completed during a temporary possession of the rail corridor, then works will be completed in accordance with the conditions of the temporary possession and/or wayleave agreement granted to ARTC by QR.

23.4.15 Hazard and risk

Hazard identification and risk assessment have been undertaken in accordance with the requirements of *AS ISO 31000:2018—Risk Management Guidelines* (Standards Australia, 2018b). The hazards and risks associated with the Project throughout the design, construction and operation phases have been assessed to identify the potential for impacts to people, property and the environment. This includes risks that may arise from natural events from which impacts could be increased by the Project.

Key hazards that have been assessed in the hazard and risk assessment include:

- Natural hazards: Bushfire, flooding, storms and cyclones, landslides, wildlife, biosecurity, climate change
- Project hazards:
  - Health: Fatigue and stress, asbestos (naturally occurring or in existing infrastructure in the Project footprint), respirable silica and other airborne contaminants, noise and vibration, contaminated land
  - Accidents: Road infrastructure, private access and stock routes, rail infrastructure
  - Safety: Infrastructure and services, unexploded ordnance, bridges, emergency access, abandoned mines.
- Dangerous goods and hazardous substances, associated with:
  - Construction and operation maintenance chemicals
  - Freight transportation of dangerous goods
  - Explosives use in proximity to the Project.

A preliminary risk assessment has been conducted for the Project, in compliance with the requirements of the ToR. The implementation of ARTC risk management policies and procedures are anticipated to effectively reduce most of the risks associated with the Project to a low to medium level. The residual risk that remains with medium risk ranking includes potential incidents related to:

- Bushfire
- Flooding
- Climatic conditions
- Landslide, sudden subsidence, movement of soil or rocks
- Fatigue and heat stress
- Contaminated land
- Rail incidents
- Road–rail interface
- Existing infrastructure and underground and overhead services
- Bridges
- Emergency access
- Freight dangerous goods.

The hazard and risk assessment provided coverage across numerous risks that will be managed through the application of mitigation measures proposed as a result of other technical assessments. Of unique relevance to this assessment is the proposed management of hazards pertaining to dangerous goods and hazardous substances, which will be managed through the inclusion of measures in the CEMP that:

- Identify the materials and chemicals required to be stored and used in support of construction, including volumes of each, such as fuel and oil, greases, blasting chemicals, concreting, welding gases and pesticides
- Specify how dangerous goods and hazardous materials and chemicals will be handled, stored and transported for the Project
- Describe the response procedures in the event of an incident involving hazardous materials and chemicals or dangerous goods
- Establish the waste storage and disposal procedures for hazardous materials and chemicals and dangerous goods.

Occupational hazards will exist throughout the Project, including construction and operation maintenance risks. These hazards will be managed in compliance with the *Work Health and Safety Act 2011* (Qld) (WHS Act) and *Work Health and Safety Regulation 2011*, engineering standards and guidelines, as well as the procedures and work instructions that form part of ARTC's Safety Management System. Ongoing workplace risk assessments will be carried out in accordance with the requirements of ARTC's Safety Management System and the ARTC Fatal & Severe Risk Program.

23.4.16 Waste management

Waste types and volumes that are expected to be generated during the construction phase of the Project have been estimated based on information from the constructability assessment, reference design documentation and bill of quantities for the Project. These details will be subject to further refinement during progression of the detail design, as the construction approach is confirmed.

The ability of identified waste-receiving facilities to receive wastes generated by the Project has been determined based on initial consultation with operators, a review of environmental authority licencing under the EP Act and consideration of the Project's contribution to the regional waste management network. Feedback from consultation with TRC and GRC has indicated that the identified facilities that are owned and/or managed by these councils are expected to have sufficient combined capacity to accept waste materials generated by the Project. The confirmation of waste acceptance criteria and available/permissible annual disposal rates will be undertaken in consultation with the relevant operator once the construction schedule and sequencing are confirmed.

