TOWNSVILLE EASTERN ACCESS RAIL CORRIDOR

DETAILED BUSINESS CASE

November 2017

D18/1342

ABOUT THIS DOCUMENT

Building Queensland finalised the Townsville Eastern Access Rail Corridor Project Detailed Business Case in November 2017. Core elements of the Detailed Business Case are presented in this document.

This document has been publicly released to ensure that stakeholders and community members are aware of the outcomes of the Detailed Business Case, and have access to information that supports these outcomes. Commercially sensitive information has been removed to protect the State's commercial position during future project stages.

This detailed business case has been prepared with the support of funding from the Australian Government under the *Townsville City Deal (2016).*

A glossary is provided following the recommendations chapter.

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EXECUTIVE SUMMARY

The planning and development of the Port of Townsville (PoT) and improvements to the Mount Isa Line, including rail access to the port via the Townsville Eastern Access Rail Corridor (TEARC), are priorities of the Australian Government, Queensland Government, Townsville City Council and are significant drivers of economic development in Northern Queensland.

The Queensland Government made a commitment to improving port access with the establishment of the Eastern Access Corridor as a multi-modal road and rail corridor, providing direct access to the port from the Mount Isa and North Coast Lines and the State road network. A further commitment was made to develop a detailed business case investigating the viability of a new freight rail link with greater capacity connecting the Mount Isa line and North Coast line to the PoT—the TEARC Detailed Business Case (DBC).

The TEARC DBC has been prepared by Building Queensland in partnership with the project owner—the Department of Transport and Main Roads (TMR). The business case investigated shortlisted project options and delivery models identified during the preliminary evaluation stage. Changes in domestic policies, urban needs and economic factors have meant the service need for TEARC has evolved. Earlier investigations assessed the feasibility of the project in meeting rail demand forecasts and improving urban amenity. More recent policy developments through the *Townsville City Deal (2016)* have moved the emphasis toward addressing the need to grow the 'competitiveness' of Townsville.

The Preliminary Evaluation Report (2011) for TEARC was prepared during the mining boom where the medium to high demand port projections were from 10 to 15 million tonnes per annum (mtpa), excluding coal exports. At the time, an additional 10mtpa of coal export was forecast for the port and considered in the TEARC preliminary evaluation economic sensitivity analysis.

The preliminary evaluation identified several service requirements for TEARC: meet growing demand on the Mount Isa Rail System, facilitate the use of 1,400-metre long trains, reduce bottlenecks in the PoT; and improve urban amenity for Townsville. These needs have been reassessed in this DBC. The Mount Isa Line that was included in the preliminary evaluation, is not included in the Reference Project, as the service need for 1,400-metre long trains is not required.

Actual freight rail volumes accessing the PoT were approximately 8.5mt in 2016, with 3.5mt consisting of general freight, 3.4mt minerals and 1.3mt sugar. The total freight rail volumes were up to 13.1mt in 2015 prior to the closure of the QNI nickel refinery, which at its peak amounted to over 3mtpa through the PoT.

The TEARC DBC adopts the following freight rail and road demand projections for the economic assessment (excluding coal, nickel and magnetite) to 2051:

- 8.3mtpa (2017), declining to 7.6mtpa (2051), peaking at 10.6mtpa (2037) (Scenario 1 – Central demand scenario)
- 8.2mtpa (2017), declining to 5.8mtpa (2051) (Scenario 2 – Low demand scenario)
- 8.8mtpa (2017), increasing to 13.5mtpa (2051), peaking at 14.8mtpa (2037) (Scenario 3 – High demand scenario).

The Base Case scope includes the rail infrastructure from the Sun Metals Branch Line, via the North Coast Line to the Jetty Branch and associated road infrastructure. The Base Case excludes the Mount Isa Line to Townsville, the North Coast Line south of the Sun Metals Branch Line and north of the Jetty Branch. It also excludes the PoT to the port boundary.

Four potential strategic alignment options for TEARC were initially identified for assessment in order to determine the Reference Project. Two of the four options are similar, branching off the North Coast Line at Cluden (Options A and B). The other two options branch off the North Coast Line near the Stuart Industrial Precinct (Option D) and further south near the Sun Metals Branch (Option C) respectively.

- Option A:

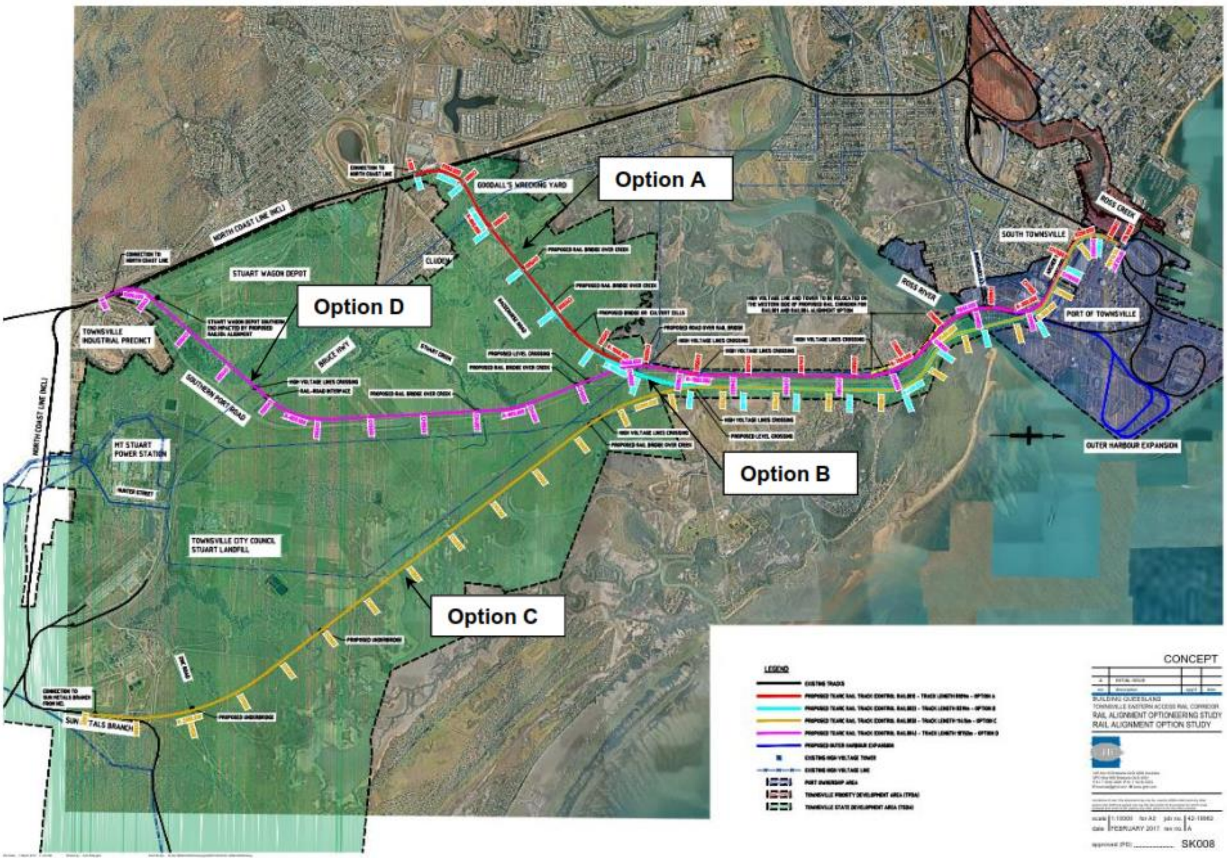
  Branching off the North Coast Line at Cluden, traversing the northern part of the TSDA, and broadly following the Southern Port Road alignment to the west of the Southern Port Road.

- Option B:
  Branching off the North Coast Line at Cluden, traversing the northern part of the TSDA, and broadly following the Southern Port Road alignment to the east of the Southern Port Road.

- Option C:
  Branching off the North Coast Line at the Sun Metals Branch and traversing the southern part of Townsville SDA, before linking up to follow on the eastern of the Southern Port Road.

- Option D:
  Branching off the North Coast Line near the Stuart Industrial Precinct and broadly following Flinders Highway and the Southern Port Road alignment.

TEARC Alignment Options A to D



Following a full assessment of the four options, the preferred option for alignment for the Reference Project was determined to be Option B, branching off the North Coast Line at Cluden, traversing the northern part of the Townsville State Development Area (TSDA), and then broadly follows the Southern Port Road alignment to the east of the road and the Ross River bridge connecting into the port minerals loops. TEARC will comprise 8.3 kilometres of single narrow-gauge track with one passing loop to accommodate a 1,000-metre train, with the capacity to be expanded to provide for up to 1,400-metre trains in the future.

TEARC has been designed to minimise the interaction between the road and rail network to maximise network efficiency and safety outcomes. TEARC is largely aligned with the existing transport corridor through the TSDA previously established to support the Southern Port Road. Some land acquisitions at the Cluden Y-junction, along Racecourse Road and within the port precinct are likely to be required.

A detailed economic analysis was undertaken for TEARC that comprised of a Cost Benefit Analysis (CBA). The CBA measured the incremental direct benefits associated with the TEARC Project against a base ('without' project) case. The CBA for TEARC produced a benefit cost ratio (BCR) of 0.16 with a corresponding net present value (NPV) of negative $226.3 million using a 7 per cent real discount rate.

The increase in activity has a positive impact on job creation, with an average of 207 direct full-time equivalent (FTE) jobs supported for five years because of the TEARC project during planning, design and construction.

The total P90 risk-adjusted project capital and operating costs are $457.7 million in nominal terms and $369.6 million in net present value (NPV) terms.

The delivery model analysis consisted of a three-phased approach:

- high-level Value for Money (VfM) assessment was conducted
- workshop which identified evaluation criteria and weightings for shortlisted delivery models
- workshop where those models were evaluated.

It was determined that the works were best delivered as a single package—Construct Only (CO) and Design and Construct (D&C) traditional delivery models. A Public-Sector Comparator assessment is not required as the delivery of the project via a PPP is unlikely to deliver value for money.

Subject to technical assessments, referral of TEARC under the *Environment Protection and Biodiversity Conservation Act (1999) (Cth) (EPBC Act)* is recommended to provide certainty for TEARC, including providing protection from a future listing event. Regulatory approvals may be required for the construction, delivery and operation of TEARC. Apart from the EPBC Act approval, the approvals are likely to be required as construction proceeds.

While the North Coast Line and Jetty Branch would remain operational with TEARC in place, the implementation of TEARC would reduce the number of trains using the existing rail network which would improve current amenity and safety related impacts and limit future impacts associated with rail traffic growth. This would also limit the amount of time that open level crossings are closed, reducing delays for road traffic.

The DBC recommends that the TEARC Project - Reference Project Alignment Corridor land is preserved and protected for rail access to the PoT and the Port Expansion Project through the following measures:

- amending the existing community infrastructure designation so that it applies to the corridor
- gazettal of the corridor as "future railway land" under the *Transport Infrastructure Act 1994* (Qld)
- ensuring the part of the corridor within the PoT is included in the master plan and port overlay for the PoT once made under the *Sustainable Ports Development Act 2015* (Qld).

The DBC noted that the TEARC Project is not economically viable. On this basis, the DBC recommended that the implementation of the TEARC project be placed on hold pending demand for the project or other requirements determined by the Australian and Queensland Governments.

In addition to the recommendations, the DBC suggested the relevant Queensland Government agencies consider implementing the following activities to facilitate future development of TEARC:

- Ongoing review of TEARC to inform a freight infrastructure investment program for the region as well as ensuring the future development of the Townsville State Development Area and PoT.
- Progress PoT's critical enabling infrastructure in the Eastern Reclamation Area to connect existing and new customer infrastructure arrangements in preparation of TEARC.
- Progress PoT Infrastructure development planning consistently with the findings of the *Port Infrastructure Layout and Land Allocations Study (2016)* and the TEARC DBC.
- Progress with legal and regulatory approval processes to facilitate transition to the TEARC Reference Project Alignment and Port Expansion Project infrastructure arrangements for the PoT existing and potential new customers.
- Progress transport planning activities to capture end to end (North West Minerals Province to PoT) transport supply chain infrastructure considerations and implementation.
- Integrate TEARC Project implementation plans, PoT Port Expansion Project Plans and Queensland Rail Infrastructure Plans to include:
  - the removal of the existing Jetty Branch, upon implementation of the TEARC Project
  - Capture land value uplift in the Townsville City Waterfront Priority Development Area.

1 INTRODUCTION

CHAPTER SUMMARY AND CONCLUSIONS:

- The planning and development of the Port of Townsville (PoT) and improvements to the Mount Isa Line, including rail access to the port via the Townsville Eastern Access Rail Corridor (TEARC), is a key priority of the Australian Government, Queensland Government, Townsville City Council and a significant driver of economic development in Northern Queensland.
- The TEARC Detailed Business Case (DBC) considers the 8.3 km of new rail corridor and associated works. The Base Case and Reference Project scope includes the rail infrastructure from the Sun Metals Branch Line, via the North Coast Line to the Jetty Branch and associated road infrastructure. The Base Case excludes the Mount Isa Line to Townsville, the North Coast Line south of the Sun Metals Branch Line and north of the Jetty Branch. It also excludes the PoT to the port boundary.
- The TEARC DBC has been prepared by Building Queensland on behalf of the project owner the Department of Transport and Main Roads.
- The DBC has been prepared with direction from a Project Steering Committee (PSC) and Project Control Group (PCG). Key stakeholders involved include the Department of the Premier and Cabinet, Department of Transport and Main Roads (TMR), Queensland Treasury, Department of State Development, the Department of Infrastructure, Local Government and Planning, Queensland Rail, the PoT and the Australian Department of Infrastructure and Regional Development. Infrastructure Australia are engaged as observers.
- The DBC has been developed using endorsed government templates and frameworks, including the Building Queensland Business Case Development Framework and the Queensland Government Project Assessment Framework. It also addresses the requirements of the Infrastructure Australia (IA) Business Case Assessment Framework and Queensland PPP supporting Guidelines.

1.1 Introduction

The planning and development of the PoT, including rail access to the Port via the proposed TEARC, is a key priority of the Australian Government, Queensland Government, Townsville City Council and supply chain markets. TEARC is a key commitment of the *Townsville City Deal (2016)*, signed by the Prime Minister, Premier of Queensland and Mayor of Townsville in 2017 to grow the economy of Townsville and the northern region.

The Infrastructure Australia *National Priority List* identified The Mount Isa – Townsville Rail Corridor, including TEARC, as a national priority in 2010. Its significance to economic development was reconfirmed in the 2017 update, and is categorised as “Early Stage - nationally significant issue or problem, but the identification or development of the right solution is at an early stage”.

The PoT plays a significant role in the local, regional and State economy, operating as a freight hub for mining and resources, agriculture, livestock, fuel import, general cargo and supports defence and tourism activities.

In 2016[1] the PoT exported $5.69 billion (3.46mt) and imported $1.62 billion (3.26mt) worth of goods. Of the total $7.31 billion, approximately 80% is transported to and from the port by rail and 20% by road. Rail

[1] Queensland Government Statistician’s Office – Queensland and Australia Trade Data, 2015-16 (2016)

accounts for $5.85 billion worth of goods, most which is transported on the Mount Isa Line, with approximately $0.6 billion (1.4mtpa) of sugar and molasses being delivered from the North Coast line south of Townsville.

The PoT is connected by road and rail corridors. Road access is provided via Boundary Road through Townsville urban core and the Southern Port Road. The existing rail systems servicing the port consists of the North Coast Line which extends north and south of Townsville along the Queensland coast and includes a branch line via the Jetty Branch into the port. The Mount Isa Line connects into the North Coast Line to the Jetty Branch south of Townsville and extends over 1,000 km through north-western Queensland to Mount Isa.

The North Coast Line carries various freight products, including containerised and industrial freight, minerals, livestock, bulk commodities and long-distance passenger services. This includes:

- minerals from the Mount Isa line are transported on the North Coast Line from the Townsville southern suburb of Stuart to the port
- industrial products such as cement and fuel are transported on the North Coast Line from the port to Stuart before joining the Mount Isa Line to Cloncurry and Mount Isa
- sugar and molasses are transported from sugar mills located south of Townsville to the port
- acid is produced and transported from the Sun Metals Refinery located to the south of Townsville to Stuart, before travelling on the Mt Isa Line to the Phosphate Hill fertiliser plant (0.4mtpa)
- in 2016 with the closure of the QNI nickel refinery approximately 3mtpa of nickel laterite ore imports and 15,000tpa of refined nickel have ceased being shipped by rail and the port. This has been taken into consideration in the demand forecast scenarios in Chapter 4.

The Mount Isa Line carries various freight products, including containerised and industrial freight, minerals, livestock and bulk commodities, and long-distance passenger services. The freight (2016 tonnages) consists of:

- copper, lead, zinc, silver and phosphate rock from established mining developments in the North-West Minerals Province of Queensland (2.65mtpa)
- general mining and non-mining related freight (0.8mtpa)
- live cattle transported to the port for export (0.15mtpa)
- acid from Mt Isa to Phosphate Hill (0.7 to 0.9mtpa)
- acid from Sun Metals Townsville to Phosphate Hill (0.4mtpa).

This DBC has reassessed the demand forecast (Chapter 4) for the Mount Isa Line, North Coast Line and the PoT. The Mount Isa Line has sufficient capacity to meet the high demand forecast, the planned upgrade works of the Mount Isa Line has been excluded from the TEARC reference project as the TEARC project does not require extended passing loops as originally envisaged in the PE.

The Queensland Government is currently progressing master planning for the PoT. The PoT has developed their Port Expansion Project (PEP) consistent with the master planning process. The PEP envisages three stages[2]:

[2] Project Overview – Port of Townsville (2017)

Table 1.1 Port of Townsville Project Expansion Project Stages

STAGE	DESCRIPTION
Stage 1 – Channel Widening	Widening of the channel from 92m to between 120m (at the sea channel) and 180m (at the entrance). Dredge material will be beneficially re-used and placed in the Port's new reclamation area (152 hectares). This stage also includes the construction of Berth 12. Planned start date is late 2017 (The State Government has approved the Additional information for the Environmental Impact Statement (AEIS) and partial funding has been committed)[3] with an estimated completion in 2022.
Stage 2 – Swing Basin and Berths	Construction of up to three new berths (14, 15 & 16) and swing basin construction in the Outer Harbour. This stage is estimated to take five years from commencement.
Stage 3 – Swing Basin and Berths	Construction of an additional two berths (17 & 18) and deepening of the channel. This stage is estimated to take five years from commencement. Figure 1.2 shows the expanded port layout following Stage 3 as submitted for the AEIS. The PoT expansion project is not included in this DBC Reference Project for TEARC. Whilst TEARC will interface with port requirements, the detail of those future requirements is to be developed. Hence TEARC must interface to the current port rail network and infrastructure. The DBC is based on assessing the service benefits and economics of the 8.3km of new railway line representing TEARC, and will not include future benefits from the Port Expansion Project.

1.2 Townsville Eastern Access Rail Corridor

The TEARC is a proposed freight rail line to the south of Townsville through the Townsville State Development Area (TSDA) from the North Coast Line to the PoT.

TEARC has a long history with the Townsville Port Access - Impact Assessment Report from 2000[4]. The objective of this study was:

> *…to provide or secure an option to provide environmentally sustainable and socially acceptable landside transport access to and from the Port of Townsville to meet the needs of the Port to the year 2025 and beyond, whilst minimising impact on Townsville's central and residential areas.*

Many options were studied and the recommendation was for the Eastern Corridor to be reserved for future road and rail access. It was recognised at the time (2000), there was not a "pressing need" to do anything further based on the capacity i.e. demand needs.

Subsequent studies, policies and investigations on the PoT and road and rail access corridors are outlined in Chapter 2. The need for TEARC has been fundamentally based on the forecast demand for imports and exports through the PoT and how best to service the freight task for the port for road and rail. All studies have investigated and assessed the environmental sustainability and social acceptance in recommending the engineering solution.

[3] PoT (September 2017)
[4] Impact Assessment Study – Maunsell (2000)

The *TEARC Preliminary Evaluation: Economics and Market Sounding (2011)*[5] was prepared on behalf of Queensland Rail (QR) and was the last study completed prior to the State Government request to Building Queensland to deliver this DBC. Hence the Preliminary Evaluation (PE) was used as the Preliminary Business Case and starting point for this DBC.

The preferred corridor (Reference Project) as shown in Figure 1.1, is an 8.3 km alignment connecting from Cluden on the North Coast Line and extends north-eastward through the TSDA for approximately 3.5 km, before joining the existing Eastern Access Corridor and running northward parallel to Southern Port Road to the port. This alignment consists of a narrow gauge single-track formation with one passing loop accommodating a 1,000m train (with corridor provision for the future extension of the passing loop to accommodate trains up to 1,400m). The alignment includes eight rail bridges and the following road realignments:

- Abbott Street at Cluden including grade separation and road over rail bridge
- Townsville Port Access Road including grade separation and road over rail bridge
- Racecourse road and road bridge over Stuart Creek
- Boundary Street from Benwell Road to Windlass Crossing.

Various alignment options within the investigation areas were considered as shown in Figure 1.1. From the North Coast Line to the Ross River four options were investigated. North of the Ross River and into the port, a number of alignment options were considered to provide effective port-rail interface and minimise social and environmental impacts.

[5] Preliminary Evaluation Report – GHD (2011)

Figure 1.1 Townsville Eastern Access Rail Corridor (Reference Design)

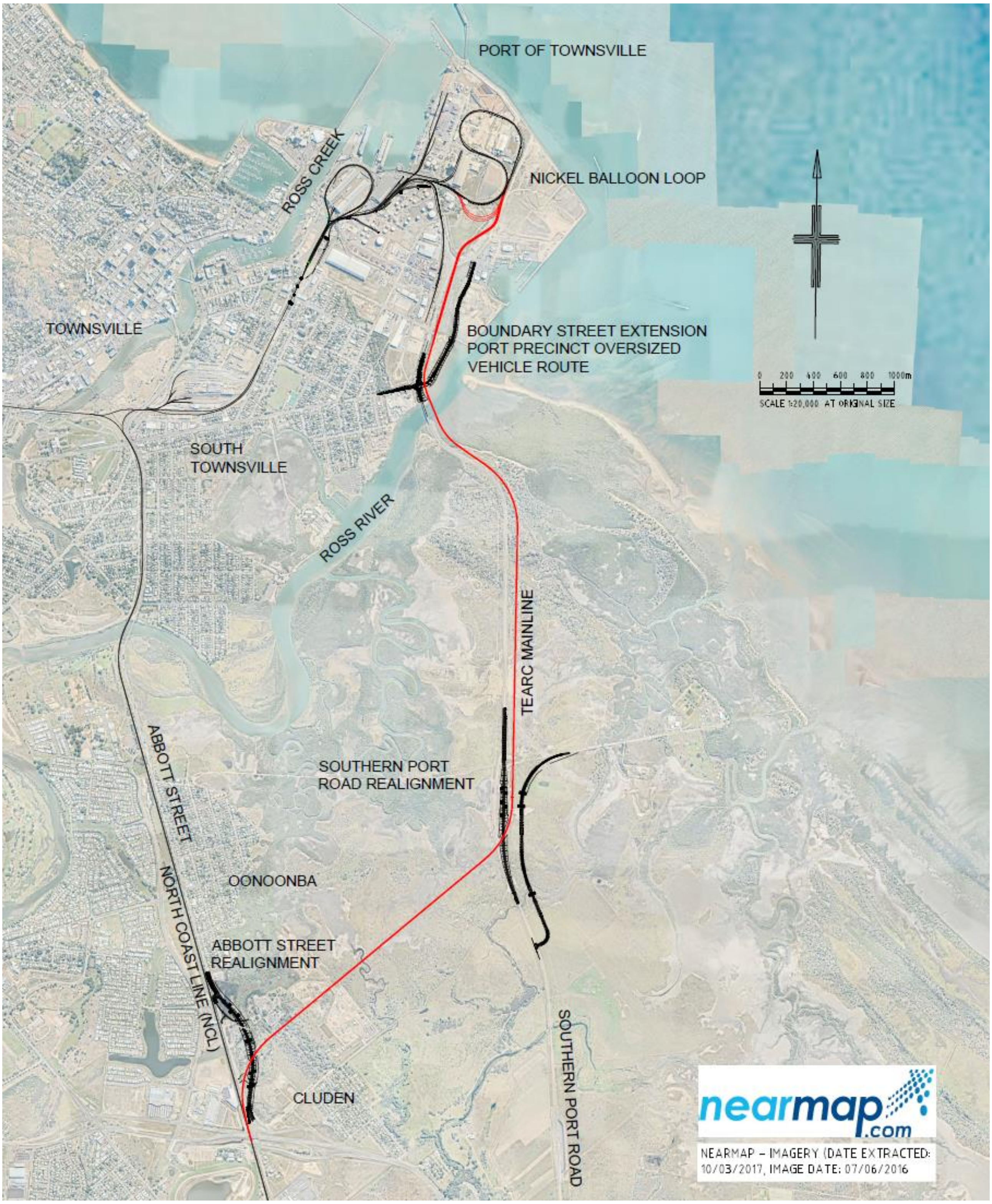
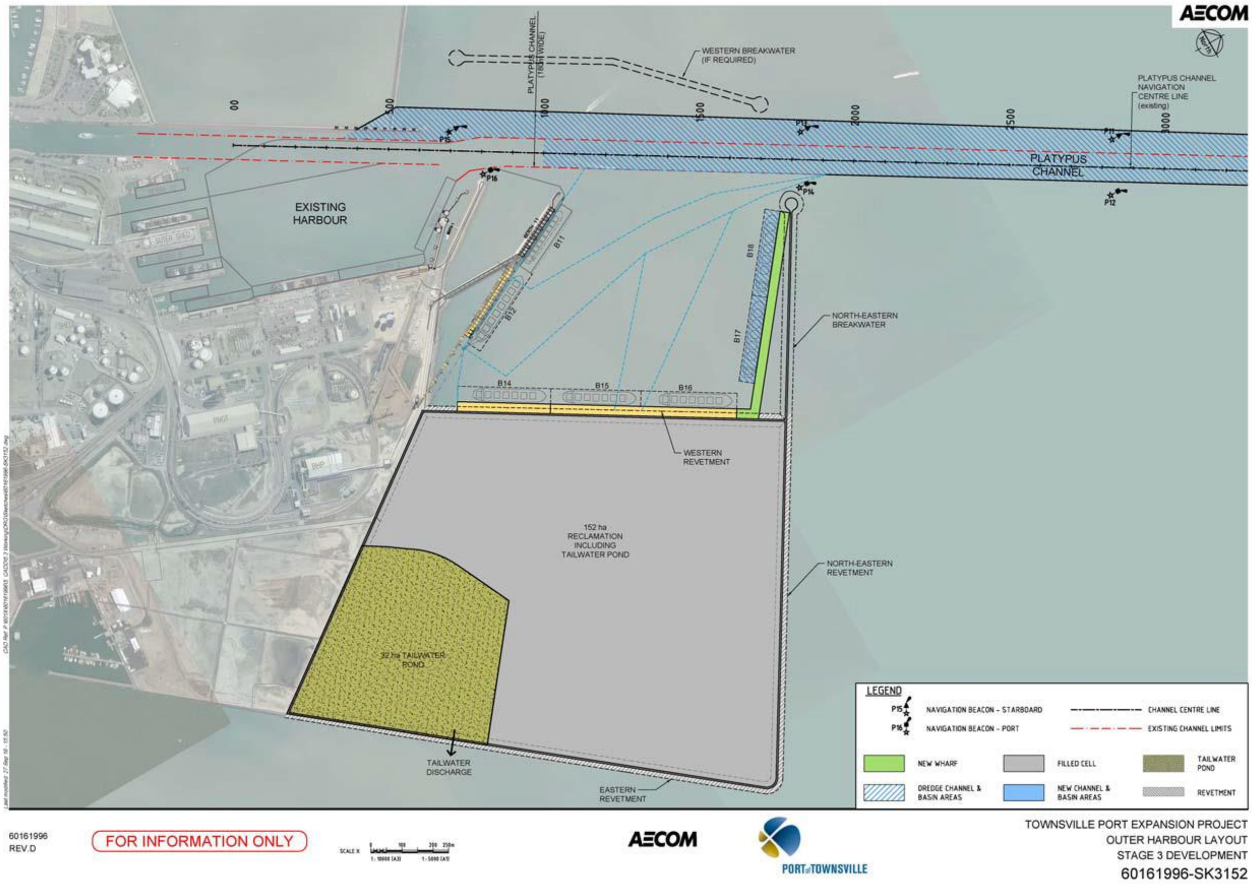


Figure 1.2 Port Expansion Plan AEIS Stage 3 Layout



1.3 Project Governance and Management

1.3.1 Project Governance

The TEARC DBC has been prepared by Building Queensland on behalf of the project owner, the Department of Transport and Main Roads (TMR).

The DBC has been prepared with direction from a PSC and PCG involving the following key stakeholders:

- Department of Transport and Main Roads (TMR)
- Department of the Premier and Cabinet
- Queensland Treasury
- Department of State Development
- Department of Infrastructure, Local Government and Planning
- Queensland Rail (QR)
- Port of Townsville
- Australian Department of Infrastructure and Regional Development

Infrastructure Australia were observers to the PSC. Details of the roles of each of the governance bodies is provided in Table 1.2.

Table 1.2 Roles of governance and oversight bodies

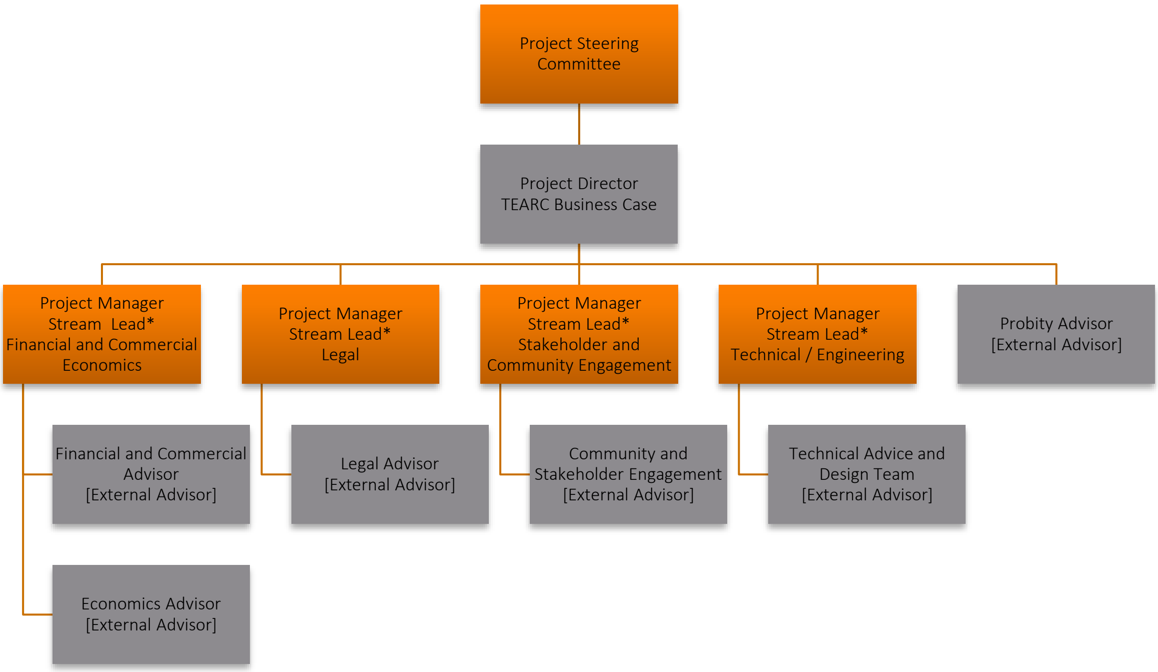
GOVERNANCE LEVEL	ROLE
Queensland Cabinet	▪ Consider the DBC and determine the nature of any further government consideration required to make a decision on the future of the project
Cabinet Budget Review Committee	▪ Consider the DBC and determine the nature of any further government consideration required to make a decision on the future of the project
Infrastructure Cabinet Committee	▪ Consider Building Queensland's advice provided through the DBC and consider its alignment with the State Infrastructure Plan and other state infrastructure priorities
Deputy Premier, Minister for Infrastructure, Local Government and Planning and Minister for Trade and Investment	▪ Receive the DBC and Building Queensland Board Report on the DBC
Minister for Transport and the Commonwealth Games	▪ Receive the DBC from the TMR
Minister for Disability Services, Minister for Seniors and Minister Assisting the Premier on North Queensland	▪ Receive the DBC from Building Queensland upon approval from the Deputy Premier
TMR	▪ Receive the DBC from Building Queensland upon endorsement from the Building Queensland Board
TEARC Business Case Stage PSC	▪ Provide leadership and direction to the development of the DBC ▪ Acting on advice from stakeholder agencies, endorse key elements of the DBC as it is developed ▪ Consider major issues and risks associated with the project ▪ Review budget and consider variations to budget, outside any delegated thresholds ▪ Consider timeframes and approval of material variations to timeframes, outside any delegated thresholds ▪ The operations of the PSC will be governed by the PSC Terms of Reference.
PSC Chair and Senior Responsible Officer (SRO)	▪ Liaise with Building Queensland on DBC development ▪ Guide consideration and decision-making on matters presented to the PSC ▪ In capacity as SRO, attend Building Queensland Board meeting project updates
Building Queensland Board	▪ Provide direction to the development of the DBC ▪ Consider the DBC ▪ Provide a report on the DBC to the Deputy Premier, Minister for Infrastructure, Local Government and Planning and Minister for Trade and Investment
Building Queensland Project Director	▪ Manage the Building Queensland Project Team ▪ Ensure quality and costs are monitored and controlled and deliverables are achieved in expected timeframes ▪ Liaise with the PSC Chair on DBC development ▪ Escalate matters to the PSC, as required

GOVERNANCE LEVEL	ROLE
	▪ Develop the DBC in accordance with Building Queensland frameworks and policies and any direction provided by the PSC and Building Queensland Board ▪ Provide information to the Building Queensland Board, Building Queensland Chief Executive Officer, Building Queensland Group Director Business Case and the PSC for information, direction or approval/endorsement, as required

1.3.2 Project Management

A dedicated project team was established combining resources of Building Queensland, TMR, QR and advisors. Resources required from TMR were discussed and agreed between Building Queensland and TMR at the commencement of the project.

Figure 1.3 Project management structure



Business case advisors were engaged by Building Queensland at the commencement of the DBC stage and managed by Building Queensland throughout the development and delivery of the DBC.

1.4 Stakeholder Engagement

A range of traditional and online engagement activities were used to inform community members and key stakeholders about the proposed alignment for the TEARC reference project. The Project Team liaised directly with potentially impacted landowners and residents, key stakeholders and the Townsville community, and provided information where possible to mitigate issues.

A communication and stakeholder management roadmap was established and followed to inform and seek feedback on the project. Chapter 12 Public Interest Considerations provides the findings.

1.5 TEARC Detailed Business Case

This document details the outcomes of the DBC stage of the TEARC project and:

- reviews the preferred project solution investigated in the PE and the Base Case
- documents the scope of the Reference Project and its contribution to achieving government policy
- documents the economic, social, environmental and financial viability of the Reference Project to enable the decision maker to decide whether to invest in the project.

The TEARC DBC advances the findings of the *TEARC Preliminary Evaluation (PE): Economics and Market Sounding Report (2011)* prepared by QR. It presents a detailed comparative analysis of the shortlisted options, with the objective of identifying and robustly assessing the project scope and delivery options most likely to achieve a value for money outcome.

The key activities undertaken in the development of the TEARC DBC include:

- re-confirmation of the problem and outcomes sought, as identified in the PE project stage
- a reassessment of the current demand serviced by the rail, road and PoT, and the role of TEARC in this supply chain
- comparative analysis of the shortlisted options from the PE stage
- determination of a recommended option (Reference Project) for detailed analysis
- consultation with key stakeholders, including the local community to ensure that their interests and concerns were effectively understood and incorporated, where possible
- development of a concept reference design
- Reference Project assessment including analysis of a wide range of issues that may impact on the delivery of the project, including policy, legal, regulatory, environmental, market, public interest, social, economic, sustainability, risks and benefits
- consideration of delivery models and packaging and staging options
- assessment of the affordability and value for money of the Reference Project.

Development of a detailed implementation plan (including governance arrangements and budget) for progressing to the next stage of the Project Assurance Framework (PAF).

2 STRATEGIC CONTEXT

CHAPTER SUMMARY AND CONCLUSIONS:

- As a large decentralised state, Queensland faces challenges in ensuring the supply chain can link producers with export markets. The Port of Townsville (PoT) is a strategically important piece of transport infrastructure that provides the final link in the supply chain for a range of industries and producers in north Queensland. Demand at the PoT is forecast to increase in the long-term, with growth in containerised and break-bulk freight, and liquid/dry bulk commodities.
- The upgrade of the Mount Isa Line and Townsville rail corridor, including the delivery of TEARC, is seen as a priority by the Australian Government, Queensland Government, Townsville City Council and supply chain markets. TEARC has been identified as critical enabling infrastructure to support the optimal port layout and PEP.
- There are a number of current policies and existing studies which highlight the strategic need and benefits of TEARC for regional economic development:
  - Provide additional rail capacity and ability to accommodate longer trains to support the efficiency of the resources sector.
  - Provide additional access capacity to support new operations within the PoT. There is some latent capacity within the PoT but not sufficient space for new entrants that constrains growth, and potentially future throughput volumes.
  - Improve freight efficiency and boost capability of the PoT by removing bottlenecks within the port caused by road and freight movement conflicts through at-grade crossings.
  - Support the activation of the Townsville State Development Area by providing a strategic freight link with direct access to the PoT, North Coast Line and Mount Isa Line.
  - Diverts freight away from the North Coast Line, helping to address road network impacts associated with at-grade crossing and urban amenity impacts from freight rail operations within the urban areas of Townsville.
- The strategic context of TEARC is strongly identified as an enabling infrastructure investment to support future PoT development. The Project is also identified as a critical enabler for the optimal future PoT layout. In particular, the designation of the PoT as a Priority Port under the *Sustainable Ports Development Act 2015* ensures increased coordination of the PoT expansion plans with TEARC.
- TEARC is also strategically aligned with the Townsville development plans, including the development of the Townsville City Waterfront Priority Development Area and the Townsville State Development Area (TSDA).
- TEARC provides strongly aligned planning benefits to Townsville.

This chapter outlines:

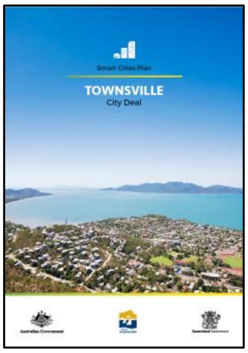
- Policy context that supports the TEARC DBC.
- Key land development and infrastructure delivery projects influencing the TEARC DBC.
- The assessments undertaken in the TEARC PE.

2.1 Policy Context

Key policy drivers that influence the TEARC DBC include:

- Smart Cities Plan – *Townsville City Deal (2016)*
- TSDA – Development Scheme
- Townsville Port Expansion Project
- Mount Isa Line Rail Infrastructure Master Plan
- Northern Australia Infrastructure Audit
- Australian Infrastructure Plan
- National Priority List
- Priority Port Master Plan
- A Strategic Blueprint for Queensland's North West Mineral Province.

2.1.1 Smart Cities Plan – *Townsville City Deal (2016)*



The *Townsville City Deal (2016)* is a 15-year commitment between the Australian Government, Queensland Government and Townsville City Council to work together to deliver a program of planning, reform and investment in Townsville.

The program has six objectives aimed at improving the competitiveness of Townsville:

- Capital of the North
- Innovative and Connected City
- Port City
- Industry powerhouse for the North
- Defence hub
- Enabling infrastructure.

TEARC supports the delivery of Industry Powerhouse for the North and Port City objectives by supporting efficient supply chain operations.

The development of a TEARC DBC is specifically noted as an action of the Industry Powerhouse for the North objective. The action is to prepare the TEARC business case by the end 2017.

TEARC is identified as enabling infrastructure, supporting other actions in the program including the future development of the TSDA and PoT. A subsequent activity under the Industry Powerhouse for the North objective is to investigate how TEARC delivery can be considered as a part of the broader innovative funding and financing options associated with the acceleration of the TSDA and the future expansion of the PoT.

The *Townsville City Deal (2016)* confirms the Prime Minister, the Hon Malcolm Turnbull MP committed $150 million in May 2016 to the delivery of the TEARC, including the joint funding of the DBC with the Queensland Government and subject to the findings of the business case. The Australian Government has subsequently transferred $3 million of this funding to the Department of the Prime Minister and Cabinet to explore options for innovative financing and value capture opportunities for the delivery of this project and other projects associated with the Townsville City Deal. This work is currently being undertaken in parallel to the development of the TEARC DBC.

A key centrepiece of the *Townsville City Deal (2016)* is "to establish Townsville as the preferred location in North Queensland for significant industrial development through the expansion of the PoT, the acceleration of development within the Townsville State Development Area, the TEARC and the Townsville Industrial Development Board."

2.1.2 Northern Australia Infrastructure Audit & Australian Infrastructure Plan

The *Northern Australia Infrastructure Audit (2015)* assessed critical economic infrastructure gaps and requirements to meet projected northern Australia population and economic growth through to 2031.

The *Northern Australia Infrastructure Audit* identifies northern Australia is rich in natural resources and agricultural land, but lacks the infrastructure to fully exploit its growth potential. It concludes economic development in northern Australia requires resilient export related infrastructure with sufficient capacity, good connections with southern Australia, and links between the growing urban economies of Darwin, Cairns, Townsville, Mackay and their hinterlands.

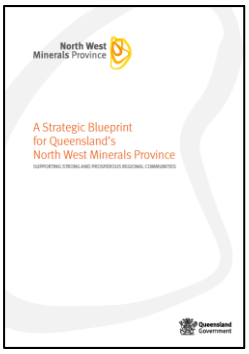
The *Northern Australia Infrastructure Audit and Australian Infrastructure Plan (2016)* identifies the need to upgrade Mount Isa – Townsville Rail Corridor to address speed, train lengths, axle loadings constraints, weather resilience and urban amenity in Townsville.

2.1.3 National Priority List

The Infrastructure Australia (IA) *National Priority List* identified The Mount Isa – Townsville Rail Corridor, including TEARC, as a national priority in 2010. Its significance to economic development was reconfirmed in the 2017 update, and is categorised as "Early Stage - nationally significant issue or problem, but the identification or development of the right solution is at an early stage".

The IA National Priority List finds "The Mount Isa - Townsville rail corridor, including TEARC, is identified as a supply chain of national significance that requires capital investment to support future economic development."

2.1.4 Strategic Blueprint for Queensland's North West Minerals Province



A *Strategic Blueprint for Queensland's North West Minerals Province (2016)* was prepared by the North-West Minerals Province Taskforce with the support of the Queensland Government, to address the social and economic issues and opportunities facing the resources sector in the region. The Department of State Development is responsible for leading the implementation of the blueprint.

The blueprint contains a range of short and medium-term actions (2017 – 2021) under three strategic priorities. TEARC is identified as a key action supporting Strategic Priority 2. Diversifying the regional economy and creating employment opportunities. It acknowledges the Queensland Government commitment to continuing to support feasibility work for more stable and reliable freight services between Mount Isa and Townsville.

The *Strategic Blueprint* states:

- Common user infrastructure provides the opportunity to drive down development costs for individual projects, with multiple users contributing to the development of, and benefiting from key forms of infrastructure required for mining and other projects. This may include transport infrastructure such as road, port and rail.

This project is expected to create greater capacity on this section of the Mount Isa Line rail system, which is a critical link between the Province and the PoT.

2.2 Industrial Development & Urban Renewal Planning

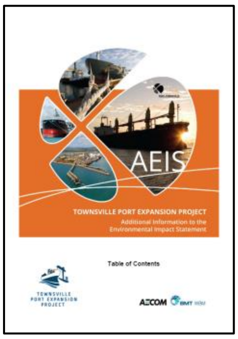
The proposed development of TEARC cannot be considered as a standalone project in the context of other related projects in Townsville. The other industrial development and urban renewal projects that inform the development of TEARC include:

- PoT Expansion Project
- PoT Priority Port Master Plan
- TSDA
- Townsville City Waterfront Priority Development Area
- Townsville City Plan.

These plans are summarised in further detail below.

2.2.1 Port of Townsville

The Port Expansion Project (PEP) was initiated by the PoT in 2011 and has been developed under the umbrella of the Priority Port Master Planning process. The PEP is currently the subject of both Australian and Queensland Government AEIS review and approval processes, which are in the final stages. The project is intended to respond to the immediate need to cater for larger ship sizes in the channel and swing basins, and address the medium and long-term need for additional berths.



The ultimate scope of the port expansion includes:

- Deepening and widening of existing approach channels
- A new deep water outer harbour
- Six additional berths in the new harbour
- Reclamation of 152 hectares of land for new berths, bulk cargo storage and a rail loop.

The project is proposed to be a staged development with the initial works for channel widening planned to commence in late 2017, subject to AEIS approval. The PEP is not included in the TEARC DBC reference project scope of work. Future stages of the PEP will require TEARC to proceed.

A *Priority Port Master Plan* is currently being prepared for the PoT. The Department of State Development is leading the master planning process working with the PoT, Townsville City Council and other key stakeholders.

The *Priority Port Master Plan* process will supersede the previous *Port Development Plan 2010 – 2040 (2009)*, which outlines proposed short, medium and long-term development and infrastructure needs to support port trade forecasts.

Master planning of the PoT is a port related action of *Reef 2050 Long-Term Sustainability Plan* and mandated under the *Sustainable Ports Development Act 2015. This master planning process seeks to optimise the use of infrastructure and address operational,* economic, environmental and community relationships as well as support supply chain and land uses opportunities.

The *Priority Port Master Plan* process is currently in its early phases of background assessment that will inform the preparation of the draft master plan for comment.

The *Port Development Plan 2010 – 2040* identifies the need for TEARC as an enabler for the future development of the Port in the medium term.

- The *Port Development Plan* found "PoT services two freight links that are of national strategic importance, the Mount Isa Line and North Coast Line. Constructing TEARC to integrate the supply chain between the Mount Isa and North Coast Lines with the PoT will support increased transport volumes, provide a competitive advantage to Townsville for export trade."

The *Port Infrastructure Layout and Land Allocations Study* (2016) was prepared to inform the current Priority Port Master Plan process.

The purpose of the report is to:

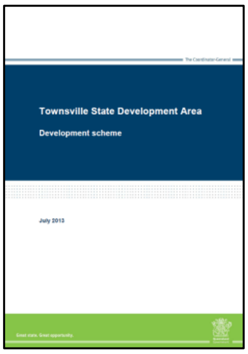
- develop an infrastructure and land use layout to accommodate forecast trade volumes to 2043/44
- optimise existing infrastructure and available port land
- ensure future port expansion plans can be accommodated.

The report identifies "the construction of TEARC and its associated rail loop within the port eastern reclamation area is a critical enabler for the optimal port layout to be achieved". It notes without TEARC:

- The proposed dry bulk rail loop cannot be delivered without a new rail connection to the loop.
- Dry bulk rail receival multi-user facilities cannot be installed.
- The general cargo area cannot be fully developed.
- The general cargo spur line and intermodal facility cannot be developed.

Future growth of the port is constrained by current infrastructure layout and location of dedicated unloading facilities interfacing to the current rail network within the port. TEARC will enable the PoT to develop an optimum layout as part of its PEP with new rail loops on the eastern reclaimed land. The PoT will plan to progressively relocate single use unloading facilities (e.g. sugar and Glencore) to the new area, which over time will negate the requirement for the Jetty Branch. As the timing of the future port layout changes are not known, the removal of the Jetty Branch cannot be scheduled with any certainty. The Jetty Branch is excluded from the DBC Reference Project, its removal is likely to be subject of a future business case, possibly in conjunction with the PEP.

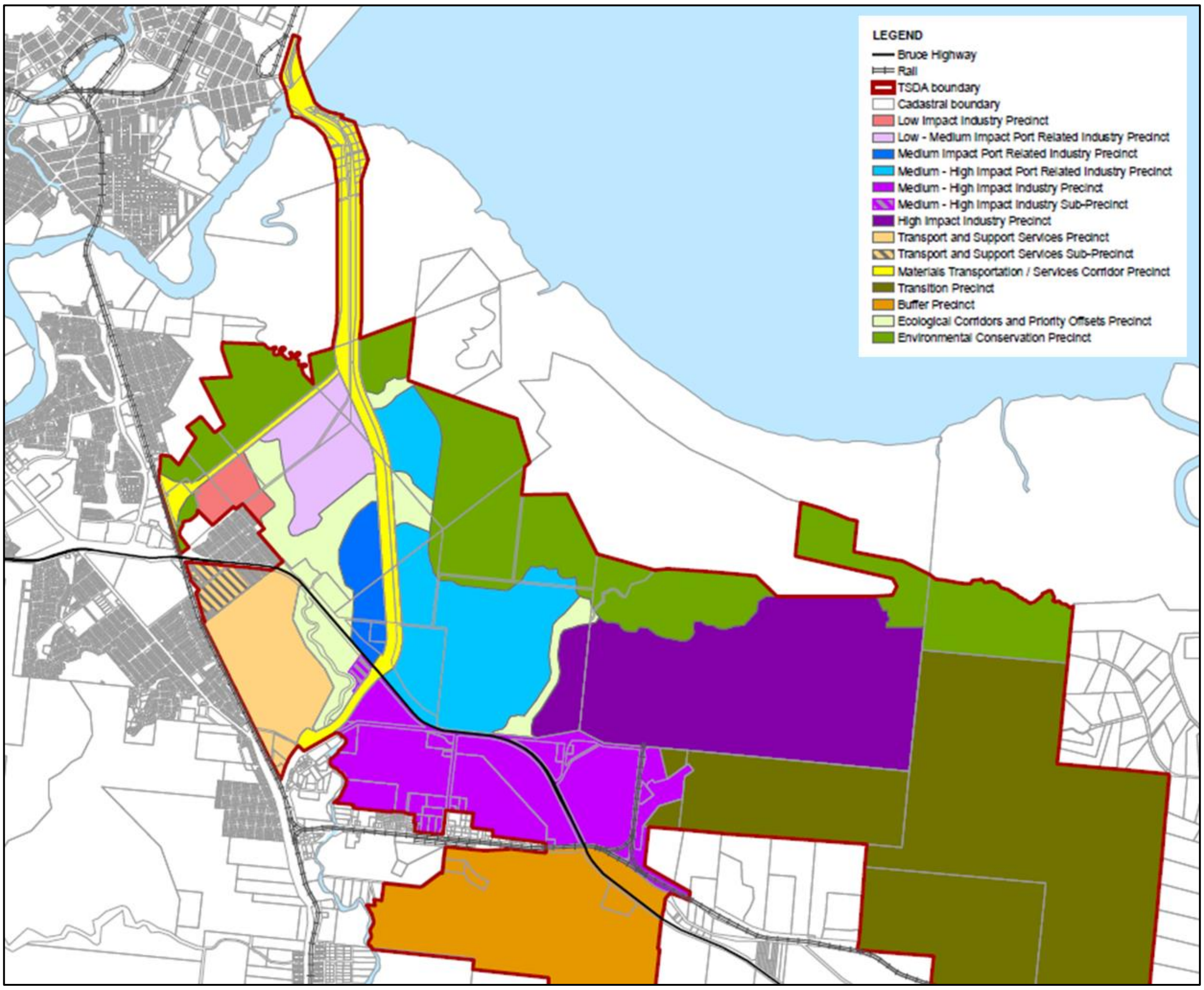
2.2.2 Townsville State Development Area



The TSDA was declared in 2003. It encompasses 4,915 hectares of industrial land located about six kilometres south-east of the Townsville CBD and two kilometres south of the PoT. The TSDA is intended to accommodate industries including; manufacturing (chemicals and metals production), minerals processing, intermodal freight and logistics, and bulk storage. Vast areas of the TSDA have yet to be developed. Key activities established in the precinct include two intermodal freight terminal facilities, metal refineries and a meat processing facility.

A preserved corridor owned by the Queensland Government for TEARC traverses the TSDA. The TSDA Development Scheme zones the TEARC corridor as a Materials Transportation/Services Corridor Precinct. Its alignment was defined based on preliminary investigations carried out by the Department of Main Roads and QR between 1996 and 2000 (Figure 2.1).

Figure 2.1 Townsville State Development Area

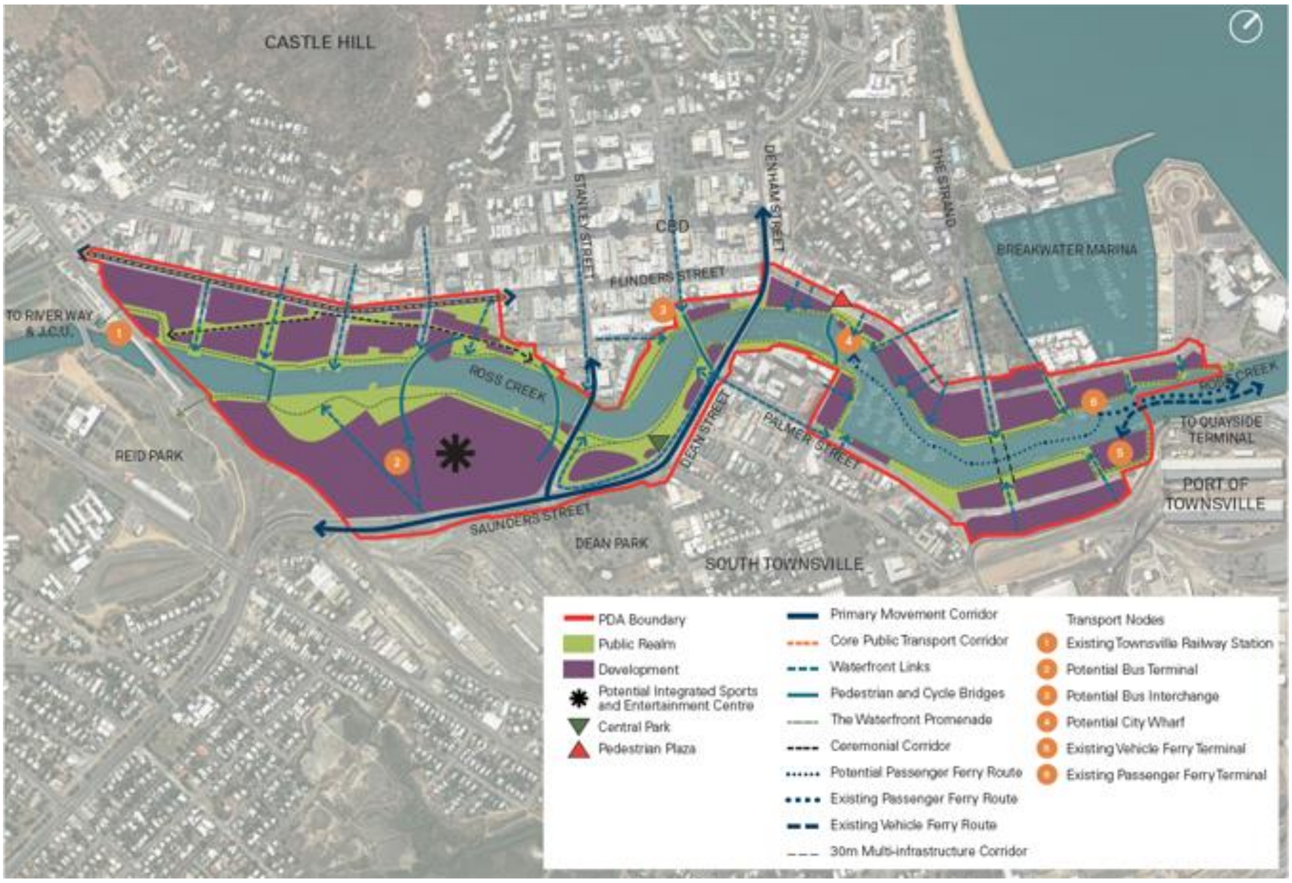


2.2.3 Townsville City Waterfront Priority Development Area

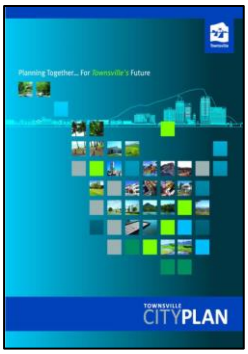
The Townsville City Waterfront Priority Development Area (PDA) was declared in 2016. It includes approximately 97 hectares of land that is located on both sides of Ross Creek, directly adjacent to Townsville Central Business District (CBD) and port activities. The precinct is planned to accommodate 30,000 people and include mixed-use development, public open space and community facilities as an extension to the existing CBD. The precinct will include the new North Queensland Stadium.

The PDA adjoins the existing North Coast Line branch into the PoT. The PDA and adjoining residential precinct incurs amenity impacts from rail operations. These impacts will increase with future growth in rail freight demand. TEARC offers the potential to divert freight rail movements away from the North Coast Line, helping to alleviate pressure on the road network, improve freight efficiency and deliver improvements to urban amenity and safety. The Townsville waterfront PDA is shown in Figure 2.2.

Figure 2.2 Townsville City Waterfront Priority Development Area



2.2.4 Townsville City Plan



The Townsville City Plan is targeting a population of 270,000 – 300,000 by 2031. An increase of approximately 100,000 with targeted employment growth of 50,000.

The city has historically achieved sustained growth from its strong defence, port and transport sectors, and by its strategic importance as a transport hub for the North-West Minerals Province and North Queensland agricultural sector. Future growth is anticipated in transport, storage and logistics industries, manufacturing (metals, food and beverage), defence, the knowledge economy (including education and research), the aviation industry, health, professional services, building/building supplies and tourism.

As the city population grows, it is increasingly important to plan for the future to support the revitalisation of the CBD and improve links between key economic precincts. The North Coast Line currently runs through the heart of the southern Townsville suburbs and causes amenity impacts to adjoining urban areas. Multiple level crossings also contribute to delays and safety issues on the road network.

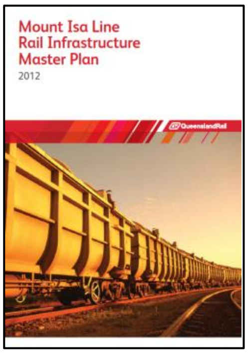
With major new residential developments planned for the south of Townsville and potential future growth in freight rail demand, road and urban amenity impacts are likely to increase. TEARC offers the opportunity to divert freight rail movements away from the North Coast Line, and ultimately the removal of Jetty Branch rail access to the PoT adjacent to Perkins Street, helping to alleviate pressure on the road network, improve freight efficiency and deliver improvements to urban amenity and safety.

2.3 Mount Isa Line

There have been a number of previous freight demand and supply chain studies undertaken to inform planning and delivery on the Mount Isa Line, including TEARC. Key documents and infrastructure projects that provide context to the strategic importance of TEARC include:

- Mount Isa Line Rail Infrastructure Master Plan (2012)
- Mount Isa – Townsville Economic Zone 50 Year Freight Infrastructure Plan (2012)
- Mount Isa Line works and the proposed Mount Isa to Tennant Creek Rail Link.

2.3.1 Mount Isa Line Rail Infrastructure Master Plan



The *Mount Isa Rail Infrastructure Master Plan (2012)*, prepared by QR, investigated low, medium and high growth scenarios to 2020 for the Mount Isa Line.

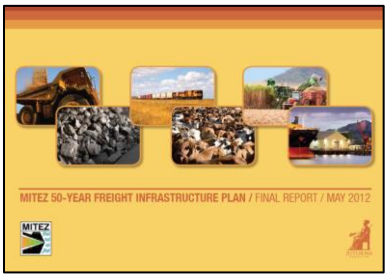
The plan acknowledges the PoT is a critical supply chain partner on the Mount Isa Line and is the primary destination for most products hauled on the line. The plan identifies that TEARC becomes essential once tonnage levels reach 20mtpa, due to the traffic congestion caused by a large number of trains servicing the PoT across numerous level crossings within the Townsville urban area, which negatively impacts on traffic flows and urban amenity.

The plan identified the following potential benefits of TEARC:

- Increased volumes transported on the Mount Isa Line through the PoT.
- Improved efficiency with longer and faster trains.
- Reduced bottlenecks in and around the PoT.
- Improved urban amenity, including increasing safety and reducing traffic delays by diverting bulk freight transport away from Townsville suburbs.

2.3.2 Mount Isa – Townsville Economic Zone 50 Year Freight Infrastructure Plan

The *Mount Isa – Townsville Economic Zone 50 Year Freight Infrastructure Plan (2012)* was prepared for the Mount Isa – Townsville Economic Zone at the request of Infrastructure Australia. This report considered the overall demand outlook for the freight transport system and supply chain including the Mount Isa Line, TEARC, TSDA and PoT.



The plan forecasts the PoT will have a demand (medium demand scenario) of up to 20mtpa, which includes 10mpta of coal. The plan notes the PoT will retain demand for high-value, low volume commodities. There is an emerging regional trend to low-value, high-volume commodities in the medium to longer term, such as coal and magnetite that will require more rail-to-stockpile infrastructure.

The plan acknowledged the outcomes of the *TEARC Preliminary Evaluation: Economics and Market Sounding (2011)* report and noted the need for the analysis on specific commodities that would benefit from TEARC.

The plan recommended it would be prudent to:

- Investigate the potential to extract greater efficiency in the short to medium term from the existing North Coast Line and Jetty Branch into the PoT for use by existing commodities passing through the port.
- Continue planning for TEARC, given its capacity for potentially handling coal and proximity to the TSDA that could accommodate stockpile infrastructure.
- Investigate the optimal timing for the implementation of TEARC, taking into consideration the transition costs and risks associated with transitioning existing port users to utilise the alternative rail corridor.

2.3.3 Mount Isa to Tennant Creek Proposed Rail Link

A number of studies by the Australian, Northern Territory and Queensland Governments have been completed to analyse the need to develop a 600 km rail link between Mount Isa and Tennant Creek in the Northern Territory. This would connect the North-West Mineral Province with the Port of Darwin. The potential rail link is considered to be enabling infrastructure to provide seamless supply-chain connections between regions around Mount Isa and Tennant Creek with the ports of Townsville and Darwin.

Subject to the technical, environmental, financial and economic feasibility of the Mount Isa to Tenant Creek proposed rail link, the Mount Isa – Darwin rail link will potentially be contestable, assuming costs are comparable with the PoT. The supply-chain cost and efficiency benefits over the existing routing via Mount Isa -Townsville would need to be attractive to use the Port of Darwin. This was not considered to be a material impact on the TEARC DBC and has been excluded from the scenario analysis for the TEARC DBC.

2.4 Townsville Eastern Access Rail Corridor

Key previous studies and investigations which form the basis to the TEARC DBC include the:

- Townsville Port Access Study (1996)
- Townsville Port Access Impact Assessment Study (2000)
- Eastern Access Corridor Preservation and South Port Road development
- TEARC Preliminary Evaluation: Economics and Market Sounding (2011).

2.4.1 Townsville Port Access Study and Port Access Impact Assessment Study

The *Townsville Port Access Study (1996)* and subsequent *Townsville Port Access Impact Assessment Study (2000)* were commissioned to identify a suitable transport access for the PoT which minimised the impact on Townsville urban areas and met demand to 2025. The study investigated both the upgrade of the existing road and rail port access corridors and the development of a new eastern corridor. The studies recommended:

- Road and rail access should be maintained on the existing corridor along on Perkins Street and Jetty Branch.
- A new Eastern Access Corridor be preserved enabling the merits of future road and rail access to be considered once there was an emerging capacity need.

The report indicated the construction of a new road connection within the preserved corridor (known as the Southern Port Access Road or Southern Port Road) is likely to be warranted in the short term and that a new rail link would be only warranted in the long-term. The report noted the urban amenity improvements would likely be one of the primary benefits of the Eastern Access Corridor, as it would reduce impacts on residents in terms of noise, vibration and exhaust emissions, and improve safety through reduced risk of incidents involving dangerous goods.

2.4.2 Corridor Preservation and Southern Port Road

The Queensland Government endorsed the *Townsville Port Access Impact Assessment Study (2000)* in November 2001 to allow detailed planning and land acquisition of the Eastern Access Corridor.

The 7.5 km Southern Port Road was constructed between 2008 and 2012 and is a designated heavy vehicle route linking the Flinders and Bruce Highway with the PoT. The road has delivered increased capacity to support freight movements to and from the port, and has reduced heavy vehicles in the Townsville urban area

2.5 TEARC Preliminary Evaluation

The *TEARC Preliminary Evaluation: Economics and Market Sounding (2011)* was prepared on behalf of QR. The document focused on:

- tonnage demand projections based on anticipated mining and port activity
- preliminary economic analysis using benefits cost analysis methods
- preliminary market sounding for private sector involvement and delivery options.

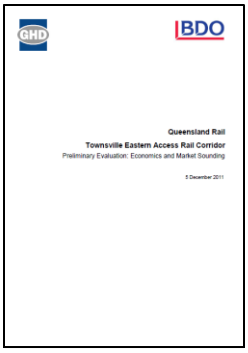
The document drew on existing demand forecasting reference documents, and was not informed by rail capacity simulation, preliminary engineering design and cost estimation.

The report provided the following highlights and findings.

2.5.1 Preliminary Evaluation Scope

Service Needs —The service requirements for TEARC defined in the PE were to:

- meet growing demand on the Mount Isa Line
- facilitate the use of 1,400m long trains
- reduce bottlenecks in the PoT
- improve urban amenity for suburbs of Townsville.


GHD
BDO
Queensland Rail
Townsville Eastern Access Rail Corridor
Preliminary Evaluation: Economics and Market Sounding
5 December 2011

Demand Projections: The PE adopted the following demand projections for the period 2012 to 2030 (excluding coal):

- 8mpta (low demand scenario)
- 10.4mtpa (medium demand scenario)
- 15.3mtpa (high demand scenario).

Note the sensitivity analysis included an additional 10mtpa of coal with the high case. However, the NPV was lower with coal because of the additional investment required for infrastructure in rail, rollingstock and port.

Nameplate Capacity of the PoT: The PoT trade figure in 2010/11 was 10.6mt. If single track constraints along the Jetty Branch were addressed with some upgrades to terminal operations the nameplate capacity of the PoT is assumed to be 15mtpa.

With the addition of Berth 12 wharf, associated balloon loops and channel dredging for Panamax vessels the nameplate capacity will rise to 25mtpa.

Project Scope—The PE evaluated the following options ($million in 2011 dollars):

- Base Case ($410m):
  - Staged upgrades to the Mount Isa Line to accommodate 1000m trains for all operations.
  - Track upgrades from the Jetty Branch into the Port to remove existing single-line constraints.
  - Berth 12 marine works and channel dredging works.
  - Construct a new balloon loop on the reclaimed area as part of Berth 12 works.
  - Extract maximum value by increasing capacity through operational efficiency enhancements.

The PE states "The Coordinator General declared the Berth 12 wharf and dredging a "significant project" meaning the project will proceed regardless if TEARC goes ahead or not. For this reason, the Berth 12 wharf and associated balloon loop and channel dredging is in the Base Case for economic analysis."

- Project Case ($735m less $174m for PoT Berth 12 and balloon loops):
  - Development of TEARC a new 8 km rail link from the NCL near Cluden, through the TSDA and to the PoT. TEARC will be a double track configuration and require a fixed bridge over the Ross River.
  - Grade separation works at Abbott Street.
  - Staged upgrades to the Mount Isa Line and yards to accommodate 1400m trains ($101m).
  - Channel dredging works and reclamation ($55m).
  - Remove single track (Jetty Branch) and reconfigure the Xstrata terminal operations ($40m).

A conveyor option was considered as an alternative to TEARC to carry stockpiled and bulk materials from the TSDA to the PoT. This option was not taken forward in the Project Case, as this option would only cater for bulk mineral materials such as coal or magnetite and would not be able to handle general freight.

The Project Case did not include the removal of either the North Coast Line or the Jetty Branch.

The PE identified TEARC could begin with a single-track configuration with a passing loop to reduce capital cost which would allow the opportunity to stage the project. No detailed engineering, environmental, social, legal and implementation assessments of the options were completed in the PE.

The findings of the economic and market sounding identified:

- The Project Case was economically viable under a medium and high demand scenario.
- There was some interest from market participants in private sector ownership of TEARC, but preferably packaged with wider freight assets for a regulated third-party owner.
- Sufficient scope for value generation from Public Private Partnership delivery options to warrant further investigation.

Table 2.1 summarises the key goals and problem definition for TEARC from the PE.

Table 2.1 PE Outcomes

TASK	KEY ISSUES
Goal Definition	▪ The Townsville Economic Gateway Vision links the Port with the Townsville TSDA. ▪ TEARC is the critical missing link in this vision. ▪ The TSDA has a valuable role in supporting the future development and growth of Townsville. Given its proximity to the port, opportunities for port-related industries, logistics and freight distribution have been identified as highly desirable uses of land adjacent to TEARC. ▪ The Mount Isa - Townsville corridor is the strategic link between the North-West Queensland Minerals Province and the PoT. It represents one of the most significant supply chain and logistics routes in Queensland. The significant challenge is transporting produce by rail.
Problem Identification	▪ The PoT and Mount Isa Line are constrained to 1000m trains. ▪ Trains lengths within the port are constrained to 650m due to short sidings, and level crossings with roads. ▪ Up to 15mtpa port capacity can be achieved by upgrading the existing single track (Jetty Branch) and terminals (Xstrata). ▪ Significant inefficiencies exist because of the amount of shunting movements needed. ▪ Community impacts and amenity issues arise from running trains through suburban areas.
Problem Assessment	▪ Tonnage projections are forecast to grow beyond current operational capacity levels. ▪ Train numbers and frequencies will increase in line with growing demand. ▪ This will exacerbate the existing economic, environmental and social impacts. ▪ There is limited scope to improve the efficiency of the port in its current configuration.
Problem Analysis	▪ Significant investment in passing loops will be needed to meet demand using 1,400m trains. ▪ Significant investment in rolling stock will be needed to meet demand using 1,400m trains. ▪ Inefficiencies at the port and delays to vehicles at level crossings will result from 1,400m trains.
Option Generation	▪ 1400m trains by constructing TEARC and lengthening existing passing loops and yards on the Mount Isa Line. ▪ Overland conveyor systems linking the TSDA to the Port. ▪ Upgrade from Direct Train Control (DTC) to Remote Controlled Signals (RCS). ▪ Track strengthening to increase axle load limits from 20 to 26 tonnes. ▪ Contestability of PoT with Abbot Point for coal exports in particular.
Option Assessment	▪ TEARC and associated 1400m upgrades has an NPV of $241m and BCR of 4.65 for the high case. ▪ There was some interest from market participants in private sector ownership of TEARC, but preferably packaged with wider freight assets for a regulated third-party owner. ▪ A stakeholder workshop found sufficient scope for value generation from Public Private Partnership delivery options to warrant further investigation.

2.6 Reconfirming the Preliminary Evaluation Outcomes

2.6.1 Changes to Service Needs and Project Case Scope in DBC

Since the preparation of the PE, there are two key factors that influence the evaluation of TEARC in the DBC:

- Freight Demand—The slowdown in the resource sector since the PE required a reassessment of minerals and other freight demand profiles for rail capacity.
- PoT—Changes to planning assumptions and delivery of associated projects within the port.

These factors suggest the Service Needs and scope of the Project Case presented in the PE needs to be adjusted for the purposes of the DBC.

Table 2.2 compares the Service Needs adopted in the PE to the updated Service Needs in this DBC.

The detailed justification of the updated Service Needs is documented in this Chapter. Details on the Base Case and Project Case included in the DBC are discussed in Chapter 5.

Table 2.2 PE and DBC Comparison of Service Needs

PRELIMINARY EVALUATION	DETAILED BUSINESS CASE
Meet growing demand on the Mount Isa Line	Meet revised demand forecasts (Chapter 4 DBC)
Facilitate the use of 1,400m long trains	Cater for 1,000m long trains initially with the ability to extend passing sidings on TEARC to 1,400m, if required in the future
Reduce bottlenecks in the PoT	Reduce bottlenecks in the PoT
Improve urban amenity for suburbs of Townsville	Improve urban amenity for suburbs of Townsville

Freight demand Mount Isa and North Coast Lines—The PE adopted demand forecasts for the PoT which identified high resource demand and high commodities prices. This supported a large number of potential mines to be viable or on-line which required access to the Mount Isa Line and the port. Since the preparation of the PE, there has been a decline in actual rail volumes to the PoT. In 2014, there was 12.7mtpa throughput at the port, which has since reduced to 8.5mtpa in 2016, representing a reduction of 4.2mtpa.

The DBC adopts the following demand scenario projections to 2051:

- 8.3mtpa (2017), peaking at 10.6mtpa (2037), declining to 7.6mtpa (2051) (Scenario 1 – Central demand case)
- 8.2mtpa (2017), declining to 5.8mtpa (2051) (Scenario 2 – Low demand scenario)
- 8.8mtpa (2017), peaking at 14.8mtpa (2037), increasing to 13.5mtpa (2051) (Scenario 3 – High demand scenario).

A Future Demand Case was produced and used for PoT Master Planning purposes. It is not utilised for the DBC economics modelling.

- 9.0mtpa (2017) increasing to 27.3mtpa (2051) (Future Demand Case).

The Future Demand Case would require additional infrastructure (which is not a like-for-like comparison on a cost basis with the low, medium and high demand scenarios):

- Mount Isa line to accommodate 1,400m trains

- bulk stockpile and handling facilities
- new berths and ship loaders.

The total rail demand forecast, excluding road transport is:

- 6.0mpta (2017) declining to 3.3mtpa (2051) (low demand scenario)
- 6.0mtpa (2017) declining to 3.9mtpa (2051) (central demand scenario)
- 6.3mtpa (2017) increasing to 8.6mtpa (2051) (high demand scenario).
- 6.5mtpa (2017) increasing to 22.3mtpa (2051) (additional future demand case).

The total road demand forecast, excluding rail transport is:

- 2.2mpta (2017) increasing to 2.6mtpa (2051) (low demand scenario)
- 2.3mtpa (2017) increasing to 3.7mtpa (2051) (central demand scenario)
- 2.5mtpa (2017) increasing to 5.0mtpa (2051) (high demand scenario).

The PE reported the theoretical capacity of the Mount Isa line is on average 19 to 20mtpa with 1,000m trains and 27 to 28mtpa with 1,400m trains.

As a result of the changes in freight demand the Service Needs and scope of the Project Case were re-evaluated for the DBC, the changes of which are detailed Table 2.3.

Table 2.3 Reconfirming of Preliminary Evaluation (Freight Demand Implications)

REVIEW OF PRELIMINARY EVALUATION (CHANGE TO THE DETAILED BUSINESS CASE)	RATIONALE
Delete the Service Need, 'meet growing demand on the Mount Isa Line'. Delete the Service Need, 'facilitate the use of 1,400m long trains'. Delete scope of works from the Project Case associated with Mount Isa Line from Project Case.	Rail operations analysis undertaken as part of the DBC has identified the high demand on the Mount Isa Line that was previously forecast in the PE is no longer present. There is no motivation for operating 1,400m trains and undertaking the associated capacity improvements. Further detail on the change of demand and proposed forecast scenarios is presented in Chapter 4. The upgrade of the Mount Isa Line for 1,400m trains is excluded from the DBC Reference Project.
Create a new Service Need, 'meet supply chain demand'.	The PoT priority port master plan process has identified, despite the port having latent capacity there are constraints in the ports ability to introduce new (demand) customers. The constraints are as a result of inefficiencies and operational limitations with its existing configuration and tenure arrangements on single use berths. The PEP includes the proposed development of new multi-purpose common use berths to support new demand and accommodate new customers. These berths will require rail access via future rail loops accessible from TEARC to provide the optimum layout.
Create a new Service Need, 'longer trains'.	The PoT priority port master plan process has identified there are inefficiencies with rail access to specific berths within the port, as trains (up to 1,000m) need to be broken into shorter lengths (up to 250 – 400m) for some freight types. TEARC allows longer trains to access port berths and improved port efficiency through fewer rail movements.

PoT—The PE was based on high freight demand and sought to address capacity and efficiency constraints along the Mount Isa – Townsville supply chain including on the Mount-Isa Line, rail access to the port via TEARC and port infrastructure. The PE identified the following scope of work in the Project Case for the PoT:

- Remove single track from the Jetty Branch and upgrade the Xstrata (now Glencore) terminal.
- Channel dredging and land reclamation.

This excluded the Berth 12 and balloon loops as this work is being progressed by the PoT.

Changes to the Project Case in the PE which are be included in the DBC as a result of the PoT PEP are detailed in Table 2.4.

Table 2.4 Reconfirming of Preliminary Evaluation (PoT Implications)

REVIEW OF PRELIMINARY EVALUATION (CHANGE TO THE DETAILED BUSINESS CASE)	RATIONALE
Delete scope of works from the Project Case associated with the PoT.	The scope of work identified in the PE is included in the PEP. The first stage of the PEP includes channel and berth 12 works scheduled to be constructed between 2017 and 2022. The outcomes of the priority port master plan that is in early stages of preparation, will inform and confirm the future development of the port including implications for rail alignments within the port to support terminal and berths. TEARC is identified as critical enabling infrastructure to support the optimisation of the port layout and PEP. These projects are in early definition stage as part of the priority port master plan. They have been excluded from the TEARC DBC evaluation to avoid duplication of accrued benefits in subsequent project business cases.

2.7 Conclusions

This DBC and the scope of the Reference Project consider the implementation of the 8.3 km of TEARC line and associated road grade separations. The Reference Project excludes any upgrades to the Mount Isa line for 1,400m trains, the North Coast Line (south of the Sun Metals Branch and north of the Jetty Branch) and work associated within the port through the PEP. The Reference Project includes the grade separation for Abbott Street and the Southern Port Road.

Table 2.5 summarises the changes in scope between the PE and this DBC.

The PoT upgrades are being managed under a separate initiative the Port Expansion Project and it was agreed by the key stakeholders to remove any Port upgrades from the DBC. Consideration was given to relocating the Port facilities to allow sugar and Glencore trains to fully utilise TEARC, however it was agreed with the PoT that this would be considered as part of the Port Expansion Plan.

The Mt Isa line and any requirement for upgrades to cater for 1,400m long train lengths was agreed by the stakeholders to be removed from the scope of this DBC because the demand forecast is relatively flat for the medium case (Scenario 1). QR does not foresee a requirement for 1,400m long trains at this time.

Table 2.5 PE and DBC Comparison of Scope of Work

<table>
<tr><th colspan="2" rowspan="2">SCOPE</th><th colspan="2">PRELIMINARY EVALUATION</th><th colspan="2">DETAILED BUSINESS CASE</th></tr>
<tr><th>BASE CASE</th><th>PROJECT CASE</th><th>BASE CASE</th><th>PROJECT CASE</th></tr>
<tr><td rowspan="3">PoT</td><td>Berth 12 and balloon loops</td><td rowspan="3">In-scope</td><td>Excluded</td><td rowspan="3">Excluded</td><td rowspan="3">Excluded</td></tr>
<tr><td>Remove single track and terminal upgrades</td><td rowspan="2">In-scope</td></tr>
<tr><td>Channel dredging and reclamation</td></tr>
<tr><td rowspan="3">TEARC</td><td>Connection to the North Coast Line</td><td rowspan="3">Excluded</td><td rowspan="3">In-scope</td><td rowspan="3">Excluded</td><td rowspan="3">In-scope</td></tr>
<tr><td>Alignment through the TSDA</td></tr>
<tr><td>Bridge over Ross River</td></tr>
<tr><td rowspan="2">Abbott Street</td><td>Abbot Street Grade Separation (road-over-rail)</td><td>Excluded</td><td rowspan="2">In-scope</td><td>Excluded</td><td rowspan="2">In-scope</td></tr>
<tr><td>Avoided cost for Abbot Street Deviation</td><td>In-scope</td><td>In-scope</td></tr>
<tr><td>Mount Isa Line</td><td>Mount Isa Line capacity improvements 1,400m train capacity</td><td>Excluded</td><td>In-scope</td><td>Excluded</td><td>Excluded</td></tr>
</table>

Red Text indicates change between Primary Evaluation and Detailed Business Case

The Base Case includes the existing rail and road system, excludes the Mount Isa line, the North Coast Line (south of the Sun Metals Branch and north of the Jetty Branch) and any work associated with the port.

The DBC takes up the option from the PE to build a single track with a passing loop to reduce the capital cost that allows for staged approach for the future as required.

TEARC facilitates access to the existing port balloon loops. The Jetty Branch remains in use for existing customers such as sugar and Glencore. The Jetty Branch cannot be removed without major changes within the port to relocate the unloading facilities for existing customers. This work is outside the scope of the DBC Reference Project as the timing of these changes is not known.

The economic assessment of the PE Project Case included benefits to be gained from being able to operate 1,400m long trains as opposed to the current 1,000m long trains. The savings in rail operating costs and externalities were a major contributor to the economic benefits of the PE.

The DBC economic assessment of TEARC is independent of the PEP and the Mount Isa line. TEARC is based on potential road vehicle delay savings and improvements in rail efficiency.

TEARC is a priority infrastructure project to enable the future landside development of the PEP to be realised.

3 DEFINING THE SERVICE NEED

CHAPTER SUMMARY AND CONCLUSIONS:

- The *Townsville City Deal (2016)* is a 15-year commitment between the Commonwealth of Australia, the State of Queensland and the Townsville City Council for a collective program of planning, reform and investment which aims to grow the economy of Townsville, and strengthen Townsville as a prosperous and lifestyle-rich city. The development of major infrastructure in rail, roads and the port will improve the competitiveness of Townsville as a centre for industry and business. The development of infrastructure will follow the strategy of progressively improving the liveability of residential areas that are negatively impacted on by noise, dust, road delays and safety at level crossings.
- TEARC will assist in addressing the following issues which impact on the competitiveness of Townsville:
  - The existing freight rail configuration does not enable future port expansion plans.
  - The competitiveness of Townsville is constrained by freight network inefficiencies.
  - Freight rail movements through Townsville is reducing liveability.
  - Improve urban amenity by providing the opportunity to remove the existing Jetty Branch connecting to the PoT and subsequently reduce heavy freight movements through urban areas.
  - Provide an integrated transport network connecting the North-West Minerals Province to the PoT and provide streamlined port-road-rail interfaces.
- The existing rail network is able to support some freight growth. Any increase in the number of trains will reduce urban amenity. The strategic response is to implement TEARC to handle any significant increase in the numbers of trains to the port.
- A number of important strategic responses and business solutions have been identified as a result of the TEARC DBC, which include:
  - addressing the complexities and inefficiencies of port operations
  - ensuring future port lease renewals are aligned to the Port Master Plan objectives
  - addressing line speed constraints on the Mount Isa Line (including the provision of passing loops and other upgrades)
  - regulatory reform to encourage industry growth, reduce input costs and a level the playing field between road and rail transport
  - exploring options to remove the Jetty Branch access into the PoT which would provide a stepped increase in urban amenity for south Townsville residents.

3.1 Introduction

Townsville is an important coastal infrastructure hub for North Queensland with the PoT, North Coast Line, Mount Isa Line and associated road network supporting the mining, agricultural and general industry.

The use of the rail and road systems to the PoT has increased over time. Key rail access corridors are well within city and residential areas that is less than desirable from an overall safety, operational and urban amenity perspective. A commitment to improving port access was made with the establishment of the Eastern Access Corridor as a multi-modal road and rail corridor, providing direct access to the port from the Mount Isa Line and North Coast Line, and State road network. Road network improvements were introduced in 2012 with the opening of the Southern Port Road.

The Service Need for TEARC has evolved over time, reflecting changes in domestic policies, urban needs and economic factors. Earlier investigations assessed the feasibility of the project in terms of its ability to meet rail demand forecasts and improve urban amenity. Recent policy developments have moved the emphasis toward addressing the need to grow the 'competitiveness' of Townsville.

Table 3.1 summarises the potential stakeholders of the project and their interest in it. Chapter 12 discusses the stakeholder engagement strategy for this DBC. The service need is multilayered from the strategic, to the transport and then the community and environmental needs. The engagement strategy supported this multilevel approach.

This chapter discusses the key issues constraining the overall competitiveness of Townsville and how this relates to the potential development of TEARC as a means of enhancing freight movement efficiency, port development and land use outcomes.

Table 3.1 Stakeholders and Interest in the Project

STAKEHOLDER CATEGORY	INTEREST IN THE PROJECT
Port of Townsville	Key beneficiary of the project and member of the PSC and PCG; will be interested in connectivity issues around existing road and rail
Townsville City Council	SAG member and will want to ensure a positive outcome for the city and community; high interest in job creation and economic benefits
Adjacent stakeholders - Cluden	Residents will receive new rail line; high interest in project impacts including noise, amenity, property impacts and property values
Adjacent stakeholders – near the Port	Residents will receive new rail line; high interest in project impacts including noise, property impacts and property values
Adjacent stakeholders – North Coast line	Residents will be interested in potential removal of existing North Coast line and level crossings including timeframes and rehabilitation or reuse of the area
Residents and action groups	Residents and local action groups will have a general interest in Townsville and its economic prosperity; including any social and financial impacts on residents
Elected representatives - State	Alignment runs through a number of electorates with local elected representatives interested in job creation and state election
Elected representatives - Federal	Alignment runs through a number of electorates with a high level of interest in project in relation to City Deal
QR	As the owner of the North Coast and Mt Isa lines, QR has a high level of project interest; particularly surrounding the potential removal of the North Coast line through Townsville and removal of four level crossings
Rail operators	Operators on the North Coast and Mt Isa line are currently supportive of the project
Industry	Industry groups will have some level of interest in the project, particularly how it affects their freight

STAKEHOLDER CATEGORY	INTEREST IN THE PROJECT
Peak industry associations	Local industry associations will want to be informed about the impacts the Project will have on local amenity and future development opportunities
Energy providers	Impacts on existing utilities
Queensland Government Agencies	There are several state agencies that will be involved in the options assessment and any impacts on community, infrastructure and existing transport networks
TMR	Project owner
Australian Government Agencies	There are several Australian Government agencies that will be involved in the options assessment, with particular interest in delivery of the City Deal, Project cost and funding
Traditional Owners	The Native Title Representative Body
Environmental and community groups	There are a number of environmental groups that have active campaigns to protect the Great Barrier Reef from Port expansion activities.
Media	As well as being part of the City Deal, this will be a significant Project for Townsville that will attract both local community and media attention

3.2 Factors influencing the Competitiveness of Townsville

All levels of government have committed to positioning Townsville as the “Capital of the North”, with the intention of growing the city as the economic powerhouse of Northern Australia. The *Townsville City Deal (2016)* aims to grow the economy of Townsville and strengthen Townsville as a prosperous and lifestyle-rich city. This deal will be delivering major infrastructure, creating new and sustainable jobs, and enhancing the liveability of the city.

Delivering major infrastructure will increase the competitiveness of Townsville by providing a more efficient rail, road and port supply chain linked to the TSDA.

TEARC is identified as a key piece of enabling infrastructure to expand export operations, retain existing industries and attract new economic investment including growth within the TSDA and redevelopment of the PoT.

There are a number of factors discussed in Sections 3.2.1 to 3.2.4 impacting the competitiveness of Townsville which have a bearing on TEARC including economic contraction, regulatory issues, supply chain constraints at the PoT and the decline in urban amenity.

In summary, these issues deter capital investment and offer less incentive to retain existing and grow industry within Townsville. As employment opportunities in mining industries decline and large employers take their operations offshore, unemployment in Townsville continues to rise, reducing demand and constraining economic growth. The rise in social issues including higher crime rates and the migration of younger workers to other regions is negatively impacting the attractiveness and viability of Townsville as a place to live.

3.2.1 Economic Contraction

The PE[6] for TEARC was prepared during the mining boom with medium to high demand projections from 10 to 15mtpa, excluding coal exports. At the time an additional 10mtpa of coal exports was being forecast for the PoT and considered in TEARC in the economic sensitivity analysis.

The PE identified the following service requirements (needs) for TEARC to:

- meet growing demand on the Mt Isa Rail System
- facilitate the use of 1,400m long trains
- reduce bottlenecks in the PoT
- improve urban amenity for suburbs of Townsville.

These service needs have been reanalysed under this DBC and are discussed later in this chapter.

The end of the mining boom led to contractions in many of Queensland's regional economies. This is reflected in the current demand forecasts provided in Chapter 4. Although the Townsville economy remains relatively diversified, it was highly geared towards mining and related industries and activities. The slowdown in the resources sector with the decline in world commodity prices has further inhibited the flow of investment to regional Queensland.

Slower economic growth is also partly due to the level of business activity enjoyed during the construction phase of the mining boom not being sustained through the operational phase. The 50% contraction in gross regional product since the peak of the boom in 2013 has led to a sharp downturn in investor confidence and employment[7]. Unemployment has reached 10.7%[8], almost double the state average with youth unemployment[9] climbing to 17.6% inducing many to leave the city in search of work. These figures highlight the need to rebalance the economy of Townsville and retain workers by supporting existing industries, attracting new business and boosting overall productivity.

Port operations, particularly the export of natural resources from the North-West Minerals Province, remain key drivers in the economy generating more than $5.6b in the 2015-16 financial year[10]. The PoT faces domestic competition from other ports including Abbot Point, Darwin and Brisbane. Expanding export operations and value-add industries in Townsville is vital to supporting the economy, requiring the port and associated infrastructure to operate efficiently and offer the capacity to meet demand.

The PoT has been identified as one of four priority ports in North Queensland under the *Sustainable Ports Development Act 2015*. Port operations are constrained by the size of vessels the port can accommodate and inefficiencies in the rail and road interfaces. The Port is currently developing a landside and marine development master plan to expand the port, improve operations and attract new customers. A staged approach to the implementation of the plan has been adopted, the first stage addresses the need to accommodate larger vessels with the immediate benefit of existing customers becoming more efficient, and being in a position to offer more competitive rates resulting from economies in scale. Future implementation stages will involve the development of the rail and road systems interfacing and servicing the port to provide an integrated and efficient import/export hub linking to the Mt Isa and North Coast Lines.

[6] TEARC Preliminary Evaluation GHD, BDO (Dec 2011)
[7] Townsville Economic Development Scorecard (2016)
[8] Department of Employment: Unemployment Rate by Labour Force Region (2017)
[9] Australia's Youth Unemployment Hotspots: Snapshot (2016)
[10] Queensland Government Statistician's Office – Queensland and Australia Trade Data, 2005-06 to 2015-16 (2016)

3.2.2 Regulatory Issues

- Rail pricing for freight

  The Mount Isa and North Coast Lines are owned by QR and deemed essential. In Queensland, contracts for the use of essential rail infrastructure are negotiated within bounds set by the Queensland Competition Authority[11]. This section of the Queensland network is not regulated. The use of rail infrastructure by rail freight is priced through contracts with individual rail operators that includes Aurizon and Pacific National[12].

- Road pricing for freight

  The cost of road freight using publicly-owned road infrastructure is priced by a combination of annual registration and fuel-based road user charges on heavy vehicles. Australia uses a Pay-As-You-Go (PAYGO) model to determine the user charges. The National Heavy Vehicle Regulator and TMR regulate the use of road networks by heavy vehicles[13] with the calculation of charges being undertaken by the National Transport Commission. The charges enable heavy vehicles to use parts of the road network commensurate with the type of vehicle[14].

  The PAYGO model is a direct charging pricing mechanism based on distance, with the routes travelled constrained by the appropriate heavy vehicle network. A network is distinct from a link such as the Flinders Highway that runs roughly parallel to the Mount Isa rail line [15]. There is no publicly available information regarding TMR directly charging for road freight or heavy vehicle operators for specific use of the Flinders Highway.

- Relationship between rail and road pricing for freight

  Road freight has an inherent advantage over rail in that passenger and other light vehicles use roads extensively. Many costs including street lighting, signage and traffic management, and the minimum pavement costs for light-vehicle use that are 'common' or 'un-attributable' can be largely shared with other road users.

  In contrast to road provision, rail infrastructure generally operates within a commercial structure. Charges for many rail services fall well below their long-run economic costs, as assessed by regulators. Exceptions to this finding are generally limited to the transport of coal[16].

- Competition between rail and road for freight

  The varying pricing arrangements for road and rail have been identified as the possible cause of distortions in competition between road and rail for freight cargo. The potential for these distortions is strongest in general freight markets with relatively long-distance line hauls or high traffic densities, such as highways or roads which run parallel to rail lines, including to urban ports[17]. Within this broadly defined scenario where road and rail may compete, there are further conditions that must be met to allow any meaningful competition, as supported by evidence between the modes.

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[11] http://www.qca.org.au/Rail
[12] Queensland Rail (2012) *Mount Isa Line Rail Infrastructure Master Plan*
[13] https://www.tmr.qld.gov.au/business-industry/Heavy-vehicles/National-heavy-vehicle-regulator.aspx
[14] https://www.ntc.gov.au/heavy-vehicles/heavy-vehicle-charges/
[15] https://atap.gov.au/framework/policy-choices-system-planning/4-multi-modal-network-planning.aspx
[16] Australian Government Productivity Commission (2006) *Road and Rail Freight Infrastructure Pricing Productivity Commission Inquiry Report*
[17] Infrastructure Australia (2011) National Land Freight Strategy

> The choice of transport mode generally involves a trade-off between cost and several service quality factors. Key freight service quality factors include transit time, reliability and service frequency. The relative importance of these service factors is highly contingent on the nature of the freight, bulk or non-bulk. Bulk freight generally involves large quantities of homogenous product, typically transported in large quantities and without packaging, while non-bulk freight is generally characterised as any containerised freight and often involves heterogeneous goods being moved between dispersed locations.

The available evidence demonstrates there is little competition between road and rail for freight in aggregate, for bulk and non-bulk freight cargo[18]. While competitive distortions between road and rail are possible, the evidence suggests these distortions are limited and (even if network road charges were greatly increased) rail would not derive much benefit given the limited interchange ability between the two modes[19]. Circumstances where road and rail do compete include the transport of some grains and non-bulk freight between capital cities[20].

The complexity of rail regulation, commercial arrangements and road/rail policies has generally incentivised the use of road over rail transport for non-bulk freight. Road freight has an inherent advantage over rail in that asset management and operational costs of road infrastructure are largely shared with other road users. The asset management and associated costs for operators are more complex for rail freight providers than that of road freight providers. The potential for distortions in general freight markets are strongest with relatively long-distance line hauls or high traffic densities, such as highways or roads that run parallel to rail lines, including to urban ports[21].

3.2.3 Supply Chain Constraints at the Port of Townsville

The PoT is one of four priority ports identified by the Queensland Government in Northern Queensland under the *Sustainable Ports Development Act (2015)*. To protect the economic potential of the region and provide a sustainable future for the Great Barrier Reef, no new ports are permitted to be built.

The Queensland Government is developing master planning for the priority ports in accordance with the *Sustainable Ports Development Act (2015)* and to meet its commitments under the Reef 2050 Long Term Sustainability plan.

The PoT has developed the PEP that includes a program of staged development over 30 years to meet the Ports medium to long-term trade capacity requirements. This PEP is consistent with the master plan. A number of smaller port projects have recently been completed, with other projects currently underway to improve the efficiency and capacity of existing port infrastructure, including upgrades of Berth 4, Berth 8 and Berth 10 and the demolition of Berth 6/7.

The first phase of the PoT 30-year expansion program includes the Channel Capacity Upgrade project, which involves widening of the sea channels to cater for larger ships and a larger swing bay. The dredge spoil can no longer be disposed of at sea and will be pumped to a new reclaim area for future landside development.

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[18] Bureau of Infrastructure, Transport and Regional Economic (2009) *Road and rail freight: competitors or complements?*
[19] Australian Government Productivity Commission (2006) *Road and Rail Freight Infrastructure Pricing Productivity Commission Inquiry Report*
[20] Bureau of Infrastructure, Transport and Regional Economic (2009) *Road and rail freight: competitors or complements?*
[21] Infrastructure Australia (2011) National Land Freight Strategy

The stages are:

- Stage 1 – Channel Widening

  Widening of the channel from 92m to between 120m (at the sea channel) and 180m (at the entrance) with dredge material being beneficially re-used and placed in the Ports new reclamation area (152 hectares). This stage also includes the construction of Berth 12.

  Planned start date is late 2017 (subject to approval of the AEIS) with an estimated completion in 2022.

- Stage 2 – Swing Basin and Berths

  Construction of up to three new berths (14,15 & 16) and swing basin construction in the outer harbour.

  This stage is estimated to take five years from commencement.

- Stage 3 – Swing Basin and Berths

  Construction of an additional two berths (17 & 18) and deepening of the channel.

  This stage is estimated to take five years from commencement.

Subsequent stages of the PEP involve the creation of additional berths to accommodate larger ships and long-term forecast trade growth. The new berths will require new landside development on the reclaimed land from dredging to the east of the current port operations. This landside development will include new rail loops that will need to be connected to TEARC to enable the port to operate efficiently.

The PEP will need to develop a detailed plan and cost to reorganise and relocate the existing unloading facilities for sugar and Glencore to the eastern side of the port. The PoT will need to negotiate with current leaseholders to seek in principal agreements on the relocation of their facilities. The timing and approval for the relocation of these existing unloading facilities is highly dependent on the timing and availability of TEARC.

The DBC project team had meetings with the PoT on the status of planning of the relocation of the existing unloading facilities and concluded the concept was not sufficiently developed to include in this DBC. The scope of the Reference Project allows for connection to the existing balloon loops at the port and retains the Jetty Branch.

3.2.4 Decline in Urban Amenity

Urban amenity has a significant bearing on the liveability, urban development opportunity and competitiveness of a city. At present all freight movements are through industrial, commercial and urban areas in Townsville, which lowers urban amenity and limits the opportunities for urban renewal and uplift. Freight rail movements through residential areas expose residents to noise, dust and potential safety issues from hazardous cargo. Although the rail operators must have safe working practices in place for the handling and transport of hazardous cargo, the risk still remains for an incident unless the cargo can be removed completely from the area.

As the city expands around the existing rail corridors, and if the rail demand grows, these issues are expected to grow.

3.3 Definition of Problem and Service Needs

An investment logic-mapping workshop was held with the key project stakeholders to define issues constraining the competitiveness and attractiveness of investment in Townsville. This workshop offered an opportunity to review, clarify and agree upon the program logic underpinning the proposed investment. The service need, expected benefits of the project, and strategic responses to address identified problems were explored and captured in the Investment Logic Map (ILM) as shown in Figure 3.1. The percentages represent the relative weightings for each of the problems and benefits.

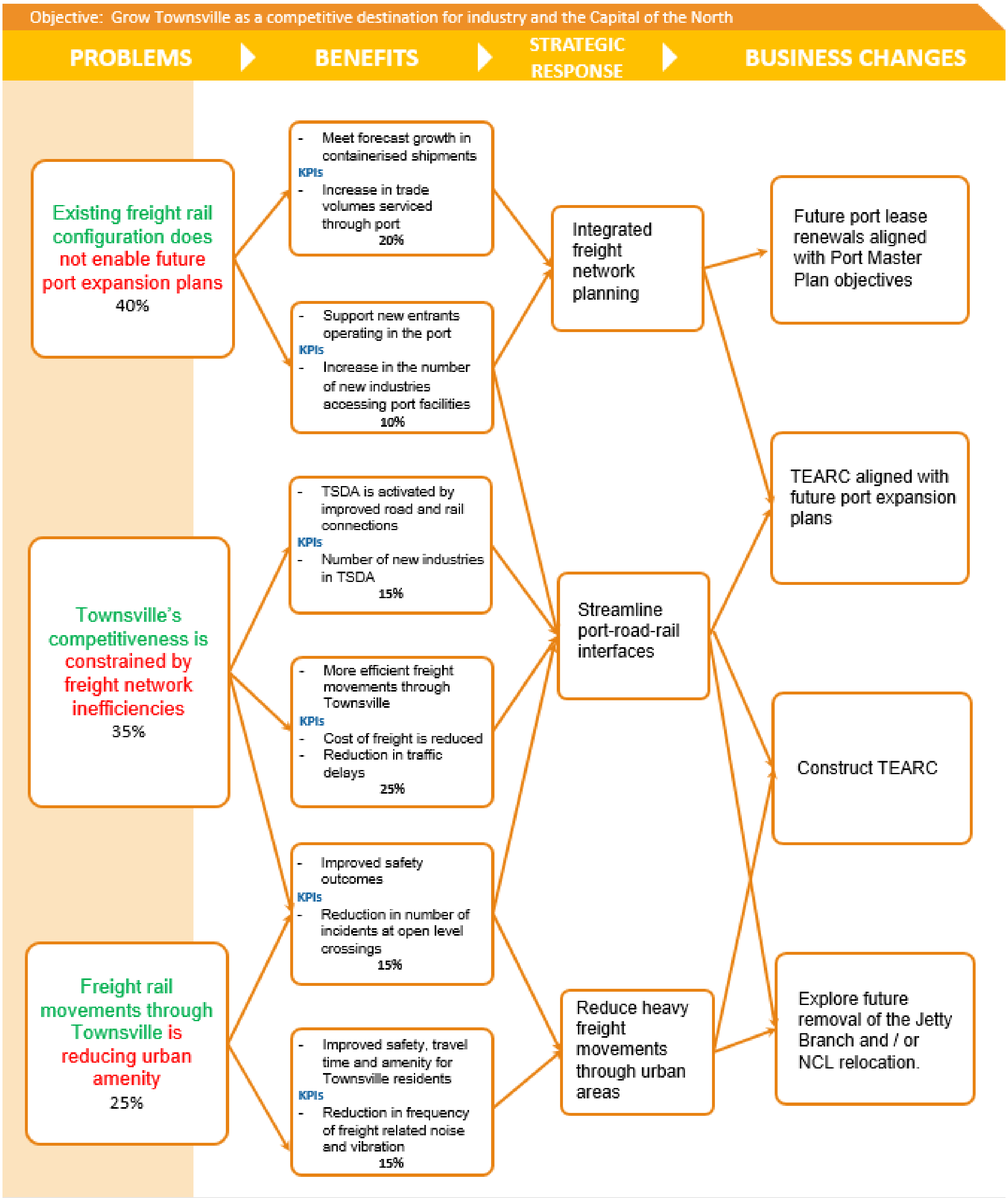
It is evident from the revised demand outlook and supported by the outcomes of the ILM workshop, some of the original service needs from the PE in terms of 'growing demand' on the Mt Isa line are not currently applicable.

This chapter outlines the strategic objectives, core problems, expected benefits and strategic responses identified through the Investment Logic Mapping process.

The ILM process identified three core problems relating to the strategic objective of growing Townsville as a competitive destination for industry and as the Capital of the North:

- Existing freight rail configuration does not enable future port expansion.
- Townsville's competitiveness is constrained by freight network inefficiencies.
- Freight rail movements through Townsville is reducing urban amenity.

Figure 3.1 Investment Logic Map[22]



[22] Percentages represent the weighting of the importance of the problem and benefit

Table 3.2 maps the problems to TEARC Service Needs.

Table 3.2 DBC Service Needs

PROBLEM	SERVICE NEEDS
Existing freight rail configuration does not enable future port expansion plans	Ability for the Port to accommodate new customers and meet the Ports projections of growth in containerised shipments and any potential export growth
Townsville's competitiveness is constrained by freight network inefficiencies	Provide for longer trains into the Port Reduce bottlenecks and complexity of operations in the Port
Freight rail movements through residential areas are negatively impacting on urban amenity (noise, dust, delays) and safety at level crossings	Improve urban amenity for suburbs of Townsville Reduced risk of safety incidents at open level crossings

3.3.1 Existing Freight Rail Configuration Does Not Enable Future Port Expansion Plans

The volume of cargo that can be moved to and from the PoT by rail is currently constrained due to sub-optimal rail layouts and various dedicated user and commodity specific rail receival facilities within the port.

The current rail alignment to and through the port has numerous at-grade road crossings, leading to potential safety issues both within and outside the port.

Planning to expand the PoT is underway. While both the port and the existing railway can continue to operate as is, opportunities for freight network efficiency are lost, compromising Townsville's competitive export position.

Key issues identified include:

- Road congestion due to trains queuing across at-grade road/rail crossings.
- Underutilisation of Berth 11 as bulk materials handling infrastructure that does not support multi-user activity.
- Over utilisation of Berth 3 for trucked dry bulk material.
- Fragmentation of port yards makes optimisation of infrastructure (roads, road/rail dumps, berths) through multi-user access difficult, resulting in inefficient operations.
- Minimal land area available immediately behind container and break-bulk berths 3 and 4.
- Community interface issues with dusty and noisy dry bulk activities and odorous livestock activities occurring at Berths 8, 9 and 10, the berths closest to the city.
- Existing dredge spoil management area is nearing capacity requiring development of a new method or area to dispose of dredged material. Additional reclaim area would allow continued beneficial re-use of this material.
- Congestion, over-utilisation of berths and inefficient operations can add to operational costs for port customers, while underutilisation of berths and existing infrastructure can result in lost business opportunity for the port.
- The current configuration of port and rail network restricts the ability of the Port to gain economies of scale and therefore to reduce average costs in the future.

- TEARC will be required to address these issues in conjunction with both the marine and landside port upgrades.
- Berth Utilisation

  The existing berths are not used effectively due to the port lease arrangements and berth ownership. Some of the berths such as berth 11 are dedicated to bulk mineral exports and cannot be utilised by other customers. Berth 3 is almost fully utilised. The Port would need to free up capacity on the berth, or provide an alternative berth to accommodate forecast in growth in containerised shipping. Table 3.3 shows the recent utilisation of the berths for the PoT.

Table 3.3 Existing Berth Use

BERTH	EXISTING PRODUCT BERTH INFRASTRUCTURE CAPABILITY	2015/2016 UTILISATION %	2015/2016 THROUGHPUT (T)
1	Bulk Liquids	28	1,120,038
2	Bulk Nickel (currently not in use)	33	1,638,690
3	Multi-purpose (incl. containers)	80	1,702,694
4	Multi-purpose. Crane upgrade.	44	645,898
8	Bulk material/multi-purpose	44	1,884,841
9	Sugar, molasses, motor vehicles, bulk, general cargo	30	1,545,664
10	Navy/cruise/multi-purpose (incl. cattle)	44	288,718
11	Bulk mineral export	17	403,025

The PEP will provide a roadmap to improving the capacity and flexibility of the port through a staged approach:

- Stage 1 – Initial outer harbour reclamation, channel widening and development of Berth 12.
- Stage 2 – Ultimate outer harbour reclamation and development of Berths 14, 15 and 16.
- Stage 3 – Channel deepening and development of Berths 17 and 18.

In the longer term TEARC will be required to address the service needs of the PoT as delivered through the PEP.

3.3.2 Townsville's Competitiveness is Constrained by Freight Network Inefficiencies

The existing freight network in Townsville is subject to time delays and capacity constraints. The inefficiencies described below, increase costs for industry and reduce their competitiveness.

Network inefficiencies are generated by road/rail interfaces as cargo moves through urban areas (e.g. along the Jetty Branch and along the North Coast Line).

Key issues identified include:

- Traffic congestion delays arising from congestion at level crossings and reduced line speeds cost residents, commercial vehicles and freight operators' time and money.
- Mount Isa Line restrictions, the maximum speed along the line is 80 km/h, the poor quality of some sections of track has led to many speed restrictions. This compounds the delays experienced once the trains reach Townsville urban areas, reducing the competitiveness of hauling along the Mount Isa Line.

- The existing rail infrastructure into the port restricts train lengths for freight and bulk goods unloading which reduces the efficiency of the operations.
- The existing rail corridor along the Jetty Branch does not allow for effective connection to the new Port rail loops to the east of the current facilities proposed by the PEP.

TEARC is part of a 'last mile' solution that will significantly reduce freight movements through urban areas and reduce road/rail interfaces both inside and outside the port. Maintaining consistent asset capability along the rail network will allow industries across Northern Queensland to link to an effective freight system, unlocking the economic potential of the region and positioning Townsville as the optimal supply chain environment. Realisation of full efficiency and competitiveness would require additional investments over and above the reference project considered in the DBC.

3.3.3 Freight Rail Movements through Townsville is Impacting on Liveability

Freight rail movements through Townsville are impacting on liveability such as Community Impacts, Road Safety and Travel Time. Key issues are summarised below.

- Community Impacts:

  The number of rail movements to the PoT is impacting urban amenity of the suburban areas of Townsville.

  There is a weekly average of 175 train movements on the Jetty Branch into the PoT (derived from TEARC DBC demand and rail simulation modelling). The average does not reflect the higher peak number of train movements during the sugar-harvesting season.

  The number of train movements accessing the PoT is projected to increase to an average of about 203 train movements per week, representing an increase of about 17% between 2017 and 2047 (based on Scenario 1 – Central demand case detailed in Chapter 4).

  Table 3.4 details the estimated number of Number of Train Movements on the Jetty Branch to PoT between 2017 and 2047 for the Base Case.

Table 3.4 Estimated Number of Train Movements on the Jetty Branch to PoT

YEAR	ANNUAL	AVERAGE WEEKLY	AVERAGE DAILY
2017	9,100	175	25
2022	9,464	182	26
2027	9,464	182	26
2032	10,920	210	30
2037	10,920	210	30
2042	10,556	203	29
2047	10,556	203	29

Based on Scenario 1 - Central demand case detailed in Chapter 4

Based on the aforementioned (Table 3.4) train movements, there is an average of 1 to 2 trains every hour throughout the year accessing the PoT, negatively impacting urban amenity.

Urban renewal is planned along the rail corridor that includes the Townsville City Waterfront Priority Development Area adjoining the Jetty Branch. Existing freight rail movements along the Jetty Branch create urban amenity issues along the corridor, including noise, vibration, reduced air quality and low visual amenity. The forecast increase in train movements to meet freight demand at the port will compound these issues. These impacts will influence the attractiveness of the Townsville Priority Development Area (PDA) site as an urban renewal site and its ability to act as a catalyst for broader urban renewal opportunities in the neighbouring residential areas.

- Road Safety:

  At-grade road-rail crossings introduce increased risk to road safety and rail operations.

  On the North Coast Line and Jetty Branch, from where the Mount Isa Line joins the North Coast Line at Stuart to the PoT entry, there are 11 at-grade road crossings that includes one pedestrian crossing.

  From 2008 to 2017 there have been a total of 175 incidents with approximately 20 incidents per year.

  As identified in Table 3.5, there is an estimated weekly average of 175 train movements (2017) on the North Coast Line to the PoT. This is forecast to increase to 203 train movements by 2047. The forecast increase in train movements to meet freight demand at the port, and increased road traffic will increase the potential safety risks at the at-grade level crossings.

- Travel Time

  Travel time on the road network is impacted by disruptions caused by freight trains accessing the PoT activating at-grade road-rail crossings. Abbott Street and Boundary Street are key corridors that feed traffic onto road links with the at-grade road-rail crossings. Table 3.5 identifies the growth in general traffic volumes along the key road corridors.

Table 3.5 General Traffic Volumes on Abbott Street and Boundary Street (Average Annual Daily Traffic)

YEAR	2016	2022	2026	2036
Abbott Street	3,551	8,618	13,684	14,924
Boundary Street	8,391	11,506	14,622	23,182
Perkins Street	357	1,031	1,706	2,680

Source: Southern Townsville Strategic Model

It is estimated the road network is currently disrupted on average for up to 9 hours 40 minutes per week from freight trains activating the at-grade crossings. By 2047 it is forecast the time the road network will be disrupted will increase by 45 minutes to 10 hours 25 minutes per week.

Table 3.6 identifies the estimated average number of minutes per week the road network is disrupted from at-grade level crossings due to freight train movements for the Base Case. The times in Table 3.6 relate to the estimated time the at-grade crossings are closed for trains' movements, not person minutes of delay to road users.

The weekly and daily times represent an average and do not reflect the higher number of train movements during at peak sugar harvesting season, where the number of times the crossings are activated is more frequent and therefore disruption time to the road network is greater.

As the Reference Project retains the existing Jetty Branch, sugar-harvesting freight would continue to use existing rail infrastructure.

Table 3.6 Delay Minutes At-grade Crossings Activated

YEAR	ANNUAL	AVERAGE WEEKLY	AVERAGE DAILY
2017	30,576	588	84
2022	32,032	616	88
2027	31,304	602	86
2032	35,308	679	97
2037	35,672	686	98
2042	33,124	637	91
2047	32,760	630	90

Based on Scenario 1 - Central demand case detailed in Chapter 4

- Excludes Jensen Street and Southwood Road at grade crossing

Future planned developments will generate significant additional traffic volumes and increase congestion at existing at-grade road-rail crossings. The additional travel time will impact on both business and community liveability. Currently the identified growth and development includes:

- urban development adjoining the Mount Isa and North Coast Lines
- new employment areas at TSDA, Roseneath Medium Impact Industrial Precinct, Woodstock Industrial Land and Stuart Industrial Estate
- residential growth at Townsville City Waterfront Priority Development Area
- Elliot Springs land release to the south of Townsville that will accommodate over 26,000 people upon completion in 2050.