Project impacts that relate to waste management have been identified, as follows:

- Waste disposal additional to current levels, resulting in increased consumption of airspace and reduction of community access to waste facilities surrounding the impact assessment area
- Uncontrolled release of waste from the improper storage or failure of management systems resulting in contamination of receiving environments (i.e. land, surface water and air)
- Increase in the incidence of vermin, insects and pests from the inappropriate storage and handling of putrescible wastes
- Reduced visual amenity of land uses adjacent to the Project
- Increased transportation of waste materials onsite and offsite, resulting in:
  - The increase of greenhouse gas emissions (GHG) due to the combustion of hydrocarbons from the operation of vehicles/plant
  - Decreased amenity of land uses adjacent to the Project from the generation of dust and road deterioration.
- Risks to human health and safety of site personnel, through the release of pollutants from the poor management of regulated wastes.

The construction of the Project will generate several waste streams that will be managed by maximising opportunities to avoid or reduce, reuse and recycle; however, there will be waste streams (including municipal solid waste arising from non-resident workforce accommodation facilities) for which this cannot be achieved, and these will be disposed of within appropriately licensed facilities.

Wastes generated during Project operation are expected to be typical of the current networks of freight rail. Waste quantities during this phase of the Project are not considered significant and are able to be managed using recognised and proven methods.

23.4.17 Cumulative impacts

Technical assessments that comprise the draft EIS have considered existing operational projects where they are located within the defined impact assessment area for each of the studies. Consequently, existing, operational projects have been accounted for in the impact assessment of the Project; therefore, the cumulative impact assessment only considers projects that meet one of the selection criteria listed below:

- Projects that have been approved but where construction has not commenced
- Projects that have commenced construction subsequent to issuance of the ToR for the Project but have potential for overlap in construction activities with the Border to Gowrie Project
- Projects that have been completed subsequent to issuance of the ToR for the Project
- Are operational developments that have future plans for expansion
- Projects that are currently being assessed as 'coordinated projects for which an EIS is required' under the SDPWO Act.

Twenty-three projects were identified for preliminary consideration for their potential to contribute to cumulative impacts, in combination with the Project. Projects that are already operational would not traditionally be considered in a cumulative impact assessment as their operation would typically be included in baseline assessments for an impact study; however, seven projects regarded as operational have been included in the initial list for preliminary consideration for cumulative impact potential in response to feedback from consultation during the EIS process. In some instances, operational projects have known or potential expansion plans, e.g. Commodore Mine; such projects have warranted consideration through cumulative impact assessment. Other operational projects did not progress beyond preliminary consideration.

The cumulative impact assessment identified that cumulative impacts may arise in association with the following specific matters:

- Land resources
- Landscape and visual amenity
- Flora and fauna
- Surface water
- Noise and vibration
- Non-Indigenous heritage
- Traffic, transport and access
- Hazard and risk
- Waste
- Social.

Where the potential for cumulative impacts have been identified with the adjoining projects in the Inland Rail Program, the North Star to NSW/Queensland Border Project and the Gowrie to Helidon Project of the Inland Rail Program, it is proposed that these potential impacts be managed through a combination of mitigation measures proposed for the Project, in isolation, in addition to the implementation of Program-wide management measures. These will be consistent with the Inland Rail Environment and Sustainability Policy and environmental management framework contained within the Outline EMP for the Project.

ARTC will also facilitate communication between principal contractors of adjoining Inland Rail packages to ensure that construction methodologies and the scheduling of activities are compatible with one another and do not exacerbate the potential impacts of a single project.

Where cumulative impacts have been identified with other projects outside of the Inland Rail Program, individual proponents will be invited to participate in the Community Reference Group established for the Project. This will provide opportunities to verify outcomes of the cumulative impact assessment and, if necessary, identify further mitigation measures which can be implemented by ARTC within their area of control.

It is proposed that monitoring be undertaken during construction of the Project that is scheduled (i.e. groundwater, surface water and ecology) or in response to complaints (i.e. air quality, noise). Results obtained from these monitoring events will be compared to baseline data established during the detail design phase of the Project. Where exceedances in adopted criteria are observed, ARTC will investigate the cause of that exceedance. If the exceedance is found to be attributed to by non-Project activities, then one of the following actions may be taken:

- If the recorded impact is contributed to by coincident short-term activities, ARTC will consult with the proponent of the contributing activity to establish a shared understanding of activities and schedules to avoid the future compounding of impacts.
- If the recorded impact is contributed to by long-term activities by one or more developments, then additional measures may have to be implemented to mitigate impacts that are within ARTC's control. These additional measures would be bespoke to the type of impact, and the receptor(s) that is/are impacted.