Whilst the demand and frequency for existing public transport routes (Route 208 University to CBD and 209 Stuart to CBD) is currently low. Increased urban density in southern Townsville (including the Elliot Springs land release) will generate the demand for increased service frequencies and the introduction of new routes. Timetable reliability and efficiency of the public transport system will be impacted by the forecast increase congestion caused at existing at-grade road-rail crossings.

3.4 Overall Benefits of TEARC

The economic benefits of the TEARC Reference Project included in Chapter 7 can be divided into three broad categories:

- Rail freight benefits through a reduction in the cost of freight transportation on rail.
- Reduced rail crashes and negative externalities.
- Road user benefits: reduced cost of travel on the local south Townsville road network due to reduction in delays from freight trains (e.g. at level crossings).

At a strategic level, TEARC will provide further broader benefits and enable the implementation of the PoT master plan, and improved freight efficiency to and from the port. This integrated rail, road and port plan is expected to contribute to the competitiveness of Townsville as a major port for import and exports for the region.

In turn, this will likely foster increased:

- industry investment, particularly in value-add industries
- economic resilience through diversification of the regional economy
- employment opportunities
- new opportunities for urban renewal and development.

Reducing freight movements through urban areas and providing a freight rail link through the TSDA, will encourage industries to establish operations along the new rail alignment, helping to activate the precinct and shift freight movements away from the inner city and residential areas. In addition to improved safety, congestion and urban amenity, this may promote the development of the Townsville CBD and the Townsville Waterfront PDA.

TEARC is expected to play a role in addressing some, but not all of the aforementioned problems. Many urban amenity and safety issues would be mitigated or removed over time.

At a project level, TEARC is expected to contribute to a number of strategic benefits for economic development that are detailed in Table 3.7.

Table 3.7 Overall Contribution of TEARC to Broader Initiatives

PROBLEM	EXPECTED BENEFITS
Existing freight rail configuration does not enable future port expansion plans	▪ Port can meet expected growth in container shipments ▪ Increased trade volumes can be serviced through the port ▪ Export-led growth in Townsville ▪ Enabler for the expansion of the port ▪ Support new entrants to operate in the port
Townsville’s competitiveness is constrained by freight network inefficiencies.	▪ TSDA activation through improved rail connections to port ▪ Reducing freight costs ▪ More efficient freight movements through Townsville
Freight rail movements through Townsville is reducing liveability	▪ Opportunities for urban renewal ▪ Reduced noise and vibration impacts on urban neighbourhoods ▪ Reduced road network delays ▪ Reduced risk of safety incidents at open grade level crossings

3.5 Strategic Response

Emerging strategic plans and policy objectives are now focused on enhancing the competitiveness of Townsville. TEARC is identified as a key enabling project through which a stronger industry base and export hub may be developed by improving the efficiency of port operations. The project is also expected to improve urban amenity, reduce the risk of safety incidents and open up opportunities for urban renewal in Townsville.

The existing rail network can handle some freight growth, albeit inefficiently. Any increase in the number of trains will reduce urban amenity. The strategic response to mitigate the reduction in amenity is to implement TEARC.

- Some of the issues identified fall outside the scope of TEARC and should be looked at from a strategic perspective. These issues will need to be considered and addressed in order to fully realise the overarching objective of growing Townsville as a competitive destination for industry and Capital of the North.
- The realisation of benefits from TEARC exclude the following issues:
- Constructing TEARC to create a competitive rail freight network between Queensland, the North-West Mineral Province, Townsville industry, and the PoT.
- Addressing the complexities and inefficiencies of port operations.
- Ensuring future port lease renewals are aligned to the Port Master Plan objectives.
- Addressing line speed constraints on the Mount Isa Line, including the provision of passing loops and other upgrades.
- Regulatory reform to encourage industry growth, reduce input costs and a level the playing field between road and rail transport.
- Exploring options to remove the Jetty Branch into the PoT that would provide a stepped increase in urban amenity for south Townsville residents.

TEARC will be an enabler in order to provide a resolution to these issues.

The final TEARC DBC will inform further studies and investigations to be undertaken as part of existing commitments and future opportunities under the *Townsville City Deal (2016)* including:

- the PoT channel capacity upgrade and port expansion
- acceleration of the TSDA
- maximisation of export opportunities
- supply chain prioritisation.

The Australian Government, Queensland Government and Townsville City Council will also continue working on the identification of innovative financing and value capture opportunities on the wider economic benefits related to TEARC, acceleration of the TSDA and expansion of the port.

4 DEMAND FORECASTS

CHAPTER SUMMARY AND CONCLUSIONS:

- Actual freight rail volumes accessing the PoT were approximately 8.5mt in 2016, with approximately 3.7mt consisting of general freight, 3.5mt minerals related and 1.3mt sugar. The total freight rail volumes were up to 13.1mt in 2015 prior to the closure of the QNI nickel refinery.
- The TEARC DBC adopts the following freight rail and road demand projections for the economic assessment (excluding coal, nickel and magnetite) to 2051:
  - 8.3mtpa (2017), declining to 7.6mtpa (2051), peaking at 10.6mtpa (2037) (Scenario 1 – Central demand case)
  - 8.2mtpa (2017), declining to 5.8mtpa (2051) (Scenario 2 – Low demand scenario)
  - 8.8mtpa (2017), increasing to 13.5mtpa (2051), peaking at 14.8mtpa (2037) (Scenario 3 – High demand scenario)
- As part of the PoT master planning process, a demand forecast (Scenario 4) has been generated to identify parameters for an ultimate port footprint to 2050. This demand case includes the following freight rail (only) projections:
  - 6.5mtpa (2017) increasing to 22.3mtpa (2051) (Demand Case – Ultimate port footprint case).
  - This scenario included coal production up to 9.5mpta by 2032, nickel returning to volumes of 4mtpa and magnetite demand peaking at 1.6mtpa in 2022. Scenario 4 has not been tested in the TEARC DBC i.e. economic and financial analysis.

This chapter provides an assessment of demand including rail and road tonnages of freight movements that will be impacted by TEARC, including from the North-West Minerals Province, in and out of the PoT.

The demand forecast has been used to estimate:

- train services required and operating costs (below and above rail costs)
- road movements and delays (congestion)
- the economic benefits of TEARC
- the potential below rail revenue impacts of TEARC.

The demand forecast was not utilised to assess the capacity of the existing rail network. There will be a theoretical limit on the freight capacity of the existing network that will limit the throughput of the port without the addition of TEARC. As the rail/road, unloading facilities, port layout, berth utilisation and ship sizes all come into play it would be recommended an overall simulation model be developed to provide a quantitative assessment of the capacity and bottlenecks. This was not within the scope of the DBC Reference Project.

The demand forecast is separated into minerals, general freight and agricultural demand. Demand is also considered under a number of different scenarios to incorporate the impact of changes in the assumptions on the forecasts.

4.1 Background

The rail network in the project area (i.e. North Coast Line accessing the PoT and the Mount Isa Line) facilitates a diverse trade mix, comprising of mineral resources, agriculture, general freight and industrial commodities. Freight movements flow domestically and internationally (both import and export), and internally within the corridor.

Over the last three years there has been a significant decline in rail volumes as a result of the closure of the QNI nickel refinery. During 2014 and 2015 nickel contributed around 3 million tonnes per annum (mtpa) on rail which declined to approximately 250,000 tonnes per annum (tpa) in 2016. In terms of net tonnes, general freight made up the majority of demand in 2016 followed by minerals related freight and sugar freight.

4.2 Demand Scenarios

The demand scenarios incorporated in the business case include assessment of rail and road based transport demand.

Three demand scenarios were assessed:

- Central case (Scenario 1)
- Low case (Scenario 2)
- High case (Scenario 3)

A summary of the demand scenario parameters is shown in Table 4.1. The Central, Low and High scenarios were assessed based on geological provinces within the region that were identified as having potential rail demand based on geological characterisation, known mineralisation, commodity type and transport infrastructure.

The Central case includes existing production for life of the current Joint Ore Reserves Committee (JORC) reserve base plus known projects which are "Giant" or "Large", well advanced and have good prospectively (i.e. 50% of mines under exploration). For non-minerals and other general freight, demand is informed by current and historical demand and forecast growth in the population and economy, while indirect mining related freight is based on the forecast level of mining activity.

The Low case considers the same mining projects as the Central case (i.e. incorporates all operating mines), it excludes mines at the study/feasibility stage or the advanced exploration stage. This is a worst-case scenario that assumes no new mining development occurs to replace current capacity. Resource pricing would have to be in a low cycle for a period of time for this scenario to be realised, which is unlikely. Other freight is also assumed to grow at a slower rate (e.g. lower population and economic growth) while indirect mining freight is based on the low mining activity.

The High case investigated the same mining projects as the Central case, with the addition of 100% of possible projects based on an assessment of other assets within the province, and the likelihood of future discoveries of assets of high prospectively. This is based on higher margins and improved economic outlook. Other freight is also assumed to grow at a higher rate (e.g. higher population and economic growth) while indirect mining freight is based on the higher mining activity. This scenario also includes the impact of a new world-class deposit discovered within the catchment area, for example a new discovery of a similar type and scale to the Mount Isa deposits. In this scenario, it was assumed a new discovery would come online after one of the major mines is decommissioned, such as the Mount Isa Open Pit project.

All scenarios included in the business case assume there are no competing infrastructure projects (e.g. rail or port) and demand between the base case (world without TEARC), and the project case (world with TEARC) is the same, i.e. the TEARC project does not induce or generate additional (latent) demand above the base case.

Table 4.1 Demand Scenario Parameters

SCENARIO PARAMETERS	SCENARIO 1 (CENTRAL CASE)	SCENARIO 2 (LOW CASE)	SCENARIO 3 (HIGH CASE)
Mining – operating mines	Yes	Yes	Yes
Mining – study/feasibility stage	Yes	No	Yes
Mining – advanced exploration	Yes (50% of mines under exploration)	No	Yes (100% of mines under exploration)
Other general freight demand, including agriculture and indirect mining demand etc. (consistent with PoT forecasts)	Yes	Yes	Yes
New mine discovery (e.g. new Mount Isa deposits) demand	No	No	Yes
Energy product demand	No	No	No
New Magnetite and Nickel	No	No	No

4.3 Minerals Demand Forecast

A mining demand forecast was undertaken based on a first principles approach to forecast future mining freight tonnages.

The catchment area was defined as the fourteen geological provinces identified with potential for rail access to the PoT. Five provinces to the north and northwest of Townsville were eliminated following provincial assessment. Three were due to the lack of current rail infrastructure and a further two were due to the current rail alignment and access from the north of Townsville. The McArthur Basin was also eliminated in the provincial assessment, given the uranium mineralisation present is unlikely to trigger rail demand and it is located 370km from Mount Isa.

For the remaining eight geological provinces, the forecast was developed by scheduling on a project by project basis. The complete list of projects has been developed using a top down intersecting a bottom up approach using industry databases and reviews of previous studies:

The bottom up reviewed all mineral resource sites as presented in the:

- "Queensland Minerals 2015" report from the Department of Natural Resources and Mines (DNRM) Geological Survey of Queensland and associated database of information
- Queensland Tenure Database, which was updated in January 2017 by DNRM, which incorporates all mining tenure such as:
  - Exploration Permits Minerals (EPMs)
  - Mineral Development Licences (MDLs)
  - Mining Leases (MLs).

For each project the resource scale, stage of development and the potential impact on rail demand was assessed. There were 117 discrete projects identified of which, 60 projects were assessed to be included in the schedule of potential demand. For each of the 60, the "Scale" of the Resource and the "Status" were assessed based on industry and publicly available information.

Table 4.2 details the status classification for each mine and its inclusion in each scenario.

Table 4.2 Classification of Mine Status

STATUS	DEFINITION	INCLUDED IN SCENARIO
Inactive	No current tenure	N/A
Exploration	Evidence of mineralisation and exploration targets but limited proving of Resource	Scenario 3 (High)
Advanced Exploration	Established Resource generally with a JORC Resource	Scenario 3 (High) Scenario 1 (Central) – 50%
Studies/Feasibility	Well-understood Resource with evidence of varying levels of Study. Often the Study will result in the definition of a Reserve.	Scenario 1 (Central) Scenario 3 (High)
Operating	Currently operating	Scenario 1 (Central) Scenario 2 (Low) Scenario 3 (high)

4.4 Minerals Rail Demand

A list of the projects included in the demand forecast is shown in Table 4.3. A demand schedule was developed based on public and industry information on a project-by-project basis. The following assumptions were applied to developed three cases:

- Projects with a status Advanced Exploration or more mature, were scheduled on an individual basis. Projects assessed with a status of Exploration were not individually scheduled but rather seen as part of the exploration funnel. A representative Exploration 1 and Exploration 2 project were scheduled to reflect the potential impact of this funnel on long-term demand.
- The potential exists for another world-class deposit of the scale of Mount Isa Open Pit project. Discovery exploration, study and development of the deposit is likely to take in excess of 25 years particularly given the discovery maybe facilitated by improvements in exploration technology. A potential new world class deposit has been included in Scenario 3 (High) with rail demand being the same as the same levels of rail demand as Mount Isa Open Pit.
- With the exception of Mount Isa Open Pit, no ramp up profiles has been scheduled.
- Company guidance on mine life, concentrate grades, timing etc. were used when available and assessed as reasonable.
- Where logistics haulage basis is known, it has been included i.e. road verses rail.
- Earliest timing for non-operating or development projects:
  - Studies/Feasibility – 4-6 years
  - Advanced Exploration – 6 – 8 years.
- Where there is limited information available for Advanced Exploration Projects, general rules of thumb have been applied including:

- Assumption the Project results in new concentrate volumes
- 30% of contained metal in Total Resource (Measured, Indicated and Inferred).

- The life of the Project is dependent on Scale:
  - Large 10 years
  - Medium 5-10 years
  - Small 2 years.

Standard concentrate grades have been assumed based on a conservative (maximum) concentrate basis. It should be noted the actual concentrate grades will vary.

Table 4.3 Mines included in Demand Forecast by Status

INACTIVE	EXPLORATION	ADVANCED EXPLORATION	STUDIES/ FEASIBILITY	DEVELOPMENT/ OPERATING	CARE & MAINTENANCE
Fort Roger	Constance Range	Mount Elliott/Swan	Mount Isa Open Pit	Cannington	Lady Loretta
Deposit I	Broader Altia	Walford Creek	Capricorn Copper	Dugald River	Highway Reward
Julivon Creek	Mount Norma	Cloncurry Copper Project	Merlin and Mt Dore	George Fisher	
Mount Jennifer	Phantom Hills	Kalman	Rocklands Copper Project	Mount Isa Copper	
Mount O'Connor	Riversleigh	Maronan	Roseby Copper Project	Ernest Henry	
Limelight	Beacon Prospect	Mary Kathleen	Barbara	Lady Annie Project	
Mount Les	Black Rock JV	Mount Oxide	Mount Watson	Eloise	
	Chinova Other	Mount Philp	White Range Project	Korella	
	Eloise Copper JV	Paradise Phosphate Project		Leichhardt Project	
	Flamingo	Pegmont		Monakoff / Mount Margaret	
	Fountain Range Project	Starra Line		Mount Carlton Project	
	Granite Castle	Cloncurry Copper and Gold Project		Osborne	
	Hazel Creek Project	Lady Ella		Phosphate Hill	
	Mount Avarice	Lorena		Thalanga	
	Laroona Lime	Overlander			
	Selwyn	Victoria Stuart			

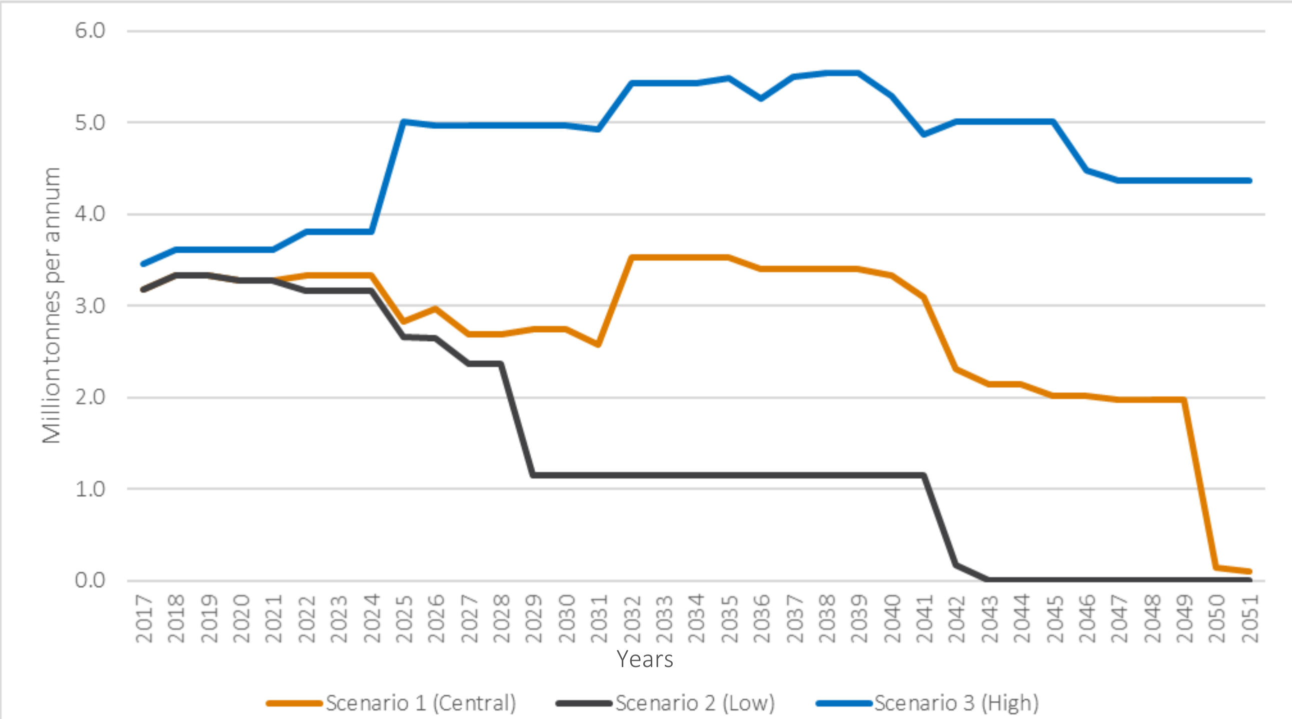
A summary of the minerals demand forecast under each scenario is shown in Table 4.4 and Figure 4.1. The main difference between Scenario 1 and 2 is the assumption that the Mount Isa Open Pit mine (around 1.2 -

1.8mtpa) (Mount Isa Silver-Lead mine) is not commissioned, while the main difference between Scenario 1 and Scenario 3 is the inclusion of the Paradise Phosphate Project (around 1.2mtpa) in 2024 of the high scenario.

Table 4.4 Minerals Demand for Each Scenario (mtpa)

TRAIN TYPES	2017	2022	2027	2032	2037	2042	2047	2051
Scenario 1 - Central	3.2	3.3	2.7	3.5	3.4	2.3	2.0	0.1
Scenario 2 - Low	3.2	3.2	2.4	1.1	1.1	0.2	-	-
Scenario 3 - High	3.5	3.8	5.0	5.4	5.5	5.0	4.4	4.4

Figure 4.1 Minerals Demand Forecast for Each Scenario



4.5 Other Freight (Non-Minerals)

The forecast growth projection for other freight (non-mining) is based on modelling assumptions, and a detailed understanding of the PoT current customers and cargoes, Queensland government projections of population, and irrigated agriculture. The non-minerals freight forecast was prepared based on the data being used by PoT for master planning purposes.

There is inherent uncertainty in growth projections, possible size, timing of future development, and the timing of trigger points for industry developments. The growth scenarios were developed based on a 30-year master planning timeframe (PoT master planning), with incremental growth over the next 10 and 20 years expected.

A range of growth scenarios have been developed to account for the inherent uncertainty in the magnitude and timing of growth, providing flexibility in a range of possible long-term port growth outcomes.

The following should be noted when reading the growth scenarios:

- Growth scenarios are for the TEARC business case assessment, focusing on maximum reasonable estimates of throughputs over the assessment period, regardless of when this throughput is achieved.
- The analysis does not form a view about the likelihood of any of the scenarios occurring or indicate government support for any particular infrastructure project or industry development.
- The analysis recognises that individual ports (as a freight generator) compete for trade, with growth scenarios for each port accommodating of maximum trades without forming a view about which port may be more likely to receive the trade.

The freight demand forecast for Scenario 1 (Central) is shown in Table 4.5. Scenario 1 includes the following overall assumptions:

- Growth in the Port's existing trade (exports and imports).
- Development of the currently known North West Minerals Province projects (including phosphate and excluding coal and uranium), northern Queensland irrigated agriculture projects and ethanol plant projects.
- Port capture of contestable agricultural export and household goods import container trades.
- Central Galilee Basin coal development starts with fuel and project cargo routed via the PoT.

Table 4.5 Other Rail Freight Demand – Scenario 1 (Central Case) (mpta)

	2017	2022	2027	2032	2037	2042	2047	2051
Total	2.8	3.0	3.2	3.4	3.5	3.6	3.7	3.8

The freight demand forecast for Scenario 2 (Low) is shown in Table 4.6. Scenario 2 has the following overall assumptions:

- Further growth in the port's existing trade (exports and imports).
- Further development of currently known North West Minerals Province projects generating dry bulk exports (including phosphate as dry bulk and excluding coal and uranium), northern Queensland irrigated agriculture projects and ethanol plant projects.
- Further part-capture of contestable agricultural export and household goods import container trades.
- Central Galilee Basin coal development is expanded with two mines being supplied with fuel and project cargo via the PoT.

Table 4.6 Other Rail Freight Demand – Scenario 2 (Low Case) (mtpa)

	2017	2022	2027	2032	2037	2042	2047	2051
Total	2.8	2.8	2.9	3.0	3.1	3.2	3.2	3.3

The freight demand forecast for Scenario 3 (High) is shown in Table 4.7. Scenario 3 has the same assumptions as Scenario 1 with the addition of increased dry bulk exports routed through the PoT.

Table 4.7 Other Rail Freight Demand – Scenario 3 (High Case) (mtpa)

	2017	2022	2027	2032	2037	2042	2047	2051
Total	2.8	3.1	3.4	3.6	3.8	3.9	4.1	4.2

4.6 Total Rail Demand

The total rail demand for TEARC incorporates both the minerals (concentrates and fertilises/phosphate) and other freight demand forecast. A summary, by train type and commodity, is shown in Figure 4.2 and Table 4.8. In the analysis, no generated demand is assumed. Consequently, the estimates of total freight tonnes are assumed to be equal in the base case and project case.

The majority of rail traffic over the forecast period is for concentrates and sugar/molasses. Fertiliser/phosphate is an important source of demand, however in Scenario 1 this demand is assumed to end in 2041.

Figure 4.2 Total Rail Demand Forecast for Scenario 1 (Central Case) (mtpa)

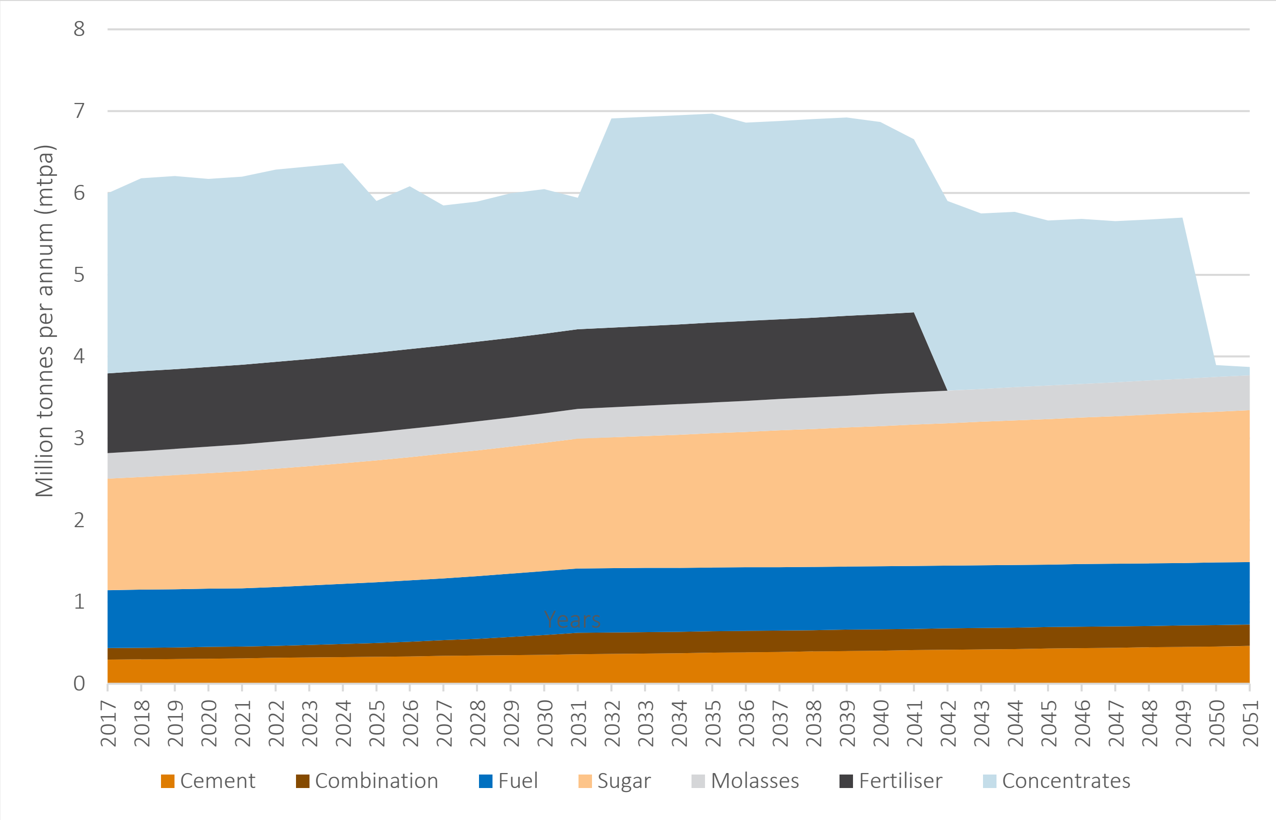


Table 4.8 Total Rail Demand Forecast for Scenario 1 (Central Case) (mtpa)

	2017	2022	2027	2032	2037	2042	2047	2051
Total	6.0	6.3	5.8	6.9	6.9	5.9	5.7	3.9

A summary of the total rail demand for all scenarios is provided in Figure 4.3 and Table 4.9.

Figure 4.4 compares the demand forecast to historical demand. The significant decline in rail traffic is predominately due to the decline in nickel that at its peak amounted for over 3mtpa. Note the nickel ore was transported from the PoT via the Jetty Branch to the North of Townsville via the North Coast Line.

Figure 4.3 Total Rail Demand Forecast (mtpa)

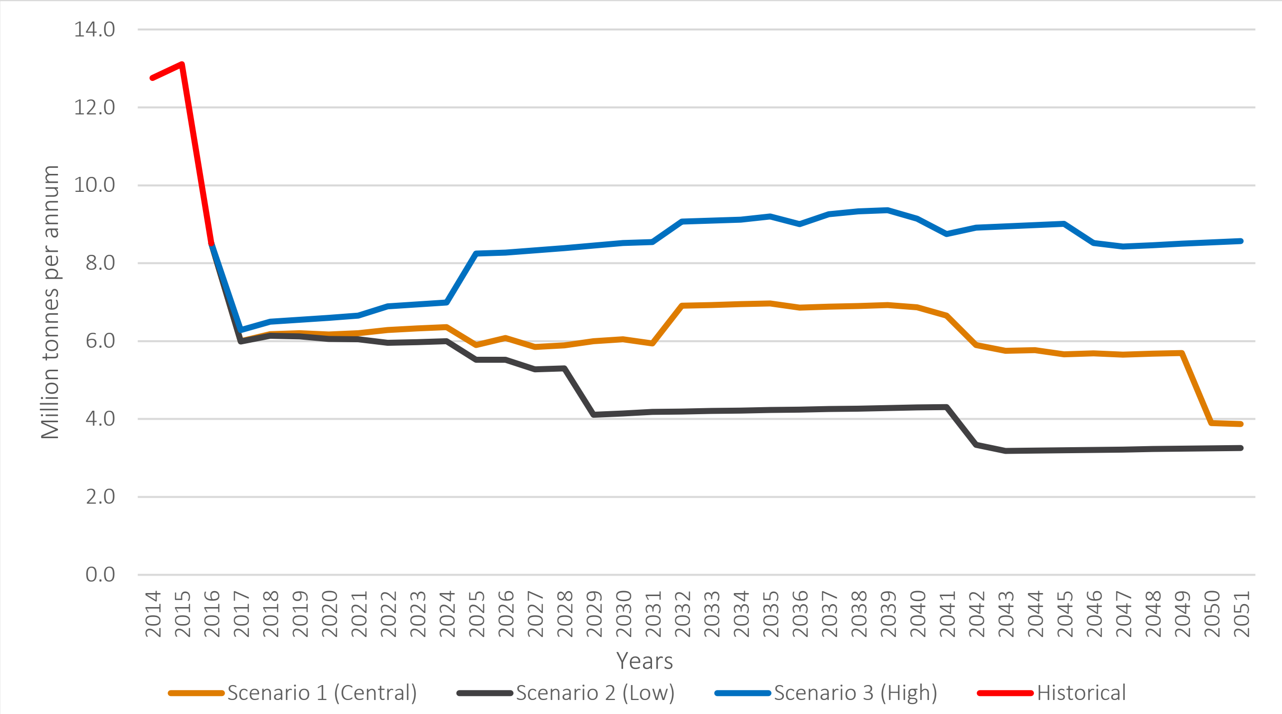


Table 4.9 Total Rail Freight Demand (mtpa)

SCENARIO	2017	2022	2027	2032	2037	2042	2047	2051
Scenario 1	6.0	6.3	5.8	6.9	6.9	5.9	5.7	3.9
Scenario 2	6.0	6.0	5.3	4.2	4.3	3.3	3.2	3.3
Scenario 3	6.3	6.9	8.3	9.1	9.3	8.9	8.4	8.6

4.7 Road Demand

In addition to the forecast rail demand, the impact to the road network was forecast based primarily on growth assumptions developed with the PoT.

The predominate road demand is from general container freight, Scenario 1 forecasts this freight at 2.3mtpa in 2017, increasing to 3.7mtpa by 2051.

The forecast road demand through the PoT is shown in Table 4.10.

Table 4.10 Total Road Demand Forecast for Scenario 1 (Central Case) (mtpa)

	2017	2022	2027	2032	2037	2042	2047	2051
Total	2.3	3.6	3.5	3.6	3.7	3.7	3.7	3.7

A summary of forecast road demand for each scenario is shown in Table 4.11.

Table 4.11 Total Road Freight Demand (mtpa)

SCENARIO	2017	2022	2027	2032	2037	2042	2047	2051
Scenario 1	2.3	3.6	3.5	3.6	3.7	3.7	3.7	3.7
Scenario 2	2.2	2.7	2.6	2.5	2.6	2.6	2.5	2.6
Scenario 3	2.5	5.2	5.2	5.4	5.5	5.5	5.0	5.0

4.8 Total Rail and Road Demand

The rail and road demand is combined to provide an indication of the forecast freight task for the PoT. Overall demand is expected to decline from 7.4mtpa in 2017 to 6.9mtpa in 2051. This is primarily due to the reduction in minerals rail traffic over the period.

Total PoT freight demand under each scenario is shown in Table 4.12.

Table 4.12 Total Rail and Road Freight Demand (mtpa)

SCENARIO	2017	2022	2027	2032	2037	2042	2047	2051
Scenario 1	8.3	9.9	9.4	10.5	10.6	9.6	9.3	7.6
Scenario 2	8.2	8.6	7.8	6.7	6.8	5.9	5.8	5.8
Scenario 3	8.8	12.1	13.5	14.4	14.8	14.4	13.4	13.5

These scenarios were used to inform the rail and road modelling simulations for economic assessment in Chapter 7.

4.9 Additional Future Demand Case

Scenarios 1, 2 and 3 are based on the demand side forecast models which is utilised for the DBC economic assessment in Chapter 7. The economic assessment for TEARC shows that higher demand i.e. more trains to the port, reduces the economic benefit and therefore Scenario 4 was not used in the sensitivity analysis (as part of the PoT master planning process, the Scenario 4 demand forecast has been generated to identify parameters for an ultimate port footprint to 2050).

It is important to understand the longer-term potential of TEARC for the purposes of the port master plan.

The PoT is one of four priority ports under the *Sustainable Ports Development Acts (2015)*. The Queensland Government is developing master planning for priority ports in accordance with the Ports Act. The master planning process has a timeframe out to 2050. Future demand is an important component of the master planning process. During this process, the PoT developed Scenario 3 to inform the possible future infrastructure requirements for the “ultimate footprint” of the port which compares to the DBC Scenario 4.

In addition to the DBC Scenario 3 (High) case, this ultimate port footprint includes:

- coal production up to 9.5mtpa by 2032
- nickel returning to volumes around 4mtpa
- magnetite demand peaking at 1.6mtpa in 2022.

Coal, oil shale, magnetite and nickel were excluded from the economic appraisal (base and project case). The resumption of nickel imports/exports will not be material on the Benefit Cost Ratio (BCR) for this DBC.

A summary of the total rail demand under the ultimate port footprint case is shown in Table 4.13 below. Overall the peak level of rail demand is 24.4mtpa. This is significantly higher than the peak level of demand which was forecast in Scenario 3 (High) case of 9.3mtpa (a comparison is shown in Figure 4.4).

This scenario has not been assessed further in the business case (i.e. economic and financial analysis). It is included in this section to provide an overview of demand that has been contemplated during the Port Master Planning process.

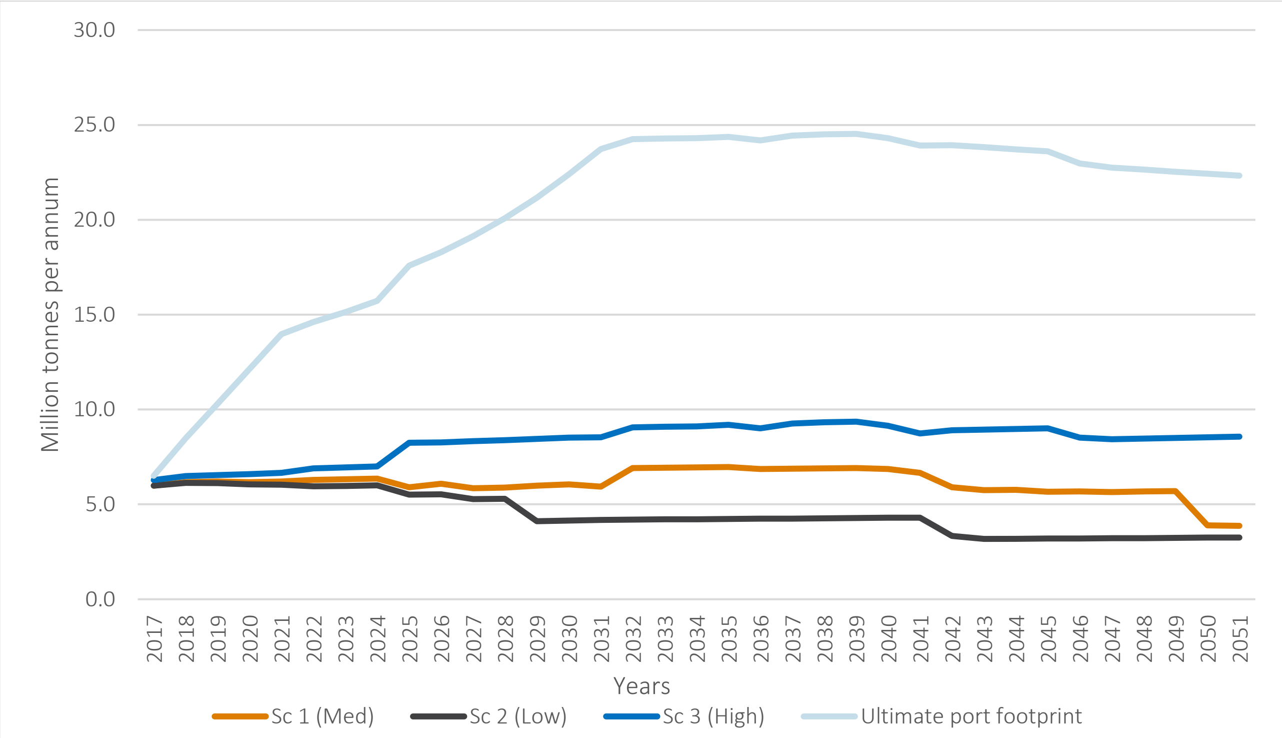
Should this level of demand be achieved it would require a significant change to TEARC and Port infrastructure requirements to cater for existing and new customers, (Berths, Loading/unloading facilities, land requirements and potentially additional passing loops on TEARC and the Mount Isa Line.

Table 4.13 and Figure 4.4 detail the demand profiles for the ultimate port footprint case.

Table 4.13 Total Rail (Only) Demand Forecast – Ultimate Port Footprint Case

	2017	2022	2027	2032	2037	2042	2047	2051
Total	6.5	14.6	19.1	24.3	24.4	23.9	22.7	22.3

Figure 4.4 Total Rail Demand Forecast under Various Scenarios



5 BASE CASE, OPTIONS ANALYSIS AND RECOMMENDED SOLUTION

CHAPTER SUMMARY AND CONCLUSIONS:

- The existing integrated transport system includes the Mount Isa Line and North Coast Line linked to the Port via Abbott Street and the Jetty Branch. Queensland Rail (QR) has in place a committed upgrade plan for the Mount Isa line. The PoT is developing the first stage of the PEP with the channel-widening project. Future stages of the PEP are in concept development.
- The Mount Isa Line, North Coast Line and the Port are an integrated freight transport system. The DBC demand forecast shows longer trains (1,400m) are not required. Given the aforementioned, the Mount Isa line is not included for the DBC evaluation. As the PoT is managing a separate PEP, the PoT is not included in the DBC evaluation.
- The Base Case scope includes the rail infrastructure from the Sun Metals Branch Line, via the North Coast Line to the Jetty Branch and associated road infrastructure. The Base Case excludes the Mt Isa Line to Townsville, the North Coast Line south of the Sun Metals Branch Line and north of the Jetty Branch. It also excludes the PoT to the port boundary.
- Four potential strategic alignment options for the TEARC were initially identified for assessment. Two of the four options are similar, branching off the North Coast Line at Cluden (Options A and B). The other two alignments branch off the North Coast Line near the Stuart Industrial Precinct (Option D) and further south near the Sun Metals Branch Line (Option C) respectively.
- The Reference Project recommended branches off the North Coast Line at Cluden, traversing the northern part of the TSDA, and broadly following the Southern Port Road alignment to the east of the road and the Ross River bridge connecting into the port minerals loops only.
- The Reference Project for the TEARC will provide port access redundancy for rail, increase operational flexibility and reduce the level of interaction between rail and road traffic thereby improving urban amenity, safety and traffic flows.
- TEARC has also been designed to minimise the interaction between the road and rail network in order to maximise network efficiency and safety outcomes. The design includes several grade separated crossings where road and rail intersect and road intersection realignments.
- TEARC is largely aligned with the existing transport corridor through the TSDA that was established previously to support the Southern Port Road. Some land acquisitions at the Cluden Y-junction, along Racecourse Road and within the port precinct are likely to be required.
- The risk adjusted capital cost for the project is: P50 risk adjusted $368,736,292, P90 risk adjusted $391,729,775 based on an estimate base date of July 2017 and design and construct delivery. Anticipated operating costs for the project including risk contingency and escalation are: P50 Risk Adjusted $32,637,788 and P90 risk adjusted $36,080,084 based on a 30-year evaluation from 2022.

This section provides an overall description of the existing integrated transport system for the rail, road and port. The scope of the Base Case is described which provides the starting point for the options assessment process for TEARC. It includes a discussion of the comparative benefits and constraints of the various alignment options considered, together with the rationale for the preferred option (the Reference Project).

5.1 Description of the Existing Integrated Transport System

5.1.1 Introduction

The PoT is connected and serviced by a network of existing rail and road infrastructure that is important for exports and imports in North Queensland and west to Mount Isa. Approximately 70% to 80% of the freight tonnage in and out of the port is transported by rail as compared to road, with rail being preferred for longer hauled bulk materials.

The existing narrow-gauge rail infrastructure in Townsville comprises of two main rail corridors owned and managed by QR, North Coast Line and the Mount Isa Line which connect to the PoT as shown in Figure 5.1.

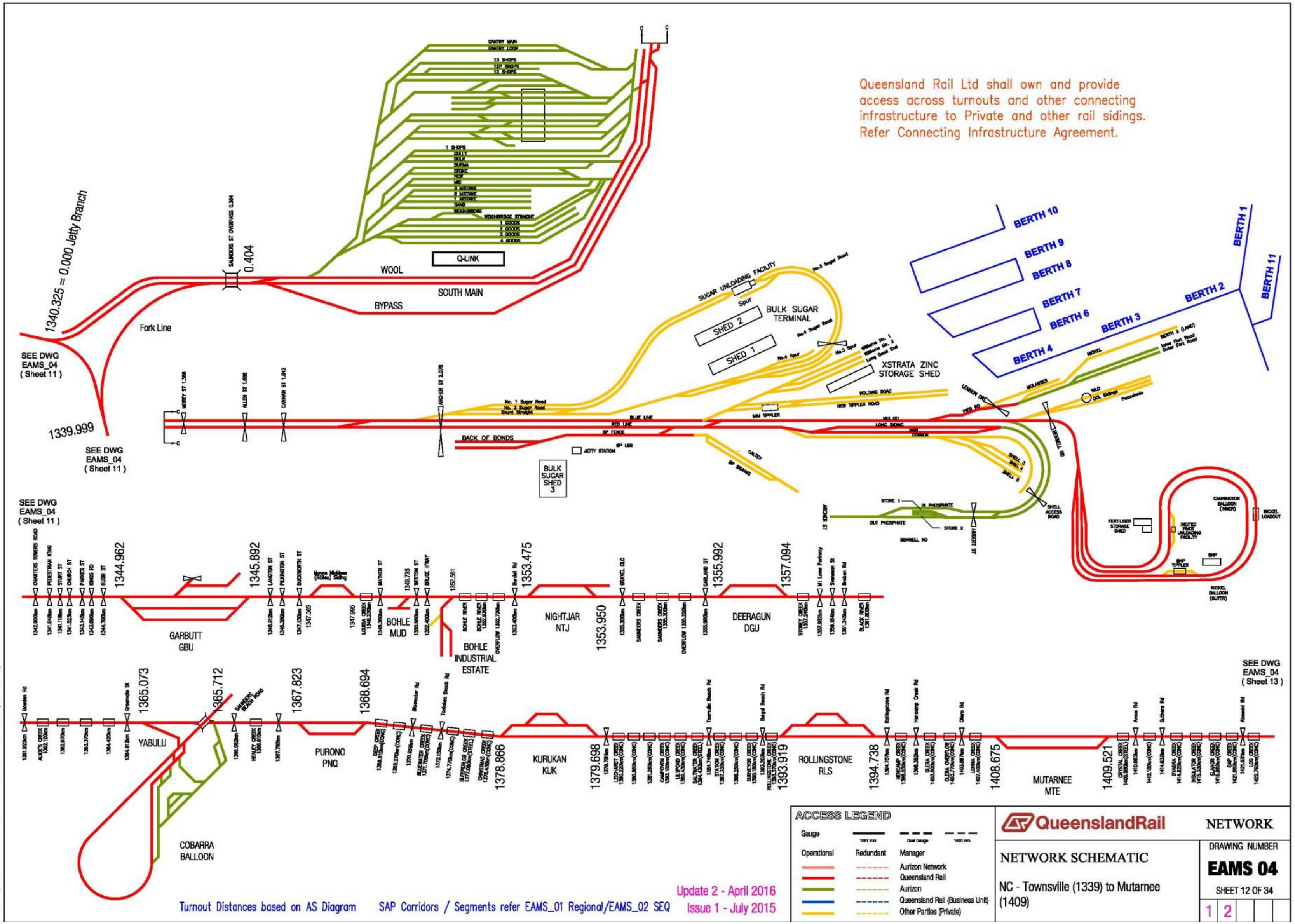
In addition to the main rail corridors connecting Townsville, rail infrastructure within the Townsville area includes:

- the Jetty Branch connecting with the sidings, cargo handling and storage facilities within the port
- Stuart-Townsville rail corridor (along Abbott Street)
- the refinery branch rail line connecting with the Sun Metals zinc refinery and a livestock facility, both located within the TSDA
- Yabulu Nickel Refinery rail loops owned by Aurizon, and QR owned track connecting the North Coast Line to the rail loops
- two intermodal rail terminals at Stuart, one linked to the North Coast Line and the other to the Mount Isa Line
- rail siding into the Glencore copper refinery at Stuart linked to the North Coast Line
- multiple road to rail access points providing intermodal connections along the rail lines.

QR and other third parties own the track infrastructure (below rail) with Aurizon and Pacific National providing rail freight services (above rail) in the area. QR operates a limited number of passenger services on the lines to Cairns, Brisbane and Mount Isa.

Although the Mount Isa Line, North Coast Line and the Port are an integrated freight transport system, the DBC demand forecast shows longer trains (1,400m) are not required. As longer 1,400m trains are no longer required the Mount Isa line is not included for the DBC evaluation. The PoT is managing a separate PEP and hence the PoT is not included in the DBC evaluation.

Figure 5.1 Network Schematic for the Port of Townsville



5.1.2 Existing Rail Infrastructure at the Port of Townsville

The Jetty Branch, which branches off the North Coast Line at Boundary Street, provides access to the PoT. Within the port there are a number of separate terminal facilities for loading and unloading trains, with some shared track sections and private sidings owned by customers or Aurizon. The rail infrastructure is nominally capable of handling 20 tonne axle loads, with a permitted maximum speed of 15 km/h.

The Jetty Branch crosses several roads on the approach to the port and within the port, which with train movements and shunting practices delays local traffic around, into and out of the port.

The following rail load-out and unload facilities located within the port are under control of the PoT:

- sugar balloon loop with sugar dumper on dedicated sidings
- molasses unloading facility at Berth 4
- Glencore tippler facility
- nickel loader on the Nickel balloon loop, currently not in use
- South 32 tippler on the Cannington balloon loop
- Incitec fertiliser dumper on the Cannington balloon loop
- cement loading facility on dedicated sidings
- fuel loading facility on sidings owned by Shell and BP
- two intermodal rail lines at the port intermodal terminal are available for loading/unloading containerised freight trains.

The bulk sugar terminal comprises of a balloon loop and two through-sidings. These sidings are either side of the bottom dump un-loader for the queuing of loaded and empty trains, and the stowage of wagons during the non-crush sugar season. Rail operations within the terminal do not impact external rail operations; however, shunting movements associated with unloading operations at the Glencore tippler can block access to and from the terminal.

A combined sugar and molasses train arrives at Stuart yard where it is split in to two rakes. The sugar rake is hauled to the sugar balloon loop for unloading and returns to the same yard following completion of the unloading process. The molasses rake is hauled separately to the Cannington balloon group to turn the train after which it is shunted back into Berth 4 siding for unloading.

The Glencore terminal area consists of five short dead-end holding roads, including the tippler road used to unload concentrates originating from Mount Isa and Cloncurry. Due to the configuration of the jetty rail infrastructure, and the requirement to align the wagons for operating through the tippler, most Glencore concentrate trains must be run around the Cannington balloon loop on arrival to re-orientate the train. The train is then broken into shorter wagon rakes, and shunted into the short dead-end sidings for the progressive unloading of wagons on each rake.

The Nickel and Cannington balloon consists of two balloon loops. The outer track is utilised for loading nickel ore (currently unused), and the inner track is used for unloading both Cannington concentrate and Incitec Pivot Limited (IPL) fertilizer trains. The inner track (Cannington) has an off-line wagon tippler for South32 concentrates, and an off-line bottom dump pit for unloading IPL fertilizer. On the inner track an overhead chute is used for loading containers with bulk sulphur to return on the Mount Isa Line.

Cement Australia have three sidings for loading cement and fly ash. Empty trains are hauled from the Partington yard and run around the Cannington balloon loop to allow the train to be correctly orientated before being shunted into the cement loading siding.

The BP and Shell fuel sidings consist of eight sidings. The sidings are short and only suitable for storage or loading individual wagons. Significant shunting is required to make and/or break wagons, and wagon rakes into combination trains for the line haul task.

Berth 2 also has a short dead-end siding currently utilised for handling in-bound zinc concentrate railed to Sun Metals refinery.

Trains arriving from Mount Isa are handled within the port by an additional shunting locomotive to the intermodal terminal.

There are two tracks running parallel to Benwell Road that connect to private sidings associated with the previous phosphate balloon loop. These two dead end sidings are primarily used for the arrival, shunting and make up of outgoing combination trains, bulk trains from the Glencore tippler and wagon storage.

5.1.3 Discussion on Port Rail Infrastructure

The existing port rail infrastructure meets current demand and requirements although it is not operationally efficient[23]. The PoT manages the movement of freight through the terminal by providing preferred access to berths for the current private leaseholders and scheduling other shipping as required improving berth utilisation.

The existing rail infrastructure requires trains to use the North Coast Line and Jetty Branch that have become surrounded by urban development as Townsville has grown.

The current infrastructure does not readily provide for the PEP, where new loops are intended to be built on reclaimed land to the east of the current facility.

Although the Mt Isa line can handle 1,000m length trains they cannot be handled at the port due to the limitations of the rail infrastructure. The rail services into the port are either operating shorter length trains or the train is split at Partington Yard Stuart to enable shorter shunt transfer operations to the port.

The overall productivity of the PoT is constrained by the existing infrastructure.

5.1.4 North Coast Line Improvements

The QR Annual Report 2015-2016 states: “The North Coast line extends from South East Queensland to Cairns. Each year QR spends approximately $86.91m maintaining the line. This year a further $100m of expenditure was allocated as part of the North Coast Line Capacity Improvement project to enhance connections between South East Queensland and communities in the north. The project will increase the capacity of the North Coast line by improving infrastructure that will allow increased train lengths to be used. The North Coast line upgrade project will ensure that the line can accommodate a growth in demand on this vital part of the freight network.”

No further details are available on the North Coast Line upgrades specific to this base case.

[23] NBQ Report Infrastructure Capacity Audit 2013.

5.1.5 Mount Isa and Stuart to Townsville Rail Corridor

This 9km section of the North Coast Line is double track from Stuart through to Boundary Street where it splits to the Jetty Branch and the PoT. It includes Aurizon's south yard freight terminal and workshop facilities.

North of Boundary Street, the North Coast Line heads to Townsville Station for passenger train services to Cairns. The Stuart to Townsville track section is shared with domestic freight, passenger train movements on the North Coast Line corridor, and other local train operations.

The track standard and structures allow 20 tonne axle load, with track comprising 60 kg/m rail on concrete sleepers (track will be QR Type 50-6). The corridor interfaces with five level crossings with half-boom and flashing light protection.

The Mount Isa Line joins the North Coast Line 10km south of Stuart and the Partington yard. The line continues 1,032km to Mount Isa and includes the Phosphate Hill branch line. This is a single line narrow gauge system with 46 passing loops providing for 1,000m length trains, and incorporates balloon loops at Yurbi, Phosphate Hill and Mount Isa.

During the resource sector growth in 2011 to 2013 QR and the Department of State Development, Infrastructure and Planning (DSDIP) undertook Master Planning[24] and capacity reviews of the existing system respectively. The DSDIP reviews[25] included the rail infrastructure (below rail assets) capacity audit and rail operations. Rail operations covers loading and unloading facilities, train cycle times, rollingstock in use, operating practices and co-ordination of the supply chain links.

The reviews have provided QR and DSDIP with a pathway to progressively upgrade the Mount Isa Line if the demand requires it.

The QR Annual Report 2015-2016 states:

"The Mount Isa Line extends from Townsville to Mount Isa and each year, QR spends approximately $50m maintaining the line to ensure its ongoing safety and reliability. In 2015-16 QR announced an additional $25m investment in the line to replace 41km of sleepers at high priority locations between Richmond and Julia Creek. Work commenced in May 2016 and will ensure QR delivers a more stable and reliable track structure for freight services, by replacing steel sleepers with concrete. Other works throughout the year included an upgrade of the Acid Junction to Mount Isa section of track, with new rail, ballast and concrete sleepers. This also includes a full track relay of the Cape River Bridge between Homestead and Pentland, and a one kilometre of full track relay between Cloncurry and Marimo."

QR has developed a planning program of works to upgrade the infrastructure of the network to increase long-term stability of the line, and to bring the line up to a consistent standard that includes:

- replacing steel sleepers with concrete sleepers
- replacing light rail with heavy 60kg/m rail
- improving safety at grade level crossings
- replacement of older steel bridges.

[24] Queensland Rail Mount Isa Line Rail Infrastructure Master Plan 2012
[25] NQRSC 2013 Reports (Rail Infrastructure Capacity Assessment and Rail Operations Assessment)

QR aims to continue the replacement of steel sleepers and light rail program to complete the transformation of the entire system. The current timing of the program is dependent on sufficient growth occurring on the line to provide the additional funding of these works. Should significant additional tonnes be contracted on the network, the works program will need to be accelerated to coincide with the increased traffic.[26]

The works do not provide for any increase in train lengths above 1,000m but seek to reduce speed restrictions and increase safety.

5.1.6 Existing Road Infrastructure

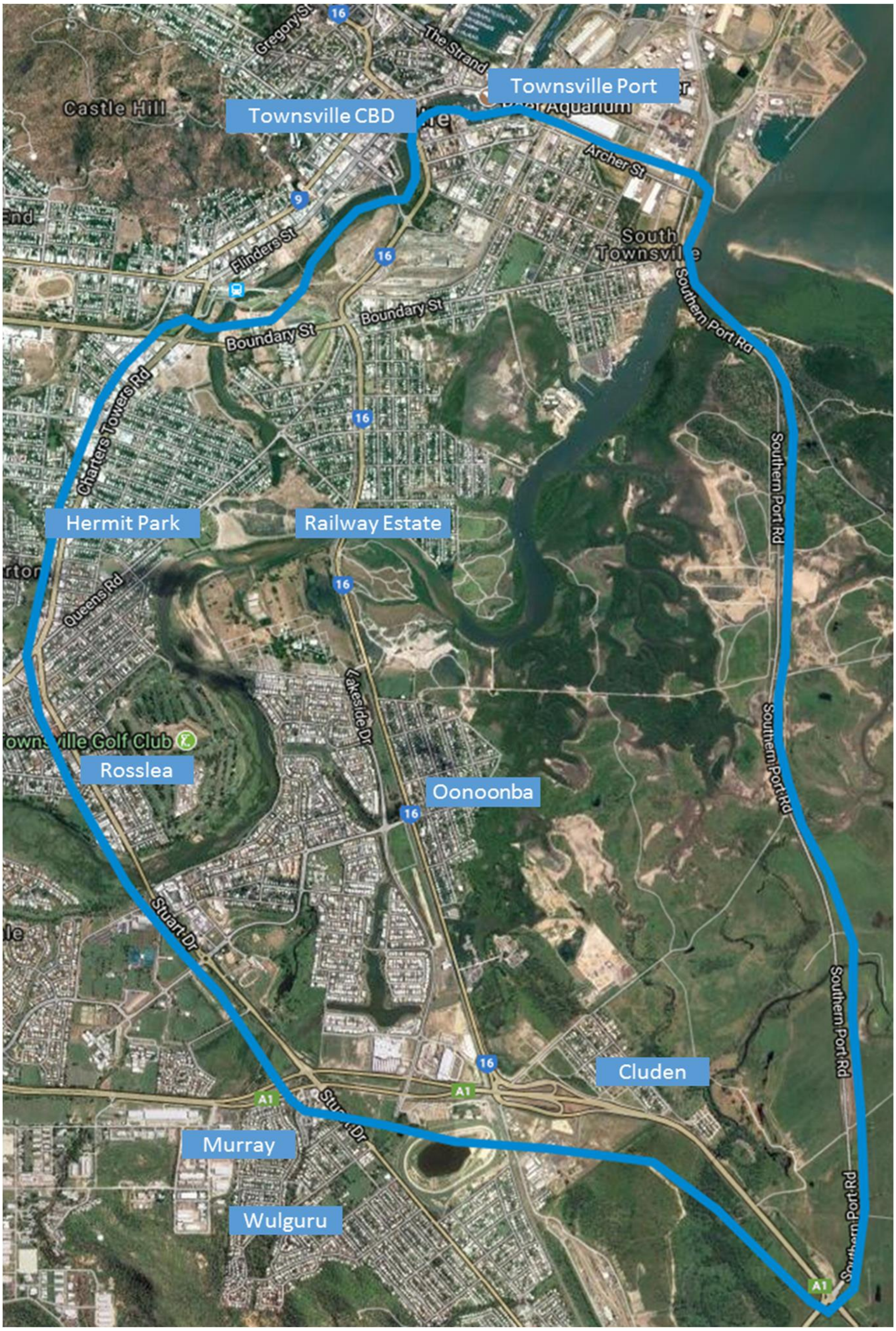
Road connectivity and freight corridors for the PoT are provided through a number of primary and secondary roads (Figure 5.2) which includes:

- Primary road corridors:
  - Southern Port Road—provides access to the port for over-size and over-mass vehicles that include B-Triples and Road Trains from the Ring Road and areas south of Townsville. There is a road-train de-coupling site at the start of the Southern Port Road (Bruce Highway end) for vehicles coming from the Flinders Highway. Southern Port Road becomes Benwell Road as it enters the PoT.
  - Bruce Highway (North of Townsville)—connects the port to industry and freight generators/users in northern Queensland.
  - Bruce Highway (South of Townsville)—connects the port to industry and freight generators/users in central Queensland.
  - Flinders Highway—links the port to agricultural and resource activities at sites located to the west of Townsville to Mount Isa. It is a heavy vehicle combination route with vehicles up to 53.5m in length permitted.
  - Townsville Ring Road (Deeragun to Cluden)—an important road for freight vehicles with origins to the north and south of Townsville accessing the port.
- Secondary road corridors:
  - Duckworth Street and Nathan Street—links Woolcock Street in the north to the Townsville Ring Road in the south, and provides access to a light industrial, retail and commercial precinct along Duckworth Street (northern half).
  - Woolcock Street—connects existing industrial users to the ring road and the port.
  - Abbott Street—connects from Woolcock Street through to the ring road. This is not the primary heavy vehicle corridor for entering the port but in connection with Boundary Street, provides alternative access to the port.
  - Boundary Street—in conjunction with Abbott Street, provides an important alternative road connection to the Port.
  - Archer Street—provides access to the northern side of the Port and connects with the Southern Port Road and Benwell Road. Different sections of Archer Street are currently managed by different agencies (TCC and PoT).
  - Hubert Street—provides access from Archer Street for heavy vehicles servicing port users in the central area of the Port.

Completed in 2016 -17 was Section 4 of the Townsville Ring Road and a heavy vehicle uncoupling pad on the Southern Port Road.

[26] Queensland Rail Mount Isa System Information Pack Version 3.1: 20/02/2017

Figure 5.2 Existing Road Infrastructure



5.2 Base Case

The Base Case scope for the rail and road infrastructure is generally confined to the area shown in Figure 5.2. Specific elements are:

- The Jetty Branch connecting with the sidings, cargo handling and storage facilities to the port boundary.
- Stuart-Townsville rail corridor (North Coast Line along Abbott Street) connecting to the Jetty Branch.
- The refinery branch rail line connecting with the Sun Metals zinc refinery and a livestock facility, both located within the TSDA.
- Two intermodal rail terminals at Stuart, one linked to the North Coast Line and the other to the Mount Isa Line.
- Rail siding into the Glencore copper refinery at Stuart linked to the North Coast Line.
- Multiple road to rail access points providing intermodal connections along the rail lines.

The Base Case scope does not include:

- The Mt Isa line from Mt Isa to Townsville where it joins to the North Coast Line.
- The North Coast Line south of the Sun Metals Branch.
- The North Coast Line north of the Jetty Branch.
- The PoT to the port boundaries.

- The Base Case rail configuration restricts the ability of the PoT to fully utilise the existing berth capacity, especially for bulk commodities and to effectively operate trains to handle this.
- The Base Case will not be able to effectively support the PEP in the longer term as the PEP high-level plans have new rail loops in the Eastern Reclaim Area (ERA). The Base Case rail configuration does not provide an efficient connection to the ERA loops as train lengths and operations are still compromised.
- The existing road and rail network within the Base Case project area is generally not subject to delays from flooding apart from extreme weather events such as cyclones. However, Abbott Street is subject to flooding in major rainfall events at the southern end between Oonoonba and the Bruce Hwy due to a break out of Gordon Creek.
- In 2014, there was 12.7mtpa throughput at the port, which has since reduced to 8.5mtpa in 2016, representing a reduction of 4.2mtpa. The change to the demand profile includes small increases in the volume of sugar (0.1mtpa), fertiliser (0.1mtpa), freight (0.1mtpa) and a decline in volumes of minerals (0.4mtpa), shunts (0.3mtpa), bulk (0.5mtpa), coal (0.3mtpa) and nickel (3.0mtpa).

5.3 Options Evaluation

A Multi Criteria Analysis (MCA) was utilised to provide an agreed approach to re-assessing TEARC options identified from the Preliminary Evaluation (PE), together with any new options and changes. Under the Building Queensland Detailed Business Case Guidelines, the options considered and evaluated during the PE phase are to be reviewed and formally re-evaluated. Building Queensland also needed to redefine the Reference Projects' scope to ensure it represented the requirements of stakeholders QR, PoT, Department of Transport and Main Roads.

5.3.1 Multi-Criteria Analysis Methodology

The MCA options assessment was undertaken over a number of methodology stages, with key stakeholders engaged throughout the process to help inform the progression through to a preferred TEARC alignment option.

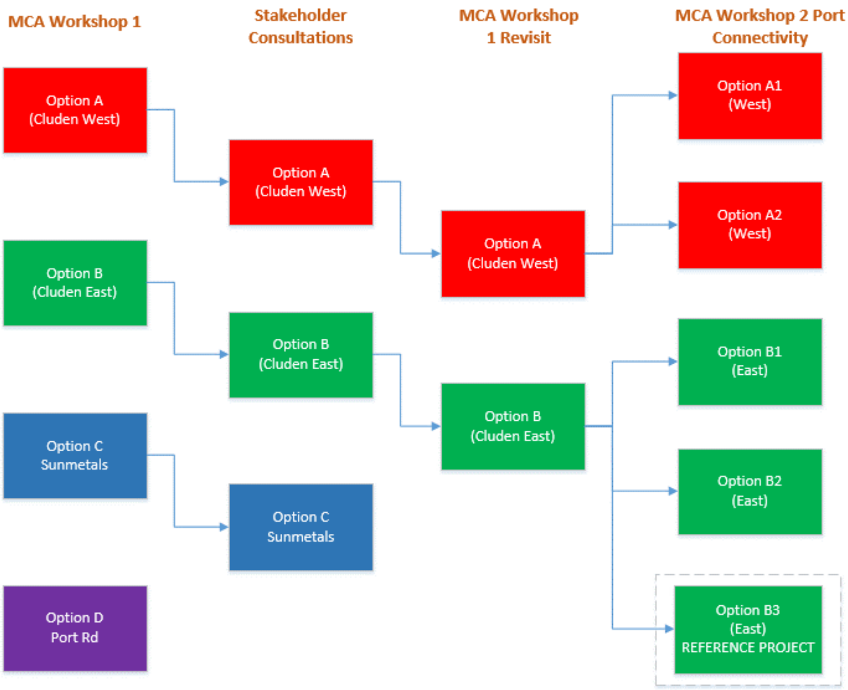
The MCA process steps utilised in the workshop were:

- Key criteria and sub-criteria developed to consider economic, social, environment and engineering. The overarching key criteria and their sub-criteria were developed during the development of the DBC. Generally the key criteria capture triple bottom line needs as well as engineering needs.
- Criteria were developed to address port connectivity issues for options north of the Ross River.
- A workshop was subsequently held with key representatives from Building Queensland, QR, PoT, Department of Transport and Main Roads (DMR) and subject matter experts. The workshop agreed the prioritisation of criteria to guide the Multi-Criteria Analysis, and identified preferred alignment options for more detailed investigation and assessment.
- Subject matter experts presented the rationale behind their scores for individual sub-criteria.
- The results of the prioritisation process were used to develop weightings that were applied to the scores provided by the subject matter experts for each of the sub-criteria.
- An overall weighted score for each of the four alignment options was then calculated.

The PE initially considered four strategic alignment options, which were narrowed to three alignments after the first workshop. The three alignment options were then canvassed with a range of external stakeholders.

A further round of assessments narrowed the focus down to two strategic alignments, with five detailed sub-alignment options. These were assessed to identify a preferred alignment option (the Reference Project), as illustrated in Figure 5.3.

Figure 5.3 MCA Assessment and Stakeholder Engagement Process to Identify a Preferred Option



5.4 TEARC Alignment Options

Four potential strategic alignment options for TEARC were initially identified for assessment. Two of the four options are similar, branching off the North Coast Line at Cluden (Options A and B). The other two branch off the North Coast Line near the Stuart Industrial Precinct (Option D) and further south near the Sun Metals Branch (Option C) respectively. The four options are shown in Figure 5.4.

- Option A:

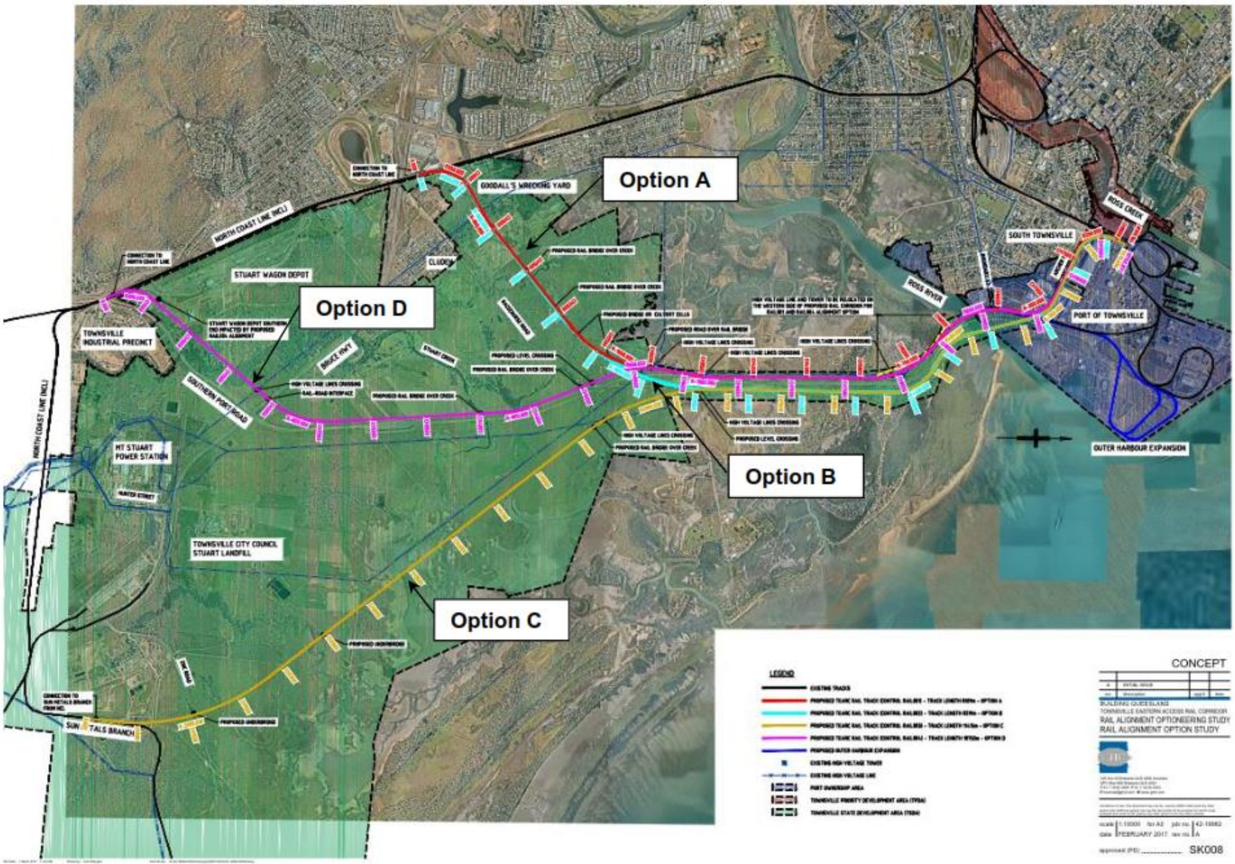
  Branching off the North Coast Line at Cluden, traversing the northern part of the TSDA, and broadly following the Southern Port Road alignment to the west of the Southern Port Road.

- Option B:
  Branching off the North Coast Line at Cluden, traversing the northern part of the TSDA, and broadly following the Southern Port Road alignment to the east of the Southern Port Road.

- Option C:
  Branching off the North Coast Line at the Sun Metals Branch and traversing the southern part of Townville SDA, before linking up to follow on the eastern of the Southern Port Road.

- Option D:
  Branching off the North Coast Line near the Stuart Industrial Precinct and broadly following Flinders Highway and the Southern Port Road alignment.

Figure 5.4 TEARC Alignment Options A to D



5.4.1 Assessment and Shortlisting of Capital Investment Options

Subject matter experts assessed each option against economic, social, environment and engineering criteria and sub-criteria. Key stakeholders discussed the assessments with minor refinements being made to some of the scores to reflect discussion outcomes.

The first workshop concluded Options A and B were preferred, with Options D and C ranked third and fourth respectively.

Option D was discounted from further consideration, as it presented a number of engineering challenges and did not meet operational requirements.

More specifically Option D constraints included:

- Engineering:
  - Requires a major road bridge at the Bruce Hwy.
  - Requires relocation of HV power line on the western side of the Southern Port Road close to the Ross River.
  - Requires re-signalling of North Coast Line into Stuart Yard.
- Operations:
  - Operationally constricts Stuart Depot (reverse shunt moves would be required).
  - New cord line required from Stuart Deport onto realigned North Coast Line.
  - Would result in increased complexity of signalling.
- Constructability and cost:
  - Longer than Options A and B, would be more expensive in terms of route kilometres.
  - Construction of major structure to cross Bruce Hwy, including realignment would require complex delivery arrangements.
  - Estimated to be higher cost, given the need for grade-separated crossing over Bruce Hwy, reconfiguration of signals and HV line relocation.

Option C was less desirable for a number of reasons including:

- Significantly higher cost, given the required track length is nearly double the length of Options A and B.
- Cultural sensitivities associated with an aboriginal burial ground that intersected with the proposed alignment.
- Operational issues, including required realignment of existing Sun Metal loop, Mount Isa – North Coast Line junction which will adversely affect the local community and re-signaling of existing infrastructure. Access to Stuart Yard would also have to be retained.
- Potential negative impacts on the Bruce Hwy bridge crossing. A new level crossing would be required on Racecourse Road.
- Unproven option with risk attributed to construction difficulties through greenfield and wetlands involving the crossing of numerous creeks, extensive soft soils areas and roads requiring significant geotechnical investigation.
- The longest construction timeframe and greatest risk of complex construction due to poor ground conditions and environmental constraints.

Options A and B are similar, differentiated by east vs. west trade-offs:

- Options A and B are both scalable and able to accommodate forecast demand.
- Social benefits are expected to be higher for an eastern alignment (Option B), particularly with respect to noise, vibration and visual amenity.
- Option A was expected to be lower cost due to a shorter bridge span.

It was noted during the workshop, careful planning was needed to consider how the line connects to the port from the east (B), or west (A) as trains coming over Ross River would need to be considered in future port expansion plans.

Although Option C was ranked last, it was assessed as likely to have the fewest adverse social impacts. For this reason, it was retained as an option for further investigation.

Table 5.1 summarises the results of the MCA assessment for the four strategic alignments Options A through D.

Table 5.1 MCA TEARC Alignment Options Assessment by Weighted Sub-criteria (Workshop 1)

CRITERIA	Sub Criteria Wtg (%)	STRATEGIC OPTIONS			
		A - WESTERN CLUDEN	B - EASTERN CLUDEN	C - SUN METALS	D - FOLLOW PORT ROAD
		Rating 1 -4	Rating 1 -4	Rating 1 -4	Rating 1 -4
ENGINEERING					
Rail Engineering	2.9%	4	3	1	2
Road Engineering	2.2%	2	1	4	2
Constructability	3.7%	4	3	1	2
Operations	3.7%	4	4	1	3
Flooding	6.6%	2.5	3	4	1.5
Geotechnical	2.2%	4	2	1	3
ENVIRONMENT					
Flora and Fauna	6.6%	4	2.5	1	2
Land use and Approvals	5.2%	4	4	1	2.5
Noise, Air and Vibration	8.1%	1	1	4	2.5
SOCIAL					
Cultural Heritage	10.3%	2.5	1	1	2.5
European Heritage	3.7%	2.5	2.5	4	1
Visual Amenity	2.2%	2.5	2.5	4	3
Property Acquisition	3.7%	2.5	4	2.5	2.5
Public Safety and Congestion	11.8%	4	2.5	2.5	1
ECONOMIC					
Cost	7.4%	4	3	1	2
Benefits	11.0%	4	3	1	3
Supply/Demand	8.8%	3	3	3	3
	SCORE	**3.23**	**2.57**	**2.09**	**2.23**
	RANK	**1**	**2**	**4**	**3**

- Feedback from Stakeholder Engagement Session

Options A, B and C were considered at an engagement session with key stakeholders groups including Mount Isa Rail System operators, users, customers, government[27] and community representatives.

At the engagement session Option C was identified preferred option. The key reasons for promoting Option C included:

- aligned with the TSDA master plan and could potentially cater for future growth and higher demand
- could provide Townsville with a flood levy.

The Option C alignment was also perceived as having a lesser social impact on South Townsville communities such as Cluden. There was a suggestion the Option it could prevent residential growth in communities, such as Elliott Springs. Some participants argued that constructing rail through the TSDA would isolate this community, or discourage residential growth through the area.

Outcomes of MCA Workshop 1 - Revisit

Further consultations and investigations regarding Option C found:

- Option C cannot traverse an approved solar farm.
- QR advocated for a variation to Option C by moving to the south of the existing Option C and paralleling the Southern Port Road corridor sooner.
- Option C was more flood prone, higher cost and is not within existing Townville SDA transport corridors ($30m sunk cost in existing corridor preservations, i.e. corridor aligning with Options A and B).

Flooding—The baseline flood assessments have considered TEARC in isolation and as a combined TEARC and TSDA joint development outcome. The inclusion of TSDA, results in higher flood levels due to the constriction of the flood plains with the TSDA filling.

There are marginal differences in structure provisioning between TEARC, and the TEARC and TSDA combined option. If the flood infrastructure provisions for TSDA and TEARC were planned jointly, there are opportunities for rationalisation, specifically one of the major drainage structures (CH1730 20 x 15m span) could in combination with other related mitigation works be significantly reduced in size and delivering cost savings.

The floodplain area is low lying, and significant fill will be required to support both TEARC and the future development of the TSDA. Inclusion of floodplain filling (both TEARC and TSDA) changes the flood characteristics in the floodplain and has the potential to impact existing sensitive areas (i.e. reserve and caravan park), with the potential for adverse flood impacts. Flood impacts have been appropriately managed through structure provisioning and the inclusion of related mitigation works, with opportunities for further optimisation through the future TEARC detailed design.

The natural flood flows north to northwest direction, to both the Ross River and eastern coastal fringe areas. The TEARC line would traverse across the major Stuart Creek floodplain, with structure provisioning included managing flow distributions to the north, and the Townsville CBD via several major bridge structures. Options A & B traverse the same major Stuart Creek floodplain and are subject to similar major bridge structure provisions.

Option C is now least preferred, flood provisioning requirements would be higher given the alignment is longer and traverses a considerably wider cross section of the floodplain.

[27] Relevant government stakeholders were from all levels of government, including Townsville City Council, Department of State Development, and Department of Defence.

Costing—Option A (west) originally scored over Option B (east), as the additional bridge over Southern Port Road and the longer bridge to the east of the existing road bridge was thought to make B the higher cost option. This was subsequently reassessed due to the cost impact of relocating the power link on the west (previously underestimated), Option A now outweighs the cost of Option B.

Option C Remained Least Preferred

Option C is not aligned with the existing TSDA master plan, which has already secured transport corridors aligned with proposed Options A, B and D, but not Option C.

A detailed flood impact assessment indicates that Option C is unlikely to deliver expected flood levy functionality, and would likely increase flood impacts as it would impede water flowing east to the coast.

Much like Option D, Option C does not link to the existing Stuart Yards, and does not achieve any greater level of rail service than can be accommodated by A and B with spur lines. The proposed alignment would intersect a planned solar farm under construction by Sun Metals.

Given the significant constraints identified with alignment Option C, the second MCA Options Analysis concluded that Option C should be discounted from further consideration.

provides a high level “traffic light” summary of the outcomes of the second MCA options analysis, showing that Options A and B were ranked above Option C

The recommendation was to carry forward Options A and B into the detailed assessment of rail connections into the port.

Table 5.2 MCA TEARC Alignment Options Assessment by Weighted Sub-criteria (revisit following Workshop 1)

CRITERIA	SUB CRITERIA Wtg (%)	A - WESTERN CLUDEN	B - EASTERN CLUDEN	C - SUN METALS
ENGINEERING				
Rail Engineering	3.7%	4	3	1
Road Engineering	3.2%	2	1	4
Constructability	3.7%	4	3	1
Operations	3.7%	4	4	4
Flooding	6.3%	4	2.5	1
Geotechnical	3.2%	4	2	1
ENVIRONMENT				
Flora and Fauna	6.3%	4	2.5	1
Land use and Approvals	4.7%	4	4	1
Noise, Air and Vibration	5.8%	1	1	4
SOCIAL				
Cultural Heritage	8.4%	2.5	1	1
European Heritage	4.7%	2.5	2.5	4
Visual Amenity	1.6%	2.5	2.5	4
Property Acquisition	2.6%	2.5	4	2.5
Public Safety and Congestion	10.0%	4	2.5	2.5
ECONOMICS				
Cost	6.8%	2.5	4	1
Benefits	9.5%	4	3	1
Supply/Demand	6.8%	3	3	3
SUSTAINABILITY				
Townsville City Deal Delivery	3.7%	2.5	4	1
Townsville Growth (e.g. Elliott Springs)	2.1%	2.5	2.5	2.5
Future Development Opportunities TSDA	3.2%	4	4	1
	SCORE	3.24	2.71	1.93
	RANK	1	2	3

5.5 Further Rail Connection Options to the Port of Townsville

To the north of the Ross River, all of the initial alignment options investigated ran parallel to the Archer Street corridor. It was agreed at the first MCA workshop further investigation would be undertaken into additional refined alignment options north of the Ross River in order to address port-rail-road interface requirements and, where possible minimise likely social and environmental impacts.

Further detailed examination of five different alignment options north of the Ross River was undertaken.

The main drivers influencing the alignment of the sub-options north of the Ross River are:

- Ensuring an effective port-rail-road interface.
- Minimising social impacts for residents who live along Archer St (e.g. noise, vibration etc.).
- Environmental issues.
- Cost, including capital costs of new infrastructure, potential property acquisition and land reclamation.

Key considerations focus on whether the preferred alignment should:

- run to the east or to the west of the existing Southern Port Road
- run parallel to Archer Street, or follow an alternate alignment through the port precinct
- close the Abbott St line and reroute all North Coast Line traffic via the port loop and TEARC.

The rail connection options to the Port were reviewed at a second MCA options assessment workshop. The assessment criteria considered engineering, environmental, social impacts, sustainability issues, additional criteria to assess port-rail-road interfaces and customer requirements.

5.5.1 Options A1 and A2 Ross River to the Port of Townsville

Options to the west of the Southern Port Road are effectively an extension of Option A, whereas options to the east of the Southern Port Road are effectively an extension of Option B. The western options are defined as A1, A2, and eastern options are defined as B1, B2, and B3.

The following sections summarise the relative merits of western versus eastern alignment options.

Figure 5.5 shows Option A1 that provides a new rail line in Archer Street to connect to the Jetty Branch and the nickel, fertiliser and South 32 loops while being able to connect to a new port loop.

This option allows:

- sugar trains to enter and exit the port via TEARC
- molasses trains to enter and exit the port via TEARC
- Glencore trains to enter and exit the port via TEARC
- North Coast Line trains to bypass the port loops.

Figure 5.6 shows Option A2 which provides a new rail line in Archer Street to connect to the Jetty Branch and the nickel, fertiliser and South 32 loops while being able to connect to a new port loop.

This option allows:

- sugar trains to enter and exit the port via TEARC with a new unloading facility and conveyor to the existing storage sheds
- removal of the existing sugar rail loop
- molasses trains to enter and exit the port via TEARC
- Glencore trains to enter and exit the port via TEARC
- North Coast Line trains to bypass the port loops.

In terms of planning precedents, it is important to note, corridor planning for the Southern Port Road was undertaken on the basis that any future rail connection would be to the east of the road corridor. Subsequent planning decisions (e.g. location of HV lines) have also assumed the rail corridor would be placed west of the Southern Port Road Ross River bridge.

Table 5.3 and Table 5.4 outline the benefits and constraints of Options A1 and A2.

Figure 5.5 Option A1 Alignment

Continues from Option A, crossing the Ross River to the west of the Southern Port Road, crossing Boundary Street as rail over road.

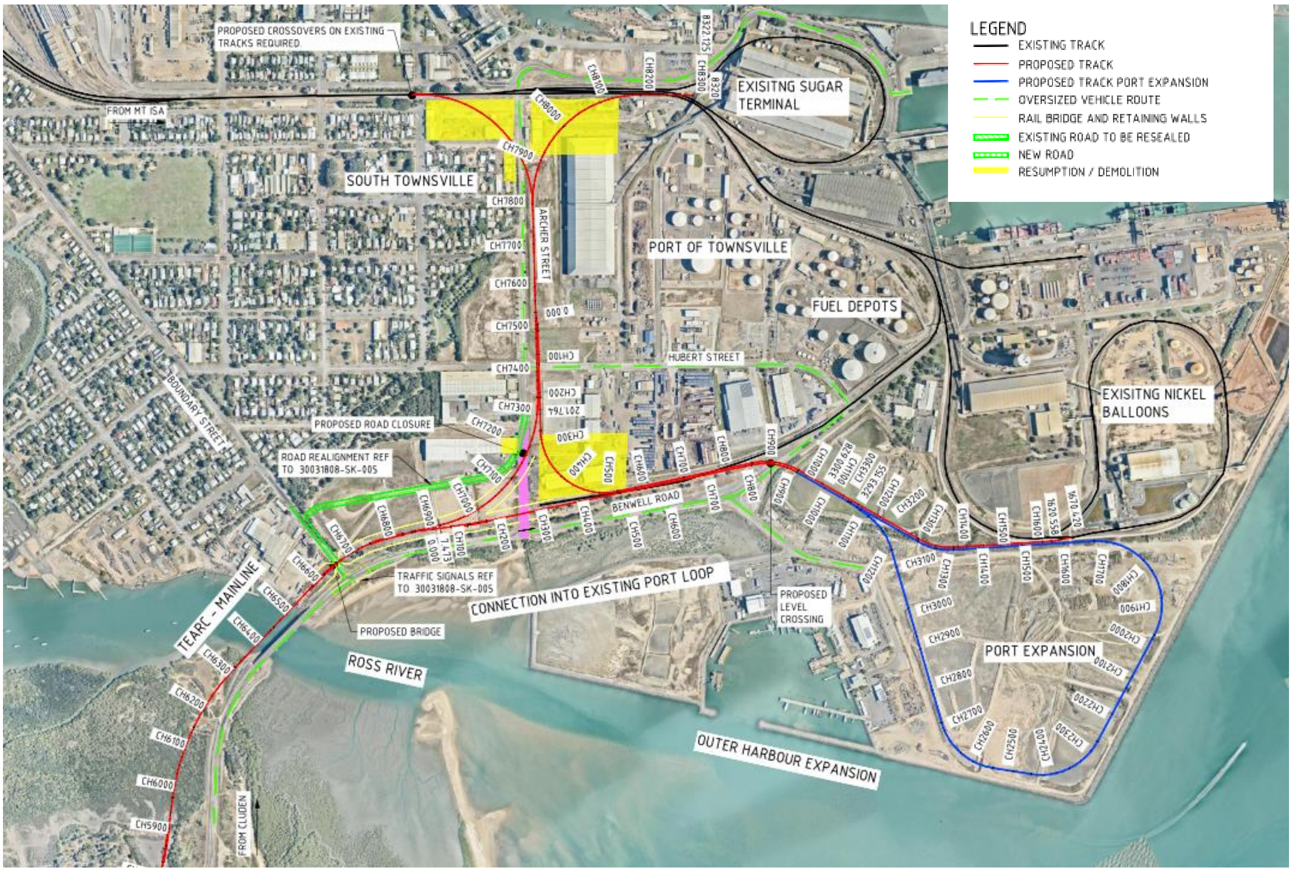


Table 5.3 Summary of Major Advantages and Constraints (Option A1)

ADVANTAGES	CONSTRAINTS
Shorter bridge span across Ross River	Higher cost
Connects to existing port infrastructure (ore loop and sugar loop)	Does not support optimal future port expansion layout
North Coast Line passenger services do not run through port	Rail over road crossing at Boundary Street
Supports potential North Coast Line relocation	Higher social impacts due to closer proximity to residents on Archer Street
Operational flexibility	Higher road impacts with major road reconfiguration at intersection of Boundary Street and Southern Port Road, and reconfiguration of Hubert Street
	Requires HV line relocation
	Property acquisition impacts

Figure 5.6 Option A2 Alignment

Continues from Option A, crossing the Ross River to the west of the Southern Port Road, crossing Boundary Street as Rail over Road, continuing along the existing Benwell Road stabling siding, with a proposed conveyor to the sugar shed.

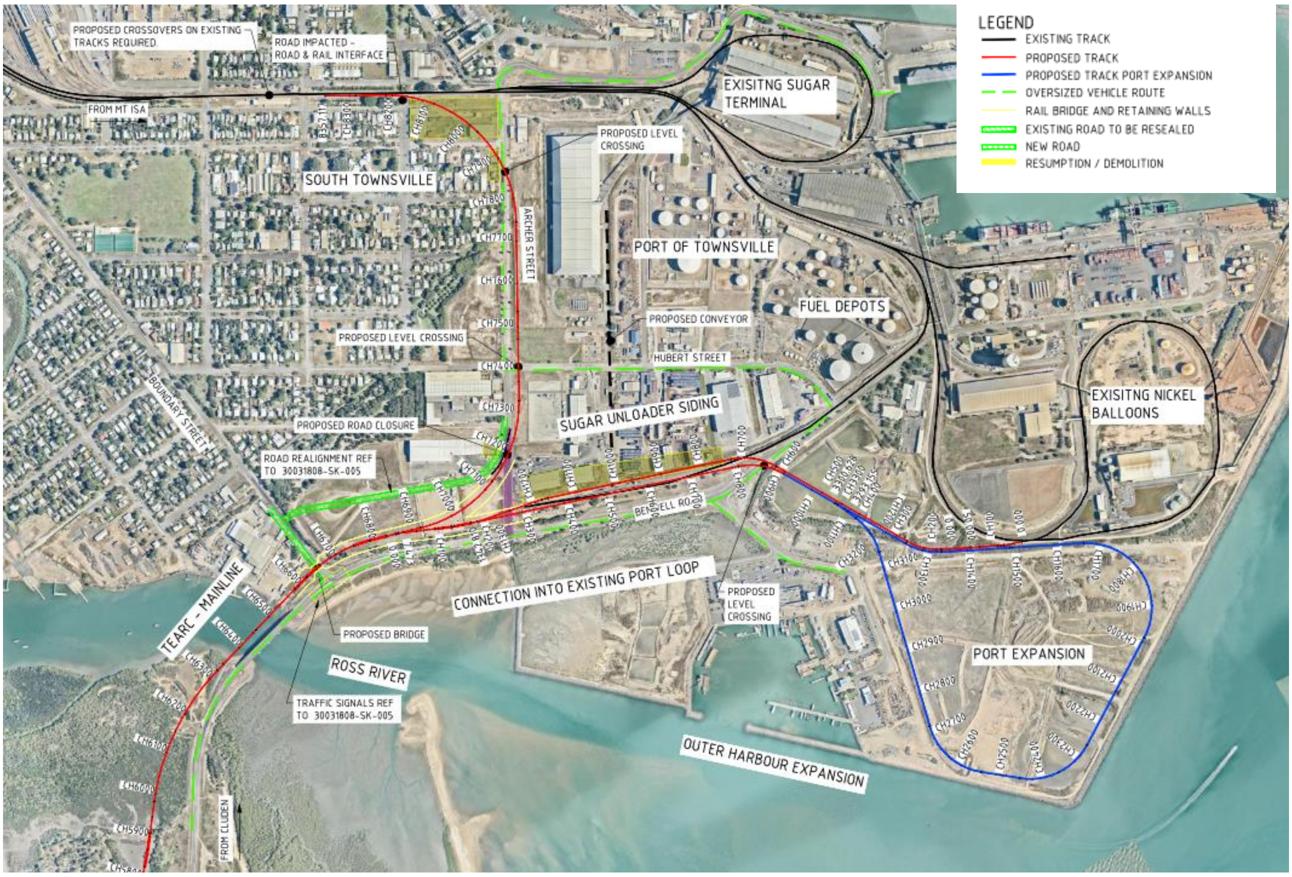


Table 5.4 Summary of Major Advantages and Constraints (Option A2)

ADVANTAGES	CONSTRAINTS
Shorter bridge span across Ross River	Higher cost
Connects to existing port infrastructure (ore loop)	Does not support optimal future port expansion layout
North Coast Line passenger services do not run through port	Rail over road crossing at Boundary Street
Supports potential North Coast Line relocation	Higher social impacts due to closer proximity to residents on Archer Street
New sugar unloading facility and transfer conveyor allows removal of the existing sugar unloading loop	Rail/road crossing at Benwell Avenue
	Higher road impacts with major road reconfiguration at intersection of Boundary Street and Southern Port Road, and reconfiguration of Hubert Street
	Requires HV line relocation
	Property acquisition impacts

5.5.2 Options B1, B2, B3 north of Ross River

The general functionality for Option B1 (Figure 5.7) compares to A1 and similarly B2) to A2. Option B3 (Figure 5.9) simplifies the connection into the port without requiring a new line down Abbot Street. Table 5.5, Table 5.6 and Table 5.7 outline the benefits and constraints of Options B1, B2 and B3.

Figure 5.7 Option B1 Alignment

Continues from Option B, crossing the Ross River to the east of the Southern Port Road, crossing Benwell Road as Rail over Road, turning into Archer Street, then out of Archer Street via a 'Y' connection that facilitates continuation to the Sugar Loop and the North Coast Line.

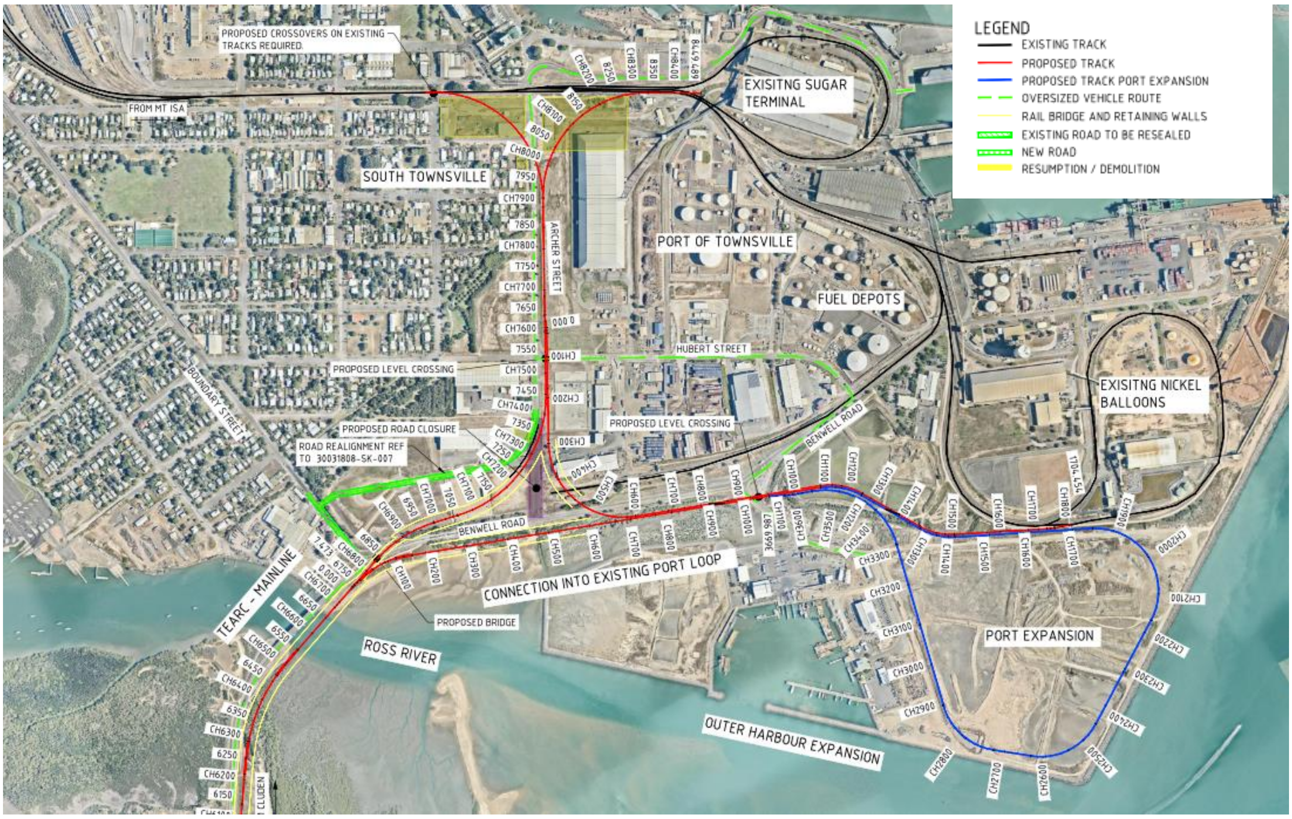


Table 5.5 Summary of Major Advantages and Constraints (Option B1)

ADVANTAGES	CONSTRAINTS
Connects to future port expansion loop	Higher cost
Connects to existing sugar loop	Longer bridge span across Ross River
North Coast Line passenger services do not run through port	Higher social impacts due to closer proximity to residents on Archer Street
Supports potential North Coast Line relocation	Higher road impacts with major road reconfiguration at intersection of Boundary Street and Southern Port Road, and reconfiguration of Hubert Street
Does not require HV line relocation	Higher social impacts due to closer proximity to residents on Archer Street
	Rail over road structures for connection of the southern wye to Abbott Street
	Grade separated road over rail crossing required where alignment intersects the Southern Port Road

Figure 5.8 Option B2 Alignment

Continues from Option B, crossing the Ross River to the east of the Southern Port Road Crosses Benwell Road as rail over road, then crosses Archer Street.

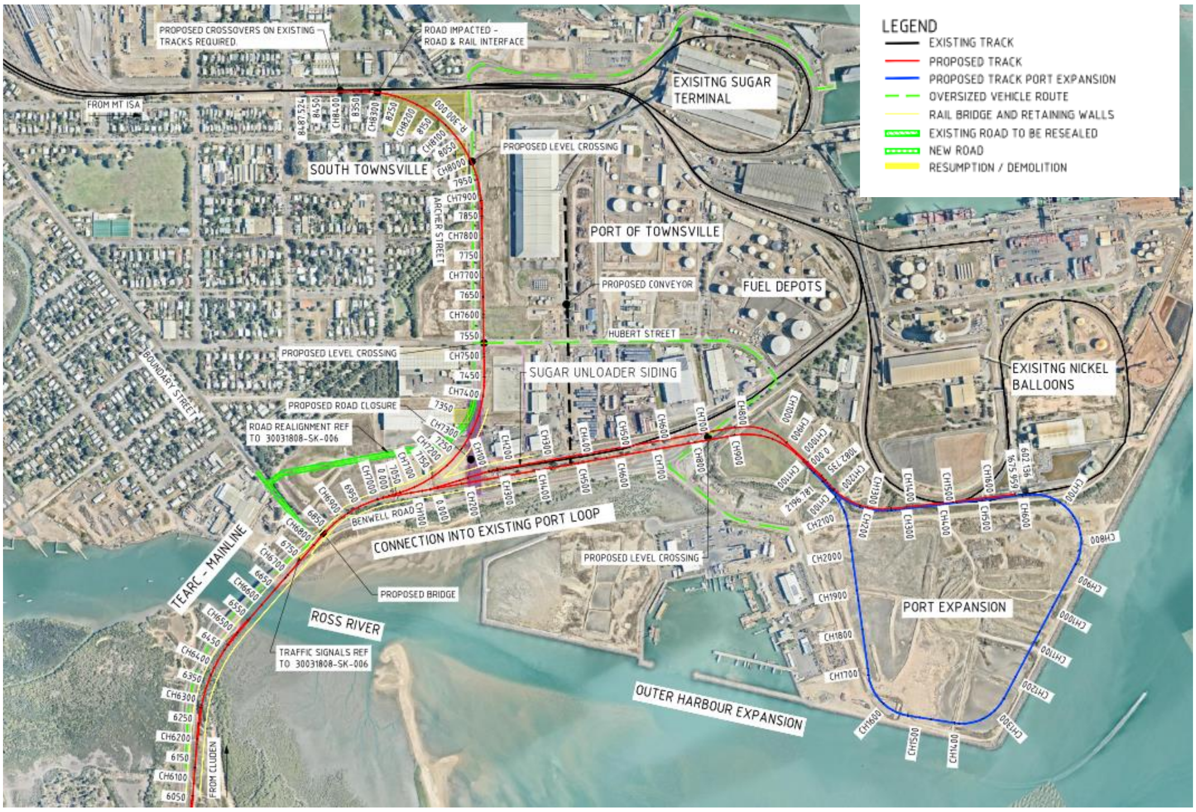


Table 5.6 Summary of Major Advantages and Constraints (Option B2)

ADVANTAGES	CONSTRAINTS
Connects to future port expansion loop North Coast Line passenger services do not run through port Supports potential North Coast Line relocation Does not require HV line relocation New sugar unloading facility and transfer conveyor allows removal of the existing sugar unloading loop	Higher cost Longer bridge span across Ross River Higher social impacts due to closer proximity to residents on Archer Street Higher road impacts with major road reconfiguration at intersection of Boundary Street and Southern Port Road, and reconfiguration of Hubert Street Grade separated rail over road crossing of Benwell Road Grade separated road over rail crossing required where alignment intersects Southern Port Road.

Figure 5.9 Option B3 Alignment

Continues from Option B, crossing the Ross River to the east of the Southern Port Road, remaining east of Benwell Road. Crosses Windlass Crossing at grade and connects to both the existing ore and future extension loops. Conveyor to sugar shed.

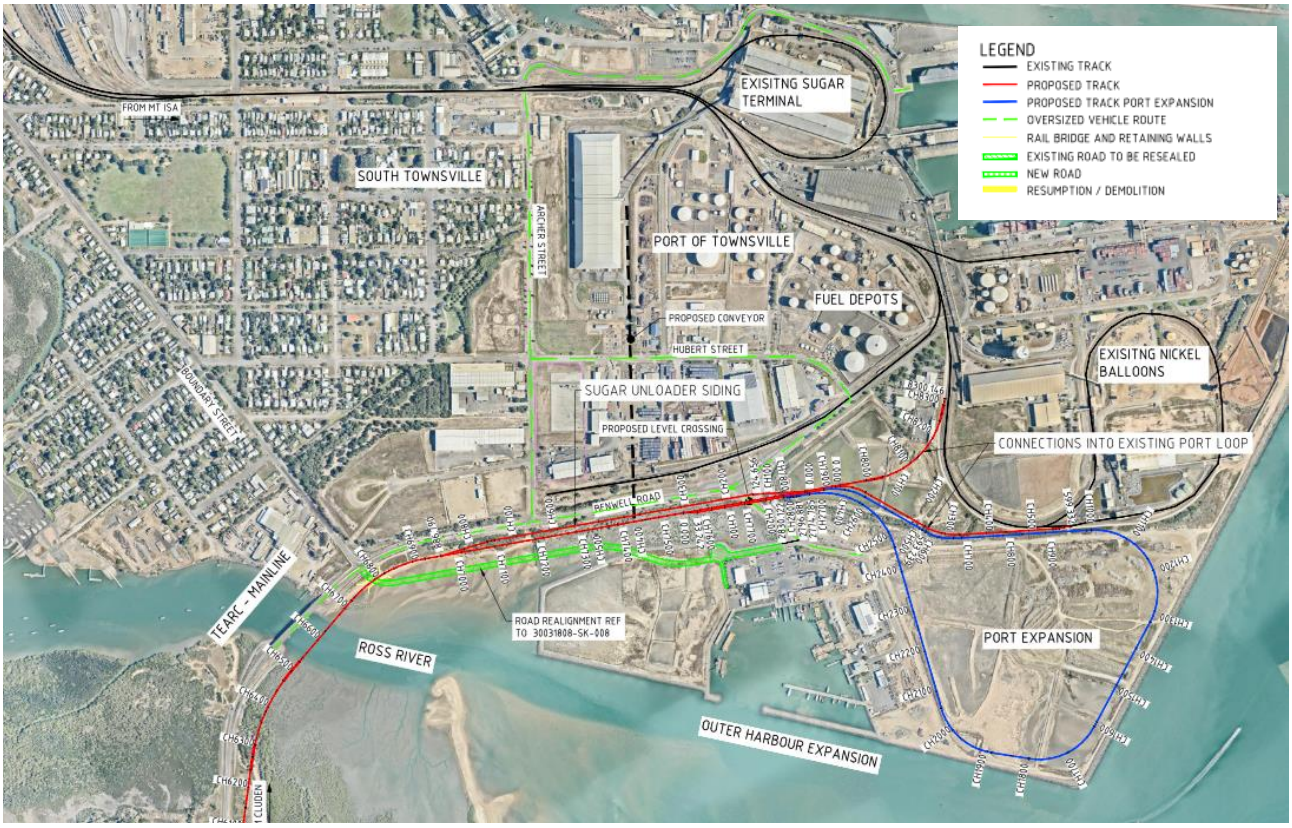


Table 5.7 Summary of Major Advantages and Constraints (Option B3)

ADVANTAGES	CONSTRAINTS
Lowest cost	Longer bridge span across Ross River
Supports optimal future port expansion layout	North Coast Line passenger services would need to run through port or continue via North Coast Line
Connects to existing port infrastructure (ore loop)	Grade separated road over rail crossing required where alignment intersects Southern Port Road.
Lower social impacts, given located away from residents on Archer Street	
Lowest impacts on road network	
Does not require grade separated rail over road crossings inside port	
Does not require HV line relocation	
New sugar unloading facility and transfer conveyor allows removal of the existing sugar unloading loop	

5.5.3 Preferred Connection Option to the Port

Table 5.8 summarises the outcomes of the second MCA workshop for sub-alignment options.

Option B3 was identified as the preferred alignment solution.

Table 5.8 MCA Sub-Alignment Options Assessment by Weighted Sub-criteria (Workshop 2)

CRITERIA	Sub Criteria Wtg (%)	A1	A2	B1	B2	B3
ENGINEERING						
Geotechnical	2.9%	2.5	3	2	3	1.5
Constructability	6.6%	2	2	1	1	3
Road/Rail Interfaces	5.9%	2.5	2.5	2	1.5	3.5
Rail Ops (Current/Future)	8.1%	4	2.5	2.5	2.5	1
ENVIRONMENT						
Noise + Air+Vib'n	9.6%	1	1	1	1	2.5
Port Land Use + Approvals	2.2%	1	2.5	2.5	2.5	4
Flora and Fauna	5.9%	4	4	1	1	1
ECONOMICS						
Cost	2.9%	1	4	1	2.5	4
Benefits	10.3%	2.5	2.5	2.5	2.5	2.5
Supply/Demand	7.4%	2.5	2.5	2.5	2.5	2.5
SOCIAL						
Visual Amenity	2.9%	1.5	1.5	3	3	3.5
Property Acquisition	4.4%	2	3	2	3	2
Road Interfaces (Safety)	10.3%	2.5	2.5	2.5	1.5	3.5
SUSTAINABILITY						
NCL Relocation	6.6%	4	4	4	4	4
Perkins St Removal	2.2%	1	1	1	1	1
Port Customers - Road	5.1%	2.5	2.5	2	2	3.5
Port Customers - Rail	6.6%	4	2.5	2.5	2.5	4
	SCORE	2.57	2.53	2.11	2.10	2.76
	RANK	2	3	4	5	1

5.5.4 Supplementary Reference Design Work

Following the identification of the reference project (Option B3), supplementary options, A3 and Option B4 were developed as shown in Figure 5.10 and Figure 5.11. The proposed alignments would follow the corridor which runs parallel and to the north of the sugar shed, with connections to the existing sugar loop and future port expansion loop.

These alignments offer similar advantages to Option B3 (e.g. improved social outcomes by locating freight rail movements further away from Archer Street). From an operational perspective, the proposed B4 Option would facilitate relocation of North Coast Line, with passenger services running through the port, rather than continuing on the existing North Coast Line corridor along Abbott Street. The achievable return rail radii connection to the Jetty Branch would limit North Coast Line passenger train operating speeds.

These supplementary options were not adopted for the reference project.

Figure 5.10 Option A3 Alignment

Continues from Option A, crossing the Ross River to the west of the Southern Port Road, remaining west of Benwell Road. Connects to both the existing sugar loop and future extension loops.

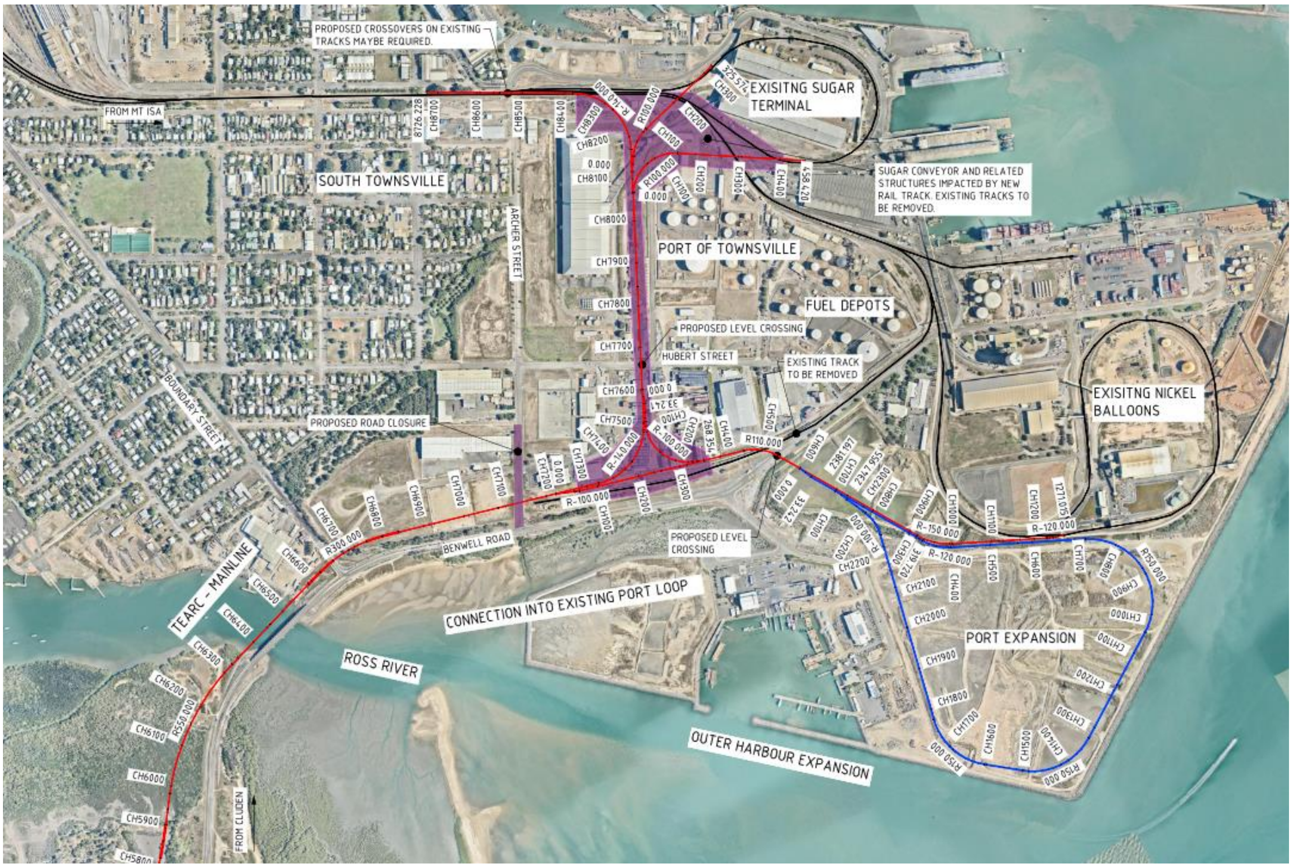
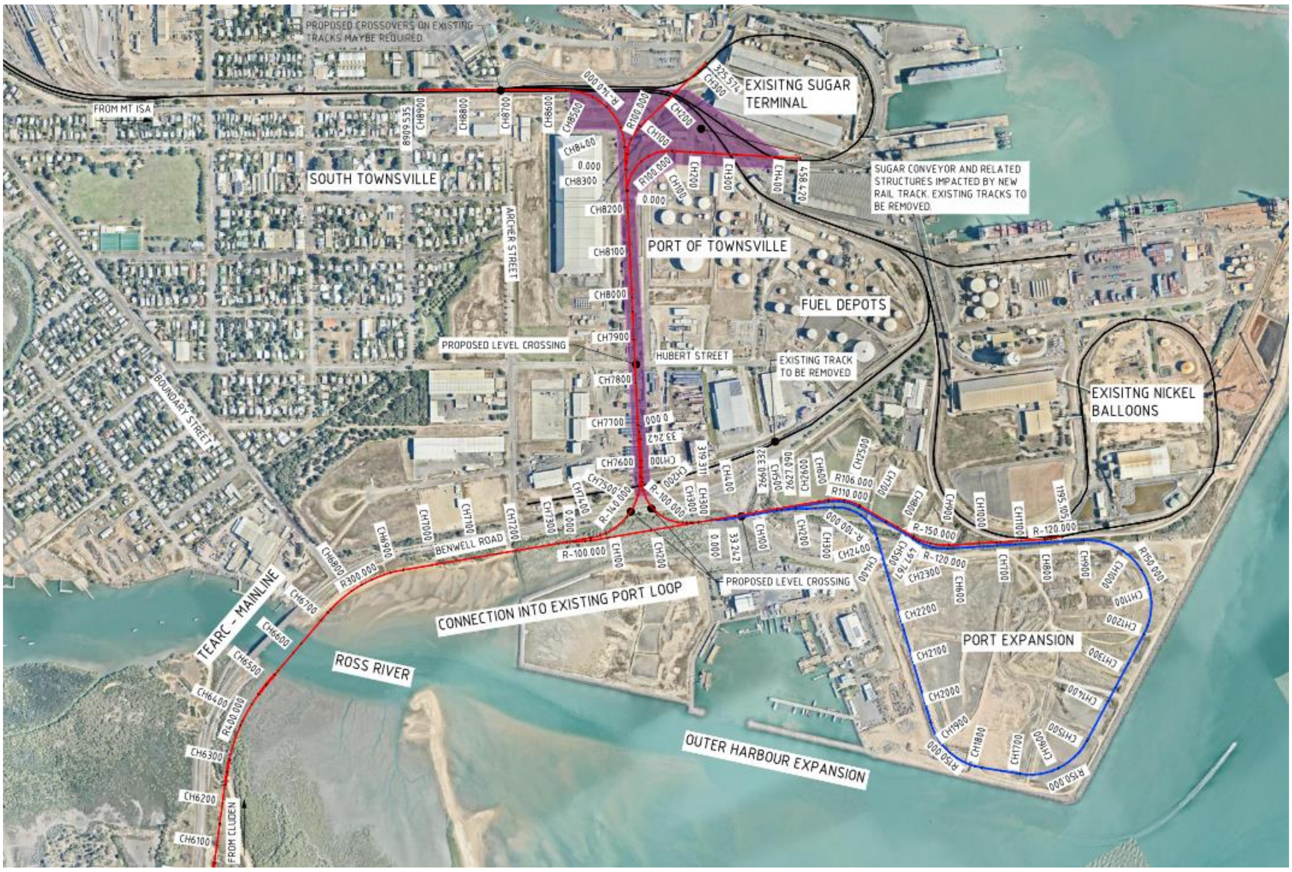


Figure 5.11 Option B4 Alignment

Continues from Option B, crossing the Ross River to the east of the Southern Port Road, remaining east of Benwell Road. Connects to both the existing sugar loop and future extension loops.