Due to the nature of projects included in the cumulative impact assessment (i.e. mostly coordinated or otherwise assessable rail and road upgrades and high-density industrial infrastructure development), it is anticipated that this process of assessing potential cumulative impacts will occur for all of these projects, i.e. each of the projects will also be required to mitigate and manage potential cumulative impacts to acceptable levels.

23.5 Principles of ecologically sustainable development

Ecologically sustainable development refers to using, conserving and enhancing the community's resources so that ecological processes are maintained and the total quality of life, both now and in the future, can be increased. There are four principles of ecologically sustainable development, described in Sections 23.5.1 to 23.5.4:

1. Precautionary principle
2. Principle of inter-generational equity
3. Conservation of biological diversity and ecological integrity
4. Improved valuation and pricing of environmental resources.

Environmental, social and/or economic impacts (positive and negative) are inevitable for a project of this scale and complexity. During Project development, the four principles of ecologically sustainable development were used to identify potential impacts and develop mitigation measures that afford equal weighting to environmental, social, economic and engineering opportunities and constraints.

23.5.1 Precautionary principle

The precautionary principle stipulates that if 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. In applying the precautionary principle, decisions should be guided by:

- Careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment
- An assessment of the risk-weighted consequences of various options.

The assessment of potential impacts has been based on best practice, using the best available information. The assessment has involved key stakeholders and the relevant government agencies.

The EIS has undertaken a conservative and worst-case approach to identifying the potential impacts of the Project, including cumulative impacts. Examples of a conservative approach to assessment include:

- The Project footprint that has been nominated in this draft EIS and has formed the basis of assessment for many specific matters, has been developed to include all land that is foreseeably required to enable the safe and efficient construction, operation and maintenance of the Project. The Project footprint will be refined through the detail design phase. The final Project footprint is expected to be less than what has been nominated in this draft EIS.
- Unless evidence was available to confirm that a species or habitat type does not occur in proximity to the Project, the flora and fauna assessment has assumed that these ecological matters have potential to occur within the Project footprint
- Operational air quality modelling has been developed on the assumption that all existing emission sources within the regional air shed are compliant with the emission thresholds of their environmental authority
- The assessment of flooding impacts and sensitivity testing has considered the effects of climate change on a 1% AEP scenario. For this purpose, an RCP8.5 scenario has been adopted, which is the worst-case climatic scenario for 2090.
- Predictive models for groundwater seepage and drawdown have been developed by adopting the upper limit of parameter ranges as input data. Model outputs have also been subject to sensitivity testing to compare model outputs with different sets of reasonable parameter estimates to allow for more accurate predictions.
- Construction noise and vibration assessment has assumed that the loudest and most vibratory plant or equipment will be positioned on the outer boundary of the Project footprint. By doing so, the assessment has considered the shortest distance between the worst noise or vibration source and sensitive receptors.
- Buffer factors have been applied to each transportation task to allow for additional journeys that may be required as a result of factors such as material quality compliance issues, breakages etc. These buffer factors also cater for potential minor changes to material volumes resulting from design and rail alignment updates (horizontal or vertical).

23.5.2 Intergenerational equity

The principle of intergenerational equity is that the present generation should ensure that the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations.

The Project is aligned with the principle of intergenerational equity in the following ways:

- Avoidance or minimisation of environmental and social impacts was a determining factor in establishing the Project footprint. This will ensure that environmental values (hydrological regimes, water quality, habitat connectivity, cultural heritage sites, etc.) are conserved for existing and future generations.
- Climate change projections were factored into flood modelling for the Project, and climate-change specific mitigation measures are proposed
- A Sustainability Management Plan will be implemented for the Project, which will include engaging meaningfully with stakeholders, promoting long-term economic benefits and training and development opportunities for local residents (refer Section 23.7.1).