5.5.5 Concepts for Removal of part of the North Coast Line and Jetty Branch

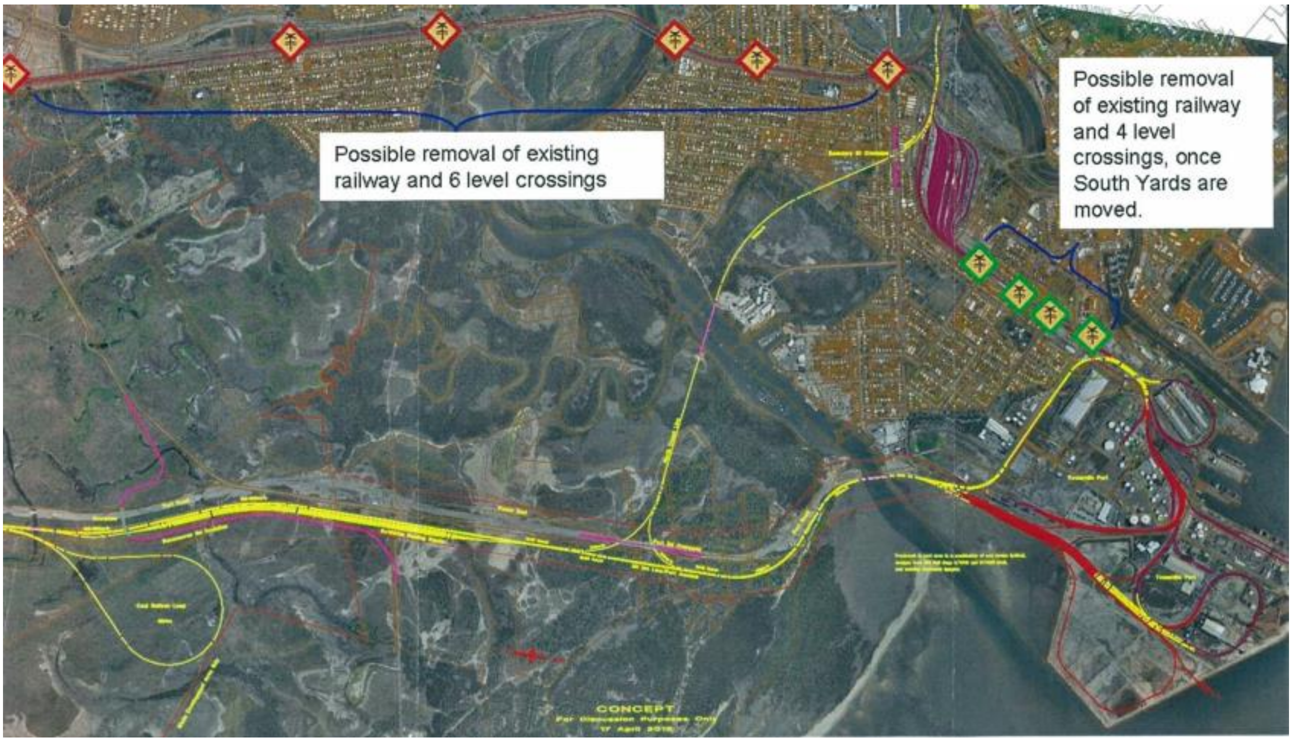
Additional ideas were discussed on the future opportunities that TEARC may provide in reconfiguring the North Coast Line and Jetty Branch to provide additional benefits to the Townsville community.

The analysis of alignment options included a high-level feasibility assessment of:

- Removing the section of the North Coast Line along Abbott Street (between the Bruce Highway at Cluden and Boundary Street), and/or
- Removing the section of rail that runs parallel to Perkins Street back the North Coast Line.

Refer to Figure 5.12 for an overview of the concept.

Figure 5.12 Alternative Alignment to allow the removal of Jetty Branch and section North Coast Line



QR developed this concept sketch for an alternate alignment that would connect from the proposed future TEARC connection to the North Coast Line in 2013. The configuration would potentially facilitate the removal of the North Coast Line and Jetty Branch. Assessing the feasibility of this option was not considered within the scope of this business case. This option would involve significant additional costs, as it would require an additional rail bridge across the Ross River. The additional bridge would be further inland with the alignment passing through the land that surrounds the defence base, and connecting to the North Coast Line near to the existing North Coast Line/Jetty Branch junction. It would also require grade-separated crossings where it intersects with the Southern Port Road.

The potential benefits of removing a section of the North Coast Line include reduced freight movements through southern Townsville suburbs, and the elimination of up to five level crossings with flow on benefits for safety, congestion and urban amenity.

The potential benefits of Jetty Branch removal include reducing social impacts on residents that live near the Jetty Branch, removal of up to three level crossings and the potential to support future urban renewal along this corridor.

Alternative Scenarios:

- Rerouting of the North Coast Line traffic is potentially feasible under the sub-alignment options considered as part of this business case, provided the Jetty Branch rail connection is maintained to allow through movements on the North Coast Line. In this scenario the section of North Coast Line from Cluden to Boundary Street may be removed.
- If the North Coast Line section were to be removed, the preferred alignment B3 would require passenger services and north south freight movements to run through the port. A safety case would be required on the routing of passenger services through the port loops.
- The North Coast Line could be retained for passenger services with freight movements diverted via TEARC, through the port and Jetty Branch connections. This alternative assumes the sugar unloading

facilities would be modified to bring sugar trains in and out of TEARC. Under this scenario, the North Coast Line would continue to operate as a port by-pass for passenger movements. Given there are only a few passenger services a week, this would still lead to reduced impacts on residents in Southern Townsville located along Abbott Street, it would mean higher operational costs associated with the maintenance of two lines.

- If the Jetty Branch connection were removed and the North Coast Line was retained, based on the alignments considered as part of this business case, the proposed TEARC connection would effectively need to operate as a two-way spur connection from the junction at Cluden to and from the port.
- Given the need to maintain north-south through movements on the North Coast Line, removal of the Jetty Branch would require the Abbott Street section of the North Coast Line to be retained in order to service passenger and freight movements which travel north along the Abbott Street corridor. This could in turn diminish some of the expected benefits of TEARC. Further investigation of engineering and operational constraints would need to be undertaken to fully understand the impacts of removing the Jetty Branch would potentially have on future North Coast Line operations.

These alternative scenarios were not considered to form part of the business case or reference project.

5.5.6 Conclusion

Option B3 was identified as the preferred alignment solution to be used for the Reference Project. The North Coast Line along Abbott Street and the Jetty Branch remain in use for the Reference Project.

Option B3 requires grade separation for Abbott Street and the Southern Port Road with an underpass at Boundary Street.

The relative advantages and constraints of each of the alignments compared to the Base Case are summarised in Table 5.9 to Table 5.12.

Table 5.9 Summary of Advantages and Constraints (Base Case)

DESCRIPTION	ADVANTAGES	CONSTRAINTS	UNLOADING STRATEGY
Base Case			
▪ Continued train movements through South Townsville.	▪	▪ Three heavily used open level crossings and one pedestrian crossing in residential areas. ▪ Approximately 140 dwellings noise affected. ▪ Operational impacts (delays) on road network. ▪ Existing open level crossings delay vehicle movements. ▪ Bottlenecks at port.	Existing arrangements

Table 5.10 Summary of Advantages and Constraints (Option A – Cluden West)

DESCRIPTION	ADVANTAGES	CONSTRAINTS	UNLOADING STRATEGY
Option A			
▪ Connects to the existing North Coast Line north of Cluden, traverses northeast towards the Southern Port Road and runs parallel to the port along the western side of the Southern Port Road to the Ross River. ▪ Option A is 6km in length from North Coast Line connection to Ross River.	▪ Does not have to cross the North Coast Line at approx. CH3000. ▪ Sets up for a reduced bridge crossing of the Ross River to the west of the existing highway bridge. ▪ Aligns with existing TSDA corridors. ▪ Reduced environmental footprint within the Ross River marine environment than Option B.	▪ Would require the relocation of the 132kV HV power line to the west of the Ross River bridge. ▪ Higher social impacts due to railway being closer to the residential areas on Archer Street. ▪ Potential for greater social impacts due to railway being closer to the residential areas of South Townsville (Macrossan Street and Eighth Avenue) and Cluden (Racecourse Road).	Refer to options A1 and 2
Option A1			
▪ Continues from Option A, crossing the Ross River to the west of the Southern Port Road, crossing Boundary Street as Rail over road. ▪ The alignment turns into Archer St, runs along Archer St with a 'Y'	▪ Good through rail access and operational efficiency. ▪ Shorter bridge crossing and reduced environmental footprint within Ross River. ▪ Utilises existing rail land to the west of Benwell Road ▪ Approximately 8 adjacent dwellings noise affected (lower than base case of 140).	▪ Rail over road bridge required at Boundary Street. ▪ Slightly more land take requirement when compared to Option B around the Archer Street/Benwell Road area. ▪ Relocation of the 132kV HV Power Lines parallel to the bridge. ▪ Higher social impacts due to railway being closer to the residential areas on Archer Street and Eighth Avenue.	Bottom discharge at existing sugar loop

DESCRIPTION	ADVANTAGES	CONSTRAINTS	UNLOADING STRATEGY
connection linking both the Sugar Loop and the North Coast Line. ▪ Access to the port expansion loop would be facilitated, via connection to the Benwell Road stabling track. ▪ 'Y' connection required to both the east and west of Archer Street.		▪ Requires major reconfiguration of Boundary Street/Archer Street intersection. Large impacts/constraints to the road network created due to the Archer Street Link. Archer Street severed from Benwell Road Boundary Street/ TPAR connection required with signals. Hubie Taylor Place extension to Boundary Street OLCs at Hubert Street and north of port gates. O/size vehicles connected via Hubert Street.	
Option A2			
▪ Continues from Option A, crossing the Ross River to the west of the Southern Port Road, crossing Boundary Street as rail over road, continuing along the existing Benwell Road stabling siding. ▪ The unloading point located along Benwell Road with transfer via belt conveyor to bulk sugar shed 3.	▪ Good through rail access and operational efficiency with regards port expansion. ▪ Shorter bridge crossing and reduced environmental footprint within Ross River. ▪ Utilises existing rail land to the west of Benwell Road. ▪ Reduced impacts due to the removal of the proposed 'Y' connection around Archer Street. ▪ Approximately 8 adjacent dwellings noise affected (lower than base case of 140).	▪ Rail over road bridge required at Boundary Street. ▪ Requires major reconfiguration of Boundary Street/Archer Street intersection. Large impacts/constraints to the road network created due to the Archer Street Link. ▪ Archer Street severed from Benwell Road Boundary Street/ TPAR connection required with signals. Hubie Taylor Place extension to Boundary Street. OLCs at Hubert Street and north of port gates. O/size vehicles connected via Hubert Street. ▪ Relocation of the 132kV HV Power Lines parallel to the bridge ▪ Higher social impacts due to railway being closer to the residential areas on Archer Street and Eighth Ave.	Bottom discharge at proposed Benwell Road, with conveyor transfer to sugar shed 3 ▪

Table 5.11 Summary of Advantages and Constraints (Option B – Cluden East)

DESCRIPTION	ADVANTAGES	CONSTRAINTS	UNLOADING STRATEGY
▪ **Option B – Cluden East**			
▪ Connects to the existing North Coast Line north of Cluden, traverses north east towards the Southern Port Road, crosses the Southern Port Road at approx. CH3000, and runs parallel to the port along the eastern side of the Southern Port Road. ▪ Option B is approximately 6km in length from North Coast Line connection to Ross River.	▪ Would not impact the 132kV HV power lines to the west of the existing road bridge. ▪ Approximately 8 adjacent dwellings noise affected (lower than base case of 140). ▪ Lower social impacts than western options, due to being approximately 100m further away from residential areas of South Townsville (Eighth Ave). ▪ Would ease curves required for 'Archer Street' option B1 ▪ Aligns with existing TSDA corridors and Port land use plan (Marine Industry areas within the Ross River North Precinct).	▪ Would require a grade separated crossing, most likely road over rail, at approx. CH3000. ▪ Would require a longer bridge crossing of the Ross River. ▪ Eastern alignments will result in a larger environmental footprint within the Ross River estuary than Options A. ▪ Potential for greater social impacts due to railway being closer to the residential areas on Archer Street (Macrossan Street) and Cluden (Racecourse Road).	▪ Refer to Options B1, 2 and 3
▪ **Option B1**			
▪ Continues from Option B, crossing the Ross River to the east of the Southern Port Road, crossing Benwell Road as Rail over Road, turning into Archer Street, out of Archer St via a 'Y' connection allowing continuation to the Sugar Loop and the North Coast Line. ▪ Onward access to the proposed port extension and the existing Ore loop. ▪ In summary a 'Y' connection would be required to the east and west of Archer Street.	▪ Good through rail access and operational efficiency. ▪ Avoids the need to relocate the 132kV power supply to the west of the Ross River road bridge. ▪ Approximately 8 adjacent dwellings noise affected (lower than base case of 140). ▪ Lower social impacts than western options, due to being approximately 100m further away from residential areas of South Townsville (Eighth Ave). ▪	▪ Large impacts/constraints to the road network created due to the Archer Street Link. ▪ Larger bridge structure required to cross the Ross River to the East of the existing road bridge and require disturbance to exposed tidal mudflat. ▪ Eastern alignments will result in a larger environmental footprint within the Ross River estuary than Options A. ▪	▪ Bottom discharge at existing sugar loop
▪ **Option B2**			

DESCRIPTION	ADVANTAGES	CONSTRAINTS	UNLOADING STRATEGY
▪ Continues from Option B, crossing the Ross River to the east of the Southern Port Road. ▪ Crosses Benwell Road as Rail over Road, crossing Archer Street. ▪ The alignment utilises the existing Benwell Road siding, continuing on to both the existing Ore loop and proposed expansion loop. ▪ A 'U' connection would be required, along Archer St, to ensure adequate route option for through traffic onto the North Coast Line.	▪ Utilises the existing Benwell Stabling formation base. ▪ Reduced construction requirements along Archer Street (when compared to B1). ▪ Approximately 8 adjacent dwellings noise affected (lower than base case of 140). ▪ Lower social impacts than western options, due to being approximately 100m further away from residential areas of South Townsville (Eighth Avenue). ▪	▪ Archer Street would require extensive modifications and would become a cul de sac with rail crossing road. ▪ A 'U' connection would be required to accommodate through traffic for the North Coast Line. ▪ Eastern alignments will result in a larger environmental footprint within the Ross River estuary than Options A.	▪ Bottom discharge at proposed Benwell Road, with conveyor transfer to sugar shed 3 ▪
▪ Option B3			
▪ Continues from Option B, crossing the Ross River to the east of the Southern Port Road, remaining east of Benwell Road. ▪ Crosses Windlass Crossing at grade and connects to the existing Ore and future Extension loops.	▪ Eliminates road interfaces along Benwell Road. ▪ Creates a direct connection to Ore and extension loops. ▪ Lower social impacts than all other options due to being located away from residential areas on Archer Street.	▪ Stabilisation works required to the east of Benwell Road (noting land reclamation already proposed as part of future port expansion). ▪ Eastern alignments will result in a larger environmental footprint within the Ross River estuary than Option A.	▪ Bottom discharge at proposed Benwell Road, with conveyor transfer to sugar shed 3

Table 5.12 Summary of Advantages and Constraints (Option C – Sun Metals)

DESCRIPTION	ADVANTAGES	CONSTRAINTS	UNLOADING STRATEGY
Option C			
▪ Option C connects to the existing North Coast Line railway network at the Sun Metals branch. ▪ The proposed alignment traverses northwest to join what would also be option B at approximate chainage 7000. ▪ This option continues, as per Option B, to the Ross River crossing on the Eastern Side. ▪ Option C is approximately 9.5km from North Coast Line connection to Ross River.	▪ Would create a direct linear connection from the North Coast Line to the Ross River crossing point. ▪ Would better serve industry in and around the Sun metals area. ▪ Potential to link to common user facility with slightly amended alignment. ▪ Will not result in amenity impacts to residents in the Cluden area.	▪ Highest cost, additional 3.5km in track compared to Options A and B leading to additional costs. ▪ Operationally, and assuming the North Coast Line would be taken off line between Stuart Industrial precinct and South Townsville, would create operational issues with Stuart yard becoming single rather than double ended and would require reverse shunting and re-signalling. ▪ Cultural heritage concerns have been raised around the indigenous burial site located near to Sandfly Creek that the rail line would cross. ▪ Does not align with existing transportation corridors with the potential to reduce proposed developable precincts of the TSDA. ▪ Bisects Sun Metals approved solar farm within TSDA. ▪ Flood impacts, Option C alignment traverses several existing major drainage features which includes Sandfly Creek and several existing tributaries of Stuart Creek that generally flow in an easterly direction to discharge to the coast. All existing flows associated with the Sandfly Creek catchment would be effectively blocked resulting in considerable ponding and elevated upstream flood levels. ▪ Environmental constraints due to alignment traversing greenfield wetland environment through TSDA. ▪ Eastern alignments will result in a larger environmental footprint within the Ross River estuary than Options A.	Refer to Options B1, 2 and 3

- **Assumptions and Clarifications**

- Conveyor unloading will commence on the return/exit i.e. not on entry to the port precinct. This accommodates greater train length and avoids being under compression as a result of vertical geometry constraints
- Staging ponds at the junction of Benwell Road and Windlass Crossing have not been avoided during alignment development. They will be removed prior to rail construction.
- It is understood the staging of TEARC will be implemented prior to the port expansion loop
- Options A, B and C from the North Coast Line to Ross River are within the Townsville SDA
- The existing North Coast Line between the take off at Cluden (Stuart Yard for Option C) connection for the proposed TEARC and Townsville South may be decommissioned

5.6 Recommended Solution

The recommended alignment option (Reference Project), branches off the North Coast Line at Cluden, traversing the northern part of the TSDA, and then broadly follows the Southern Port Road alignment to the east of the road and the Ross River bridge connecting into the port minerals loops. Figures 5.13 provides a general layout arrangement for the Reference Project Alignment and Figures 5.14, 5.15 and 5.16 provide details of the Reference Project.

Figure 5.13 – Reference Project Alignment – General Layout Arrangement

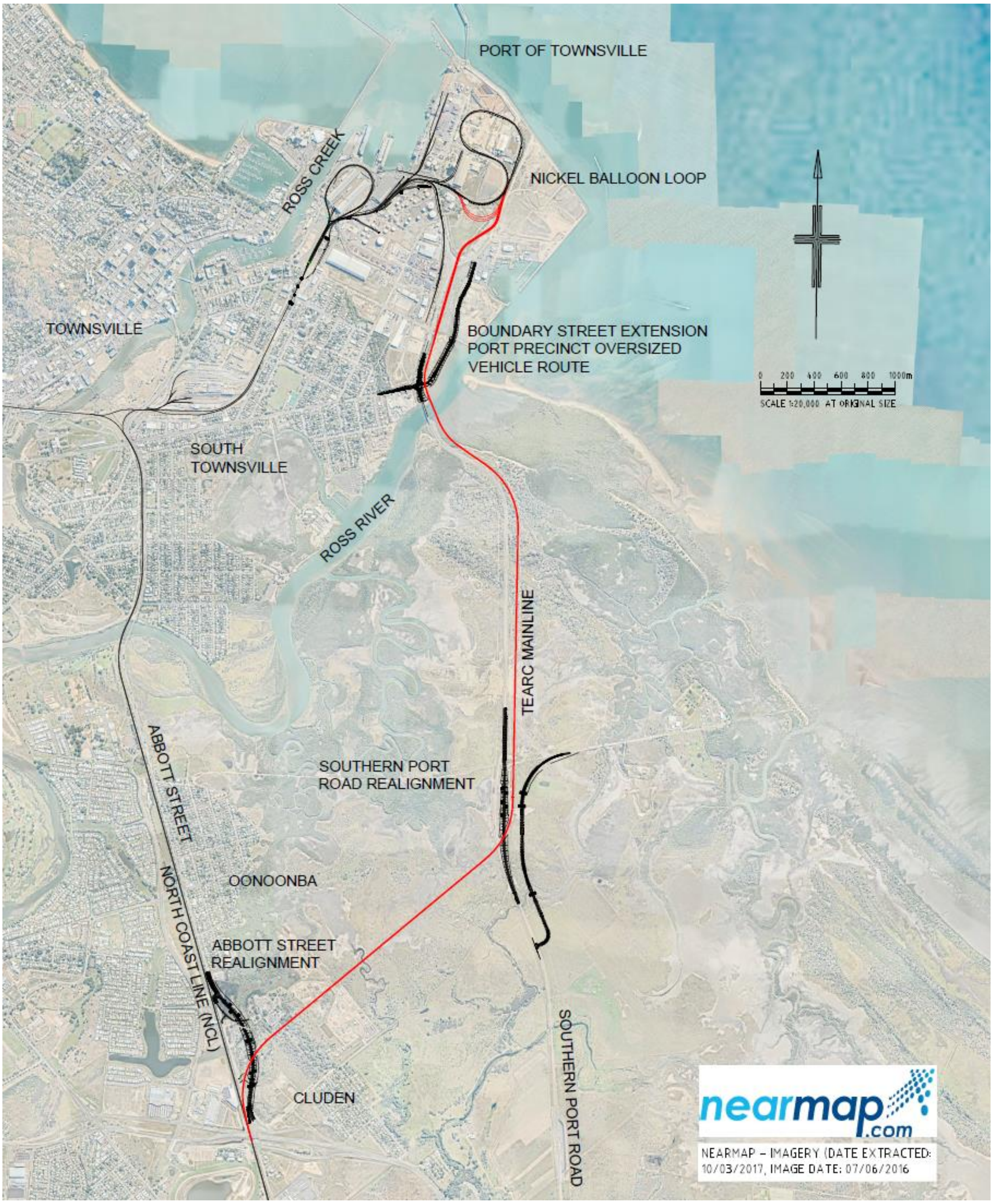


Figure 5.14 – Reference Project Alignment – Southern Connection

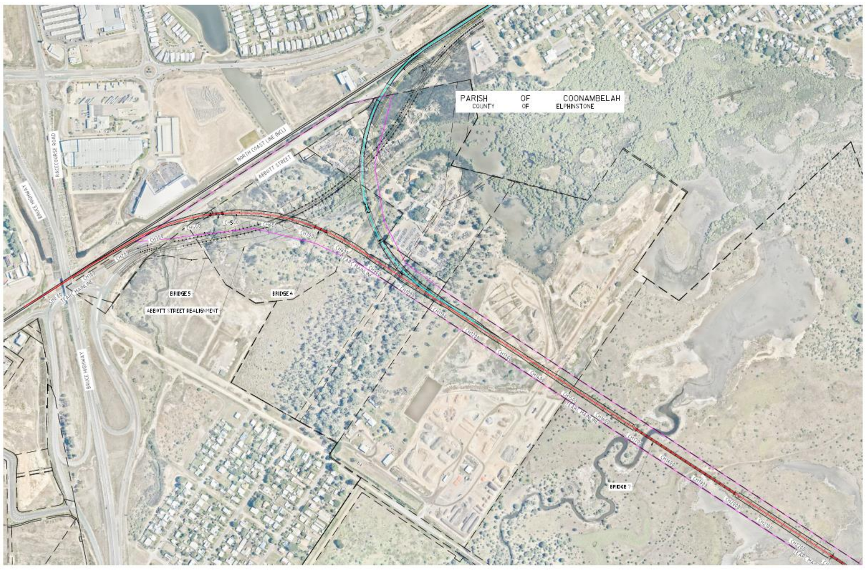


Figure 5.15 – Reference Project Alignment – Eastern Access Road Section

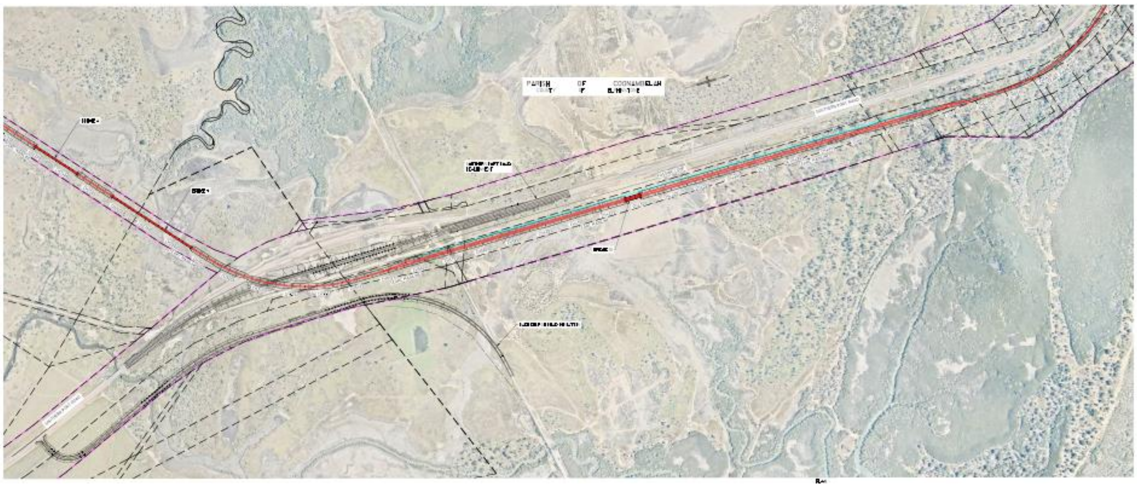


Figure 5.16 – Reference Project Alignment – Northern Connection to the PoT

5.7 Reference Project

TEARC is a proposed new 8.3km freight rail link, branching off the North Coast Line at Cluden and connecting directly to the PoT. The alignment broadly follows the eastern side of the Southern Port Road, crossing near the mouth of the Ross River and connecting to the existing inner (Cannington) and outer (Nickel) balloon loops within the PoT. Refer to Figure 5.17. Refer to Table 5.13 for a summary comparison to the Base Case.

TEARC has been designed to facilitate future staged infrastructure upgrades, including the proposed port expansion. The design also responds to strategic needs and aims to maximise project benefits that include:

- Providing additional rail capacity and ability to accommodate longer trains to support the efficiency of the resources sector.
- Providing additional access capacity to support new operations at the PoT. There is some latent capacity within the port but not sufficient space for new entrants, which impinges growth and potentially constrains future throughput volumes.
- Improving freight efficiency and boosting capability of the Port by removing bottlenecks caused by road and freight movement conflicts through at grade crossings.
- Supporting the activation of the Townsville SDA by providing a strategic freight link with direct access to the PoT, Mount Isa and North Coast Lines.
- Diverting freight rail movements away from the North Coast Line, helping to address road network impacts associated with at-grade crossing and urban amenity impacts from freight rail operations within the urban areas of Townsville.

Table 5.13 Comparison of Base Case and Reference Project

DESCRIPTION	BASE CASE	REFERENCE PROJECT
New Rail Line and associated signalling	Nil	8.3km narrow gauge from Cluden to PoT modified balloon loops
New Road/Rail Grade Separations	Nil	Abbott St, SPR and Boundary St
Removal of Jetty Branch	Nil	Not in scope

Methodology

The design for TEARC was undertaken engaging a wide range of stakeholders between January and September 2017. The objective of the engineering component of the study is to provide sufficient definition of the project scope and estimate to support the business case.

Stakeholder inputs have included:

- Queensland Rail
- Transport and Main Roads
- Department of State Development
- Port of Townsville Limited
- Other consultants, including finance and economics
- Community engagement.

The design of the alignment has been influenced and guided by various factors as the project has progressed which include:

- Operational efficiency
- Value for money
- Community impacts
- Environmental impacts
- Stakeholder requirements
- Economic and financial viability.

The engineering team has worked in collaboration to take the existing design, stakeholder inputs and workshop outputs to develop the design through the phases and assessing the various options. The discipline inputs include the following:

- Alignment design
- Road impact design
- Hydrology and Drainage
- Bridges and structure
- Geotechnical design
- Environmental
- Cultural and Indigenous Heritage
- Public utilities and general civil engineering.

Ancillary discipline inputs also included modelling of the rail and road infrastructure, which provided guidance to the discipline leads during the design process and informed the economic analysis.

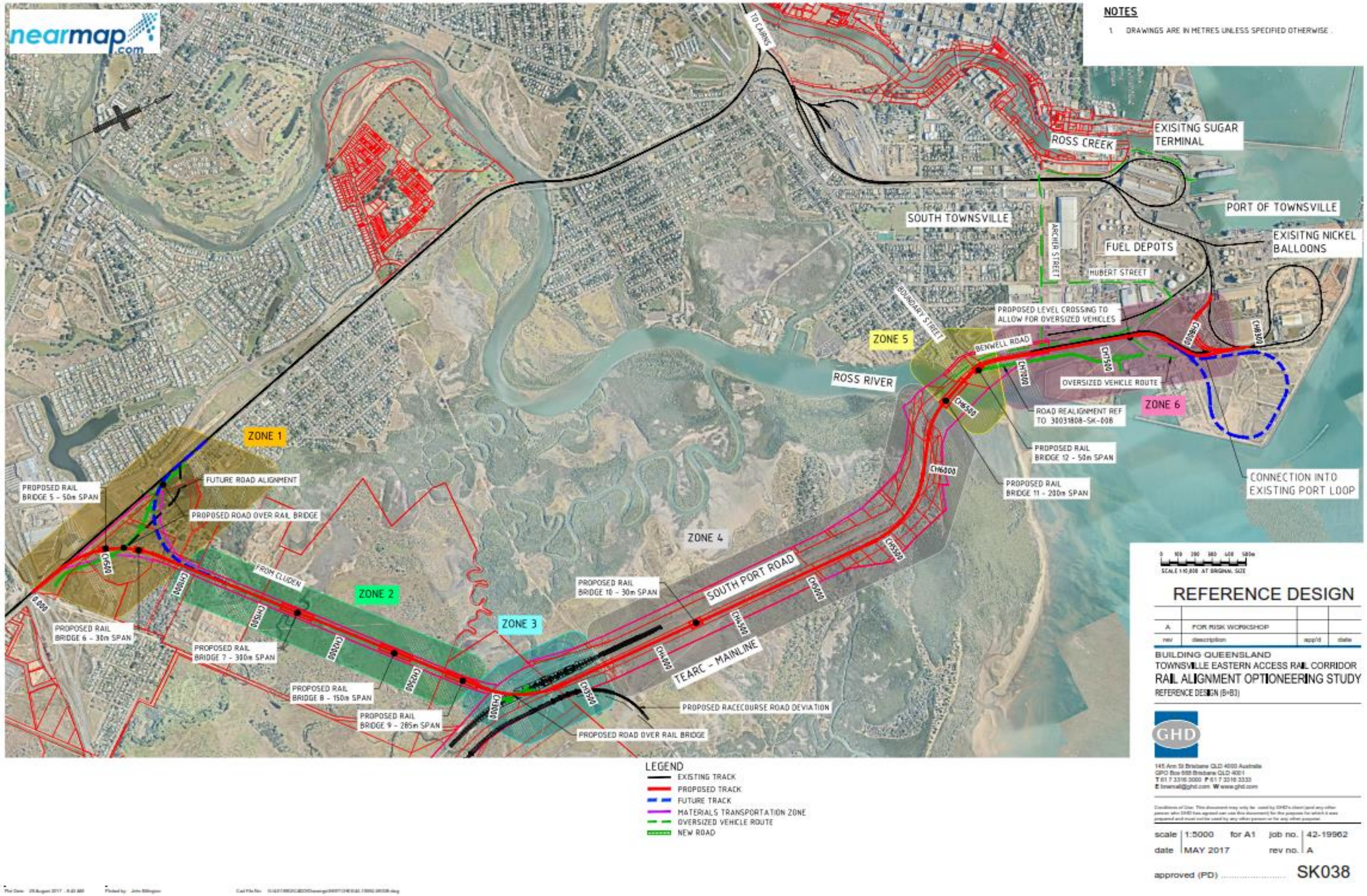
The following sections provide a summary of the project, including design scope, key technical features for each discipline, functionality, operations, services, inclusions and exclusions.

The project commences at the North Coast Line approximately 6km south of Townsville and consists of the following major components:

- Construction of 8.3km single-track narrow gauge (1067mm) rail line from Cluden to PoT with a new embankment, maintenance access road, bridge and drainage structures.
- Realignment and grade separation of Abbott Street.
- Realignment and grade separation of the Southern Port Road.
- Realignment of Racecourse Road to the sewerage treatment plant.
- Extension of Boundary Street from Benwell Street to Windlass Crossing.
- Integration with existing and planned future PoT expansion.

The following sections provide further detail on the design scope and considerations for each of technical disciplines.

Figure 5.17 TEARC Reference Design Project Zones



5.7.1 Rail Infrastructure

5.7.1.1 Scope Overview

The total length of TEARC, excluding passing loops and mainline duplication, is 8.281km (rounded to 8.3km for discussion).

TEARC will be predominantly single track with a passing loop accommodating a 1,000m train south of Ross River (with the provision for up to 1,400m trains in future), a single track across Ross River and then double track to connect to the existing port minerals loops.[28]

TEARC will branch off the North Coast Line at Cluden, via a southern access leg, with an allowance for connection of a northern leg in the future, if required.

TEARC will be grade separated after it crosses Ross River, and run along the southern side of Benwell Road.

The rail is 60kg/m standard carbon with concrete sleepers, and contains 14 turnouts of the following type: (3 x 1 in 25; 3 x 1 in 16; 8 x 1 in 8.25). Top of the embankment formation to head of rail is a minimum of 658mm.

The mainline is predominantly on fill with embankment heights ranging from 1.5m to 2m above the proposed access road, with 1 in 2 embankment slopes and an average formation level of 4.85m. The minimum radius curve is 300m, and the maximum radius is 550m. In the port precinct, the minimum radius is 140m to accommodate QR's maintenance plant capacity.

The maintenance access road provides for a 3m wide Type 2 at natural surface level (where possible).

Maintenance access road entry points have been allowed for at the following locations:

- Cluden connection; joining onto the existing access road via Abbott Street.
- Racecourse Road; joining at nominated locations along Southern Port Road.
- Port Precinct; via Benwell Road.

Signalling system for the TEARC mainline to the port boundary will be an extension of the current QR system. Train control within the port precinct is proposed to be under the PoT manual system.

5.7.1.2 Limits of Project Scope

- There will not be any relocation or removal of the North Coast Line as part of the project (Abbott Street).
- There will not be any removal of the Jetty Branch as part of the project.
- TEARC does not rely upon any upgrades to the Mount Isa Line and hence Mount Isa Line upgrades are not included in the project scope.
- No work within the PoT precinct past connecting TEARC into the existing minerals loops.

[28] Modelling of the alignment for the project case has stress tested the corridor. This has not highlighted the need for full duplication of track (i.e. current single track with passing loops is sufficient). Road over rail bridges as currently designed would not facilitate future track duplication

5.7.1.3 Rail Embankments

The TEARC design planning levels for flood immunity (vertical grade provisions) were established based on the following criteria:

- Rail embankments will generally meet 1% Average Exceedance Probability (AEP) flood requirements.
- Within the coastal areas, design level criteria are based on the adopted Design Storm Tide (DST) event levels in accordance with the Townsville City Council City Plan 2014. Current City Plan 2014 provisions necessitate higher design-planning levels compared to those applied under the former 2005 scheme.
- In floodplain areas, design-planning levels are based on the TCC Defined Flood Event (DFE), but also include conservative allowances for climate change (within a 2100 planning timeframe), unmitigated catchment development and inclusion of the ultimate Townsville SDA strategy.

5.7.1.4 Bridges

In total, twelve bridges (eight for railway and four for road) have been proposed along the rail and road alignments between North Coast Line across Ross River to the PoT. Due to the complex hydrology of the area, many of these bridges have significant spans and embankments. While bridges have been used to provide appropriate waterway openings in this design, structures providing water openings may be optimised during the detailed design phase and some (or all) of these bridges may be more cost effectively provided as large banks of culverts. Maintenance access has been assumed to be at grade without any cross-drainage provision. Refer to the Section 5.2.6 for further information regarding drainage structures.

Rail bridges include:

- BR05 – CH450: 2 x 15m span bridge for cross drainage provision
- BR06 – CH720: 2 x 15m span bridge for cross drainage provision
- BR07 – CH1700: 20 x 15m span bridge over Gordon Creek
- BR08 – CH2300: 10 x 15m span bridge for cross drainage provision
- BR09 – CH2580: 19 x 15m span bridge for cross drainage provision
- BR10 – CH4260: dual 3 x 15m span bridges for cross drainage provision
- BR11 – CH6470: 6 x 32m span bridge over Ross River
- BR12 – CH6740: 2 x 24m span over the Boundary Street connection.

The road works require the following new bridges:

- BR01 (RB – BR01) – single span road over rail for southern leg North Coast Line connection
- BR02 (RB – BR02) – single span road over rail for future northern leg North Coast Line connection
- BR03 (RB – BR03) – single span road over rail for realigned Southern Port Road
- BR04 (RB – BR04) – 3 x 18m span for realigned access of Racecourse Road for access to Cleveland Bay Purification Plant.

As a result of the road alignment relative to TEARC, the road over rail bridges (BR01, BR02, and BR03) are at a very large skew, which requires complex bridge geometry and design. In future design development stages, the road alignment should be optimised to reduce skew angles with TEARC.

5.7.1.5 Signalling

QRs Townsville rail network is controlled by Remote Controlled Signalling (RCS), the junction to the North Coast Line will be signalised, using RCS and to the port including; signalling, powered connections and turnouts. The project is not advocating any new technology, but additions to the existing RCS System using approved QR and existing design standards.

There is no RCS in place inside the port borders, and none will be introduced through this project. The PoT will continue to operate under its current signalling arrangements, a combination of mimic panels, numbered stop boarders and cameras. The manipulation of points against the “normal” direction of travel will continue to be manually undertaken, requiring shunting/operational staff on the ground, as and when required.

5.7.1.6 Integration with PoT

There will be two tracks connecting to the ore loops at the PoT from the single track over Ross River. This will alleviate blocking of access and egress for TEARC to and from the existing tracks and terminal infrastructure for trains unloading at the dump shed in the ore loop.

The two tracks leading into the port will be capable of holding 1,000m trains each, but may allow for provision to scale to longer trains if required in future.

There will be an additional crossover between the loops to provide operational flexibility, particularly with loop track selection. This will enable trains to pass through to the western side of the port via TEARC if trains are dumping at the IPL fertiliser and South 32 unloading facilities.

In terms of integration with the North Coast Line, existing QR vertical track levels have been ‘tied into’ at the North Coast Line and the port area. The design level for the top of the embankment for TEARC is based on the TCC DST level of 4.5m AHD in coastal areas and a TCC DFE 1% AEP flood level. These levels are higher than the current track levels for the North Coast Line and the port.

Sugar traffic and port intermodal trains will continue to enter and exit the port on the current North Coast Line alignment and proceed along the Jetty Branch to the PoT.

Mount Isa Line traffic will use TEARC, though some of these trains may also use the North Coast Line alignment, especially those trains that need to re-orientate within the port, including Glencore and molasses, cement and fuel

The development timing of the TSDA development is currently unknown. Both TEARC and TSDA would benefit from coordination, particularly in terms of managing flood infrastructure and cross drainage requirements.

Descriptions of the applied operating rules for trains under TEARC and Base Case infrastructure are provided in Table 5.14 for each train type.

Table 5.14 Train Movement Impacts of Proposed TEARC Arrangement

TRAIN TYPE	EXISTING OPERATIONS BASE CASE (NO TEARC)	OPERATIONS WITH TEARC REFERENCE PROJECT
A. Sugar train	A.1 Sugar train enters port via the Jetty Branch and proceeds to dedicated Sugar Balloon Loop. A.2 It takes about 1.7 hours on average to unload, the train leaves the port via the Jetty Branch. A.3 Sugar trains do not interfere with other rail traffic at the port due to complete separation of Sugar Balloon loop from the rest of port infrastructure	A.1 No change A.2 No change A.3 No change
B. Sugar-Molasses train	B.1 A combination sugar and molasses train (about 9 wagons molasses and 18 wagons sugar) will arrive at Stuart Yard where it will be split into 2 rakes. B.2 A sugar rake will be shunted to the Sugar Balloon Loop at the port and back to Stuart yard after unload. B.3 The molasses rake will be shunted to the port via the Jetty Branch, proceed to Cannington Balloon loop to realign direction, run back to port exit signals and pushed back onto Berth 4 molasses unloading facility behind Xstrata Shed. B.4 It will take approximately 1.3-1.6 hours to unload and empty rake shunted back to Stuart yard. B.5 At Stuart yard empty Sugar and Molasses rakes are reassembled into full consist and exits South along NCL line.	B.1 No change B.2 No Change B.3 The molasses rake will be shunted to port via TEARC, proceed to Nickel Balloon loop to enter port, run back to port exit signals and pushed back onto Berth 4 molasses unloading facility behind Xstrata Shed. B.4 No change B.5 No change
C. Cement Train	C.1 Empty train shunted from Partington Yard to PoT and enters port via the Jetty Branch. C.2 It realigns direction by going via Cannington Balloon Loop and back to the port exit signals and push back onto Cement Loading siding. C.3 It takes about 1.5 hours on average to load, train is shunted back to Partington via the Jetty Branch. C.4 It is assumed the rail operator (Pacific National) will route cement wagons as part of bigger combinational train later from Partington Yard.	C.1 Empty train shunted from Partington Yard to PoT and enters port via TEARC. C.2 Train runs via Nickel Balloon Loop to the port exit signals and then pushed back onto Cement Loading siding. C.3 No Change C.4 No Change
D. Fuel Train	D.1 Empty train shunted from Partington Yard to PoT and enters port via the Jetty Branch. D.2 It realigns direction by going via Cannington Balloon Loop and back to port exit signals and pushed back onto Shell sidings. D.3 It takes about 3.8 hours on average to load, train is shunted back to Partington via the Jetty Branch. D.4 It is assumed the rail operator (Pacific National) will route fuel wagons as part of a bigger combinational train later from Partington Yard.	D.1 Empty train shunted from Partington Yard to PoT and enters port via TEARC. D.2 Train runs via Nickel Balloon Loop to the port exit signals and then pushed back onto Shell sidings. D.3 No Change D.4 No Change
E. Containerised Freight train	E.1 Train originated from Mt Isa Line. E.2 Train enters port via the Jetty Branch and proceeds straight to one of two available intermodal sidings within port Intermodal terminal. E.3 It is assumed; intermodal trains do not require realignment by going via Cannington Balloon Loop, if any realignment is required it will be provided by means of spare shunting loco available for intermodal operations.	E.1 No Change E.2 No Change E.3 No Change E.4 No Change

TRAIN TYPE	EXISTING OPERATIONS BASE CASE (NO TEARC)	OPERATIONS WITH TEARC REFERENCE PROJECT
	E.4 On average, it will take about 2.5 hours to load/unload containerised train at the port intermodal terminal.	
F. Nickel train	F.1 Nickel train originates at the Nickel refinery facility north of Townsville. F.2 It enters port via the Jetty Branch and proceeds toward the Nickel Balloon Loop and exits port back to Nickel refinery facility after unloading. F.3. It takes about 1.8 hours on average to load Nickel train at Nickel loading facility. F.4 Note: currently Nickel imports and Nickel refinery facility is not operational due to closure of Nickel Refinery Facility. F.5 Nickel rail operations were enabled only in scenario 4 (High High), where for scenarios 1, 2 and 3 Nickel traffic was disabled.	F.1 No Change F.2 No Change F.3 No Change F.4 No Change F.5 No Change
G. South32 (Cannington Concentrate train)	G.1 Train originated from Mt Isa Line. G.2 Train Enters port via the Jetty Branch and proceeds to South32 dumper on the Cannington Balloon Loop. G.3 It takes about 3 hours on average to unload Cannington Concentrate train. G.4 Train exits port to Mt Isa via the Jetty Branch.	G.1 No Change G.2 Train Enters port via TEARC and proceeds to South32 dumper on the Cannington Balloon Loop. G.3 No Change G.4 Train exits port to Mt Isa via TEARC.
H. Fertiliser Train	H.1 Train originated from Mt Isa Line. H.2 Train Enters port via the Jetty Branch and proceeds to IPL dumper on the Cannington Balloon Loop. H.3 It takes about 2.5 hours on average to unload Cannington Concentrate train H.4 Train exits port to Mt Isa via the Jetty Branch.	H.1 No Change H.2. Train Enters port via TEARC and proceeds to IPL dumper on the Cannington Balloon Loop. H.3 No Change H.4 Train exits port to Mt Isa via TEARC.
I. Glencore (Zinc Concentrate and Magnetite) Train	I.1 Train originated from Mt Isa line. I.2 Train arrives first to Partington Yard from Mt Isa Line where it is split into two 45 wagon rakes. I.3 Every rake is shunted from Partington to the port sequentially and back to Partington where unloaded rakes are reassembled back into full length consist to depart to Mt Isa. I.4 Every Glencore rake enters port via the Jetty Branch. I.5 It is required to realign train orientation by going via Cannington Balloon Loop and back to port exit signal. I.6 Train is pushed back into Xstrata Tippler Shed. I.7 There are two dead end sidings behind Xstrata Shed utilised during unload. I.8 When unloaded, two short rakes are combined together and a 45 wagon rake is shunted back to Partington Yard via the Jetty Branch. I.9 Note: a 45 wagon Glencore rake may be unloaded in one go without additional shunting and will not interfere with other trains at the port once unloading process started.	I.1 No Change. I.2 No Change. I.3 No Change I.4 Every Glencore rake enters port via TEARC. I.5 Train runs via Nickel Balloon Loop to port exit signals. I.6 No Change I.7 No Change I.8 No Change I.9 No Change.

5.7.2 Road Realignments

The proposed alignment of TEARC has required the realignment or extension of a number of existing roads, including:

- Realignment of Abbott Street to allow grade separation (road over rail) from TEARC.
- Realignment of Southern Port Road; grade separation (road over rail) from TEARC.
- Extension and realignment of Racecourse Road. The proposed Racecourse Road intersection and road realignment have been located to accommodate future Townsville SDA master planning requirements, including connection to form part of a future major industrial collector road.
- Extension of Boundary Street to connect with Windlass Crossing, including a new intersection with Benwell Road. Planning for the Boundary Street/Benwell Road intersection (including extension of Boundary Street) does not preclude changes to the intersection configuration to suit future TMR planning requirements.
- The existing access road to the marina and dog beach on the southern side of the port will be re-routed to provide continued access.

The concept design of all new proposed roads has been developed using standards from Austroads and Department of Transport and Main Roads. The new roads all utilise the Normal Design Domain, except for elements of the existing Boundary Street and Benwell Road intersection, whereby safe intersection sight distance is impeded by the position of proposed new bridge piers and abutments.

A number of opportunities and issues regarding the road realignments proposed in this design have been considered, as shown in Table 5.15.

Table 5.15 Road Realignment Opportunities and Issues

OPPORTUNITIES	ISSUES
Alignment refinement to reduce road width (and potentially bridge width). Staging of the North Coast Line connection may allow the proposed Abbott Street realignment to be re-configured to avoid resumption requirements, and complex access arrangement to the existing freehold property. Applying design exceptions to Racecourse Road to reduce horizontal geometry, which in turn may avoid resumption for connection to the existing Racecourse Road. Alternate drainage solutions, such as realignment of channels to cross at low embankments.	High embankments required in soft soil areas which will result in extensive ground improvement works by excavation, backfill and pre-load. Land resumptions to accommodate realigned or extended roads. Freehold property access near Abbott Street. Marine environment at Boundary Street.

5.7.2.1 Abbott Street

The Abbott Street realignment is approximately 1.4km long and provides for grade separation (road over rail) over the southern and northern leg connections of TEARC to the existing North Coast Line at Cluden. The road has high embankment requirements due to the vertical clearance requirements for TEARC (6.4m), and traverses mostly undisturbed low lying marsh land offline from the existing Abbott Street alignment.

The proposed realignment has considered access requirements to the existing TCC pump station, which is located between the car wreckers and the Vantassel-Cluden interchange on the existing Abbott Street alignment. Access to the freehold property located adjacent to the proposed realignment has also been considered. The only online portions are the connections to the existing road network. The proposed road alignment will require some resumption of freehold and TCC property; however, most of the alignment is contained within the corridor previously designated for TEARC.

5.7.2.2 Southern Port Road

The Southern Port Road realignment is approximately 1.3km long and provides for grade separation (road over rail) over the proposed TEARC. This road also has high embankment requirements due to the vertical clearance requirements for TEARC (6.4m), and traverses mostly undisturbed low-lying marshland offline from the existing road alignment. The horizontal geometry of the proposed realignment was previously considered as part of the original Southern Port Road design, which means the works can largely be completed without impact to existing road operations. There are no resumptions required as part of this proposed realignment.

5.7.2.3 Racecourse Road

Racecourse Road extension is required to avoid a level crossing with TEARC. Racecourse Road provides access to the existing Cleveland Bay Purification Plant. The extension is approximately 1.7km long and traverses mostly undisturbed low-lying marshland. The realignment has been positioned on the easternmost edge of the materials transportation/services corridor to avoid multiple crossings of future utility services, and requires bridging to cross Stuart Creek. The road length is required to avoid conflict with the proposed Southern Port Road realignment and TEARC, and to tie-in with an agreed future intersection point. In order to maintain compliant horizontal geometry for the proposed design speed, land resumption will be required for a small portion at the connection to the existing Racecourse Road.

5.7.2.4 Boundary Street

The extension of Boundary Street is required, as the proposed TEARC alignment will sever access to Windlass Crossing from Benwell Road. The extension will connect the Boundary Street/Benwell intersection to Windlass Crossing across the existing marine area near the port. To provide continuity of service, TEARC will be grade separated (rail over road) from the proposed extension. The vertical clearance to TEARC will be 5.2m (minimum), which is equivalent to a highway standard level of clearance. To accommodate oversize-overmass vehicles, the existing intersection between Benwell Road and Windlass Crossing will be maintained with a level crossing added for TEARC. Manually operated control gates will be provided to prevent access during normal operations.

5.7.2.5 Design Optimisation Analysis

A number of design elements (e.g. grade separated crossings and road/intersection realignments) have been included in the Reference Project in order to maximise network efficiencies and safety.

As these design elements typically increase overall project costs, each has been assessed against the alternative 'do minimum' scenario, in order to identify its incremental costs, value and benefits.

In all cases, the recommendation is that these design elements be included in the Reference Design.

Table 5.16 summarises the design optimisation analysis and data for traffic volumes.

Table 5.16 Optimisation analysis of key design elements

LOCATION OF ROAD /RAIL INTERFACE	OPTIONS	DESCRIPTION	ISSUES/IMPACTS	RISKS OF ADOPTING DO-MINIMUM OPTION	REFERENCE PROJECT PREFERRED SOLUTION
Abbott Street	Do Minimum Open Level Crossing (OLC)	Signalised rail crossing at the locations where the proposed southern (reference project) and northern (possible future need) legs cross the existing road.	Introduces an additional OLC on the Townsville rail network. Reduces safety and efficiency of Abbott Street. Significant disruption to City inbound/outbound traffic, including heavy vehicles. Negligible land resumption needed.	Increased safety risk due to presence of crossing and additionally the skew nature of crossing.	Grade Separation
	Grade Separation	Realign Abbott Street to provide grade separation between TEARC and Abbott Street.	Land resumption required Additional costs associated with providing access to freehold property and existing TCC pump station. Additional costs to control settlements on high fills	Abbott St is a high-volume traffic route with up to 16,000 two-way traffic flows, with up to 6% heavy vehicles in 2037 Refer to Tables 5.17 and 5.18 for AADT forecasts	
Southern Port Road	Do Minimum - OLC	Signalised rail crossing at the location where TEARC crosses the existing Southern Port Road.	Introduces an additional OLC on the Townsville rail network. Reduce safety and efficiency of Southern Port Road. Significant disruption to Port inbound/outbound, large combination vehicles (LCV) requiring long slow acceleration and decelerations. Negates benefit of LCV travel time savings from existing advance	Increased safety risk due to presence of crossing and additionally the skew nature of crossing. Isolated OLC crossing on the Townsville – Mount Isa road corridor is	Grade Separation

			detection traffic signal arrangements at the Bruce Highway/ Southern Port Road intersection.	inconsistent with driver expectations.	
	Grade Separation	Realign Southern Port Road to provide grade separation between TEARC and Southern Port Road.	Additional costs associated with providing access to freehold property and existing TCC pump station Additional costs to control settlements on high fills.	High volume traffic route with up to 21,000 two-way traffic flows, with up to 9% heavy vehicles in 2037. Refer to Table 5.17 and Table 5.18 for AADT forecast on Southern Port Road.	
Racecourse Road	Do Minimum - OLC	Provide open level crossing at Racecourse Road crossing TEARC line and south-of-river holding loop line.	Reduce the safety and efficiency of access to the Cleveland Bay Purification Plant, albeit low road traffic volumes. Location of the holding loop results in trains stored across this crossing at regular intervals during the day with unpredictable stopping times. Road access must be available at all times for emergency vehicles as Purification Plant is a no through road.	Increased safety risk due to presence of crossing Solution is intolerable for unfettered emergency services access.	Road Realignment
	Road Realignment	Extend Racecourse Road by 1.7km to the south to remove OLC and avoid interaction with TEARC. Locate new intersection consistent with agreed Townsville SDA/ Southern Port Road access location to avoid introducing a new	Land resumption. Additional costs associated with providing access to the Purification Plant.	Refer to Table 5.17 and Table 5.18 for AADT on Southern Port Road (which intersects with Racecourse Road)	

		intersection on Southern Port Road			
Boundary Street Extension	Do Minimum	Provide level crossing (signalised) at Windlass Crossing to avoid construction of Boundary Street Extension.	Limits work in marine areas. Reduced safety and efficiency of the port operations, specifically for operations that must access Windlass Crossing (currently commercial marina operators plus future Eastern Reclaim Area (ERA) industrial uses). With TEARC in operation, Windlass Crossing will be cut for frequent and extended periods of time, which will be intolerable for emergency services commercial marina operators and customers.	Increased safety risk due to presence of crossing. Solution is intolerable for unfettered access for emergency services and commercial providers. Refer to Table 5.17 and Table 5.18 for AADT on Southern Port Road (which intersects with Boundary Street).	Grade Separation and Road Realignment.
	Grade Separation and Road Realignment	Provide rail over road separation near Boundary Street with minimum clearance as per Austroads requirements. Extend Boundary Street across marine area to connect to Windlass Crossing to provide unimpeded access to port operations. Provide level crossing at Windlass Crossing, with access controlled by locked manual gates, to cater for infrequent	Works in marine area. Additional costs associated with providing unfettered access to the Commercial Marina industries which commensurately provides excellent access to future industrial users in the ERA and future Port Expansion Project zones. Additional costs to control settlements on moderate fills on tidal zones.		

		oversize-overmass vehicles.			

#Basis of Incremental Costs
Abbott Street
A number of cost deductions and additions were made to the total estimated cost for the Abbott Street realignment grade separated design (Reference Project Preferred Solution) to determine an order of magnitude (OoM) cost difference between a grade separated solution and an at grade option. This was achieved by deducting the cost of approach embankment earthworks (including pre-loading and ground treatment), the two bridges over rail and underpass access to Goodall property and adding the cost of two signalised rail crossings. Costs that are deemed to be common to both solutions were not considered. (Excludes land costs).
Southern Port Road
A number of cost deductions and additions were made to the total estimated cost for the Southern Port Road realignment grade separated design (Reference Project Preferred Solution) to determine an OoM cost difference between a grade separated solution and an at grade option. This was achieved by deducting the cost of approach embankment earthworks (including pre-loading and ground treatment), the road bridge over rail and adding the cost of a signalised rail crossing. Costs that are deemed to be common to both solutions were not considered.
Racecourse Road
This OoM differential is essentially the cost of a signalised rail crossing compared with the full cost of realignment of Racecourse Road. (Excludes land costs).
Boundary Street Extension
A number of cost deductions and additions were made to the total estimated cost for the Boundary Extension grade separated design (Reference Project Preferred Solution) to determine an OoM cost difference between a grade separated solution and an at grade option. Boundary Street currently forms a T-intersection with Southern Port Road and traffic has to travel along Benwell Road to gain access to Windlass Crossing. If Boundary Street was not extended there would be no requirement for a rail bridge over the Boundary Street extension and it would be replaced by rail embankment. The cost difference was achieved by deducting the full cost of Boundary Street Extension works (including rock wall) and the rail over road bridge and adding the cost of a signalised rail crossing at Windlass Crossing.

Table 5.17 Traffic Volumes and Forecasts Annual Average Daily Traffic (AADT)

LINK AADT	2017		2027		2037	
	NORTHBOUND	SOUTHBOUND	NORTHBOUND	SOUTHBOUND	NORTHBOUND	SOUTHBOUND
Southern Port Road	1,294	1,022	5,855	8,468	6,291	14,384
Abbott St	2,365	2,643	7,833	5,505	8,747	7,101

Table 5.18 Share of Heavy Vehicles

SHARE OF HEAVY VEHICLES	2017		2027		2037	
	NORTHBOUND	SOUTHBOUND	NORTHBOUND	SOUTHBOUND	NORTHBOUND	SOUTHBOUND
Southern Port Road	12%	20%	7%	5%	9%	7%
Abbott St	3%	3%	4%	7%	5%	6%

5.7.3 Allowance for Future Staged Infrastructure Upgrades

TEARC has been designed to allow for the provision of future staged infrastructure upgrades. Future infrastructure upgrades may include:

- Connection to the future planned port expansion loop (ERA balloon loop) to accommodate changes and improvements in port operations. While the ERA is not part of the infrastructure configuration for the Reference Project, TEARC enables a connection to it.
- Provision of a future Y-junction at Cluden to facilitate future freight access to and from the north.
- Accommodation of up to 1,400m trains.

5.7.3.1 Port Expansion Project

Under the future port expansion scenario, the following assumptions have been made:

- Sugar access in the medium term will remain unchanged via the Jetty Branch.
- The ERA loop would require multiple tracks, to allow for the efficient handling of train arrivals for presentation at dump sheds with minimal delays.
- Removal of track within the PoT, including removal of sections of the existing Cannington and Nickel ore loops to facilitate the expansion and development of container storage facilities within the port. Essentially, the ERA would be flipped and inverted (to the east) of the Cannington and Nickel ore loops.
- The existing outer nickel loop would need to be retained, but the nickel loader would need to be removed.
- Any consideration of the removal of the existing track within the PoT and/or the Jetty Branch would be the subject of future port operations and considerations.

5.7.3.2 Cluden Y-Junction

The northern access leg at Cluden is not included in the Reference Project scope, however enabling infrastructure works to provide this link in future are included, as follows:

- Realignment of Abbott Street at the Cluden Y-junction, including minimum property acquisition and property access requirements.
- Grade separated road over rail bridges to facilitate both the northern and southern access legs at the Cluden Y-junction.

The provision of the northern leg may be required in the event that QNI nickel operations are recommissioned, or new customers wish to access the Port via TEARC from the north.

5.7.3.3 Provision for Longer Trains

TEARC effectively forms part of a ‘last mile’ solution for the Mount Isa Line connection to the PoT. TEARC will accommodate 1,000m trains; provision for train lengths of up to 1,400m can be accommodated to service future increase in demand. Accommodating 1,400m trains in the future would require significant upgrades to the Mount Isa Line with longer passing loops and new load-out facilities at the port.

Upgrades to the Mount Isa Line are not included in the TEARC design scope.

5.8 Site Investigations

The following sections summarise the outcomes of site investigations undertaken to inform the Reference Project design, including:

- Geotechnical and groundwater
- Hydraulics
- Public utilities.

5.8.1 Geotechnical, Survey and Groundwater Investigations

The main objective of the geotechnical assessment is to highlight any constraints relating to the proposed construction. The scope of work included:

- examining the subsurface and groundwater conditions encountered within the proposed rail corridor
- developing foundation systems for a number of the rail and road bridges proposed
- assessing the settlement caused by embankment construction on soft soils and identifying geotechnical risks pertaining to the stability of the embankments
- preparing potential ground improvement concepts
- providing advice on the likely presence of Acid Sulfate Soils (ASS) and soil aggressivity.

Geotechnical inputs for TEARC are based on available historical and recent geotechnical investigation data within vicinity of the project. This existing information has facilitated an understanding of the subsurface conditions to develop a ground model that enabled input into the evaluation of options and to substantiate proposed bridge structures and embankments for the project. The reference design (model topography) is based on the latest available Airborne Laser Survey (LIDAR) data collected by TCC in December 2016.

Following a gap analysis of available geotechnical information, additional geotechnical investigations of four boreholes and geophysical investigation between the North Coast Line and Southern Port Road were carried out. As conclusions were largely derived from inferred geotechnical models based on available data, additional investigation and verification will be required during future stages of project delivery.

The Townsville regional geological maps indicate the surface geology to comprise of Quaternary Alluvium. Current and previous investigations indicate the alluvium clays to be frequently overlain by a sand layer (mostly south of Ross River) and man-made fill (in the port area), although the origin of the fill is difficult to confirm.

5.8.1.1 Inferred Geology

In general, the following stratigraphy is noted:

- Firm to stiff clay or dense sand/fill soils layers of about 1m to 1.5m thick have been observed at most of the previous investigated locations. The clays found near surface are likely to be reactive based on the findings of historic investigations.
- A soft (marine) clay of Holocene age with thickness varying up to 7m has been observed and this layer appears to be continuous along the proposed alignment. A significantly thick layer of these compressible materials has been found around the Southern Port Road intersection.
- Closer to south of Ross River area, the near-surface material consists of medium dense to dense fine to medium sand overlain by the soft/firm Holocene clay layer, which appears to be thinner than inland of the river.

- As noted in previous investigations, the proposed rail alignment north of Ross River appears to be spanning on mostly reclaimed land, often comprised loose sand potentially from harbour and channel dredging. Distinguishing this material from underlying soft mud has been found difficult, as the dredge spoil appears quite sandy.
- Underlying these units is very stiff to hard clay and sandy clay and dense to very dense clayey sand layer of Pleistocene age often displaying Standard Penetration Test values greater than 20 or cone resistance larger than 4MPa.

The Holocene layers are generally found to be slightly over consolidated based on the available geotechnical information. Generally, these soils will move to a normally consolidated state due to high embankment loading proposed once the embankment is in place resulting in consolidation settlement. In addition, the proposed high embankment overlying the soft materials also introduces stability risks into the project.

5.8.1.2 Acid Sulfate Soils

Review of the available details of acid sulfate in the form of maps and assessments by others indicates that acid sulfate is likely to be present in the site and may be impacted by construction. Acid sulphate soils (ASS) generally require seawater (with its sulphur) to form. They thus generally occur below an RL of 3m AHD (but up to RL 5m) where tidal inundation occurs or has occurred. Actual ASS (AASS) generally occur above the water table, especially in sandy soils in which oxygen can rapidly diffuse. Potential ASS (PASS) generally occur below the water table or where the soil cover has restricted oxygen diffusion into the soil mass. For TEARC, the ASS is most likely to present as soft marine clays. The overlying soils are likely to be Aeolian sands not ASS.

5.8.1.3 Design considerations

A detailed acid sulphate soil management plan will be required depending on the proposed construction activities. The stiff to very stiff clay crust found at number of investigated locations is likely to be highly reactive and shall require further investigation to confirm and manage in the construction. In addition, the exposure conditions of the piles in soil were also assessed and inferred to be “very severe”, being at the coastal environment and therefore, buried structures shall be treated accordingly in the detailed design.

Preloading time of up to 4 months will be required for sections of the rail and road embankments.

5.8.2 Hydraulics

TEARC traverses the low-lying Stuart Creek floodplain and the associated coastal areas. The area is highly flood prone from both riverine flooding and coastal inundation, including storm tide (cyclonic) events. The major catchments intersected by the TEARC alignment include Stuart Creek, Sandfly Creek and Gordon Creek, as well as the larger Ross River. Each of these floodplains will require significant waterway provisions to support the Reference Project design, and have been sized through hydraulic investigations.

Flood and hydraulic assessments undertaken for this project have utilised previous hydraulic models that have been sourced from Townsville City Council (TCC). The TCC models have been subsequently refined and revised to aid in investigations for this Project. There is significant history associated with the previous modelling prepared for the Stuart Creek floodplain.

The TCC adopted model was developed previously to inform the proposed TSDA strategy. The model has also been updated to incorporate the most recent topographical LiDAR data collected by TCC in 2016. The current hydraulic model represents the best available modelling for the greater floodplain area and is the most appropriate basis for flood assessments for the TEARC design.

The updated hydraulic model has been assessed for a range of design flood event scenarios and durations to quantify existing flood characteristics throughout the floodplain. The 24-hour storm duration was assessed to be the critical duration for the proposed TEARC alignment. Flood characteristics considered the TCC adopted Defined Flood Event (DFE) represented by the 1% Average Exceedance Probability (AEP) event, in addition to a more frequent event.

The flood provisioning requirements outlined in this report have been determined based on design criteria which considers the DFE scenario at a low tail water condition. This is consistent with previous instructions and advice provided by TCC in respect to the technical requirements pertaining to flood impact assessments.

The specific criteria applied in respect to flood impacts are summarised as follows:

- Tolerable flood afflux allowable up to a maximum of 300mm in areas already subject to riverine and coastal flooding constraints and for which there is no existing infrastructure or development.
- No adverse impacts (actionable nuisance) to existing residential and since development areas. Effectively, this means maintaining zero afflux (or reduced flood levels) for existing development.
- No adverse impacts (actionable nuisance) to the existing Southern Port Road.
- No adverse impacts (actionable nuisance) to the proposed TSDA fill precincts. That is, freeboard provisions for all proposed TSDA precincts comply with the requirements outlined in the City Plan 2014.

The cross drainage and infrastructure provisions necessary to support the TEARC business case are summarised in Table 5.19.

The cross-drainage provisions include a mixture of culverts and bridges at specific locations along the TEARC alignment that have been determined and sized via detailed flood modelling to meet the above design criteria. In addition to the cross-drainage provisions outlined, some discrete flood mitigation works will also be required to support the TEARC business case. These related works are summarised as follows:

- Zone 1 - Localised channel excavation works to be provided in combination with the cross-drainage provisions. The channel works provides a formalised channel connection that extends from Abbott Street to the lower Stuart Creek floodplain via the proposed TEARC alignment. The channel provides the necessary additional conveyance and supports both the inclusion of the TEARC southern and future northern track extensions.
- Zone 2 – A discrete flood levee is to be included extending from the TEARC formation to extend to the boundary of Lot 33 SP192632. This discrete levee functions to preclude inundation extending into the upstream lot given the raised water levels associated with the provision of the TEARC alignment.

The infrastructure provisions outlined have been provided to cater for TEARC only. The timing and associated delivery of either or both the TEARC and TSDA projects is not known, nor is the sequencing upon which these major projects may proceed in the future. There is a potential strategic opportunity for TEARC to be delivered and considered in conjunction with the proposed Townsville SDA, providing mutual benefit to both, as well as the potential rationalisation of infrastructure and subsequent cost savings.

In the context of the TEARC design, consideration of this potential risk has been partially mitigated through investigation of a combined TEARC and TSDA joint design outcome. The investigation has identified the infrastructure provisioning determined for the TEARC design would need to be revised to enable both projects to be jointly delivered. Specifically, this would likely include a significant reduction in one of the Stuart Creek floodplain bridges and extension of a new localised levee to mitigate adverse impacts. These changes would likely result in a reduction of infrastructure costs compared to the current TEARC business case.

Table 5.19 TEARC Reference Design Cross Drainage Infrastructure Provisions

TEARC ZONE REFERENCE	ZONE DESCRIPTION	PEAK DISCHARGE (M3/S) (APPROX.)	TEARC CHAINAGE (M)	STRUCTURE SIZE AND DIMENSIONS
1	TEARC connection with North Coast Line	200	ch0480	2 x 15m span bridge
			ch0650	2 x 15m span bridge
			ch0830	Nominal Size Culvert
			ch0420 (Future Track)	5 x 15m span bridge
			ch0680 (Future Track)	5 x 15m span bridge
			ch0770 (Future Track)	Nominal Size Culvert
2	Stuart Creek Floodplain	565	ch1730	20 x 15m span bridge
			ch2300	10 x 15m span bridge
			ch2800	19 x 15m span bridge
			ch3000	Nominal Size Culvert
3	TEARC / Southern Port Road Junction	25	ch3300	20 No. 1200mm Reinforced Concrete Pipe (RCP)
			ch3300	20 No. 1200mm RCP
			ch3480	25 No. 900mm RCP
			ch3480	25 No. 900mm RCP
4	Southern Port Road Alignment	6	ch4270	2 No. 18m Span Bridges
			ch4740	3 No. 600mm RCP
			ch4860	3 No. 600mm RCP
			ch5110	2 No. 1200mm RCP & 1350mm RCP
			ch5210	1 No. 1200mm x 1200mm Reinforced Concrete Box Culvert (RCBC)
			ch5300	1 No. 600mm RCP
			ch5360	2 No. 600mm RCP
			ch5690	1 No. 1200mm x 1200mm RCBC
			ch5760	2 No. 600mm RCBC
			ch5850	1 No. 600mm RCP
			ch5990	1 No. 600mm RCP
5	Ross River Crossing	740	ch6600	200m total width span bridge
6			ch8230	3 No. 1800mm x 2100mm RCBC

TEARC ZONE REFERENCE	ZONE DESCRIPTION	PEAK DISCHARGE (M3/S) (APPROX.)	TEARC CHAINAGE (M)	STRUCTURE SIZE AND DIMENSIONS
	Townsville Port Area	Less than 30m3/s (Port area local drainage)	ch7700	2 No. 900mm x 1200mm RCBC
			ch8100	4 No. 2100mm x 2400mm RCBC

5.8.3 Public Utilities

A review of TEARCs rail and road alignment revealed a number of clashes between existing and future Public Utility Plant (PUP) and services. These potential clashes have been captured within the PUP register, and factored into capital cost estimates. The PUP register includes advice as to whether relocation or protection of the service is required. Further consideration will be required during detailed design in consultation with authorities to develop optimum solutions for protection or relocation.

Some of the larger services that may be impacted by the construction work include existing:

- existing 132kV high voltage line owned by Powerlink
- existing DN600PVC relined
- existing twin DN900 (1xRCP and 1xPoly) pressure sewer mains
- existing DN500DiCL pressure sewer main
- existing DN375AC/FR pressure sewer main along Abbott Street
- existing multiple 11kV and 66kV overhead power line crossing the road and rail alignments at various locations
- future DN710PE & DN450PE pressure sewer mains along the Ron Mclean Road corridor.

The location of the services has been determined based on available Dial Before You Dig and TCC Mosaic Mapping information.

On site potholing and specific service locating will be required during detailed design and more potential clashes may arise following this process.

5.9 Land Acquisition

The Reference Design identifies the potential need for land acquisition in the following locations:

- At the northern leg of the Y-junction at Cluden where TEARC branches off the North Coast Line.
- Near the junction of Racecourse Road and the Southern Port Road, in order to accommodate a realignment of Racecourse Road.
- Within the port precinct.

A number of these land acquisitions may be reduced or eliminated through further design refinements. However, for the purposes of costing, they have been included as part of the Reference Project. The following section identifies and summarises the main impacts and affected properties.

5.9.1 Cluden Y-Junction

The reference design for TEARC at the connection to the North Coast Line provides for both southern and northern access legs branching off the North Coast Line at Cluden. These access legs, forming the Y-junction connection to the existing North Coast Line, their clearance offsets and the Abbott Street road realignment, traverse nine parcels of land, as described in Table 5.20.

Table 5.20 Summary of Affected Lots

LOT	IMPACT
Lot 31 SP273629	This lot was specifically acquired as part of the previous planning works for a future TEARC rail alignment and road diversion. It will be utilised by both the northern and southern branches of the 'Y' connection, in addition part of the road deviation will also utilise this property.
Lot 2 RP725280	The lot will be impacted by the northern branch of the 'Y' connection and part of the road deviation will also impact this property. Lot 2 is 13.47Ha with the project impacting approximately 30% of this property.
Lot 1,2 and 3 RP717802	There is no designated use at present. However, it appears there are several underground services through the lots. Further consultation with TCC is required to confirm if the land is proposed to be used for future development.
Lot 22 SP261125	It is understood this property was acquired specifically for a potential realignment of Abbott Street as part of a proposed TEARC connection to the existing NCL line.
Lots 2, 3 and 4 RP716809	Further design refinements may reduce or eliminate the need for land resumption on these lots.

5.9.1.1 Racecourse Road Realignment

The extension and realignment of Racecourse Road is proposed to avoid a level crossing with TEARC, crossing the existing road near the intersection with the Southern Port Road as described in Figure 5.18. The horizontal geometry also accommodates required separation distance (clear zone separation) between the road and the existing high voltage power tower. Land resumption will be required for a small portion at the connection to the existing Racecourse Road as indicated by the hashed area.

The proposed road geometry is based on a design speed of 70km/h for a posted speed of 60km/h. In order to maintain compliant road geometry at the connection to the existing Racecourse Road, a 380m horizontal curve is required, which means some land resumption is required in order to accommodate the proposed realignment.

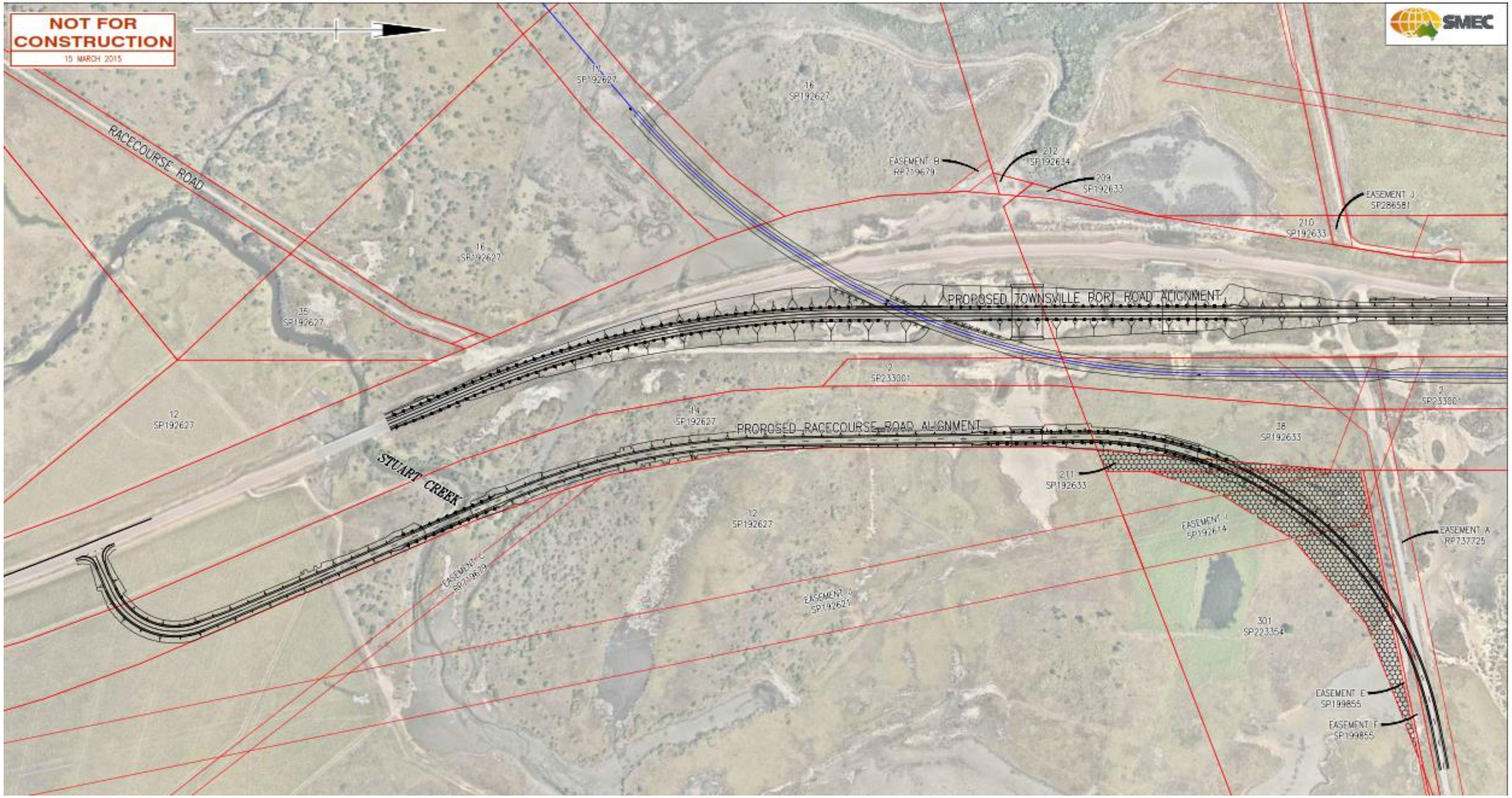
The following constraints were considered as part of the road extension concept design:

- The alignment of the proposed new road was to be kept as close as practical to the existing corridor boundary to allow for a potential future services corridor which was planned as part of the initial Southern Port Road corridor to allow for connection between TSDA and the port (for example, an overland conveyor).
- There are existing overhead high voltage power lines and towers at the location where the proposed new road connects to the existing Racecourse Road.
- The proposed extents of TEARC and the realignment of the Southern Port Road.

Given the access road connects to critical community infrastructure (i.e. Cleveland Bay Purification Plant), it is considered prudent to provide safe and compliant access that has a flood immunity level commensurate with that provided for the Southern Port Road.

The proposed road length is driven by the need to avoid intersecting with the raised realignment of the Southern Port Road. The proposed new intersection is located to provide compliant intersection sight distance, as well as tie into future intersections as planned as part of the Townsville SDA.

Figure 5.18 Land Acquisition for Transport Purposes at Racecourse Road



5.9.2 Port Precinct

The reference design for the TEARC is required to integrate with existing rail infrastructure in the PoT. To facilitate rail connection to the existing port infrastructure, three parcels of land are impacted.

Table 5.21 identifies the land requirement within the PoT.

Table 5.21 Land Requirements in PoT

LOT ON PLAN	AREA (HA)	OWNERSHIP	EXTENT OF ACQUISITION	TENURE	LOCALITY	APPROX. CHAINAGE
773SP223346	40.45	PoT	Partial (10.0)	Lands Lease	South Townsville	6650-7600
302SP223346	1.28	PoT	Full	Lands Lease	South Townsville	6650-7600
791EP2348	97.32	PoT	Partial (3.5)	Freehold	South Townsville	7600-8200

The land requirements for TEARC will impact existing port operations and reduce the area available to the port for customers. The key impact identified relates to lot on plan 791EP2348. The rail realignment and subsequent land requirements are to provide for operational movements. The realignment is required to provide crossover for six turnouts to facilitate movements in and out of the port.

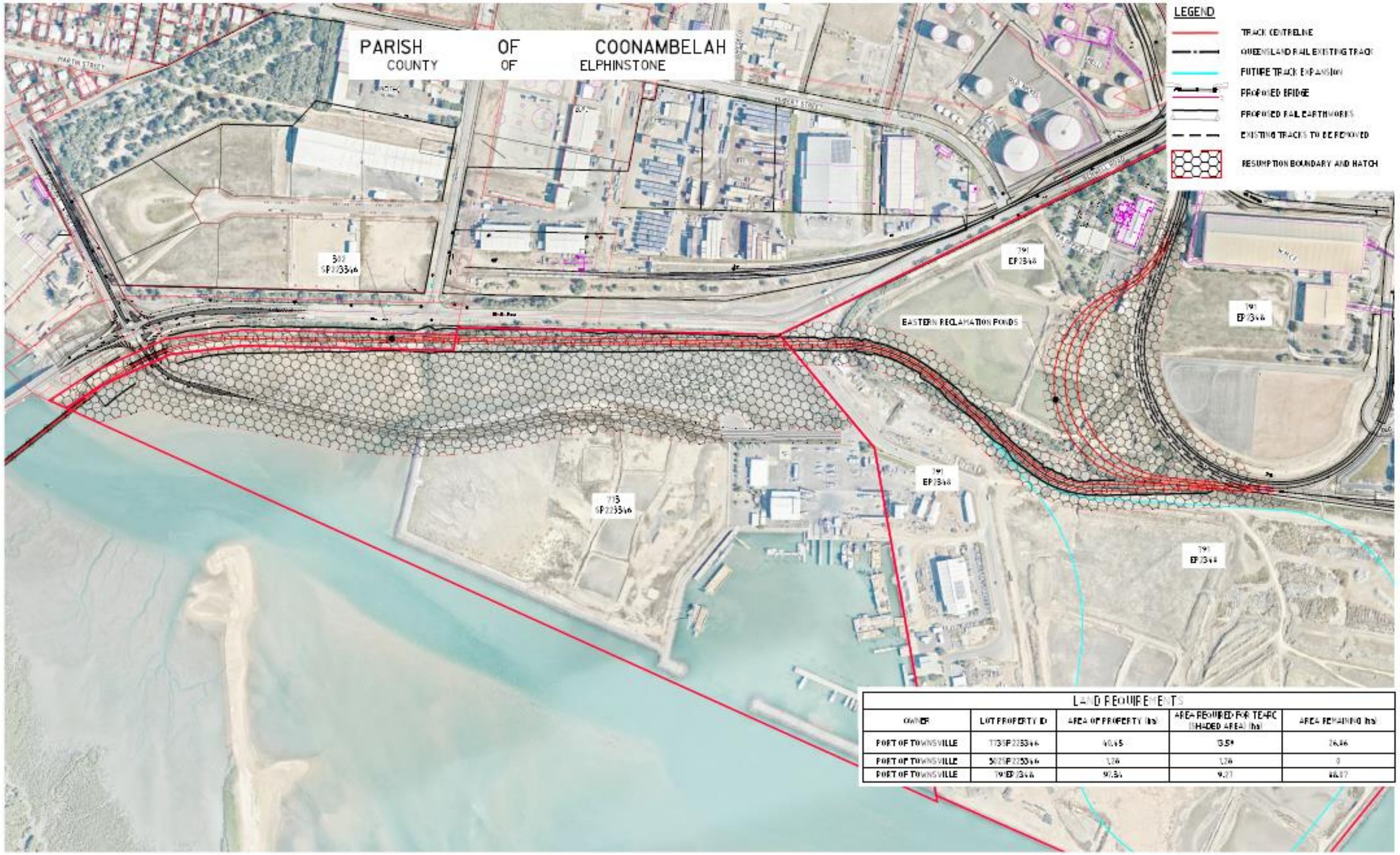
The location of the cross-overs is currently a hardstand area used as a layover for the importation of vehicles. The hardstand area was constructed by the port in recent history and currently no commercial leases reside over this portion of Lot on plan 791EP2348. Due to the impacts of rail realignment, an alternative area of 0.9ha has been shown in Figure 5.19.

The connection of TEARC to the existing port rail also impacts the existing ponds located on Lot on plan 791EP2348. These ponds are used for drying purposes for the Eastern Reclaim Area.

The land requirement for Lot on plan 773SP223346 is extended to include the extension of Boundary Street and connection to Windlass Crossing. The connection is required to avoid the introduction of an open level crossing.

Figure 5.19 shows port land requirements for transport purposes.

Figure 5.19 Land Acquisition for Transport Purposes at PoT



LAND REQUIREMENTS

OWNER	LOT PROPERTY ID	AREA OF PROPERTY (ha)	AREA REQUIRED FOR TEARC (SHADED AREA) (ha)	AREA REMAINING (ha)
PORT OF TOWNSVILLE	773SP225346	40.45	13.59	26.86
PORT OF TOWNSVILLE	502SP225346	1.26	1.26	0
PORT OF TOWNSVILLE	791EP2348	97.34	9.27	88.07

5.9.3 Corridor Protection

Apart from the land lots that will require potential acquisition for transport purposes the DBC recommends preservation of the overall identified TEARC Project – Reference Project Alignment Corridor Land.

A complete listing of land lots affected is provided in Table 5.22.

Table 5.22 TEARC Project property tenure

Lot on plan	Area (Ha)	Ownership	Extent of Acquisition	Tenure	Locality	Approx. Rail Chainage	Drawing Ref
Rail Alignment							
41SP130009	4.6	Queensland Rail Limited	Partial (0.3)	Lands Lease (North Coast Railway)	Cluden	0-300	42-19962-C001 42-19962-C050 (Rail)
Abbott Street	N/A			Road Reserve	Cluden	300-400	42-19962-C001 42-19962-C050 (Abbott St / Rail)
22SP261125	1.671	Department of Transport and Main Roads	Partial (0.7237)	Freehold	Cluden	400-450	42-19962-C001 42-19962-C050 (Abbott St)
31SP273629	14.17	Co-ordinator General	Partial (10.33)	Freehold	Cluden	440-1100	42-19962-C002 42-19962-C050 (Abbott St / Rail)
34SP192632	2.535	Co-ordinator General	Full	Freehold	Cluden	1100-1500	42-19962-C002
18SP192627	7.032	Co-ordinator General	Full	Freehold	Cluden	1500-2700	42-19962-C003 42-19962-C004
17SP192627	1.911	Co-ordinator General	Full	Freehold	Stuart	2700-3000	42-19962-C005
Southern Port Access Road	N/A			Road Reserve	Stuart	3000-3200	42-19962-C005
2SP233001	12.75	Co-ordinator General	Partial (12.465)	Freehold	Stuart	3200-5800	42-19962-C005 42-19962-C006 42-19962-C007 42-19962-C008 42-19962-C009
105SP217641	0.1373	Co-ordinator General	Partial (0.012)	Freehold	Stuart	5000-5100	42-19962-C008
54SP192636	0.87	Co-ordinator General	Partial (0.07)	Freehold	Stuart	5100-5200	42-19962-C008
43SP192635	0.47	Co-ordinator General	Partial (0.06))	Freehold	Stuart	5200-5300	42-19962-C008

Lot on plan	Area (Ha)	Ownership	Extent of Acquisition	Tenure	Locality	Approx. Rail Chainage	Drawing Ref
46SP192635	0.5	Co-ordinator General	Partial (0.136)	Freehold	Stuart	5300-5400	42-19962-C008
63SP192639	0.6	Co-ordinator General	Partial (0.237)	Freehold	Stuart	5400-5460	42-19962-C008
66SP192639	0.6095	Co-ordinator General	Partial (0.15)	Freehold	Stuart	5460-5560	42-19962-C009
108SP217641	0.1343	Co-ordinator General	Partial (0.049)	Freehold	Stuart	5560-5580	42-19962-C009
69SP192639	0.6097	Co-ordinator General	Partial (0.1)	Freehold	Stuart	5580-5580	42-19962-C009
72SP192639	0.779	Co-ordinator General	Partial (0.08)	Freehold	Stuart	5580-5580	42-19962-C009
75SP192639	0.6575	Co-ordinator General	Partial (0.007)	Freehold	Stuart	5580-5580	42-19962-C009
Southern Port Access Road	N/A			Road Reserve		5800-6100	42-19962-C009
4SP236063	1.378	Co-ordinator General	Partial (1.26)	Freehold	Stuart	5820-6200	42-19962-C009
86SP192640	0.54	Co-ordinator General	Partial (0.018)	Freehold	Stuart	5820-6200	42-19962-C009
3SP192640	0.34	Co-ordinator General	Partial (0.028)	State Land	Stuart	5820-6200	42-19962-C009
93SP240551	0.1459	Co-ordinator General	Full	Freehold	Stuart	6200-6230	42-19962-C009
2SP192640	0.1251	Department of Natural Resources and Mines	Full	Freehold	Stuart	6200-6230	42-19962-C010
92SP240551	0.322	Department of Natural Resources and Mines	Full	Freehold	Stuart	6230-6320	42-19962-C010
91SP240551	0.228	Department of Natural Resources and Mines	Partial (0.09)	Freehold	Stuart	6230-6320	42-19962-C010
Ross River	N/A			Unallocated State Land			
773SP223346	40.45	Port of Townsville	Partial (13.59)	Lands Lease	South Townsville	6650-7600	42-19962-C010 42-19962-C011 42-19962-C012 42-19962-C013 42-19962-C055 (Road/Rail)
302SP223346	1.28	Port of Townsville	Full	Lands Lease	South Townsville	6650-7600	42-19962-C055 (Rail)
791EP2348	97.32	Port of Townsville	Partial (9.27)	Freehold	South Townsville	7600-8200	42-19962-C055 (Rail)
Abbott Street Realignment							
2RP725280	13.4625	Freehold	Partial (4.01)	Freehold	Cluden	N/A	42-19962-C002 42-19962-C050 (Abbott St/Rail)

Lot on plan	Area (Ha)	Ownership	Extent of Acquisition	Tenure	Locality	Approx. Rail Chainage	Drawing Ref
3RP717802	0.7512	Townsville City Council	Partial (0.6474)		Oonoonba	N/A	42-19962-C050 (Abbott St)
2RP717802	0.1654	Townsville City Council	Partial (0.0732)		Oonoonba	N/A	42-19962-C050 (Abbott St)
1RP717802	0.3642	Townsville City Council	Partial (0.1452)		Oonoonba	N/A	42-19962-C050 (Abbott St)
Ireland Street	N/A			Road Reserve			42-19962-C050 (Abbott St)
2RP716809	0.1624	Ergon Energy Limited	Partial (0.0515)		Cluden	N/A	42-19962-C050 (Abbott St)
3RP716809	0.0857	Ergon Energy Limited	Partial (0.0207)		Cluden	N/A	42-19962-C050 (Abbott St)
4RP716809	0.0857	Townsville City Council	Partial (0.0129)		Cluden	N/A	42-19962-C050 (Abbott St)
Racecourse Road Realignment							
211SP192633	0.2799	Co-ordinator General	Full	Freehold	Stuart	N/A	42-19962-C056 (Racecourse Rd)
301SP223354	285	Department of National Parks Sport and Racing	Partial (1.7484)	Freehold	Stuart	N/A	42-19962-C056 (Racecourse Rd)
38SP192633	10.93	Co-ordinator General	Partial (1.11)	Freehold	Stuart	N/A	42-19962-C056 (Racecourse Rd)
14SP192627	9.902	Co-ordinator General	Partial (7.11)	Freehold	Stuart	N/A	42-19962-C056 (Racecourse Rd)

Red - requires external stakeholder engagement

Blue - requires inter agency MOU transfer agreement

5.10 Cost Estimation

The estimated Project Capital and Operating Cost for TEARC include the following major components:

- construction of 8.3km single track narrow gauge rail line from Cluden to PoT
- realignment and grade separation of Abbott Street
- realignment and grade separation of Southern Port Road
- realignment of Racecourse Road to Cleveland Bay Purification Plant
- extension of Boundary Street from Benwell Street to Windlass Crossing
- land acquisition.

5.10.1 Project Capital Costs

The risk adjusted capital cost for the project is based on the following:

- estimate base date of July 2017
- a design and construct delivery in accordance with the Transport Infrastructure Contract (TIC)
- planned and unplanned risk contingency
- escalation
- DBC Reference Design.

The anticipated capital cost for the project including risk contingency (and escalation) is shown in Table 5.23.

Table 5.23 Project Capital Cost Summary

	P50 RISK ADJUSTED (LIKELY)	P90 RISK ADJUSTED (UPPER)
TOTAL PROJECT COST	$368,736,292	$391,729,775

Project Capital Cost Assumptions

Key assumptions relied upon in the development of this cost estimate report are as follows:

- The project is a Type 2 as defined in the TMR Project Cost Estimating Manual (PCEM).
- The project will be delivered as a standard TIC Design and Construct.
- The EIS process will commence in June 2018, with approval anticipated by Oct 2019.
- The construction delivery timeframe is January 2020 to March 2022.
- Administration of the construction contract will be undertaken by a TMR contract administrator.

Limitations of Estimate

The following limitations should be noted:

- The design is currently at Reference Design stage and the estimate is limited by the level of design definition and available information

Future comparisons with this estimate should take into account any design changes, the project start date, the contract delivery method, cost rates prevailing at the time, construction program and the current risk profile associated with the construction market at the time.

5.10.2 Operating Costs

Anticipated operating costs for the project including risk contingency and escalation are shown in Table 5.24.

Table 5.24 Operating Cost Summary

	P50 RISK ADJUSTED (LIKELY)	P90 RISK ADJUSTED (UPPER)
TOTAL PROJECT OPEX COST	$32,637,788	$36,080,084

Operating Cost Assumptions

Key assumptions relied upon in the development of this cost estimate report are as follows:

- Incremental costs only from Base Case (No TEARC) to Project Case (With TEARC) considered.
- Below rail maintenance costs only (both fixed and variable).
- Above rail maintenance not included (considered by others as part of the business case).
- Queensland Competition Authority (QCA) reference tariff for below rail variable maintenance costs.
- Evaluation period is 30 years from 2022.

5.10.3 Stakeholders

The TEARC DBC Project Steering Committee (PSC) was established at the commencement of the DBC. It is the key body informing the development of the DBC by Building Queensland for the State Agency who has been nominated by the Government as the project owner, TMR along with key stakeholders such as QR and the PoT. It will include Building Queensland and the Australian Department of Infrastructure and Regional Development as full members and Infrastructure Australia as an observer.

The purpose of the TEARC Project Control Group (PCG) is to ensure delivery of the TEARC DBC for the Reference Project in accordance with the Template and the PAF. The PCG will also ensure that the DBC meets overall state objectives and strategic plans, customer needs, value for money requirements, and project budget and timing requirements. The PCG members represent the stakeholders from an operational perspective. Table 5.25 outlines the overall view of the stakeholders and interest in the eventual project.

Table 5.25 Reference Project Stakeholders

STAKEHOLDER	PSC	PCG	OPERATIONS	COMMUNITY
Deputy Director-General, Department of Transport and Main Roads	Yes	Yes		
Executive General Manager Projects, QR	Yes	Yes		
Chief Executive Officer, Building Queensland	Yes	Yes Project Director		
Chief Executive Officer, PoT	Yes	Yes		
Department of the Premier and Cabinet	Yes	Yes		
Queensland Treasury	Yes	Yes		
Department of Infrastructure, Local Government and Planning	Yes	Yes		
Department of State Development	Yes	Yes		

STAKEHOLDER	PSC	PCG	OPERATIONS	COMMUNITY
Australian Department of Infrastructure and Regional Development	Yes	-		
Regional Director (North Queensland), Department of Transport and Main Roads (Observer)	Yes	-		
Regional General Manager, North Queensland, QR (Observer)	Yes	-		
Queensland Treasury (Observer)	Yes	-		
Infrastructure Australia (Observer)	Yes	-		
Business Case Advisors		Yes		
Cluden, South Townsville and Townsville Residents	-	-	-	Yes
Port Customers (e.g. South 32, Cement)	-	-	Yes	-
Rail Operators (Aurizon, Pacific National, Glencore)	-	-	Yes	-
Key local stakeholders (e.g. Townsville City Council, Townsville Enterprise Limited, MITEZ, State elected representatives, Townsville Chamber of Commerce)	-	-	Yes	Yes

Outside of the PSC and PCG, a number of stakeholder and community engagement sessions were held in Townsville. The details of the methodology and findings are discussed in detail in Chapter 12.

The first stakeholder engagement session was held on Thursday 6th April 2017. The session was conducted to brief all relevant key stakeholders on the project, and to gain important insights for inclusion into the MCA options assessment. The stakeholder engagement session included current Mount Isa Rail System operators, users, customers and local community representatives.

A second stakeholder engagement session was held on Tuesday 27th June 2017 to present the preferred alignment to the key stakeholders, allow stakeholders to ask project questions and obtain feedback. This session included:

- providing participants with maps of the proposed corridor and a detailed summary of the preferred alignment
- presentation of the proposed corridor and reasoning behind alignment selection
- Q&A session with key stakeholders
- feedback activity where concerns and positive attributes were noted by stakeholders.

Overall, the most frequently cited stakeholder concerns related to potential social impacts to residents at Cluden and the port (in terms of noise, air, vibration and visual amenity). The potential loss of access to the dog beach near the port was also raised. Stakeholders identified potential improvements to public safety and congestion as positive attributes of the proposed project alignment.

Stakeholder feedback has been taken in account, both in informing the options assessment process and in shaping the Reference Design.

5.10.4 Implications of Not Proceeding

The main implications of not proceeding with TEARC Reference Project are:

- Growing Impacts on Urban Amenity

As Townsville City and the surrounding population centres grow, it is increasingly important to plan to maintain, and where possible improve amenity and safety for residents and the commercial interests of the city and CBD.

The existing rail corridors of the North Coast Line along Abbott Street and the Jetty Branch connection currently form the sole point of access and egress for rail to the port. These corridors run through the heart of Townsville suburbs, with rail movements resulting in interaction and amenity impacts for adjoining urban areas. Future growth in road traffic and rail freight will further exacerbate these impacts, and limit potential urban renewal opportunities in the Townsville City Waterfront Priority Development Area (PDA). The PDA is planned to accommodate an additional 30,000 people and mixed-use development, as an extension to the existing CBD.

TEARC offers the potential to divert a proportion of freight rail movements away from residential areas and is a key enabler to making longer-term improvements to Townsville City for the benefit of residents. This would help to reduce pressure on the road network, improve freight efficiency, support urban growth and deliver improvements to amenity and safety.

- Increasing Impacts on Road Safety and Network

  Projected population growth in southern Townsville suburbs is expected to lead to increased road demand. Increasing road demand, coupled with potential increased freight rail movements along the North Coast Line and the Jetty Branch will in turn lead to increasing road safety risk, decreasing efficiency and capacity of the road network, particularly at four of the level crossings (Oonoonba Road, Lakeside Drive, Queen Street/Putt Street and Boundary Street intersections).

  Modelling results show by 2027 the current road network configuration will have difficulties in serving the expected traffic demand for the South Townsville area, especially during AM and PM peak hours. This will result in some traffic congestion on Abbott Street and Railway Avenue, with queue lengths of 12 vehicles at the Lakeside Drive Intersection, and 19 to 25 vehicles at other intersections (Oonoonba Road, Queen Street/Putt Street and Boundary Street intersections), with Queen Street/Putt Street being the most pronounced.

  Developed traffic models for 2037 show significant delay and congestion for the extended south Townsville road network, which is mainly due to increased traffic demand and the inability of the road network to service this future demand. It is expected the Boundary Street intersection will be the most critical, with a Level of Service F and Queen Street/Putt Street and Lakeside Drive intersections operating at Level of Service E for the AM peak hour in the 2036 horizon year.[29]

  In summary, the current road network configuration of south Townsville does not appear to be able to meet expected traffic demand for 2036 without intervention, there will be non-responded demand during both the AM and PM peak hours.

  As a result, TEARC is expected to provide an improvement in road safety and network efficiency and capacity, with the benefits increasing with upward road demand. By providing additional rail connecting infrastructure, which bypasses the urban population centres, the effect of diverting a significant proportion of the rail freight movements away from suburban sections of the North Coast Line, will see a reduction in the interaction at-grade crossings, and therefore, network impact from interrupted traffic flow.

[29] The estimated traffic delay per vehicle on Abbott Street will increase up to 98 seconds per vehicle on the south bound direction of Lakeside Drive intersection.

- Port Operational Efficiency will Continue to be Constrained

  TEARC is a key enabling piece of infrastructure for the PEP, particularly for developments on the eastern side of the port.

  The first stage of the PEP is channel widening to cater for larger ships, which mean the establishment of new berths and landside infrastructure.

  The landside infrastructure layout and land allocation study identifies the construction of TEARC is a critical enabler for the optimal port layout and PEP with new balloon loops and sidings. Moreover, any new freight users or exporters requiring rail terminal and loading/unloading facilities would be developed on the eastern side. These new developments would subsequently be connected via TEARC, thereby minimising or eliminating incremental rail movements through the suburban areas of Townsville.

  Without TEARC in place the subsequent stages of the PEP may not be realised and any future consideration of removing either the Abbott Street or the Jetty Branch to improve urban amenity cannot occur.

- Townsville's Competitive Advantage will be impacted

  With the ongoing trend towards increasing containerisation, larger vessels, and potential new cargo types that may require specialised handling requirements. There is the need for the capability, capacity and operational efficiency of the port, its channels and hinterland connectivity (rail and road) to be fit for purpose, and aligned with the needs of the freight task to both maintain and improve Townsville's competitive position for access to markets. In summary, if TEARC does not proceed the:

  - proposed port expansion will need to consider an optimal port-rail interface to enable the port to facilitate large volumes of new trade
  - ability to generate economies of scale will be limited, which will in turn affect competitiveness, and potentially volume throughput for current port users
  - PoT may struggle to attract to new customers and growth that would also improve competitiveness.

- Federal and State Regional Economic Objectives

  The Australian Federal Government, the Queensland Government and the Townsville City Council have committed to the *Townsville City Deal (2016)* with the goals as outlined in Chapter 2.

  TEARC is nominated as key project in this deal and not proceeding will likely reduce the longer-term economics benefits.

5.10.5 Future Activities

Refer to Chapter 19 for further detail.

6 RISK MANAGEMENT

CHAPTER SUMMARY AND CONCLUSIONS:

- The Project Risk Register provides direction for the management of risks from the completion of the DBC to the delivery and operation of the project. It is a living document that should be reviewed and updated as the project progresses.
- The project risks for the Detailed Business Case (DBC) were identified and assessed based on the assumption the Townsville Eastern Access Rail Corridor (TEARC) is approved to proceed and those risks would impact the delivery of the project. The risks that could be quantified, were assessed as to the likely impact on project costs and modelled to provide the P50 and P90 levels of confidence for the capital cost estimate.
- An assessment of project risk was undertaken in two workshops during the development of the design for the Reference Project. The risk workshops engaged with relevant stakeholders and design discipline leads to identify, analyse, evaluate and recommend actions to mitigate potential risks. The workshop methodology was based on AS/NZS/ISO 31000:2009 – Risk Management.
- All risks and opportunities were recorded in the Department of Transport and Main Roads (TMR) Risk Register Template, Version 3.0. Financial and schedule delay risks to the Project were assessed using the TMR Risk Assessment and Ratings Matrix Version 4.0, applying the project cost criteria in most cases.
- The risk assessments identified a range of key project delivery risks that will need to be carefully managed. Those risks included:
  - complex hydrology of the region, which has led to the need for significant rail embankments, associated fill requirements and drainage structures along the length of the corridor
  - several geotechnical constraints, including risks associated with acid sulphate soils, compressible soils and foundation requirements for major structures
  - major cost items, including bridge structures, fill for earthworks (rail and road realignment) and signalling requirements
  - project costs, scheduling impact, those related to meeting approval requirements and addressing community concerns.
- Strategic and other qualitative risks were assessed:
  - Strategic and Political
  - General
  - Rail Logistics
  - Approvals
  - Property Acquisition
  - Legal and Regulatory
  - Stakeholder

6.1 Introduction

Risk must be effectively considered and managed throughout business case development to ensure the project delivery risks are effectively recognised and accounted for following approval to proceed.

A robust approach to risk management was taken which included the development of a comprehensive risk register and adherence to risk management framework. The framework was used to identify and assesses risks that may create, enhance, prevent, degrade, accelerate or influence the ability to meet the objectives and outcomes intended by the investment proposal. The risk management framework was also used to identify appropriate strategic responses, management and mitigation actions to address the risk.

Risk assessments were undertaken across all aspects of the DBC development, including the identification of risks associated with changes to:

- the proposal background, service need, stakeholders, options generated, strategic and political context
- DBC development, methodology, assumptions and practices underpinning the assessments (social, economic, environmental and financial), data reliability, accuracy and currency
- DBC process, stakeholder engagement activities, environmental, cultural heritage, indigenous heritage, geotechnical, flooding and engineering
- the project, timing, delivery, funding and governance arrangements.

In the case of TEARC an initial risk assessment was undertaken early in the design process once the preferred rail alignment had been identified.

A second risk workshop was held later in the design process to confirm key project risks had been adequately captured and to inform project cost estimates.

6.2 Methodology

The DBC Project Director through the monthly report has identified and assessed risks associated with the delivery of the DBC. The monthly report is updated with actions proposed, or actions taken to treat or mitigated the impact of the risk on the delivery of the DBC.

Two risk workshops were held to identify risks and opportunities, appropriate risk management responses, the result of which were captured in project costings and project implementation planning.

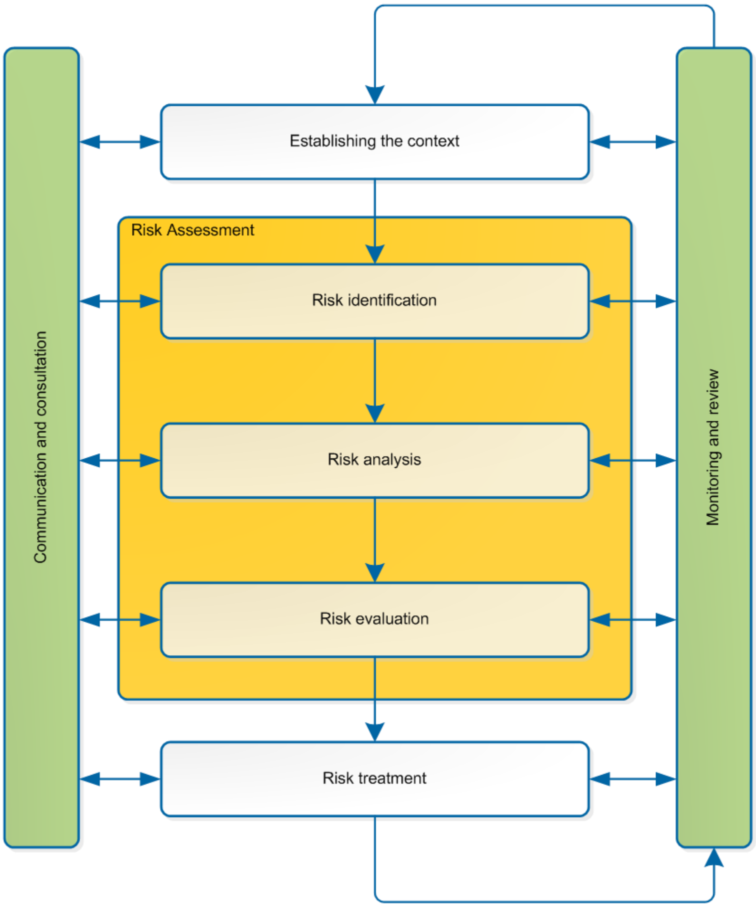
6.2.1 Initial Risk Workshop

An initial risk and opportunity workshop was undertaken with discipline leads to identify key risks and opportunities for the project, and to inform the development of appropriate strategic responses to these risks.

The workshop methodology was based on AS/NZS/ISO 31000:2009 – Risk Management.

Figure 6.1 highlights the three steps of the risk management process applied during the workshop.

Figure 6.1 Risk Management Process



The risk workshop undertook a high level assessment of the project risks and opportunities at the Reference Project Design stage. Project design risks and project impacts were categorised under the following discipline areas:

- Environment
- Flooding and hydrology
- Geotechnical
- Public Utility and Plant
- Rail design
- Rail logistics
- Legal and regulatory
- Approvals
- Stakeholders
- Weather
- Other.

6.2.2 Risk Identification, Analysis and Evaluation

The identification of issues by discipline along the rail alignment, describing the causes or source of the risk to the project.

The analysis of the identified risks for their consequence impacts and the likelihood of these consequence impacts occurring was undertaken. The consequence impacts are assumed to be “worst case”. They do not take into consideration the impact, mitigation or treatment of the risk. The likelihood of the risk consequence impact is determined by considering the planned or existing controls. For the TEARC Project, the impact of the quantifiable issues on the project costs was analysed.

The qualitative evaluation of the risk level and the determination of the project response to the risk was undertaken using a five-by-five risk matrix (Consequence and Likelihood). For the TEARC Project, high and extreme risks are treated as a priority for risk mitigation efforts.

The risks identified in the risk register were assessed to have a quantitative impact on the project, and subsequently used to inform the development of the capital and operational cost risk reports.

6.2.3 Second Risk Workshop

Quantitative cost risk was evaluated during a second risk workshop facilitated by the cost consultant. This workshop involved Building Queensland, discipline leads and external consultants undertaking financial and economic analysis.

The project risk register developed during the first risk workshop was reviewed by the cost consultant to ascertain which risks had a potential quantifiable delay and cost consequence. The review was limited to high and medium risks. There were no extreme risks, and low rated risks were deemed to be of minor cost impact and collectively captured within the global type cost risks included in the cost risk register. The high and medium risks were classified as either covered within the global style cost risks or added to the cost risk register as a project specific cost or delay risk.

Participants at the cost risk workshop evaluated each of the unplanned risks for a cost range from minimum to maximum with a likelihood of occurrence. Unplanned risks relate to potential changes in circumstances that may, upon occurrence, impact the scope or nature of the works and cost to deliver the project. The categories of cost risk that could impact the project and would need to be managed include:

- Design Development Changes
- Standards and Policy Changes
- Third Party Influences
- Revised Functionality
- Project Delay
- Property Acquisition
- Changes during Implementation Phase
- Unmeasured Items.

The results of the second workshop were used as input to a Monte Carlo simulation to determine a probabilistic risk contingency for the project. Key areas of project risk identified through the risk workshops are summarised below.

6.3 Project Risk Criteria

Financial and schedule risks to the Project were assessed using the TMR Risk Assessment and Ratings Matrix Version 4.0 by applying the project cost criteria where applicable for the assessment of the CAPEX cost risk. TMR classifies project cost consequence as a percentage exceedance of the CAPEX. The consequence severity ratings are listed in Table 6.1.

Table 6.1 Consequence Severity Ratings for Project Cost (CAPEX)

CONSEQUENCE SEVERITY	% EXCEEDANCE OF CAPEX	$ VALUE EXCEEDANCE OF CAPEX
Severe	>5% variance	>$10M
Major	3% - 5% variance	$6M - <$10M
Moderate	1% - <3% variance	$2M - <$6M
Minor	0.5% - <1% variance	$1M - <$2M
Insignificant	<0.5% variance	<$1M

The likelihood ratings are based on the probability the consequence will be realised during the project, are listed in Table 6.2.

Table 6.2 Likelihood ratings

LIKELIHOOD	PROBABILITY OF OCCURRENCE
Almost Certain	>91%
Likely	61% – 90%
Possible	31% - 60%
Unlikely	6% - 30%
Rare	0% - 5%

Application of the consequence severity and likelihood criteria produces a risk rating, from the Risk Matrix.

6.4 Project Risk Register

All project risks and opportunities were recorded in the TMR Risk Register Template, Version 3.0.

Prior to the workshop, the project discipline leads considered project risks and added “Descriptions” to the Risk Register. During the workshop, the “Causes/Sources” of risks were explored, and their potential “Impacts” were discussed with project cost impacts estimated and applied. Controls were considered where the controls are planned or are already in place. In the post-workshop review a number of new risks were added to the register and proposed treatments were identified.

6.5 Key Findings

Risks were assessed across each of the project zones, as shown in Figure 6.2. The workshop generated a Risk Register which captured risk across the major project areas. The majority of risks were rated as medium or high. There were no extreme risks. The high risks identified for the Reference Design for project delivery are summarised in Table 6.3.