The need for Inland Rail is well documented. As part of the wider Inland Rail Program, the Project would benefit existing and future generations by providing a safer, more efficient, means of transporting freight between Melbourne and Brisbane, with corresponding benefits and opportunities for economic growth, connectivity to markets and reduced prices for consumer goods.

Should the Project (and therefore the full Inland Rail Program) not proceed, the principle of intergenerational equity may be compromised. Future generations would experience increasingly worse safety and environmental impacts due to continued growth in road transport between Melbourne and Brisbane, particularly along the Newell Highway.

23.5.3 Conservation of biological diversity and ecological integrity

A broad range of sustainability initiatives were identified and incorporated into the Project during the development of reference design, which included avoiding environment features, where possible, by minimising the Project footprint.

Impacts on biological diversity and ecological integrity have been avoided to the greatest extent possible. For example, multiple investigations that considered a conservative worst-case scenario were completed to verify the presence of threatened species and ecological communities within the impact assessment area. The results were used to inform development of the reference design and opportunities for fauna movement provision and fencing.

Other ways in which the Project minimises impacts to the conservation of biological diversity and ecological integrity include:

- Adoption of a crossing structure hierarchy during design development. Preference was given to bridges over culverts as, on the whole, bridges result in less severe impacts to fauna passage.
- Consideration was given to the *Accepted development requirements for operational work that is constructing or raising waterway barrier works* (DAF, 2018e) when designing bridges and culverts across mapped Queensland waterways for waterway barrier works
- ARTC has developed an Inland Rail Landscape and Rehabilitation Strategy, which establishes landscape objectives and principles and outlines landscape and rehabilitation treatments for various phases of the Inland Rail Program. A Rehabilitation and Landscaping Management Sub-plan will be developed as a component of the CEMP to guide the approach to rehabilitating disturbed areas. Rehabilitation will occur progressively throughout the construction phase, as land becomes available.
- Other sub-plans that will be developed to minimise potential impacts on biodiversity during the construction phase, as components of the CEMP, include:
  - Biodiversity Management Sub-plan (includes species and habitat management measures)
  - Biosecurity Management Sub-plan (includes weed management procedures)
  - Soil Management Sub-plan (includes erosion and sediment control measures).

There is the potential for some Project activities to have a cumulative, irreversible and/or permanent impact on some ecological receptors, even after the implementation of all mitigation measures. In these cases, compensation for the residual impact will need to occur.

The significant adverse residual impact to habitat for MNES and MSES will be re-calculated for the Project at the conclusion of the detail design process and once the Project footprint is confirmed. Re-calculated impacts will be used to confirm the Project's offset obligations under Australian Government and State requirements. ARTC's Environmental Offset Delivery Strategy—Queensland will then be finalised in consultation with relevant Australian Government and State regulatory agencies.

23.5.4 Improved valuation, pricing and incentive mechanisms

The principle of improved valuation, pricing and inventive mechanisms requires that environmental factors should be included in the valuation of assets and services, such as:

- Polluter pays—those who generate pollution and waste should bear the cost of containment, avoidance or abatement
- The users of goods and services should pay prices based on the full life-cycle costs of providing goods and services, including the use of natural resources and assets and the ultimate disposal of any waste
- Environmental goals, having been established, should be pursued in the most cost-effective way, by establishing incentive structures, including market mechanisms, that enable those best placed to maximise benefits or minimise costs to develop their own solutions and responses to environmental problems.

It is difficult to place a monetary value on the Project's environmental impacts; however, the value placed on environmental resources within and surrounding the Project is apparent in the breadth and depth of environmental investigations undertaken to inform the reference design and impact assessment.

The costs associated with environmental design and mitigation measures have been built into the overall Projectcost.

23.6 Project aspects to be developed

Assessments documented in this draft EIS have been undertaken based on the reference design. The design will be subject to refinement and finalisation through the next phase of the Project—detail design. Through this next phase of design refinement, there are a number of Project aspects which will be developed further. These are summarised in Table 23.5.

In recognition of the current status of design, the assessments completed for this draft EIS have adopted a conservative approach, where possible, to ensure that future modifications and refinements to the design do not result in impacts greater than those predicted at this stage.