Figure 6.2 TEARC Reference Design Project Zones

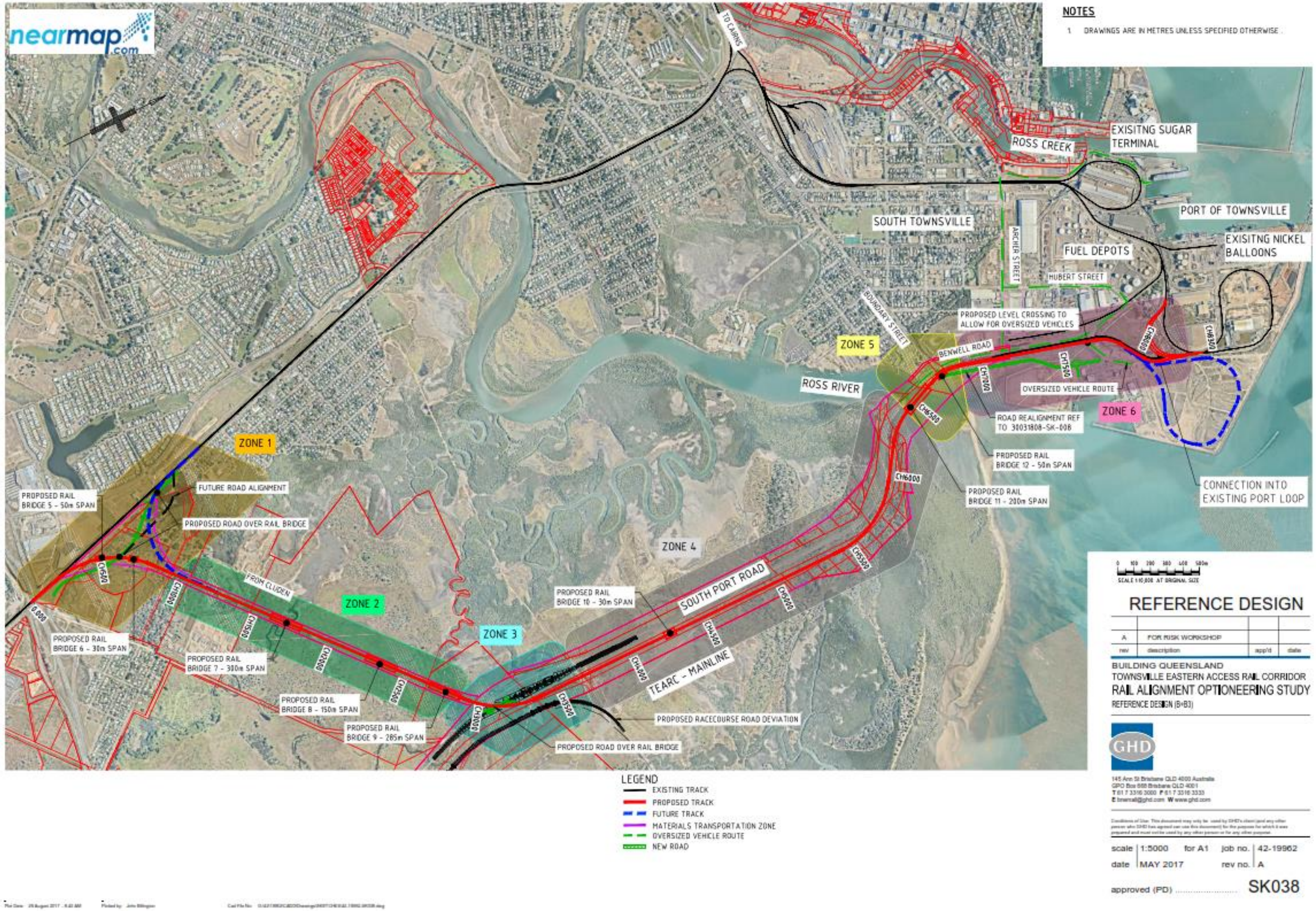


Table 6.3 Reference Design Risks (High Risks only)

DISCIPLINE	DESCRIPTION	POTENTIAL IMPACT
Environment	Unexpected find of cultural significance on a part of the project which is on a critical path	Project schedule Project costs
Environment	Environmental Offsets are triggered due to loss of shore bird, aquatic habitat and impacts listed species	Delay to project start Project costs
Environment	Noise and Air quality impacts the amenity of local residents	Social impacts Project costs
Geotechnical	Variable foundation requirements	Impact on detailed design stage, may affect foundation depths Project costs
Geotechnical	Geological variability affects embankment design	Impact on detailed design stage, may affect foundation depths Project costs
Geotechnical	Embankment instability during construction	Safety (e.g. embankments or plant collapse); Project Schedule (e.g. job stops) Project costs
Geotechnical	Piles much deeper or shallower than anticipated	Pile lengths, significant difference could affect bridge beams or arrangement Project costs
Geotechnical	Significant ground improvements required	Additional ground treatment required Project costs
Geotechnical	Treatment of acid sulphate soils	Disposal and treatment of acid sulphate soils; Program Schedule Project costs
Geotechnical	Unsuitable material	Additional cost and delay to project
General	TSDA and Sequencing: 'The design outcomes for TEARC may be compromised with the inclusion of the TSDA	Potential change to cross drainage and bridge provisions Project costs and potential scheduling impact May potentially lead to Relocation of 3 x 200m bridges; or more culverts
Weather	Climate change	Changes rail formation level, embankments, cross drainage Project costs
Flood and Hydrology	Adverse flood impacts to private property and residents	Increased costs associated with the structures designed to meet new standards (which may be imposed) Zones 1, 2 and 6 most likely to be affected
Flood and Hydrology	Future catchment development	Increased design flows, increased cross drainage and bridge provisions Project costs
Flood and Hydrology	Changes in geomorphic processes (Zones 1 and 2)	Increased cross drainage and bridge provisions Project costs
Flood and Hydrology	Changes in coastal processes	May require larger bridge opening across Ross River with additional spans Project costs

DISCIPLINE	DESCRIPTION	POTENTIAL IMPACT
Flood and Hydrology	Benefit of reduced flood impacts (potential opportunity)	Reduced flood levels (zones 1 and 2 - downstream side); community benefits (e.g. increased property values; reduced insurance costs for land owners; reduced potential damage costs for asset owners); for costs of approx. $2m there are substantial benefits to the community
Flood and Hydrology	Reconfiguration of surface water drainage from the port	Adversely impacts drainage around the Port leading to damages to stockpile, loss of existing Port operations, project cost impact
Flood and Hydrology	Bridge soffit levels impacting on Q100 stormwater levels	Increase of upstream stormwater depth during Q100 events
Rail	Rail alignment and signalling approvals by Queensland Rail	Delays or project not signed off Project costs
Rail	Crossing between 330kV electrical transmission towers - clearance under cables for road and rail	Project is required to provide the clearance to existing power line infrastructure Project costs
Rail	Additional retaining walls, to east of Benwell Road, required due to insufficient space available for embankments	Project required to provide more retaining walls than anticipated Project costs
Rail	Complexity of signalling requirements for existing loops in the port area	Project required to fund the upgrade of the existing signalling to meet Queensland Rail requirements Project costs
Rail	Problems tying into existing track and crossings	Tie in to existing track and crossings of existing road cannot be accurately defined
Rail	Assuming Nickel Balloon Loop can be used in the Port as a point of entry into the port from TEARC	Life expectancy is unknown
Rail	Queensland Rail approval of the use of Prestressed Precast Driven Concrete Piles	Unable to use proposed pile type Project costs
Rail and Logistics	Rail logistics modelling assumptions are incorrect	Cost provisions for unlikely or unforeseeable events not factored into cost estimates (e.g. allowance for nickel trains has not been factored into the cost estimate Increased nickel volumes would lead to time delays)
Public Utility and Plant	Construction of future infrastructure	The construction of potentially two new large sewer rising mains along the Ron McLean Drive road corridor
Public Utility and Plant	Discontinued utilities and service lines	Construction of new utilities to replace old infrastructure
Public Utility and Plant	Incorrectly installed services	Services backfilled incorrectly and without adequate cover and warning tape
Public Utility and Plant	Public Utility Providers - Underground piping that is not anticipated	Project is required to relocate existing PUP, unforeseen cost impacts Project costs

6.5.1 Summary of Key Project Delivery Risks

The following section summarises the key (high) risks identified:

- Environment:
  - unexpected find of cultural significance on a part of the project which is on a critical path
  - environmental offsets being triggered due to loss of shore bird
  - aquatic habitat and impacts listed species
  - noise and air quality impacts on the amenity of residents.
- Geotechnical:
  - foundation and geological variability leading to impacts on the embankment design
  - embankment instability during construction
  - deeper or shallower piles than anticipated on the Ross River Bridge (affecting the bridge design)
  - need for significant ground improvement
  - treatment of acid sulphate soils
  - need to replace unsuitable materials from other sources incurring additional transportation costs.
- General:
  - The design outcome for the TEARC Project being impacted by the inclusion of the Townsville SDA was assessed as a high risk.
- Weather—The impacts of climate change were assessed as a high risk:
  - changes in the rail formation level
  - embankments
  - cross drainage.
- Flood and Hydrology—Six flood and hydrology high risks and one opportunity were assessed. The risks included:
  - adverse flood impacts to private property and residents
  - future catchment development
  - changes in geomorphic (Zones 1 and 2) and coastal processes
  - need for a reconfiguration of the surface water drainage from the Port
  - bridge soffit levels impacting on the Q100 stormwater levels.

  The opportunity identified improved community benefits from reducing flood levels in Zones 1 and 2.
- Rail—Seven rail high risks were assessed related to:
  - achieving Queensland Rail approvals for rail alignment and signalling in Zone 1
  - achieving the necessary clearances under the 330 kV electrical transmission towers in Zone 3
  - need for additional retaining walls to the east of Benwell Road (Zone 6)
  - complexity of signalling requirements

  - tying into existing track and crossings in the port area (Zone 6)
  - utilising the Nickel balloon loop in the port as a point of entry for the TEARC Project
  - achieving Queensland Rail approval for the use of prestressed precast driven concrete piles.
- Rail Logistics—Two rail logistic high risks were assessed related to:
  - use of incorrect modelling assumptions for the rail movements
  - potential unavailability of the Jetty Branch, requiring all port traffic to enter via the TEARC and North Coast Line.

  The latter risk was subsequently eliminated, as the Reference Project does not include the Jetty Branch removal.
- Public Utility and Plant (PUP)—PUP high risks were assessed related to:
  - need for construction of new utilities and services to replace discontinued ones
  - incorrectly installed services
  - presence of unanticipated underground piping that must be relocated

6.5.2 Cost Risk

All risks with a rating of High or Medium that had been captured in the project risk register were added to the standard cost risk template. Each of these risks were evaluated prior to the second cost risk workshop (21 July 2017) to determine if they had been previously captured by the standard risk template. Those which were not captured, were quantified as a project specific cost risk.

The cost consultant used their experience to prepopulate the planned risk ranges prior to the cost risk workshop. Attendees were asked to assess cost (Min, Likely, Max) range and likelihood of occurrence for all the risks in the unplanned risk register. These inputs were used to determine the P90 and P50 risk amounts in the Monte Carlo Simulation.

Risk and Opportunity are reported in two components:

- Client related risks and opportunities
- Contract related risks and opportunities during the physical delivery of the works.

The split between Client and Contract risk is notional as the probabilistic assessment must be undertaken for all the project.

6.5.3 Project Planning

Key risk mitigation strategies identified from the initial risk workshop included:

- provide contingencies in cost plans to allow for potential project cost variability
- ensure consideration of various sequencing scenarios
- engage with relevant bodies early in the project planning to ensure that designs meet standards and expectations
- review risks during detailed design phase.

6.6 Strategic and Other Risks

The strategic and other risks considered the broader inputs from the DBC, to potential implementation and ongoing operations. These risks have been provided on an assumption the project will receive approval. The DBC recommendation is to place the implementation of the project on hold, based on the economic assessment (refer Chapter 20).

The low, medium and high qualitative risks are summarised below:

- Strategic and Political Risks:
  - Demand forecast for the Mt Isa line, North Coast Line and the Port of Townsville (PoT) – lower or much higher than the DBC.
  - Progress of the PoT Port Expansion Plan – impacting timing for the need for TEARC.
  - Developments within the Townsville Waterfront PDA progressing to a point requiring the removal of the Jetty Branch.
  - Lack of funding availability causes a delay to project commencement.
  - Procurement phase is delayed due to the approval process.
- General Risks:
  - TSDA and sequencing of TEARC. The design outcomes for TEARC may be compromised with the inclusion of the TSDA due to flood levels and runoff.
- Rail Logistics:
  - Rail logistics modelling relies on the demand forecast as a key assumption. There is a risk that the demand forecasts could change either up or down.
- Approvals:
  - Delays for approvals in obtaining planning and environmental approvals.
  - Injunction and legal challenges to approvals.
  - Dealing with native title in the project area.
- Property Acquisition:
  - Acquisition of land for the project takes longer than expected due to objections, additional cost and/or additional land.
- Legal and Regulatory:
  - Commonwealth, State or Local government may change law or policy in a manner which impacts the project.
  - Third parties may seek administrative remedies or bring claims.
  - Changes in legislation negatively impacts Environmental Approvals.
  - Legislation or standard change prior to contract award results in the need to change TEARC scope, deliver, contract conditions or delivery model.
- Stakeholder Risks:
  - Interface issues with the PoT and users of the port.

  - Key stakeholders, Cluden or Port residents object to final alignment selection
  - Rail owners, operators and customers are dissatisfied with the project case.
- Workplace Health and Safety:
  - There is a rail or road safety incident as a result of the project
  - There is a serious safety incident on or in the proximity of the project
  - Spill in an environmentally sensitive area during delivery.

6.7 Conclusion

The Project Risk Register provides direction for the management of risks from the completion of the DBC to the delivery and operation of the project. It is a living document that should be reviewed and updated as the project progresses.

The risk register will require further review to incorporate any new risks identified with the preferred procurement model, delivery timeframes and proposed governance arrangements.

The strategic risks should be considered and expanded prior to the approval decision process of the project.

7 ECONOMIC ANALYSIS

CHAPTER SUMMARY AND CONCLUSIONS:

- A detailed economic analysis was undertaken for TEARC which comprised of a Cost Benefit Analysis (CBA), which measured the incremental direct benefits associated with the TEARC Project against a base ('without' project) case.
- The CBA for TEARC produced a benefit cost ratio (BCR) of 0.16 with a corresponding net present value (NPV) of negative $226.3 million using a 7 per cent real discount rate.
- Sensitivity testing of the CBA concluded that under the tests, the BCR remained below 1. Across all tests, the BCR ranged between 0.11 (10% real discount rate) to 0.26 (4% real discount rate).
- In addition to sensitivity testing, two alternative demand scenarios were modelled to estimate the impact on TEARC of different assumptions of minerals demand and Port of Townsville (PoT) trade growth. The low demand scenario lowered the BCR to 0.14, while the high demand scenario further reduced the BCR to 0.12 due to the reduction in road user benefits.
- The outcomes of the CBA need to be considered in the context of the non-monetised benefits outlined in this Detailed Business Case.

7.1 Introduction

The purpose of this section is to outline the economic impacts of TEARC. The economic analysis comprises a detailed cost-benefit analysis (CBA).

The economic analysis considers TEARC from a community perspective and identifies the costs and benefits which are both internal and external to the rail operator including government organisations, private sector enterprises, individuals and the environment. Some of these effects (such as time savings, noise and air quality effects) are not directly quantified in market based monetary terms. An economic analysis differs from a financial analysis, as the latter focuses on revenue flows, capital and operating costs for key stakeholders, and it does not include externalities or private (user) benefits such as time savings.

7.2 Approach

CBA is an economic analysis tool, based upon the principles of welfare economics, which is used to assess whether any given project should proceed by comparing the costs of the project to its benefits.

A number of sources and guidelines were referenced to develop the CBA, including:

- Australian Transport Assessment and Planning Guidelines (ATAP), Transport and Infrastructure Council (2016), Commonwealth Department of Infrastructure and Regional Development.
- Assessment Framework: Initiative and Project Prioritisation Process, Infrastructure Australia (IA) (2016).
- Guide to Project Analysis Part 4: Project Analysis Data, Austroads (2012).
- BTE 1999, Competitive Neutrality between Road and Rail, Working Paper 40, Table II.1. (data from Columns G and H, sources and derivations of data detailed in notes to table).
- DTMR 2014, Queensland Level Crossing Safety Strategy 2012-2021.
- Australian Office of the National Rail Safety Regulator 2016, Rail Safety Report 2015-2016.

In addition, the CBA was undertaken in accordance with the requirements of the Building Queensland Cost-Benefit Analysis Guide: Supporting Business Case Development (April 2016).

7.3 Methodology and Assumptions

The CBA framework is based on an annual discounted cash flow model with an analysis period of 30 years from the finalisation of capital investment (as per the BQ guidelines).

The CBA was undertaken for TEARC through the following steps:

- Definition of the 'base case' (i.e. do-minimum, without the project) against which 'project case' (i.e. with the project) is compared.
- Identification of the costs and benefits that are expected in moving from the base case to the project case.
- Identification of the core parameters of the analysis (e.g. time scale, base year for prices to calculate present dollar values, discount rate).
- Estimation of future freight demand.
- Development of rail operational modelling for the base and project cases.
- Development of traffic modelling for the base and project cases.
- Quantification of the costs and benefits over the analysis period.
- Estimation of the NPV and BCR using discounted cash flow techniques.
- Testing the sensitivity of CBA results to changes in the underlying assumptions and different scenarios.

The key parameters and assumptions used in the analysis are summarised in Table 7.1.

Table 7.1 Key CBA Parameters and Assumptions

ITEM	PARAMETER/ASSUMPTION
Discount rate	The discount rate adopted in the analysis is 7% per annum (real) and is used to calculate present values. Sensitivity tests are undertaken at discount rates of 4% and 10%. These values are in accordance with guidance from Building Queensland. The economic discount rate differs from the discount rate used in the financial analysis. The economic discount rate represents the time value of money while the discount rate in the financial analysis represents the cost of borrowing.
Price year and inflation	All costs and benefits in the economic analysis are presented in 2017 real constant prices (i.e. excludes inflation). This differs from the financial analysis that is undertaken in nominal terms to show actual funding requirements.
Analysis period	An analysis period of 30 years from the end of the capital investment is adopted as per the BQ guidelines to represent the 'economic' life of the asset. The first year of benefits is measured from 2022, being the year of anticipated operations commencement. Therefore, the project benefits are measured from 2022 to 2052.
Modelled periods	The freight demand forecast is undertaken on an annual basis. However, the rail operations modelling is undertaken for 2017, 2022, 2027, 2032, 2037, 2042 and 2047 while the road traffic modelling 2022 and 2027. The interpolation of benefits is based on the demand forecast profile.
Perspective of analysis	The economic analysis considers TEARC from a Queensland community (social) perspective and considers the costs and benefits that are both internal and external to the rail operator, including government organisations, individuals and the environment. While the perspective of the analysis is for Queensland, several of the economic parameters used in the analysis represent an Australian value (e.g. the value of time used in the travel time savings).

ITEM	PARAMETER/ASSUMPTION
Base case	The base case is defined as the do-minimum case (Townsville without the project, i.e. the rail and road network without TEARC). Therefore, in the base case freight trains would continue to access the Port of Townsville (PoT) via the existing North Coast Line. Likewise, the road network would continue to experience delays at level crossings. The Base Case scope includes the rail infrastructure from the Sun Metals Branch Line, via the North Coast Line to the Jetty Branch and associated road infrastructure. The Base Case excludes the Mt Isa Line to Townsville, the North Coast Line south of the Sun Metals Branch Line and north of the Jetty Branch. It also excludes the Port of Townsville to the port boundary. The base case excludes any unfunded projects in the future network. It includes ongoing maintenance costs.
Project case	The project case is defined as Townsville with TEARC. The project case excludes any unfunded projects in the future network. The project case involves the full project scope (Reference Design). In the project case the majority of freight trains will use the TEARC alignment (sugar trains would continue to use the existing North Coast Line alignment). Road users would experience benefits due to the reduction in delays at level crossings. (refer to Chapter 5)
Unit costs and parameter values	Adopted from ATAP and other sources such as Austroads. The unit parameters include the value of time (i.e. $/hour), vehicle operating costs, value of life and externality parameters.
Real prices	Real price escalation was applied to the value of time and other benefits at a rate 0.75% per annum (excluding rail operating cost savings). Capital costs were escalated in real prices while ongoing costs were assumed to increase at the rate of inflation (i.e. no real increase).
Risk and uncertainty (P50 versus P90 confidence levels)	All benefits and costs in the CBA are forecasts of the future and are subject to risk and uncertainty. Sensitivity analysis is a simple approach to exploring the level of risk in CBAs. More sophisticated approaches involve assigning probability distributions to risky or uncertain variables and using computer simulations (e.g. Monte Carlo methods). In accordance with the national guidelines, the CBA results are tested at the P50 and P90 confidence level for costs. The P50 costs are used in the reporting of the main CBA results. According to the Bureau of Infrastructure, Transport and Regional Economics (BITRE) (2014)[30], the CBA results used for decision making are the 'expected values', that is, the means of the probability distributions for the NPV and BCR. These are obtained by ensuring that all the individual cost and benefit estimates going into the CBA are expected values. For investment costs, the P50 value or median will equal the mean or expected value if the probability distribution is symmetrical. If the distribution is reasonably symmetrical, the P50 value can be used as an approximation of the mean for the central scenario for a CBA.

7.4 Costs

7.4.1 Capital Costs

The outturn capital costs of TEARC were provided by the TEARC Cost and Risk Advisor. The breakdown of these costs is detailed in Table 7.2.

Risk adjustments have been included (based on detailed risk modelling), which equates the construction cost estimate to P50 and P90 equivalents. The total cost is estimated to be $368.7m in nominal 2017 prices using P50 allowance for risk. Further information on project costs and risk adjustments is included in Chapter 6 and Chapter 8.

[30] Refer to page 12 of the BITRE (2014) for more detail.

Table 7.2 Nominal Capital Costs Summary

	NOMINAL COST ($ MILLION)
Total P50 risk adjusted project costs	368.7
Total P90 risk-adjusted project costs	391.7

An adjustment was made to the project costs in order to convert the outturn cost estimates to real economic costs for use in the economic analysis. The adjustment removes the general increase in prices and reflects only real escalation increases over time (e.g. increases in labour costs over and above the general increase in prices, i.e. the Consumer Price Index (CPI).

Table 7.3 details the escalation factors used in the cost estimate. To convert the nominal cost estimate into a real (escalated) cost estimate, the CPI component of the nominal escalation is removed.

Table 7.3 Escalation Rates

ESCALATION FACTORS	RATES (NOMINAL) USED IN CONSTRUCTION COST	RATES (REAL)
2018	4.65%	2.15%
2019	2.69%	0.19%
2020	3.14%	0.64%
2021	2.79%	0.29%
2022	3.03%	0.53%

CPI escalation is based on the mid-point of the inflation rate of two to three percent targeted by the Reserve Bank of Australia (RBA) and is consistent with the assumed escalation rate by economic advisor for the TEARC DBC[31].

The capital cost escalation profile is provided by the cost and risk advisor, in accordance with Department of Transport and Main Roads (TMR) guidance, which adopts the Department of Infrastructure and Regional Development (DIRD) Project Cost Breakdown (PCB) for Federally Funded project policy.

Based on the adjustment for nominal to real escalation, the economic capital cost for TEARC is $336.1m (undiscounted) and $261.2m (discounted at seven %). These resulting economic costs are summarised in Table 7.4.

Table 7.4 P50 Economic Capital Cost

COST COMPONENT	CAPITAL COST ESTIMATE[32] ($ MILLION, P50, 7% DISCOUNT RATE)
Total P50 risk adjusted costs (financial)	368.7
Removal of nominal escalation	-43.2
Inclusion of real escalation (project cost escalation above CPI)	10.5
Total economic capital costs (undiscounted)	336.1
Total economic capital costs (discounted)	261.2

[31] Note: a sensitivity test of this assumption was undertaken which did not change the project's BCR.

[32] Contains rounding.

7.4.2 Ongoing Costs

The ongoing cost estimates are 'incremental' (i.e. cost difference between the base and project case). The ongoing costs include:

- Rail costs:
  a. Fixed ongoing rail maintenance costs (and minor capital replacement)
  b. Variable ongoing rail maintenance costs
- Road costs:
  c. Fixed ongoing road maintenance costs (including minor capital replacement).

Fixed ongoing rail costs were estimated and the results show that the TEARC will increase the fixed routine maintenance cost due to requirement to maintain the existing North Coast Line and the TEARC alignment (i.e. maintenance of 2 rail lines in the project case compared to 1 rail line in the base case). However, the TEARC will reduce the number of Gross Tonne Kilometres (GTK) running over the rail lines. This will lower the ongoing costs associated for variable (or demand) based maintenance. Variable maintenance costs were estimated using the Queensland Competition Authority (QCA) reference tariff incremental maintenance charge of $1.77 per 1,000 GTK.

Ongoing costs were assumed to increase at the rate of inflation (i.e. 2.5% per annum as per the RBA target for inflation[33]). In addition to the rail costs, there are addition maintenance costs required to maintain the re-alignment of Abbot Street at Cluden including the grade separation and also the Racecourse Road realignment and road bridge over Stuart Creek.

A summary of the increment ongoing costs used in the cost benefit analysis is shown in Table 7.5.

Table 7.5 Incremental Ongoing Costs

ONGOING COSTS	TOTAL (UNDISCOUNTED) $M	PRESENT VALUE $M
Rail	15.6	4.4
Road	13.5	3.8
Total incremental ongoing costs	29.0	8.2

7.5 Benefits

The monetised, quantifiable economic benefits of TEARC included in the CBA can be divided into three broad categories:

- Rail freight benefits: this benefit includes changes in the cost of freight transportation on rail and other external benefits such as rail crashes and negative externalities.
- Road user benefits: this benefit includes changes in the cost of travel for road user on the local south Townsville road network due to reduction in delays from freight trains (e.g. at level crossings).

A summary of the benefits included in the CBA are shown in Table 7.6. The residual value of the project at the end of the analysis period is also included as a project benefit.

[33] Note: a sensitivity test of this assumption was undertaken which did not change the BCR of the project.

Table 7.6 Benefits included in the CBA

BENEFITS	DESCRIPTION
RAIL FREIGHT	
Private benefits (producer surplus)	Reduced train operating costs
External benefits	Reduced likelihood of rail crashes (and crashes at level crossings) Reduced externalities
ROAD USERS	
Private benefits (consumer surplus)	Reduced travel times (reduction in delays caused from level crossings) Reduced vehicle operating costs
External benefits	Reduced likelihood of crashes Reduced externalities
OTHER	
Residual value	Remaining value of TEARC at the end of the analysis period

The economic benefits to TEARC were quantified based on the results of rail operations modelling and road traffic modelling undertaken. The modelling found that the proposed changes to rail operations provided by TEARC would provide the following benefits:

- TEARC will allow all shunting operations originated at Stuart Yard or Partington Yard to travel via the TEARC route, significantly decreasing the number of shunts via the city centre to the port.
- The PoT will have fully symmetrical access to its facilities from two entry points – the existing Jetty Branch and new one provided by TEARC. This will add flexibility and redundancy in daily rail operations.
- TEARC will decrease heavy rail traffic through Townsville while still allowing to route trains via Abbott and the Jetty Branch. In the longer term, only sugar trains would require access to the port infrastructure via Abbot and the Jetty Branch, with all rail traffic originating on the Mount Isa line routed to the port via TEARC.
- TEARC will help reduce train cycle times, queueing and rail network delays when under heavy load, and help facilitate port expansion infrastructure development without increasing heavy rail traffic through the city.

7.5.1 Rail Benefits

The CBA included three main rail freight benefits, including reduced:

- train operating costs
- likelihood of rail crashes (and crashes at level crossings)
- negative externalities arising from TEARC.

The rail benefits were quantified using the parameter values shown in Table 7.7.

The study estimates that the average train operating cost is 2.5 cents per net tonne kilometre (NTK). This is based on the outputs from the rail operating cost model.

Also, a number of external costs and benefits are expected to accrue from the project. These costs do not have market values and so must be valued at a “shadow price”. Standard values for these shadow prices have been calculated and are accepted within the field of transport economics. Values for key externality parameters have been derived from publications by the BTE (1999), ATC (2006) and DTMR (2014).

Rail crashes were valued at 0.049 cents per NTK ($2017) as provided by BTE (1999). Crash costs at level crossings were estimated using historical information of crash types from the National Rail Safety Regulator and crash costs from ATAP (2016). The average level crossing crash cost is $844,112 and the open level crossing crash cost is 0.24 per million train kilometres.

Table 7.7 Rail Parameter Values ($2017)

RAIL PARAMETER VALUES	VARIABLES	SOURCE
Rail operating costs		
Operating cost (average for all trains)	2.5 cents / ntk	Rail operating cost model
Rail crashes		
Rail crashes (rail only crashes)	0.049 cents / ntk	BTE (1999)
Level crossing crash rate	0.24 /m train-km	DTMR (2014)
Average level crossing crash cost	$844,112	Calculated
Externalities		
Air pollution	0.22 cents / ntk	ATC (2006)
Greenhouse/climate change	0.02 cents / ntk	ATC (2006)
Noise	0.09 cents / ntk	ATC (2006)
Water	0.007 cents / ntk	ATC (2006)
Nature and landscape	0.05 cents / ntk	ATC (2006)
Total externality cost	0.40 cents / ntk	Calculated

The total rail demand for TEARC incorporates both the minerals (concentrates and fertilises/phosphate) and other freight demand forecast. In the economic analysis, no generated demand is assumed, consequently, the estimates of total rail freight tonnes are assumed to be equal in the base case and project case. The introduction of TEARC was estimated to reduce the number of “train kilometres” required to transport the forecast rail traffic demand.

Table 7.8 details the results of the rail operations. The reduction in NTKs will lower overall rail freight transport costs, reduce the likelihood of a crashes and reduce the level of emissions from trains.

Table 7.8 Rail Freight Demand and Million Net Tonne Kilometres (mNTK)

CASE	2022	2027	2032	2037	2042	2047
Rail demand (mtpa)	6.3	5.8	6.9	6.9	5.9	5.7
Base case (mNTK)	89.5	84.0	97.3	96.8	82.0	78.6
Project case (mNTK)	86.3	81.3	94.3	94.0	80.1	76.6
Savings in mNTK	**3.2**	**2.7**	**3.0**	**2.9**	**2.0**	**2.0**

Rail benefits were calculated using the change in NTKs per annum multiplied by the relevant parameter unit rate (i.e. change in NTKs between the base and project case multiplied by $/ntk). The estimated rail benefits provide by TEARC over the 30-year analysis period are shown in Table 7.9. Overall, given the modest change in NTKs provide by the project the expected rail benefits are $0.8m using a 7% discount rate.

Table 7.9 Rail Freight Demand and Million Net Tonne Kilometres (mNTK)

RAIL FREIGHT BENEFITS	TOTAL (UNDISCOUNTED)	PRESENT VALUE $M
Rail operating cost savings	2.1	0.7
Rail safety benefits	0.2	0.0
Externalities	0.3	0.1
Total	2.7	0.8

- Rail Time Savings

The rail operations modelling included an assessment of the travel times for trains in the base and project case. However, it was found that the time savings provided by TEARC were insignificant with respect to the overall travel time of trains, for instance from Mt Isa. For example, the average travel time saving in 2022 was estimated to be around 16 minutes per train that is insignificant when the majority of trains originating from the North-West Minerals Province have a travel time of around 24 hours. Therefore, potential labour cost savings from the travel time improvements were excluded.

The majority of freight products are non-time sensitive and are therefore unlikely to derive any tangible impact for customers. Therefore, the value of freight travel timesavings was not included in the CBA based on advice from the Peer Reviewer. However, a sensitivity test was included to test this assumption.

7.5.2 Road Users Benefits

TEARC is expected to improve road conditions by diverting the majority of trains accessing the PoT away from the city centre. A traffic model was developed to evaluate the impact of TEARC on the local road network and also for trucks within the Port. The main benefit provided by TEARC is the reduction in delays at level crossings on Abbott Street.

A summary of the expected travel timesavings per trip traffic modelling was undertaken for both the low season and high season (sugar season) of rail traffic. During the 2027 high season, the forecast average travel time savings per trip was 34 seconds for cars and 57 seconds for heavy vehicles. The daily traffic modelling results were annualised using a factor of 130 for the high season and 120 for the low season (250 days in total).

On average, the number of trips are forecast to increase at a rate of 1.1-1.3% for cars and 3.5-4.1% (outside the port) for heavy vehicles.

The results show that due to rail traffic using TEARC, there are less delays at the existing level crossing on Abbot Street.

Overall there is a reduction in vehicle kilometres travelled (VKTs) due to re-routing of traffic (i.e. less diversion around level crossings to avoid delays).

The economic benefits to road users are valued using the parameter values shown in Table 7.10.

The road parameter values are sourced from ATAP (2016), Austroads (2008) and TfNSW (2011).

Table 7.10 Road Parameter Values ($2017)

ROAD PARAMETER VALUES	VARIABLES	SOURCE
Value of time ($/hour)		
Car – Private	$25.8/hr	ATAP (2016)
Car – Business	$73.3/hr	ATAP (2016)
Medium Commercial Vehicle	$40.5/hr	ATAP (2016)
Heavy Commercial Vehicle	$86.7/hr	ATAP (2016)
Vehicle operating costs		
All vehicles	Variable based on operating speed	VOC model from TfNSW
Crashes		
Fatal ($m)	8.3	ATAP (2016)
Serious ($m)	0.5	ATAP (2016)
Minor ($m)	0.03	ATAP (2016)
PDO ($m)	0.01	ATAP (2016)
Externalities		
Air pollution	Cars: 1.4 cents/vkt MCV: $0.9/1000 tonne-km HCV: $0.1/1000 tonne-km	Austroads (2012)
Greenhouse	Cars: 2.2 cents/vkt MCV: $0.5/1000 tonne-km HCV: $0.1/1000 tonne-km	Austroads (2012)
Noise	Cars: 0.5 cents/vkt MCV: $0.1/1000 tonne-km HCV: $0.02/1000 tonne-km	Austroads (2012)
Water	Cars: 0.2 cents/vkt MCV: $0.1/1000 tonne-km HCV: $0.02/1000 tonne-km	Austroads (2012)
Nature and landscape	Cars: 0.3 cents/vkt MCV: $0.1/1000 tonne-km HCV: $0.02/1000 tonne-km	Austroads (2012)

Table 7.11 details the expected benefits to road users based on the travel time and distance savings from the traffic modelling and the unit parameter values described in Table 7.10.

Overall, the benefits to road users from TEARC is $25.9m over the analysis period using a 7% discount rate. Travel timesavings to cars make up the majority of benefits (53%) while travel time savings to commercial freight vehicles (medium and heavy commercial vehicles) make up 12% of the road user benefits. Due to the reduction in VKTs there are also small crash and externality benefits.

Table 7.11 Road User Benefits ($m) – 7% Discount Rate

ROAD USER BENEFITS	TOTAL (UNDISCOUNTED)	PRESENT VALUE $M
Travel time savings		
Car – Private	23.7	12.0
Car – Business	3.5	1.8
Medium Commercial Vehicle	2.8	1.4
Heavy Commercial Vehicle	6.5	3.1
Heavy Commercial Vehicle (inside the port)	0.04	0.02
Vehicle operating costs		
Car – Private	6.4	3.1
Car – Business	0.6	0.3
Medium Commercial Vehicle	1.0	0.5
Heavy Commercial Vehicle	2.6	1.2
Heavy Commercial Vehicle (inside the port)	0.004	0.002
Other		
Crash savings	2.5	1.2
Externalities	2.8	1.3
Total		
Total road user benefits	**52.5**	**25.9**

7.5.3 Residual Value

TEARC has been assigned a residual life, as key components of the investment have economic lives that extend beyond the analysis period. This allows the salvage value of the infrastructure at the end of its life to be calculated. If TEARC was hypothetically disassembled at the end of the 30-year analysis period, there may be some remaining value to the resource. Further, it accounts for asset lives that exceed beyond the 30-year analysis period. The residual value is derived from the application of the formula below:

- Residual value = Capital Cost * [(Economic life – Analysis period) / Economic life]

The residual value of the infrastructure components is $134.9m in undiscounted terms. This equates to approximately 62% of the initial cost for these items ($134.9m / $ 217.3m = 62%). Therefore, to allocate a residual value to the project risks, a factor of 62% of the initial cost for these items has been applied.

The residual value of $225.7m is then added into the final year of the analysis as a benefit (not a 'negative' cost). The results are shown in Table 7.12. The residual value is $16.3m at the 7% discount rate.

Table 7.12 Residual Value

USER BENEFITS	ECONOMIC LIFE	COST $M	RESIDUAL VALUE $M
Design	100	17.1	12.0
Rail		**139.3**	**75.9**
Road		**60.9**	**47.0**
Sub-total		**217.3**	**134.9**
Risk			
P50 Proportion			39.2
P90 Proportion			51.6
Total			
Residual value – P50			**174.1**
Residual value – P90			**186.4**

7.6 Cost Benefit Analysis Results

The results of the CBA for TEARC are presented in Table 7.13.

The majority of costs for the project relate to the capital costs while the ongoing costs add 3% to the total costs. There are modest benefits to rail freight provided by the improved rail operations that enables the majority of trains to divert to the PoT via TEARC. A notable outcome of the CBA is the size of road user benefits (54%, comprising travel time and vehicle operating cost savings) compared to rail freight benefits. Also, the residual value makes up a significant proportion of the benefits equating to $16.3m or 38% of the total benefits.

The BCR for the project is 0.16 at the 7% discount rate. This indicates that costs outweigh the benefits by a factor of more than 5. Therefore, the TEARC Project does not generate sufficient benefits to cover its costs.

Table 7.13 CBA Results – 7% Discount Rate

CBA RESULTS	TOTAL (UNDISCOUNTED)	PRESENT VALUE $M	% OF TOTAL
Costs (P50)			
Capital Costs	336.1	261.2	97%
Operating and Maintenance Costs	29.0	8.2	3%
Total	**365.1**	**269.5**	**100%**
Benefits			
Rail freight			
Rail operating cost savings	2.1	0.7	2%
Rail safety benefits	0.2	0.1	0%
Externalities	0.3	0.1	0%
Road users			
Travel time savings	36.5	18.2	42%
Vehicle operating cost savings	10.6	5.1	12%
Safety benefits	2.5	1.2	3%
Externalities	2.8	1.3	3%
Residual value	**174.1**	**16.3**	**38%**
Total	**229.3**	**43.1**	**100%**
BCR		**0.16**	
NPV ($m)		**-226.3**	
NPV/I		**-0.87**	
IRR		**-1.86%**	

7.7 Sensitivity Testing

The CBA results are based on the best estimates of costs and benefits. However, it is common for this type of analysis that there will be some level of uncertainty in the accuracy of the estimates and assumptions adopted. Consequently, the robustness of the economic analysis results was assessed through a series of sensitivity tests.

The results of the sensitivity analyses are shown in Table 7.14.

The sensitivity testing shows that under all of sensitivity tests, the economic analysis results remain negative. This includes a best-case sensitivity test using a discount rate of 4% that returns a BCR of 0.26. Likewise, where costs are lower by 20% and benefits are higher by 20%, which returns a BCR of 0.24.

Two deferral tests were also undertaken including a 5-year and 10-year deferral. Both tests improved the NPV of the project, mainly due to the discounting effect on the capital costs that occur further out in the future when compared to the central case. A 10-year deferral improved the NPV from -$226.3 million to - $112.2 million . This indicates that deferral should be considered as it improves the NPV. Deferral would also enable the demand forecast to be revisited in the future.

Table 7.14 CBA Results Sensitivity Tests

	SENSITIVITY TEST	BCR	NPV ($M)
	Main case (scenario 1)	**0.16**	**-226.3**
1	Discount rate 4%	0.26	-223.6
2	Discount rate 10%	0.11	-214.8
3	P90 costs	0.15	-241.6
4	Project Costs +20%	0.13	-280.2
5	Project Costs -20%	0.20	-172.5
6	Project Benefits +20%	0.19	-217.7
7	Project Benefits -20%	0.13	-235.0
8	Project Costs +20%, Project Benefits -20%	0.11	-288.9
9	Project Costs -20%, Project Benefits +20%	0.24	-163.8
10	No real price increase in costs/benefits	0.16	-220.0
11	5-year deferral	0.16	-156.7
12	10-year deferral	0.15	-112.2
13	Higher rail operating costs (6c/NTK)	0.16	-225.3
14	Residual value = 0	0.10	-242.6

A sensitivity test was undertaken on the estimated rail operating costs of 2.5 cents/NTK. The value of 2.5 cents/NTK was based on the economic advisor's freight operating cost model. This value is on the lower end of the range of costs, based on the distance travelled by trains from Mt Isa to Townsville. Therefore, a test was undertaken using a higher unit cost. Assuming that rail-operating costs are higher, 6 cents/NTK, the benefits of the project would marginally increase, thereby improving the NPV[34]. However, the BCR remained unchanged. Given the nature of the project, this assumption is not material to the outcome of the results.

A sensitivity test was also undertaken on the approach to the residual value calculation. The CBA adopted a straight-line depreciation method to estimate the residual value that is the preferred approach from the ATAP (2016) guidelines and also Infrastructure Australia. However, given the low benefits estimated for TEARC, the depreciated cost approach may overstate the residual value of the asset. As such, it could be assumed that the residual value of the project is zero. The results of the sensitivity test, assuming a residual value of zero, reduced the BCR from 0.16 to 0.10.

7.7.1 Future Scenarios Not Tested

There are other future scenarios that could not be included in the Reference Project. The Port Master Plan should ultimately allow all rail traffic to utilise TEARC and hence the removal of the Jetty Branch, when the full urban amenity can be realised. The removal of the Jetty Branch does form part of the Reference Project as the Port Master Plan has not been developed to a level of detail that could support this DBC.

[34] A higher rate of 6 cents/NTK was selected to determine the sensitivity of the results if rail operating costs were double the main case i.e. to determine the importance of this variable. As rail operating costs are not provided by operators, such as Aurizon, it was important to ensure that the main estimate of rail operating costs was robust and did not materially impact the results.

The increased urban amenity and further reduction in road delays has not been analysed because the additional costs for the PoT to relocate the existing unloading facilities for sugar and Glencore and any other changes required to operations is unable to be costed at this time.

In addition, if the demand on the Mt Isa line were to significantly increase and the requirement for 1,400m long trains was justifiable than this would also provide additional benefit at a cost to support the TEARC DBC. The Mt Isa line is not part of the Reference Project because the demand forecast does not justify moving to 1,400m trains.

Table 7.15 summarises these non-quantified benefits and costs.

Table 7.15 Future Scenarios Not Tested

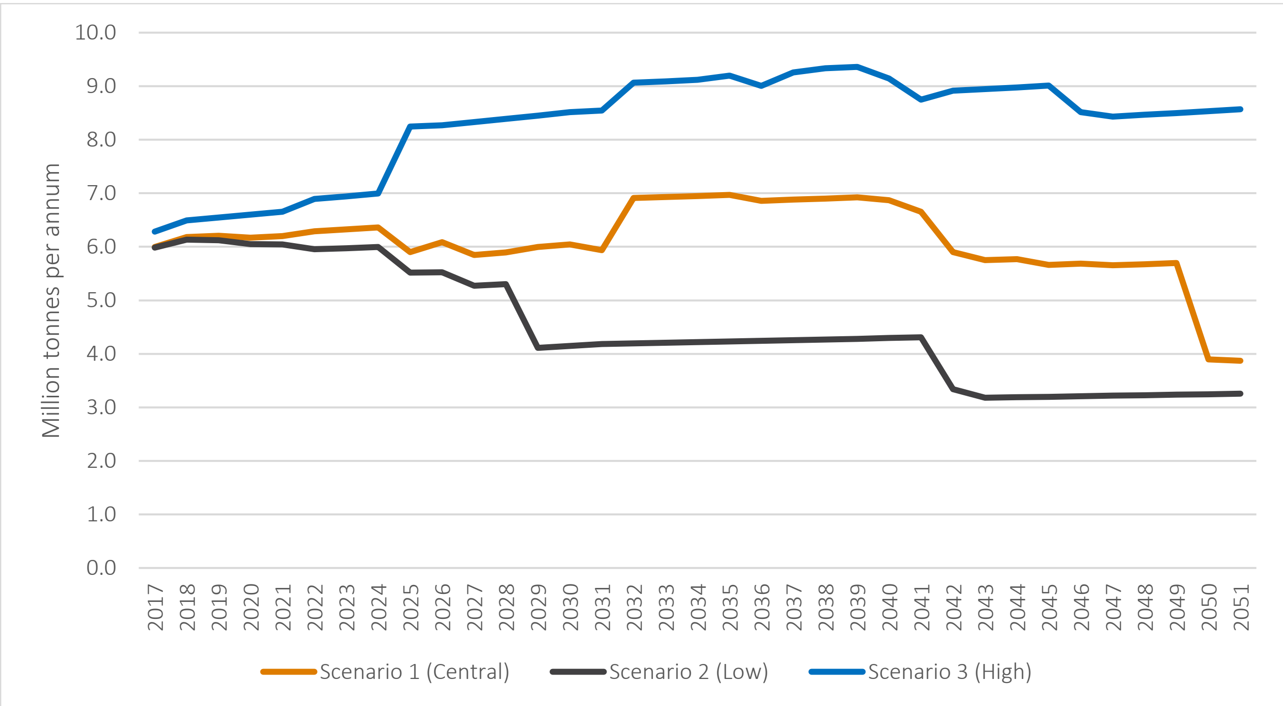
	DESCRIPTION	BENEFITS	COSTS
1	Removal of the Jetty Branch	▪ Road benefits ▪ Urban amenity	▪ Rail modifications ▪ PoT unloading relocation
2	1,400m long trains	▪ Improved train operations and lower total rail freight transport costs	▪ Mt Isa line passing loops ▪ PoT rail modifications

7.8 Scenario Testing

In addition to the sensitivity testing, 2 alternative demand scenarios were modelled to estimate the impact on the TEARC Project from different assumptions of minerals demand and PoT trade growth.

Figure 7.1 details the low and high alternative demand scenarios.

Figure 7.1 Total Rail Demand Forecast under Each Scenario (mpta)



The results of the scenario testing are shown in Table 7.16.

Under all scenarios, the BCR for the TEARC Project remains significantly below 1. The low demand scenario reduces the BCR from 0.16 to 0.14.

An interesting result is that while the high demand scenario increases the rail freight benefits, it results in a lowering of the road user benefits. The main reason is that the high scenario results in a high number of trains using the existing North Coast Line and Jetty Branch alignment in project case when compared to the central case, thereby lowering the road user benefits.

Table 7.16 CBA Results Scenario Tests

CBA RESULTS	SCENARIO 1 (CENTRAL)	SCENARIO 2 (LOW)	SCENARIO 3 (HIGH)
Costs (P50)			
Capital Costs	261.2	261.2	261.2
Operating and Maintenance Costs	8.2	8.3	8.2
Total	**269.5**	**269.5**	**269.4**
Benefits			
Rail freight			
Rail operating cost savings	0.7	0.6	1.3
Rail safety benefits	0.1	0.0	0.1
Externalities	0.1	0.1	0.2
Road users			
Travel time savings	18.2	12.9	10.3
Vehicle operating cost savings	5.1	4.9	2.8
Safety benefits	1.2	1.0	0.7
Externalities	1.3	1.4	1.4
Residual value	**16.3**	**16.3**	**16.3**
Total	**43.1**	**37.3**	**33.1**
BCR	**0.16**	**0.14**	**0.12**
NPV ($m)	**-226.3**	**-232.2**	**-236.3**
NPV/I	**-0.87**	**-0.89**	**-0.90**
FYRR	**-1.86%**	**-1.86%**	**-1.86%**

7.9 Productivity Gains

Consistent with the requirements of s14(2) of the Building Queensland Act 2015 (Qld), the DBC identifies the productivity gains that are anticipated from TEARC. Reduced transport costs, including reduced travel time and vehicle operating costs, result in a reduction in costs of doing business, lowering the costs of production and increasing the efficiency of business interactions.

Table 7.17 details the productivity gains of TEARC from the CBA.

The work and business-related productivity gains amount to $9.0m over the 30-year analysis period. This accounts for 21% of the total economic benefits of TEARC.

Table 7.17 Productivity Gains – 7% Discount Rate

PRODUCTIVITY GAINS	$ MILLION
Rail operating cost savings	0.7
Commercial vehicle travel time savings	6.3
Commercial vehicle operating cost savings	2.0
Total	9.0
Proportion of total benefits	**21%**

7.10 Jobs Supported during the Project

The Project supports direct Full-Time Equivalent (FTE) jobs during planning and delivery. The direct employment supported can be estimated by applying Queensland Treasury supplied ratios of FTE direct jobs supported per $1 million capital outlay. The methodology applied is set out below:

JOBS SUPPORTED DURING THE PROJECT	
Project Timeline	2018 – 2022: 5 years
Queensland Treasury estimated FTE Direct jobs per $1million of capital	2.7 (utilised the 2020-21 projection value from Queensland Treasury Guidance material (May 2017)
Capital Cost (less Land Acquisition, Plant, Equipment, Software)	$383m
Estimated number of jobs supported per annum	Average of 207 direct FTE jobs supported for five years

7.11 Quality Assurance Review

The CIE was engaged to undertake an independent peer review of the economic modelling for TEARC during the DBC phase. The peer review scope included a review of the CBA methodology, freight demand working papers and detailed Economic Analysis Report.

Overall, the independent peer review concluded that the approach to the economic analysis was fit for purpose and was undertaken in accordance with the relevant guidelines. Where appropriate, comments from the peer reviewer were incorporated in the final analysis.

7.12 Conclusion

Table 7.18 details the outcomes of the CBA.

A detailed economic CBA was undertaken for TEARC that measured the incremental direct benefits associated with TEARC against a base ('without' project) case. The CBA considered several scenarios to validate the results of the central case, along with sensitivity analysis designed to test any uncertainty in the parameters utilised in the analysis.

The detailed CBA for TEARC produced a BCR of 0.16 with a corresponding NPV of -$226.3m over 30 years.

The sensitivity testing of the CBA concluded that under all of tests, the BCR remained below 1. In addition to the sensitivity testing, two alternative demand scenarios were modelled to estimate the impact on TEARC from different assumptions of minerals demand and trade growth through the PoT. Under all scenarios, the BCR remained below 1.

TEARC returns a BCR of 0.16 that indicates that the monetised costs outweigh the monetised benefits for the projects. Therefore, it is likely that there are alternative investments that could be undertaken in the local region that would further improve economic conditions above the monetised benefits of TEARC.

Table 7.18 CBA Results

CBA RESULTS	4%	7%	10%
P50 costs			
BCR	0.26	0.16	0.11
NPV	-223.6	-226.3	-214.8
P90 costs			
BCR	0.25	0.15	0.10
NPV	-240.9	-241.6	-228.4

There are other future scenarios that could not be included in the Reference Project nor quantified at this time. The Port Master Plan should ultimately allow all rail traffic to utilise TEARC and hence the removal of the Jetty Branch, when the full urban amenity can be realised.

The increased urban amenity and further reduction in road delays has not been analysed because the additional costs for the PoT to relocate the existing unloading facilities for sugar and Glencore and any other changes required to operations is unable to be costed.

In addition, if the demand on the Mt Isa line were to significantly increase and the requirement for 1,400m long trains was justifiable than this would also provide additional benefit at a cost to support the TEARC DBC.

8 FINANCIAL AND COMMERCIAL ANALYSIS

CHAPTER SUMMARY AND CONCLUSIONS:

- The total P90 risk-adjusted project costs are $457.7m in nominal terms and $369.6m in net present value (NPV) terms.
- Total P90 risk-adjusted project costs ($457.7m) in nominal terms consist of $391.7m capital costs, $48.3m maintenance costs and $17.7 lifecycle costs. These capital, maintenance and lifecycle components are also P90 risk-adjusted in nominal terms.
- The incremental freight access revenues are marginally negative (i.e. loss of revenues for TEARC). No quantifiable value sharing opportunities have been identified for TEARC. Projected freight demand is not expected to increase significantly as a result of TEARC, and as result of the more direct route to the PoT afforded by TEARC, NTKs will reduce, and hence, incremental revenue will reduce
- Therefore, the net P90 risk-adjusted project costs are $458.9m in nominal terms and $370.2m in NPV terms.
- The net P50 risk-adjusted project costs are $429.6m in nominal terms and $347.9m in NPV terms.
- Unless there is scope for the PoT and the Townsville City Council to contribute funds in the Project, the Australian Government and Queensland Government is to consider other opportunities to fund the Project. The final funding model for TEARC may contain a mix of contributions from various levels of government. The Australian Government has committed $150m to TEARC and $3m of this commitment has been approved to co-fund the development of this Detailed Business Case, with a matching contribution from the Queensland Government
- Initial discussions are taking place with the Australian Government and other levels of government regarding the quantum, timing or nature of contribution from these funding sources as part of the *Townsville City Deal (2016)*. Detailed negotiations will commence subject to approval of the DBC from the Cabinet Budget Review Committee (CBRC).

This chapter outlines the financial implications and budgetary impacts of TEARC. The financial analysis incorporates all costs and revenues associated with the construction and operation of TEARC over the evaluation period and quantify the estimated cash flows and NPV for TEARC. The chapter details:

- Approach to undertake the financial analysis
- Key assumptions and data sources
- Raw capital and ongoing (whole-of-life) costs associated with TEARC
- Revenues associated with TEARC
- Net non-risk-adjusted costs of TEARC
- Value of the risk adjustments and the subsequent net risk-adjusted costs of TEARC
- Potential funding sources for TEARC
- Key findings from the independent financial model review.

Please note that the financial analysis has a different purpose to the economic analysis (Chapter 7 – Economic Analysis); the financial analysis is focused on the financial costs (the net financial impact to the

Queensland Government including cash flow implications) from an internal government funding perspective, whereas the economic analysis is focused on the overall economic benefit to the community.

TEARC is a net cost project to the Queensland Government, and the terminology of Net Present Value (NPV) has been adopted to logically convey the numerical and graphical outputs of the business case i.e. the NPV conveys the sum of the present value of all costs over the evaluation period as positive numbers and revenues and cost saving benefits as negative numbers (that reduce the NPV).

8.1 Approach

A detailed financial analysis of TEARC is required by state and national guidelines, including:

- Building Queensland Business Case Development Framework (BCDF)
- Queensland Government Project Assessment Framework (PAF)
- National Public Private Partnership Policy and Guidelines.

The result of the financial analysis determines the likely net financial impact to the Queensland Government of undertaking TEARC and is facilitated by the development of a Public Sector Comparator (PSC) financial model ('the Financial Model'). The Financial Model is used to estimate the total and net risk-adjusted project costs of TEARC and also inform the affordability assessment (Chapter 16).

The financial analysis is informed by the options analysis (Chapter 5), which defined the following options:

- The **base case** includes the rail infrastructure from the Sun Metals Branch Line, via the North Coast Line to the Jetty Branch and associated road infrastructure. The Base Case excludes the Mt Isa Line to Townsville, the North Coast Line south of the Sun Metals Branch Line and north of the Jetty Branch. It also excludes the Port of Townsville to the port boundary. The existing Southern Port Road and other existing road infrastructure provides truck access to the Port. The base case will not be able to efficiently support the Port Expansion Plan in the longer term.
- The reference project (**project case**) is an 8.3km single line narrow gauge rail line to be constructed broadly within a defined corridor starting in the suburb of Cluden and connecting to the southern end of the Port of Townsville via a rail bridge over the Ross River. The project case will provide port access redundancy for rail, increase operational flexibility, and reduce the level of interaction between rail and road traffic, thereby improving urban amenity, safety and traffic flows. It has been designed to enable future staged infrastructure upgrades, including the proposed port expansion. The project case does not include the removal of the existing line described in the Base Case. It further does not include any connections within the Port of Townsville other than connection to the existing port minerals loop

The Financial Model assesses the financial impact of the incremental difference between the base case and the project case as described above. The incremental costs and revenues have been provided by TEARC's cost and economic advisors.

Table 8.1 sets out the key outputs of the financial analysis.