The final construction activities, sites and sequencing will be determined during the detail design, considering site-specific environmental and engineering constraints, and the Principal Contractor's preferred methods. It is expected that construction and operation of the Project will be within the parameters and scale of impacts approved through the EIS. Changes to the Project that are beyond the assessment would need to progress through a request for project change process.

TABLE 23.5 MAIN PROJECT ASPECTS TO BE DEVELOPED

Project aspect	How aspect will be developed
Project footprint, including areas that need to be acquired	The Project footprint that has been nominated in this draft EIS has been developed to include all land that is foreseeably required to enable the safe and efficient construction, operation and maintenance of the Project. The Project footprint will be refined through the detail design phase. The final Project footprint is expected to be less than what has been nominated in this draft EIS.
Final level crossing design	In the development of the proposed road–rail interface treatments, ARTC have taken into consideration State and national guidelines and strategies. Both the ONRSR and DTMR have policies that focus on avoiding, where possible, the installation of new level crossings. While ARTC has sought to limit the number of new level crossings in the reference design, the Project includes lower-risk level crossings where the road–rail interface treatment assessment has concluded that the risk to safety has been minimised so far as is reasonably practicable (SFAIRP). Further review of proposed crossings will occur during detail design to confirm the design solution for road–rail interfaces, with consideration for input from affected landowners and stakeholders.
Utilities—impacts to utilities to be defined in detail	All utility owners have been consulted by ARTC during the reference design process to establish potential interface impacts and to identify initial design solutions, which have been incorporated into the reference design. Consultation with utility owners will continue through the detail design phase of the Project to further verify interface impacts and to confirm appropriate interface treatments. An additional utilities survey will be undertaken during detail design to confirm asset locations, validate current assessments and confirm relocation/protection requirements. All treatments, relocations and protection requirements will be incorporated into the detail design and will be confirmed through further consultation with the relevant asset owners.
Cross-drainage configuration	Cross-drainage structures, including culverts, have been incorporated into the reference design to enable the Project to achieve the flood immunity specified in the Basis of Design of a 1% AEP event. Culverts incorporated into the design are a mix of reinforced concrete pipe culverts and reinforced concrete box culverts. The location and design of culverts will be refined, if required, during the detail design phase to reflect design changes through that process.
Signalling and communications	The Project will be operated using ATMS, a communications-based safe working signalling system currently being developed by ARTC. The ATMS will consist of signalling and communications equipment to ensure the safe movement of trains on the Inland Rail network. The ATMS will replace the Direct Traffic Control signalling system operation on sections of replaced QR track. This will interrupt the current continuous Direct Traffic Control operation along QR's network. The interoperability of the ATMS with QR's network will be confirmed through consultation with QR and incorporated into the detail design for the Project.
Vertical alignment of the railway	The vertical alignment has been established through the reference design to achieve the target maximum railway gradient of 1:100 and to withstand a 1% EAP event, without overtopping of the formation; however, there are localised opportunities for minor alterations to the vertical alignment. This will be refined and confirmed during detail design in reference to additional geotechnical data and consultation with key stakeholders, such as asset owners (linear infrastructure and utilities).
Bridge structure design	Bridge design is intrinsically linked with the vertical alignment of the railway, and bridges have been designed to reflect localised topographical and hydrological conditions. The design of bridge structures will be refined through the detail design phase to reflect modifications to the vertical alignment (refer above) in addition to localised geotechnical and hydrological conditions.
Fencing strategy	A preliminary fencing strategy has been nominated for the Project in the reference design. This strategy has been developed to acknowledge that the Project will require various fencing types to reflect local risks, such as biosecurity, trespass and flooding. The finalised fencing approach for the Project will be location specific. The preliminary proposal at each location will be confirmed through continued consultation with potentially affected landowners, operators and asset owners that adjoin the rail corridor.

Project aspect	How aspect will be developed
Impacts to QR assets	A survey of existing QR assets within the Project footprint will be required to locate all existing rail infrastructure components and determine their type, size, materials and condition. Such assets may include turnouts, signalling systems, culverts, sleepers, rail and ballast. This survey will inform project decisions on the ability to reuse or the need to protect, remove or relocate existing QR assets. Where an existing asset requires protection, removal or relocation, these works may be conducted as a pre-construction activity if safe to do so for continued network operation.
Precast concrete facility and concrete batch plant	Two locations have been identified for the temporary siting of a precast concrete facility and concrete batch plant for the Project and allowed for in the Project footprint. While two locations have been nominated, only one plant is expected to be necessary to supplement the supply of concrete from established plants. The proposed locations are immediately north and south of the Condamine River floodplain outside the 1% AEP flood line. Onsite concrete batching will greatly reduce the number of vehicle movements required to transport precast and in-situ concrete to worksites within the Project footprint from established concrete suppliers. This will lessen the Project's contribution to traffic volumes on the local road network, as well as reducing vehicular emissions.
Construction water	Significant volumes of water will be required for various activities associated with construction along the entire project alignment, including for earthworks, concrete production and track works. ARTC recognises water sourcing and availability is critical to supporting the construction program for the Project. Sources of construction water will be finalised as the construction approach is refined during the detail design and tender phases of the Project (post-EIS). The construction methodology will be driven to adopt approaches that minimise the use of water, and will be dependent on: ▸ Climatic conditions in the lead up to construction ▸ Confirmation of private water sources made available to the Project by landowners under private agreement ▸ Confirmation of access agreements with local governments for sourcing of mains water. An assessment of the suitability of each source will need to be made for each construction activity requiring water, based on the following considerations: ▸ Legal access ▸ Volumetric requirement for the activity ▸ Water quality requirement for the activity, e.g. non-resident workforce accommodation will need potable water ▸ Source location relative to the location of need.
Borrow pits locations and usage	Borrow pit locations that could be used to supplement the material demand for the Project have been identified in the draft EIS. These locations have been identified as within reasonable haulage distance of the Project footprint and would enable the sourcing of material for construction from locations closer than from pre-established quarries and other source points. The requirement to use material from borrow pit sources will be confirmed through the refinement of the construction approach and will be supported by landowner consultation, required approvals and additional geotechnical investigations to confirm the volume and adequacy of materials at each location.
Non-resident workforce accommodation locations and layout details	An initial assessment of workforce demand and safe commutable distances has identified a potential need for non-resident workforce accommodation in the vicinity of Yelarbon, Inglewood and Millmerran. The provision of non-resident workforce accommodation in these locations would lessen the burden that would otherwise be placed on existing accommodation supply within these townships, while providing opportunities for local business. Three properties in proximity to these townships have been identified as suitable for the establishment of non-resident workforce accommodation. ARTC have consulted with the landowners of the three properties, each of whom are receptive to the idea of a non-resident workforce accommodation being located on their property. At a minimum, each non-resident workforce accommodation facility will be self-contained and will include accommodation units with kitchen, dining, ablution, laundry facilities.

23.7 Approach to environmental management

23.7.1 Sustainability

The Inland Rail Environment and Sustainability Policy (refer Appendix E: Corporate Environment and Safety Policies) outlines sustainability objectives, targets and commitments for the Inland Rail Program, including this Project. This includes the implementation of a Sustainability Management Plan, and the pursuit of an 'excellent' rating, corresponding to a score of 50 to 74 points, against version 1.2 of the Infrastructure Sustainability Council of Australia (ISCA) Infrastructure Sustainability (IS) Rating Scheme for the Program. Some of these initiatives include:

- Establishment of a Program-wide sustainable network to enable the sharing of lessons learnt between projects and with the broader industry
- Establishment of a Program-wide sustainability supply chain program, building on existing sustainability supply chain initiatives
- Balancing of materials across Project boundaries, including the exchanging of surplus fill, aggregates, pipe work and common-use materials between projects
- Use of already constructed sections of the Inland Rail network to assist with the transportation of materials including tracks and sleepers
- Skills development and training partnerships with registered training organisations and schools that enable apprentices and vocational education, and train students to continue skills development beyond the life of the Project
- Partnering with key material providers (e.g. providers of rails and sleepers) to pursue innovation opportunities, including encouraging the uptake of environmental labelling schemes
- Identifying Program-wide mitigation and adaptation strategies, including those associated with the operation phase.

23.7.2 Environmental management plans

All work associated with the Project will be in accordance with relevant ARTC corporate policies (Inland Rail Environment and Sustainability Policy, ARTC Environmental Policy and ARTC Safety Policy) and core values (no harm, future thinking, active engagement and results).

An Outline Environmental Management Plan (Outline EMP, refer Chapter 22: Outline Environmental Management Plan) has been prepared for the Project, which acts as a framework for ensuring:

- Applicable environmental approvals and licences are secured in a cost- and time-effective manner
- Compliance with the Project commitments and conditions of approval imposed on the Project
- Negligent harm to the environment is avoided
- Due consideration is given to the local community and stakeholders.

Detailed environmental management plans for the construction and operation phases of the Project will be prepared based on mitigation measures documented in the Outline EMP, proponent commitments (refer Appendix Z: Proponent Commitments) and any conditions of approval imposed on the Project. The environmental management plans will be supported by sub-plans that address specific aspects or impacts, such as soil erosion and sedimentation, dust, noise and vibration, surface water quality, traffic, safety and emergency procedures and stakeholder consultation.

Monitoring, auditing and reporting will ensure that Project activities are carried out in accordance with the environmental management plans. Should non-compliances be identified, corrective actions will be taken as soon as practicable. The environmental management plans may also be updated over time as a result of:

- Progression of the Project
- Continuous improvements and corrective actions
- Changes to legislation, regulations or Project approvals.

23.8 Concluding statement

The Border to Gowrie Project, and the Inland Rail Program as a whole, provides a 'step change' opportunity to revolutionise the capacity and mode of freight travel in Australia. Inland Rail offers a safe and sustainable solution to existing freight bottlenecks and provides opportunities for complementary development to maximise the economic growth opportunities associated with the Project.

There are key advantages in providing for a mode shift of freight to rail, including:

- Increased capacity of the east-coast road network, with reduced maintenance and deferred upgrades required
- Increased safety in the road network, with each freight train capable of moving the equivalent of 110 b-doubles
- Re-distribution of road traffic, resulting in less heavy vehicle movement through many urban centres
- Reduced fuel consumption and GHG emissions.

As part of the wider Inland Rail Program, the Project will help relieve pressure on existing road and rail corridors by providing a continuous rail freight route between Melbourne and Brisbane. The service offering will be competitive with road freight (i.e. a Melbourne to Brisbane transit time of less than 24 hours, with a reliability of 98 per cent), and will better connect regional farms with international export markets.

The draft EIS has undertaken a conservative, worst-case approach to identifying the potential impacts of the Project, including cumulative impacts. Where environmental impacts have been identified through the assessment process, efforts have, in the first instance, been made, when practicable, to avoid or minimise those impacts through development of the reference design. Where residual impacts remain, further mitigation measures have been nominated for implementation during future phases of the Project. Those measures will be implemented through the development of detail design and the CEMP framework as the Project proceeds to construction.

Opportunities have also been identified through the assessment to maximise the potentially significant economic and social benefits of the Project, through local employment, local industry participation and opportunities for complementary investment that provides for continued community benefit.

Although the Project footprint will be refined through detail design to minimise the amount of clearing and disturbance to the greatest extent possible, it remains likely that there will be significant residual impact on some habitats, requiring offset. ARTC proposes to provide its offset obligation post-EIS, following the detail design. ARTC has developed a Draft Environmental Offset Delivery Strategy—Queensland (refer Appendix N: Draft Offset Strategy), which will be revised and finalised to reflect significant residual impacts calculated at the conclusion of the detail design phase. The Environmental Offset Delivery Strategy—Queensland will be finalised in consultation with relevant Australian Government and State regulatory agencies.

Overall the Project, and Inland Rail, provides a significant opportunity to provide long-term and substantial economic benefits for Australia's future, by connecting regional and urban markets to buyers and increasing the capacity of the existing passenger and road network.

It is recommended that the Project should proceed, subject to reasonable and relevant conditions that reflect the Proponent Commitments as listed in Appendix W of the EIS.