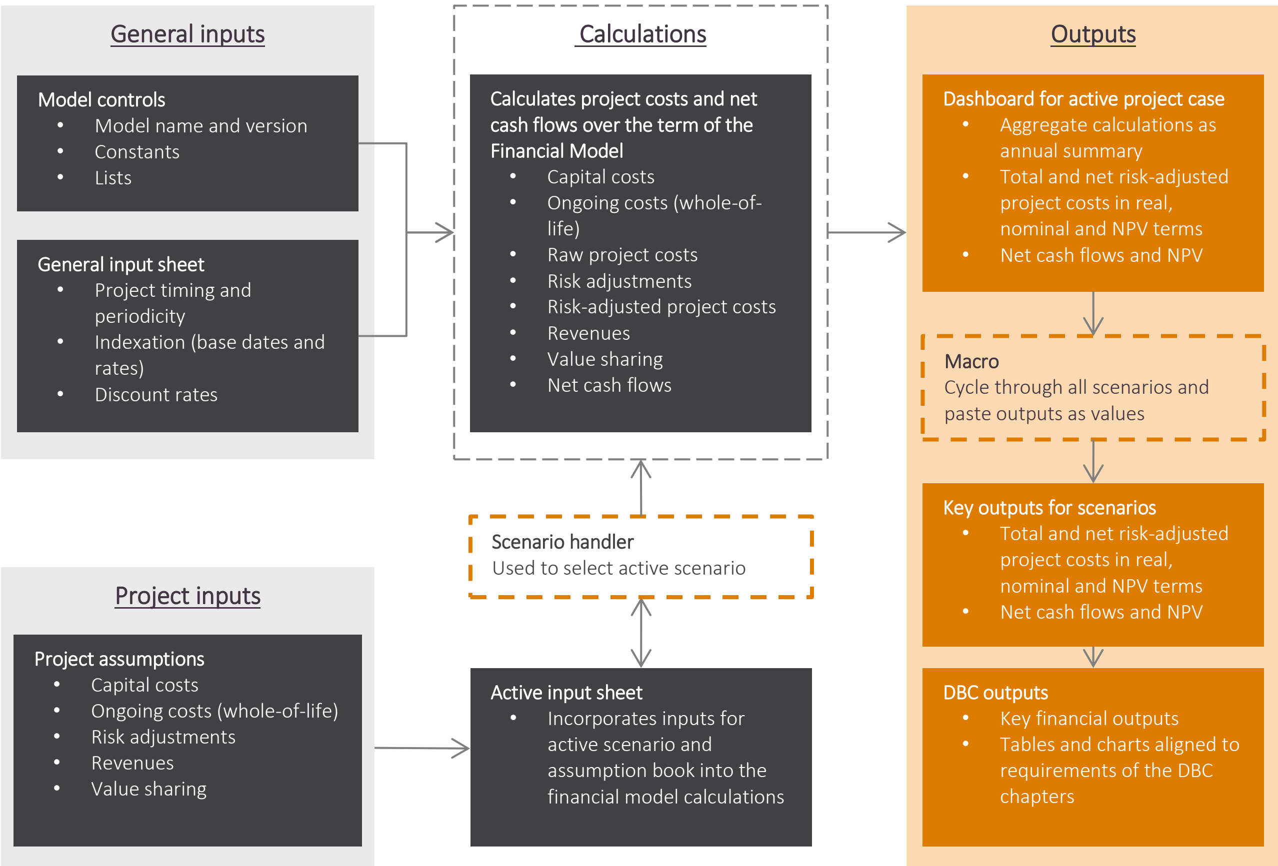
Table 8.1 Financial Analysis Outputs

KEY OUTPUT	DESCRIPTION
TOTAL RISK-ADJUSTED PROJECT COSTS	
Raw project costs	The raw project costs include the direct and indirect raw capital and ongoing costs (whole-of-life) of delivering TEARC over the evaluation period.
Risk adjustments for raw project costs	From the risk identification process (Chapter 6 – Risk Management), the project costs include an adjustment for the risks associated with TEARC being delivered through a traditional delivery model. These risks are identified as either: ▪ Planned risks – risks that relate to the potential for the cost of the construction and operation phases to differ from the base case estimates. These risks are identified by analysing the risks and opportunities in the project's scheduled activities and are assessed during the determination of raw technical costs by considering the likely ranges in quantity, unit rate or price for the construction and operation phases ▪ Unplanned risks – other risks relating to potential changes in the Reference Project's intended development, procurement, implementation, financing and operations. These changes may be triggered by actions of the Project Team, external stakeholders or the general market environment. These risks are assessed by analysing the likely impact ranges for these potential risks to the project, as well as the probability of the risks and opportunities occurring.
Total risk-adjusted project costs	The total risk-adjusted project costs include the raw project costs and risk adjustments over the life of the Financial Model. *Total risk-adjusted project costs = Raw project costs + Planned risks + Unplanned risks*
PROJECT REVENUES	
Revenues	The revenues directly generated by TEARC have been included in the financial analysis and include incremental freight access revenues.
Value sharing	In addition to the revenues considered above, potential value sharing opportunities are assessed – no quantifiable value sharing opportunities have been identified for TEARC.
NET RISK-ADJUSTED PROJECT COSTS	
Net risk-adjusted project costs	The net risk-adjusted project costs are derived by subtracting revenues that the Queensland Government would earn as a result of TEARC from the total risk-adjusted project costs. *Net risk-adjusted project costs = Total risk-adjusted project costs – Revenues*

Figure 8.1 sets out the structure of the Financial Model outlining key inputs, calculation steps and outputs.

The Financial Model is populated with inputs reflecting the costs, risk adjustments and revenues associated with TEARC. The outputs from the Financial Model provide TEARC costs and affordability cash flows in real, nominal and NPV terms.

Figure 8.1 Structure of the Financial Model



8.1.1 Sources of information

The input data used to calculate TEARC costs and net cash flows have been sourced from various parties in the TEARC Project Team, advisors and key stakeholders.

Table 8.2 provides a summary of the sources of information used in the Financial Model.

Detailed assumptions are set out in Section 8.2.

Table 8.2 Sources of Information

INPUT	TEARC PROJECT TEAM ROLE
Construction period timing	Cost and risk advisor
Operations period timing	Cost and risk advisor
Capital cost escalation	Cost and risk advisor
Ongoing cost escalation	Project Team in consultation with QR
CPI escalation	Financial advisor / Economic advisor
Discount rate	Project manager
Capital costs	Cost and risk advisor
Maintenance costs	Cost and risk advisor / Economic advisor
Lifecycle costs	Cost and risk advisor / Economic advisor

INPUT	TEARC PROJECT TEAM ROLE
Incremental freight access revenue	Economic advisor
Value sharing	Financial advisor

8.2 Assumptions

This section documents the key assumptions used in the calculation of the TEARC costs, revenues and discounted cash flows in the Financial Model.

Furthermore, this section describes the road and rail regulatory/policy environment as it pertains to the impact of TEARC on modal shift.

8.2.1 Timing assumptions

Table 8.3 summarises the key timing assumptions that have been adopted in the Financial Model.

The Financial Model captures monthly cash flows during the construction period, and quarterly cash flows during the operations period. The construction of TEARC is assumed to be completed by 31 March 2022 and the operations period starts on 1 April 2022, as well as the revenue cash flows. The operation period is assumed to be 30 years, as agreed by the BQ project team pursuant to the BCDF, and as has been employed on previous rail projects in the State. The 30-year operating period also aligns with the TEARC maintenance and lifecycle cost forecast developed by the cost and risk advisor and is accepted by Queensland Treasury as a standard practice for rail projects. It has been assumed that all cash flows occur at the end of any given period (i.e. month or quarter) in the Financial Model.

Table 8.3 Timing Assumptions

ITEM	DESCRIPTION	ASSUMPTION
Model start date	Model and other project costs commencement date	1 January 2017
Model evaluation period	Model length, assessment period and periodic separation	Business case development and procurement period: 1 January 2017 – 31 December 2019 Construction period: 1 January 2020 – 31 March 2022 Operations period: 1 April 2022 – 31 March 2052 (30 years – refer reasoning above)
Capital cost commencement date	Construction and upfront capital cost phase commencement date	1 January 2017
Capital cost forecast base date	Base date for escalating real construction and upfront capital cost forecasts	30 June 2017
Capital cost phase periodicity	Model periodicity during construction and upfront capital cost phase	Monthly
Ongoing cost commencement date	Ongoing operating and lifecycle cost phase commencement date	1 April 2022

ITEM	DESCRIPTION	ASSUMPTION
Ongoing cost forecast base date	Base date for escalating real ongoing operating and lifecycle cost forecasts	30 June 2017
Operations phase periodicity	Model periodicity during operations phase	Quarterly
Revenue commencement date	Revenue forecast commencement date	1 April 2022
Revenue forecast base date	Base date for escalating real revenue forecasts	30 June 2017
Revenue phase periodicity	Model periodicity during revenue period	Quarterly
Discount date	Base date applied to discount cash flows to determine the NPV of TEARC	30 June 2017

8.2.2 Financial assumptions

This section details the financial assumptions including escalation assumptions and discount rate that have been applied in the Financial Model.

The Financial Model contains three escalation profiles. These profiles have been agreed between the TEARC Project Team and the cost and risk advisor and recognise that different cash flows are likely to escalate at different rates, depending on the nature of the cash flow.

Table 8.4 shows the three escalation profiles and the application of the escalation profiles to the project cash flow items in the Financial Model.

Table 8.4 Application of Escalation to Cash flows

ESCALATION PROFILE	ESCALATION ITEM	ESCALATION PERIODICITY
Capital cost escalation	Construction and project delivery costs and construction period risk adjustments	Annual
Ongoing cost escalation	Maintenance and lifecycle costs and operations period risk adjustments	Annual
CPI escalation	Revenues	Annual

Escalation in the Financial Model has been applied annually to all cash flows over the evaluation period.

Table 8.5 details the escalation assumptions applied in the Financial Model.

Table 8.5 Escalation Assumptions

DESCRIPTION	CAPITAL COST ESCALATION	ONGOING COST ESCALATION	CPI ESCALATION
FY2017	-	-	-
FY2018	4.65%	2.75%	2.5%
FY2019	2.69%	2.75%	2.5%
FY2020	3.14%	2.75%	2.5%
FY2021	2.79%	2.75%	2.5%

DESCRIPTION	CAPITAL COST ESCALATION	ONGOING COST ESCALATION	CPI ESCALATION
FY2022	3.03%	2.75%	2.5%
Thereafter rate	N/A	2.75%	2.5%

CPI escalation is based on the mid-point of the inflation rate of two to three percent targeted by the Reserve Bank of Australia and is consistent with the assumed escalation rate by economic advisor for the TEARC DBC.

The capital cost escalation profile is provided by the cost and risk advisor, in accordance with Department of Transport and Main Roads (TMR) guidance, which adopts the Department of Infrastructure and Regional Development (DIRD) Project Cost Breakdown (PCB) for Federally Funded project policy.

The ongoing cost escalation is aligned with the long-term capital escalation rate as advised by the cost and risk advisor and maintenance escalation rates used in precedent projects (e.g. Beerburrum to Nambour Rail Upgrade) and is consistent with the approach taken by QR to estimating these costs. The escalation of these ongoing costs is higher than CPI escalation but lower than capital cost escalation. Ongoing costs occur during the operations phase.

The discount rate (3.76% in annual, nominal terms) applied in the Financial Model has been provided by BQ (sourced from the Queensland Treasury Corporation) and accords with Queensland Treasury practice for assessing all infrastructure projects in Queensland. The rate represents a proxy for the Queensland Government assumed cost of financing, calculated using a five-year average of the 10-year zero coupon bond yields as a proxy for the risk free rate. Discounting in the Financial Model has been applied annually to all cash flows over the evaluation period.

8.2.3 Accounting Treatments

In addition to the cash flow timing, escalation and discounting treatments discussed in the previous sections (Sections 8.2.1 and 8.2.2), this section details other accounting considerations that have been agreed with the TEARC Project Team and applied in the Financial Model, which include working capital, residual value and tax treatments.

Working capital is assumed to be zero in the Financial Model. During the construction period, there is no revenue received (i.e. no accounts receivable). During the operations period, it is assumed that all the payments (i.e. accounts payable and receivable) are captured in the same quarterly cash flow period (i.e. working capital days net to zero).

It is assumed that there is no residual value for TEARC at the end of the evaluation period. This is because residual values are typically comprised of discounted free cash flows beyond the period of evaluation (as opposed to the depreciated value of the remaining asset as is applied in economic modelling). In the case of TEARC there is a negative value of $3.7m in nominal terms in the final year of operation and no additional revenue or cost saving projected beyond the evaluation period. A residual value of zero is a common occurrence in net cost projects such as TEARC, and this approach is consistent with BQ practice.

GST has been excluded from the Financial Model in accordance with the Building Queensland BCDF.

8.2.4 Cost Assumptions

This section details the assumptions on capital costs, ongoing costs and risk adjustments that have been applied in the Financial Model.

Capital costs and expenditure profile during the construction period have been provided by the TEARC cost and risk advisor in real terms as at 30 June 2017. The capital costs include:

- Construction costs – the direct and indirect costs related to design and construction of TEARC
- Project delivery costs – the costs incurred by the Queensland Government for the delivery of TEARC including scoping, development, delivery and property costs.

These costs have been further categorised by a work breakdown structure (WBS) to provide a basis of structure for the construction schedule (Chapter 6). Capital costs have been escalated using the capital cost escalation profile on an annual basis in the Financial Model, which is aligned with the cost and risk advisor's approach.

Ongoing costs (whole-of-life) and timing during the operations period have been provided by TEARC's cost and risk advisor in conjunction with TEARC's economic advisor, and are in real terms as at 30 June 2017 for a 30-year period from 1 April 2022. The incremental ongoing costs include:

- Maintenance costs – the recurring, non-construction incremental costs borne by the Queensland Government to maintain the rail and road components of TEARC
- Lifecycle costs – the estimated incremental costs for major asset maintenance and refurbishment of TEARC infrastructure and including both rail and road components.

The maintenance costs (excluding variable below rail maintenance costs) and lifecycles costs have been provided by the cost and risk advisor and are the incremental costs between a with TEARC case and a without TEARC case.

The variable below rail maintenance costs have been provided by the economic advisor. Three sets of variable rail maintenance costs have been developed based on different demand forecasts (i.e. low, medium and high demand scenarios). Due to the reduced net tonne kilometres (NTK) of travel following TEARC's construction relative to the present number of NTKs, the variable below rail maintenance costs for all demand scenarios are actually shown as savings at the incremental level (between the with and without cases for TEARC).

The variable costs under the medium demand scenario have been adopted for the financial analysis as it represents the 'expected' position. The low and high demand scenarios have been separately assessed for the sensitivity analysis conducted in the TEARC affordability analysis (Chapter 16).

Note that the above rail operating costs associated with TEARC have been excluded from the financial analysis as these costs will be attributable to operators such as Aurizon and Pacific National. Above rail costs do not include train control and signalling costs (which are marginal), which were included in the below rail expenditure estimates provided by the cost advisor.

The Building Queensland BCDF requires the financial analysis to include an estimate of the cost of risks that may materialise over the life of TEARC. In order to estimate the cost of the risk for TEARC, the TEARC Team, together with the cost and risk advisor, prepared a risk register in accordance with the Building Queensland BCDF and undertook a detailed risk analysis with key stakeholders and advisors (Chapter 6).

For the purpose of this DBC, risk estimates at P50 and P90 have been quantified. These measures are defined as follows:

- P50 represents the cost of risks with a 50% level of confidence in the outcome meaning there is a 50% likelihood that the cost of risks will not be exceeded
- P90 represents the cost of risks with a 90% level of confidence in the outcome meaning there is a 90% likelihood that the cost of risks will not be exceeded.

P90 represents a conservative position, one that has only a 10% chance of being exceeded. This is also in accordance with the BCDF, the PAF and the IA National Guidelines. Thus, P90 risk adjustments have been adopted in the preparation of the risk-adjusted project costs and net cash flows. P50 risk adjustments have been reported in Section 8.4. All risk adjustments have been provided in real terms as at 30 June 2017.

8.2.5 Revenue and Funding Source Assumptions

This section details the revenue assumptions and other potential funding sources that have been applied in the Financial Model.

Incremental freight access revenues represent the additional freight access charges that will be received by the Queensland Government as a result of TEARC.

The incremental freight access revenues have been calculated by TEARC's economic advisor as the difference between access charge revenue with and without TEARC. The freight access revenues have been developed based on the current access pricing regime and the freight demand forecast administered by Queensland Rail. The tariff has been equated to the current tariff applying to trips between Mt Isa and the PoT. The revenues have been calculated using the price per NTK of travel (ntk – cents/ntk) multiplied by the forecast difference in NTKs between with and without TEARC. The access regime is commercial-in-confidence to Queensland Rail. This part of the Queensland Rail network is not regulated.

Three sets of incremental freight access revenue values have been developed based on different demand forecasts (i.e. low, medium and high revenue scenarios). The low, medium and high demand scenarios have assumed different population and gross domestic product (GDP) growth rates. For the purposes of this financial and commercial analysis, alternative revenue scenarios have not been modelled, as the difference between the net present value of TEARC under each scenario is negligible.

Incremental revenues under the 'with' TEARC case are negative. This is because there is no significant uplift in freight demand projected, no new trains expected, and NTKs for the purpose of user charging are reduced, meaning less revenues are recovered.

The medium demand scenario has been adopted in the preparation of the financial analysis and affordability cash flows as it represents the 'expected' position. The low and high demand scenarios have been separately assessed for the sensitivity of the TEARC Project's affordability (Chapter 17).

The TEARC Project Team has assessed potential value sharing opportunities, with no quantifiable value sharing opportunity being identified for TEARC. The reasons for this are as follows:

- It was agreed that as a freight rail only project, TEARC did not afford any significant benefits to beneficiaries such as local businesses or residents from increased amenity, foot traffic or uplift in land values.
- Land in the immediate vicinity of the TEARC corridor was predominantly State owned, special purpose zoned land within a rural, low density region, with limited scope for uplift in value
- Whilst the project involves some upgrades to the local road network, including the at-grade separation of level crossings, the roads affected have limited patronage and again, the low-density nature of the region was unlikely to defray the administrative costs of collecting a levy or applying any other form of value sharing mechanism.
- The southern portion of the TEARC corridor bisects the Townsville State Development Area, however, there is not expected to be significant benefit to the proposed industrial and commercial land uses as additional freight is more likely to use the existing road network.

- As there is no immediate freight demand resulting from the delivery of the Project, there are no private users from who a funding contribution may be sought, whether directly or by way of a levy.
- Furthermore, the removal of the existing Jetty Branch is not considered within the scope of the Reference Project, due to the existing Port operating constraints requiring it to be maintained. Were it to be removed, there may be some uplift in land values from the improved urban amenity in the vicinity of that track.
- It was considered that there was limited opportunity for land sales to fund a portion of the project, given the lack of commercial driver (for example, passenger stations) arising from delivery of the project.

8.3 Financial Net Present Value (Financial NPV)

8.3.1 Approach

The non-risk-adjusted financial NPV is an output of the Financial Model that projects the cash flow profile (i.e. costs) generated to plan, deliver and operate TEARC over the evaluation period. The Financial Model includes all capital costs, ongoing costs and residual value (which is nil). By calculating the net cash flow balances in each year over the evaluation period and discounting these at an appropriate rate, a non-risk-adjusted financial NPV has been produced for TEARC.

The non-risk-adjusted financial NPV represents the net financial impact to the Queensland Government in present dollar terms (as at 30 June 2017) from an internal financing perspective. The financial NPV calculated in this section is a non-risk-adjusted financial NPV, as it does not take into account the risk profiles of the cash flows. The risk-adjusted financial NPV is calculated in Section 8.4.

8.3.2 Raw Capital Costs

This section specifies the raw capital costs for TEARC, which includes the construction costs and project delivery costs to construct and deliver TEARC.

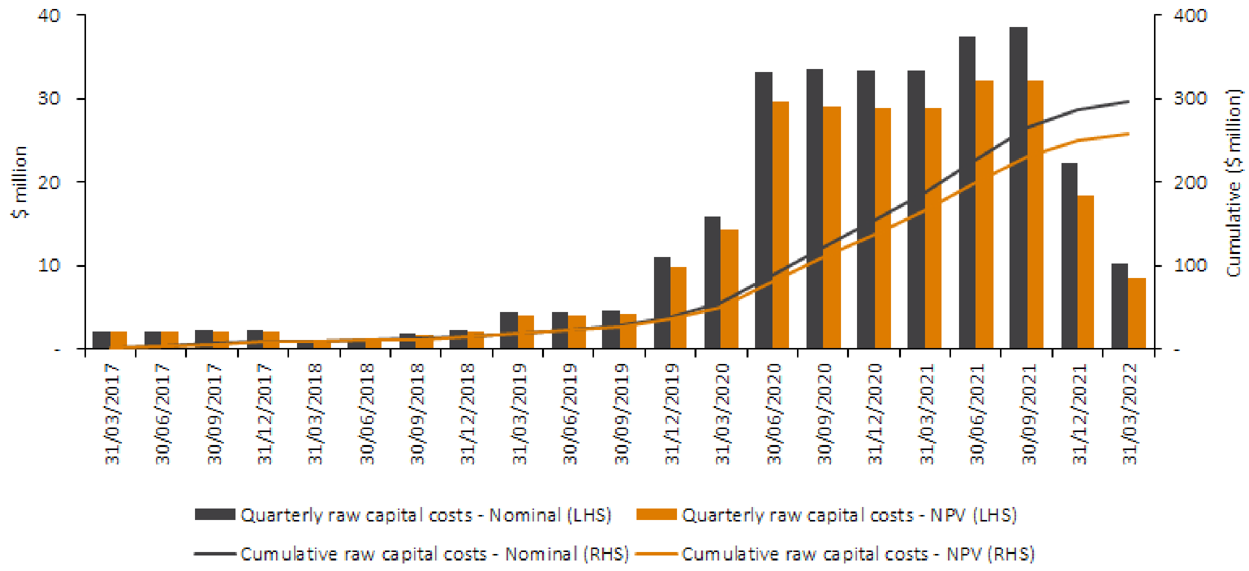
Table 8.6 sets out the raw capital costs of TEARC in real, nominal and NPV terms.

Table 8.6 Raw Capital Costs

RAW CAPITAL COSTS	REAL ($M)	NOMINAL ($M)	NPV ($M)
Construction costs	214.7	245.2	211.1
Project delivery costs	47.7	51.9	47.4
Total raw capital costs	**262.4**	**297.2**	**258.5**

Figure 8.2 shows the quarterly and cumulative raw capital costs of TEARC during the construction period in nominal and NPV terms.

Figure 8.2 Raw Capital Cost Cashflow Profile (Nominal and NPV)



The cash flow profile indicates that the quarterly raw capital costs are low during most of the DBC development and procurement period (January 2017 to December 2019) and begin to rise at the end of the procurement period. This increase continues into the construction period that starts in January 2020 with a significant rise in the second quarter of 2020. The peak period of the construction spend is the third quarter of 2021, with this phase being completed at the end of 2022.

8.3.3 Raw Ongoing Cost (Whole-of-Life)

This section specifies the raw incremental ongoing (whole-of-life) costs for TEARC over a 30-year period post construction.

Table 8.7 sets out the raw ongoing costs of TEARC in real, nominal and NPV terms.

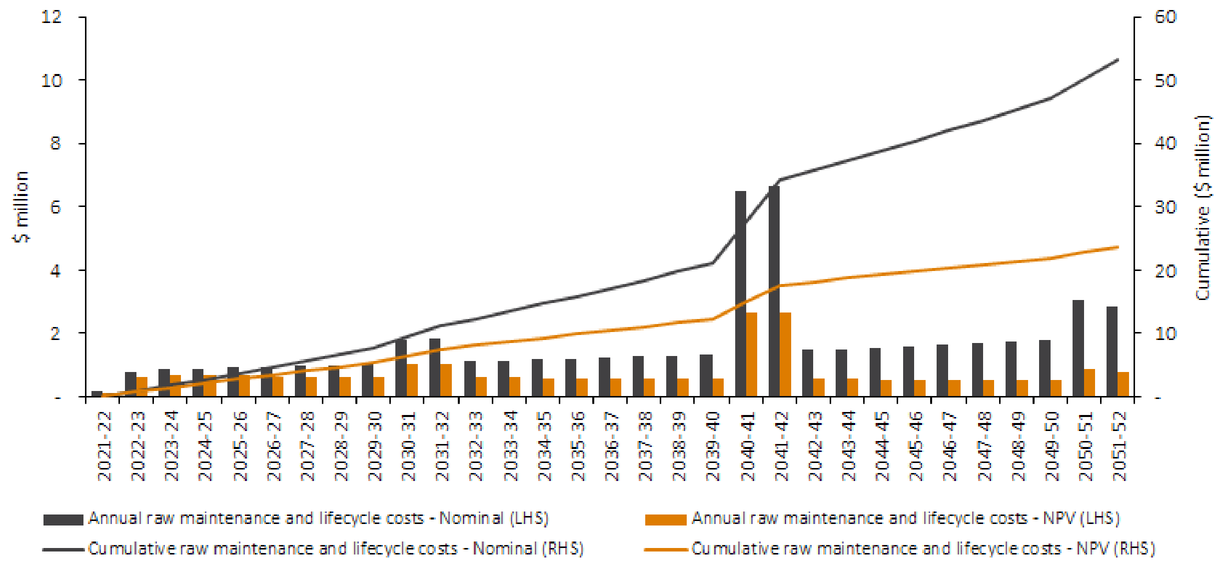
Table 8.7 Raw Ongoing Costs

RAW ONGOING COSTS	REAL ($M)	NOMINAL ($M)	NPV ($M)
Raw maintenance costs	21.8	38.9	17.9
Raw lifecycle cost	7.3	14.3	5.7
Total raw ongoing costs	**29.0**	**53.1**	**23.6**

The raw ongoing costs of TEARC are $53.1m in nominal terms and $23.6m in NPV terms.

Figure 8.3 shows annual and cumulative raw maintenance and lifecycle cost profile demonstrating the cost of TEARC during the operations period in nominal and NPV terms.

Figure 8.3 Raw Maintenance & Lifecycle Cost Cashflow Profile Illustrating the Cost of TEARC (Nominal & NPV)



The maintenance and lifecycle cash flows are divided by three distinct peaks of lifecycle expenditure at FY2031-32, 2041-42 and 2051-52 respectively. Whilst maintenance costs remain flat in real terms over the 30-year period of operations, lifecycle costs are scheduled at ten year intervals from the commencement of the operations.

8.3.4 Revenues

This section specifies the incremental revenues generated by the TEARC over the 30-year operations period, which includes the freight access revenues.

Table 8.8 sets out the raw revenues of TEARC in real, nominal and NPV terms.

Table 8.8 Revenues

REVENUES	REAL ($M)	NOMINAL ($M)	NPV ($M)
Loss of freight access revenues	0.8	1.3	0.6
Total loss of revenues	**0.8**	**1.3**	**0.6**

The total incremental loss of freight access revenue from TEARC is $1.3m in nominal terms and $0.6m in NPV terms. As noted earlier in this chapter, projected freight demand is not expected to increase significantly as a result of TEARC, and as result of the more direct route to the PoT afforded by TEARC, NTKs will reduce, and hence, incremental revenue will reduce.

8.3.5 Analysis Summary

The net raw project costs are the raw project costs net any revenues from TEARC.

Table 8.9 sets out the net raw project costs and non-risk-adjusted financial NPV for TEARC.

Table 8.9 Non-Risk-Adjusted Financial NPV

NET RAW PROJECT COSTS	REAL ($M)	NOMINAL ($M)	NPV ($M)
Raw capital costs (non-risk-adjusted)	262.4	297.2	258.5
Raw ongoing costs (non-risk-adjusted)	29.0	53.1	23.6
Raw project costs (non-risk-adjusted)	**291.4**	**350.3**	**282.1**
Revenues	0.8	1.3	0.6
Net raw project costs (non-risk-adjusted)	**292.2**	**351.6**	**282.7**

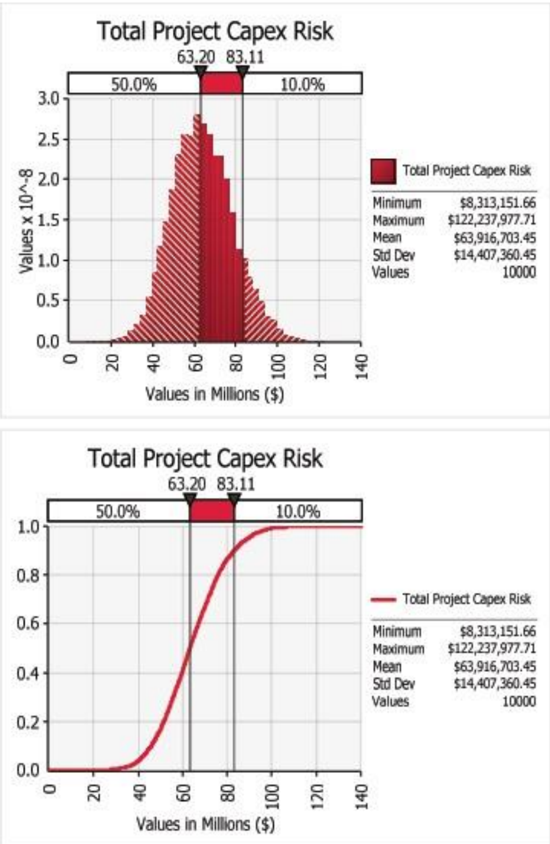
The net raw project costs are $351.6m in nominal terms and $282.7m in non-risk-adjusted NPV terms.

8.4 Risk-adjusted Financial NPV

8.4.1 Capital costs risk adjustments

Figure 8.4 sets out the distribution of capital cost risk adjustments at P50 and P90 confidence levels.

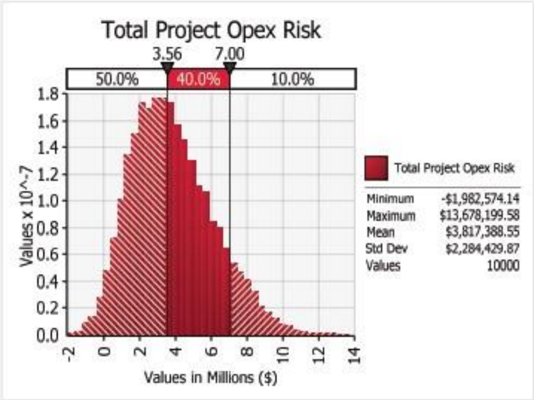
Figure 8.4 Capital costs risk adjustment profile



8.4.2 Ongoing costs risk adjustments

Figure 8.5 sets out the distribution of ongoing cost risk adjustments at P50 and P90 confidence levels.

Figure 8.5 Ongoing costs risk adjustment profile



8.4.3 Risk-adjusted project costs

The risk-adjusted financial NPV takes into account the risk profiles of the cash flows and includes risk adjustments on project costs for TEARC.

Table 8.10 sets out the net project costs and risk-adjusted financial NPV for TEARC at a P90 confidence level.

Table 8.10 P90 risk-adjusted project costs

NET RISK ADJUSTED PROJECT COSTS	REAL ($M)	NOMINAL ($M)	NPV ($M)
Risk-adjusted capital costs (P90)	345.5	391.7	340.2
Risk-adjusted maintenance costs (P90)	27.0	48.3	22.2
Risk-adjusted lifecycle costs (P90)	9.0	17.7	7.1
Total risk-adjusted project costs (P90)	381.5	457.7	369.6
Revenues	0.8	1.3	0.6
Net risk-adjusted project costs (P90)	382.3	458.9	370.2

The total P90 risk-adjusted project costs are $457.7m in nominal terms and $369.6m in NPV terms. The raw project costs account for 76.3% of the total risk-adjusted project costs in NPV terms with the remaining 23.7% comprising risk adjustments at a P90 level. The net risk-adjusted project costs are $458.9m in nominal terms and $370.2m in NPV terms.

Figure 8.6 shows the percentage breakdown of the total risk-adjusted project costs in NPV terms.

Figure 8.6 Total Risk-Adjusted Project Cost Allocation (NPV, % of Total)

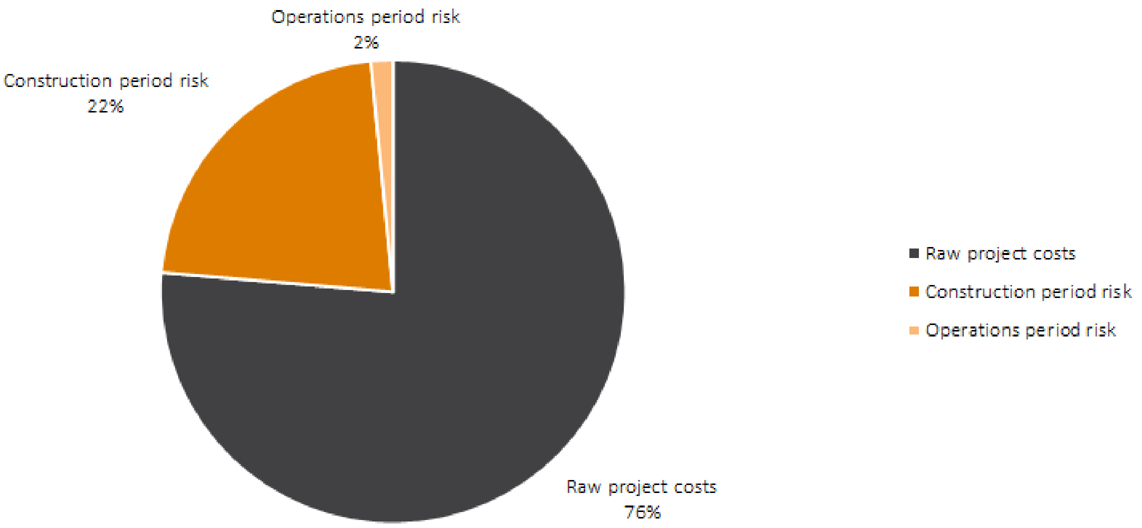


Table 8.11 sets out the net project costs and risk-adjusted financial NPV for TEARC at a P50 confidence level.

Table 8.11 P50 Risk-Adjusted Project Costs

NET RISK ADJUSTED PROJECT COSTS	REAL ($M)	NOMINAL ($M)	NPV ($M)
Risk-adjusted capital costs (P50)	**325.6**	**368.7**	**320.7**
Risk-adjusted maintenance costs (P50)	**24.4**	**43.6**	**20.1**
Risk-adjusted lifecycle costs (P50)	**8.1**	**16.0**	**6.4**
Total risk-adjusted project costs (P50)	**358.2**	**428.4**	**347.2**
Revenues	0.8	1.3	0.6
Net risk-adjusted project costs (P50)	**358.9**	**429.6**	**347.9**

The total P50 risk-adjusted project costs are $428.4m in nominal terms and $347.2m in NPV terms. The raw project costs account for 81.2% of the total risk-adjusted project costs in NPV terms with the remaining 18.8% comprising risk adjustments at a P50 level. The net risk-adjusted project costs are $429.6m in nominal terms and $347.9m in NPV terms.

Table 8.12 sets out the net risk-adjusted project costs at a P90 confidence level.

Table 8.12 P90 Risk-Adjusted Project Costs with Risk Adjustment Split by Planned and Unplanned

NET RISK ADJUSTED PROJECT COSTS	REAL ($M)	NOMINAL ($M)	NPV ($M)
Risk-adjusted capital costs (P90)	**345.5**	**391.7**	**340.2**
Risk-adjusted ongoing costs (P90)	**36.0**	**65.9**	**29.3**
Total risk-adjusted project costs (P90)	**381.5**	**457.7**	**369.6**
Revenues	0.8	1.3	0.6
Net risk-adjusted project costs (P90)	**382.3**	**458.9**	**370.2**

Table 8.13 sets out the net risk-adjusted project costs at a P50 confidence level.

Table 8.13 P50 Risk-Adjusted Project Costs with Risk Adjustment Split by Planned and Unplanned

NET RISK ADJUSTED PROJECT COSTS	REAL ($M)	NOMINAL ($M)	NPV ($M)
Risk-adjusted capital costs (P50)	**325.6**	**368.7**	**320.7**
Risk-adjusted ongoing costs (P50)	**32.6**	**59.6**	**26.5**
Total risk-adjusted project costs (P50)	**358.2**	**428.4**	**347.2**
Revenues	0.8	1.3	0.6
Net risk-adjusted project costs (P50)	**358.9**	**429.6**	**347.9**

8.5 Public Sector Comparator

The purpose of this section is to present the results of the PSC for the Project if a public private partnership (PPP) has been identified as the preferred delivery model. The PSC estimates the risk-adjusted, whole-of-life cost of TEARC to the Queensland Government using a traditional delivery method. The PSC represents the most likely and efficient form of public sector delivery of the Project. The PSC provides a benchmark against which decision-makers can compare private sector bids for projects when delivered under a PPP.

8.5.1 Approach

Table 8.14 below sets out the approach to calculating the PSC for TEARC.

Table 8.14 Financial Analysis Outputs

KEY OUTPUT	DESCRIPTION
RISK-ADJUSTED PSC COSTS	
Raw PSC costs	The raw PSC costs include the direct and indirect raw capital and ongoing costs (whole-of-life) of delivering TEARC over the evaluation period, net of any quantifiable third-party revenue attributable to TEARC (for which there is none).
Competitive neutrality adjustments	These comprise adjustments for net competitive advantages that accrue to the Queensland Government by its public sector ownership. Adjustments for such factors are required to allow a like-to-like comparison between the PSC and PPP bids. There is no competitive neutrality adjustment for TEARC.
Risk-adjusted PSC costs	Under Building Queensland's Business Case Development Framework (BCDF), the risk-adjusted PSC costs are calculated by discounting the raw PSC costs, competitive neutrality adjustments and transferred risks over the life of the Project to arrive at the NPV of TEARC.

KEY OUTPUT	DESCRIPTION
	Risk-adjusted PSC costs = discounted (raw PSC + competitive neutrality + transferred risks)

8.5.2 Applicability

The PSC calculation is limited to those components that would be in the scope of services for the private sector to include in its PPP tender response. As the preferred delivery model for the Project is as a single package through a traditional delivery model, there is no need to establish a PSC for the Project from the overall Project costs when establishing value for money against a PPP delivery model. Given that TEARC is to be procured under a traditional delivery model, the total project costs would be equivalent to the raw PSC described above. A risk adjusted PSC, as would be applied in the case of a project delivered under a PPP is not applicable to TEARC.

8.6 Independent Financial Model Peer Review

To support a successful and robust project outcome, an independent peer review of the Financial Model has been undertaken to evaluate the soundness and appropriateness of the mechanical calculations of the Financial Model.

The independent peer review confirmed that there are no outstanding issues that would impact on the financial results.

8.7 Conclusion

The financial analysis summarises the risk-adjusted capital and ongoing costs and revenues associated with delivery of TEARC. The total P90 risk-adjusted project costs are $457.7m in nominal terms and $369.6m in NPV terms. The net P90 risk-adjusted project costs are $458.9m in nominal terms and $370.2m in NPV terms.

Incremental revenues under the 'with' TEARC case are negative. This is because there is no significant uplift in freight demand projected, and NTKs for the purpose of user charging are reduced, meaning less revenues are recovered.

There is no other funding source or quantifiable value sharing opportunity identified for TEARC.

9 DELIVERY MODEL ANALYSIS

CHAPTER SUMMARY AND CONCLUSIONS:

- The delivery model analysis consisted of a three phased approach – firstly a high level Value for Money (VfM) assessment was conducted, secondly a workshop which identified evaluation criteria and weightings for shortlisted delivery models, and thirdly a workshop where those models were evaluated.
- Workshop attendees agreed that a PPP was not viable, that the works were best delivered as a single package, and that Construct Only (CO) and Design and Construct (D&C) traditional delivery models were the most appropriate for assessment. In addition, the market sounding process confirmed that the market would be equally content to bid for either a D&C or CO delivery model.
- A Public Sector Comparator assessment is not required as the delivery of the project via a PPP is not viable.
- The assessment concluded that while a CO model scored marginally higher than a D&C model, either model is considered to be a viable choice for delivering TEARC.

The purpose of this chapter is to outline and assess the range of potential delivery models to procure and deliver TEARC. The objective of this assessment is to identify a preferred delivery model that is likely to provide the best Value for Money (VfM)[35] in meeting the identified service need.

This chapter provides an overview of the packaging and delivery model options considered and the outcomes of the delivery model workshop. It considers:

- The approach and analysis methodology regarding packaging.
- The delivery model options analysis methodology.
- The qualitative VfM methodology.
- The evaluation criteria defining the State's objectives and against which the different delivery models are assessed ("the Delivery Model Evaluation Criteria").
- Key features of relevant traditional and partnership delivery models, including precedent transactions in Queensland (where available).
- Assessment of the advantages and disadvantages of each model, in the context of TEARC.
- Evaluation of each model against the Delivery Model Evaluation Criteria as agreed at the delivery model workshop.
- The preferred traditional models resulting from the assessment, and the rationale for the exclusion of PPP models from assessment.
- Conclusions drawn following the delivery model workshop.

[35] Note that VfM in this context refers to VfM between PPP and traditional delivery models. Where the term "value for money" is used, this denotes value for money more generally.

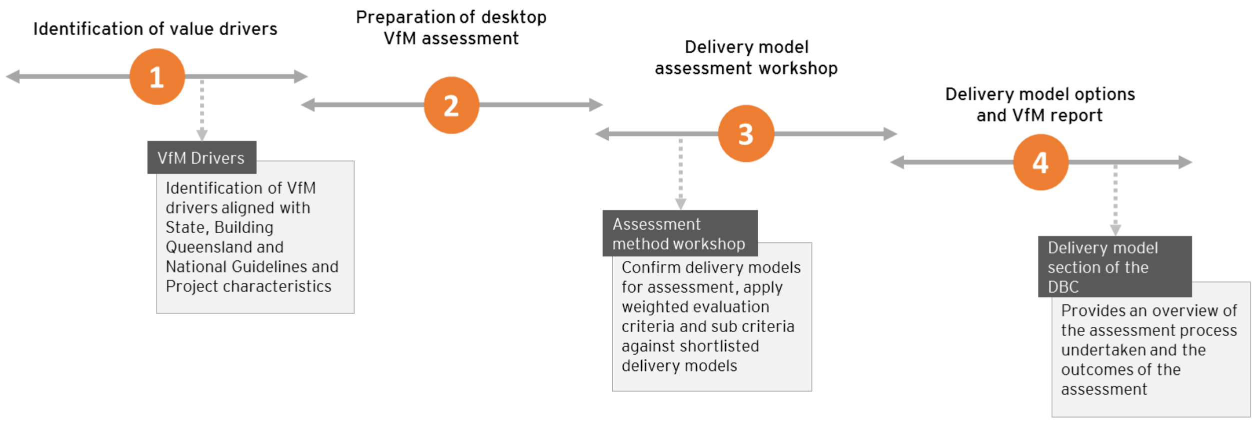
9.1 Assessment Methodology

The methodology for assessing the preferred delivery model for TEARC was prepared to build upon best practice, the work undertaken to date on TEARC and is based on State and National guidelines including:

- Queensland Government Project Assessment Framework (PAF)
- Building Queensland Framework
- National PPP Guidelines (the National Guidelines).

Figure 9.1 sets out the sequence of activities in a qualitative delivery model assessment.

Figure 9.1 Delivery Model Assessment Components



The purpose of the qualitative delivery model assessment is to subjectively test whether the objectives, service needs and proposed structure of TEARC are likely to provide the private sector with sufficient scope to access and employ the key value drivers and deliver value for money for TEARC. It tests the extent to which the value drivers are applicable to TEARC and whether the potential exists for these drivers to deliver a VfM outcome to the State under a PPP or traditional model.

A three-phase process was undertaken for the purposes of TEARC to complete the delivery model assessment:

- Phase **1: High Level VfM Assessment:**
  Identification of potentially suitable delivery models (traditional and PPP) via desktop analysis to provide focus for subsequent stakeholder workshops to undertake the qualitative assessment. This assessment considered that TEARC did not present a prima facie case for viability as a PPP project. Further details of this outcomes of this scoping are contained in Section 9.2.1.
- Phase **2: Delivery Model Methodology Workshop:**

Key stakeholder workshop to identify and agree evaluation criteria, sub-criteria and weightings to be applied to agreed delivery models. The workshop also reviewed the outcomes of the high-level scoping (Phase 1) of traditional and PPP models in the context of TEARC, and concluded that prima facie, there was no potential for VfM under a PPP model. As a result, the delivery model workshops did not assess PPP delivery models.

- Phase **3: Delivery Model Assessment Workshop:**

Key stakeholder workshop to re-confirm the evaluation criteria, sub-criteria and weightings, and perform a two-step assessment of traditional delivery model options involving a short-listing process, then evaluation of short-listed options to confirm a preferred approach.

The following key assumptions were taken into consideration during the assessment process:

- Design and construction are for TEARC only (e.g. rail line only, not including removal of existing line, port upgrades).
- Maintenance and lifecycle costs were to be undertaken by Queensland Rail given the size of TEARC relative to the rest of the network currently operated by Queensland Rail (e.g. ongoing maintenance and lifecycle replacements of below rail assets).

Table 9.1 outlines the proposed responsibilities assumed in the assessment for maintenance and operations of a Construct Only and Design and Construct delivery models.

Table 9.1 Delivery Model Assumptions and Limitations

MODEL	MAINTENANCE	OPERATIONS
Construct Only	Delivered by the State	Controlled / delivered by the State*
Design & Construct	Delivered by the State	Controlled / delivered by the State

** A private operator could be appointed by the State in accordance with existing arrangements*

9.2 VfM Assessment

The VfM Assessment is conducted to assess the suitability of a project being delivered through a PPP compared to a traditional delivery model. PPPs can deliver VfM when there is opportunity for risk transfer, whole-of-life costing and innovation, higher asset utilisation and integration of design, construction and operations.

The following section summarises outcomes of the assessment of the Phase 1a: High Level Scoping of the suitability of PPP delivery model (Section 9.2.1) and the subsequent confirmation of Phase 1a outcomes in the Phase 1b: Delivery Model Methodology Workshop (Section 9.2.3).

9.2.1 High Level Assessment of PPP Suitability

In advance of Market Sounding and Delivery Model for the DBC, a high-level assessment of VfM was carried out in order to determine whether a PPP model could be a potentially viable delivery model, and whether to include financiers in the market sounding process.

This assessment considered that TEARC did not present a prima facie case for viability as a PPP project, and therefore a high-level assessment was conducted in order to determine whether a more detailed assessment of PPP delivery models was appropriate. The prima facie case against a PPP delivery model was based on the following:

- Expected value of $300m was on the lower end of typical PPP project values. As a result, bid costs, typically in the order of $20m to $40m for a bidder, may preclude market interest in TEARC, particularly where bid costs were not reimbursed. The procurement cost for Government would also be significant relative to a traditional project.
- TEARC is of limited technical complexity, limited to a defined corridor and design and build outcomes are highly prescribed under regulation and technical specification. As such there is limited scope for innovation to drive VfM outcomes. For example, there is limited opportunity for risk transfer and therefore the performance regime would be hard to construct.
- Given the limited opportunity for risk transfer, the cost of private finance will not be justified by the transfer of systematic and project risks.
- Operations are likely to be conducted by Queensland Rail and are expected to be of very low value relative to capital costs. Therefore, there was limited scope for a PPP model to drive whole of life savings.

- The maintenance component of TEARC is limited, given the rail line length of 8 kilometres. The difficulties associated with interfacing with Queensland Rail maintenance operations on adjoining rail assets preclude any costing efficiencies from bundling maintenance with the design, construction and financing. In addition, the economies of scale are not significant enough to justify removing the maintenance and lifecycle obligations of TEARC from QR.
- There is insufficient revenue for a Build Own Operate and Transfer model or any option that involves the private sector taking market demand risk.
- Queensland Rail already manages access and charging and to carve out any revenue stream from this integrated system would be complex and potentially flawed.
- The Port of Townsville is likely to be upgraded and the existing Port Branch Rail Line may eventually be closed down. This would introduce variations for any TEARC PPP that would be difficult for the State to implement, as PPP models tend to limit post contractual close flexibility.

It was concluded that whilst a Design, Build, Finance and Maintain PPP model could offer an alternative financing solution for TEARC, it would likely deliver limited VfM benefits for the State considering it provides no additional risk transfer relative to traditional models, has limited prospect of driving increased innovation and incurs higher financing, tendering and transaction costs compared to a State funded delivery model.

9.2.2 VfM Assessment Evaluation Approach, Criteria & Scoring

The following section outlines the evaluation approach, criteria and scoring mechanism used to assess for the VfM assessment.

- Evaluation Approach

PPPs can be appropriate for projects where combining construction and operations or maintenance activities within a single project delivery contract can result in synergies or whole of life cost savings. As described in Section 9.2.1, there is a prima facie case against the viability of all PPP delivery models for TEARC.

On that basis, the VfM assessment was conducted not on a specific PPP model but on PPPs at a conceptual level, relative to traditional models at a conceptual level. Based on TEARC characteristics, objectives and outcomes sought, the following evaluation criteria were utilised during the VfM assessment.

- Evaluation Criteria

Table 9.2 identifies the VfM drivers used to compare the suitability of PPP and traditional delivery models. These drivers are derived from the PAF and the National PPP Guidelines.

Table 9.2 VfM Drivers

VFM DRIVER	DESCRIPTION
Output based service requirement encouraging innovation	▪ Does the delivery model or Project allow for setting the output, but not the means of delivery of that output (e.g. specific dimensions or engineering or fit out)? ▪ Is the output easily described and understood by bidders? ▪ Is there any scope for innovative delivery?
Risk allocation	▪ Optimal risk allocation is about allocating the potential Project risks to the party (either the public sector, or contractors) that is best placed to manage them. For instance, a construction firm that is operating a site is best placed to manage work health and safety considerations.

VFM DRIVER	DESCRIPTION
	▪ VfM is contingent upon understanding the risks and determining whether risks are better managed by the private sector under a PPP. This also requires consideration of how well risk can be transferred (built into pricing), without significant scope changes or variations. ▪ Pricing of risk requires a consideration of the premium that the private sector would likely command under a PPP project.
Whole of life costing	▪ Does integration between design, construction, operations and maintenance under PPP delivery provide the incentive to achieve lower whole of life costs? ▪ Is an efficient mix of operating and capital expenditure offered under a PPP solution? Will TEARC attract a significant operating expenditure? (This typically delivers higher value for money).
Asset utilisation	▪ Does the asset offer the opportunity to achieve additional revenue?
Competitive market	▪ Will the delivery model offer a competitive bidding process? That is, is there sufficient private market depth and market interest in TEARC?
Other factors	▪ All other factors that may arise throughout the session.

- Scoring Mechanism

The PAF, BQ Framework and National PPP Guidelines each provide alternative illustrative scoring mechanisms used to assess the scope for value generation for each assessment criteria. Table 9.3 illustrates the proposed scoring mechanism for the qualitative VfM assessment for TEARC, as described in the PAF.

Table 9.3 VfM Driver Ratings

RATING	DESCRIPTION
×	Represents no scope for value generation.
✓	Represents some scope for value generation.
✓✓	Represents reasonable scope for value generation.
✓✓✓	Represents excellent scope for value generation.

9.2.3 VfM Assessment Outcomes

The VfM assessment of traditional and PPP delivery models for TEARC is detailed in Table 9.4 to Table 9.8.

The other factors evaluation criterion was not applicable to the assessment and was recorded as "N/A" for both the PPP and traditional delivery model assessment.

Table 9.4 Output Based Service Requirements Encouraging Innovation Assessment

PPP DELIVERY	TRADITIONAL DELIVERY
▪ Uses a clear output specification to communicate the project requirement. However, the nature of TEARC limits scope for innovation in delivery.	▪ Uses a clear output specification to communicate the project requirement. However, the nature of TEARC limits scope for innovation in delivery.
▪ Development of output based specification may require larger lead times and can be complex	▪ Proponents have the potential to be motivated by price drivers, resulting in the delivery of a less innovative design.

PPP DELIVERY	TRADITIONAL DELIVERY
▪ Operations aspect not a part of TEARC limiting opportunity for innovation. Construction must be performed in accordance with highly specific QR requirements, within a defined corridor.	▪ Operations aspect not a part of TEARC limiting opportunity for innovation. Construction must be performed in accordance with highly specific QR requirements, within a defined corridor.

Table 9.5 Risk Allocation Assessment

PPP DELIVERY	TRADITIONAL DELIVERY
▪ High level of risk transfer ▪ PPP providers are incentivised to finish TEARC on time (depending upon contract form) relative to traditional delivery as a result of bearing financial obligations to financiers.	▪ Range of traditional delivery models from CO to D&C provides State with choice over who is best placed to bear relevant risks ▪ Simpler model to secure variations given the absence of financing.
▪ Premium applied for transfer of risk to the private sector, including for on time delivery and penalties for not achieving this ▪ High cost of contract variations limiting flexibility if requirements change or route extension is required ▪ Assumed that demand risk is borne by State.	▪ High level of retained risk to the public sector.

Table 9.6 Whole of Life Costing Assessment

PPP DELIVERY	TRADITIONAL DELIVERY
▪ None identified.	▪ None identified.
▪ Operations and maintenance unlikely to be bundled into Project due to small Project size and operating constraints due to QR asset ownership, so limited whole of life opportunities.	▪ Operations and maintenance unlikely to be bundled into Project due to small Project size and operating constraints due to QR asset ownership, so limited whole of life opportunities.

Table 9.7 Asset Utilisation Assessment

PPP DELIVERY	TRADITIONAL DELIVERY
▪ None identified.	▪ None identified.
▪ Potential for lack of freight demand.	▪ Potential for lack of freight demand.

Table 9.8 Competitive Market Assessment

	PPP DELIVERY	TRADITIONAL DELIVERY
	▪ PPP market is mature, although size of this Project is less likely to be of interest than others in the market.	▪ D&C market is mature ▪ Broader range of bidders, with both second-tier market participants potentially able to deliver on model.
	▪ Potential for reduced market interest due to capacity of market (e.g. significant projects currently underway in NSW and VIC) ▪ Bidding costs of $20m-40m may limit interest relative to small contract size (circa $300m).	▪ None identified.

9.3 Market Feedback

A market sounding process was undertaken to inform the TEARC procurement strategy through the packaging and delivery model analysis. The key themes arising from the market sounding include packaging, delivery model and value for money considerations.

9.4 Packaging Assessment

Following discussions on the potential benefits and challenges of packaging, it was concluded that a single packaging approach would be utilised for the purposes of the delivery model workshop.

Given the small scale, geographic localisation and limited technical complexities of TEARC and taking market sounding feedback into consideration, it was considered it would be possible to deliver TEARC as a single package to minimise interface risk, maintain competitive tension and drive the best value for money outcomes. Many market sounding participants were of the view that the scale of TEARC, at approximately $300m in value was well sized for interest by both Tier 1 and Tier 2 contractors, and that a split of works into packages would diminish market interest, given the likely low value of discrete packages. It was also considered that there was limited technical complexity associated with the build that would warrant a split by discipline.

This approach does not preclude the utilisation of sub-contractor involvement or separation of early works packages to deliver the scope of work. Most market sounding participants identified that public utilities and plant and preloading works may be delivered as early works packages.

9.5 Traditional Delivery Model Assessment

The following section summarises outcomes of the assessment of different traditional delivery model options undertaken as part of the Phase 1b: Delivery Model Methodology Workshop and Phase 2: Delivery Model Assessment Workshop.

9.5.1 Evaluation Approach, Criteria & Scoring

The following section outlines the evaluation approach, criteria and scoring mechanism used to assess traditional delivery model options.

- Evaluation Approach

The Delivery Model Assessment Workshop included a two-step approach to evaluate the suitability of different traditional delivery model options. This involved:

- Options Scoping and Shortlisting:
  High level scan of potential traditional delivery models including investigation of different options for alliances, design, construction and operate and maintenance (Refer Section 9.5.2).
- Short List Detailed Assessment:
  Detailed evaluation of short-listed options against the endorsed evaluation criteria (Refer Section 9.5.3).
- Evaluation Criteria for Short Listed Detailed Assessment

The evaluation criteria were initially developed and endorsed by workshop participants at the Delivery Model Methodology Workshop and later reconfirmed at the Delivery Model Assessment Workshop.

The criteria have been tailored to take into consideration the scope, key risks, stakeholders, timing, financial issues and policy matters specific to this Project. At the Delivery Model Methodology Workshop, a “build outcomes” sub criterion was originally included in the “Quality” criterion, with a weighting of 6%. During the subsequent Delivery Model Assessment Workshop, participants decided to remove this sub criterion, on the basis that build outcomes were prescribed under each contract model, and therefore there was no means to differentiate delivery models. The 6% weighting applied to that sub criterion was transferred to the “Design outcomes” sub criterion, reflecting participant’s views that design outcomes would be a significant point of difference between the delivery models

The evaluation criteria used for the delivery model assessment is outlined in Table 9.9.

Table 9.9 Delivery Model Scoring Mechanism

CRITERIA	SUB-CRITERIA	CONSIDERATIONS	WEIGHTING
Cost (70%)	Capital costs (60%)	▪ Competitive tension ▪ Innovation on cost ▪ Price certainty (at contract award).	42%
	Transaction and contract management (5%)	▪ Reduced capital, transaction and contract management costs.	3.5%
	Lifecycle and maintenance costs (5%)	▪ Competitive tension ▪ Reduced operations and maintenance costs ▪ Innovation on cost ▪ Price certainty (at contract award).	3.5%
	Risk transfer (30%)	▪ Potential for ‘gaps’ in responsibilities ▪ Optimised risk allocation ▪ Interface risk outcomes (delivery model) ▪ Interface risk outcomes (operations).	21%
Quality (30%)	Design outcomes (60%)	▪ Potential to upgrade/expand ▪ Innovation in design.	18%
	Timeliness (20%)	▪ Ability to meet required timeframe ▪ Procurement period ▪ Development period ▪ Certainty of timing.	6%
	Flexibility and stakeholder control (20%)	▪ Expansion / variations over construction period	6%

CRITERIA	SUB-CRITERIA	CONSIDERATIONS	WEIGHTING
		▪ Responding to changing operational requirements / incidents ▪ Stakeholder control on design and construction ▪ Stakeholder control on maintenance.	

Overall, workshop participants concluded that due to TEARC's limited technical complexity, relatively small scale, and low level of interface risks with operating elements of the rail and port networks, and reasonably long project lead time (2018-2022), cost would be the primary driver of the delivery model consideration. Quality related sub-criteria were weighted lower overall, given the highly prescriptive nature of TEARC design and build, which precluded significant design innovation and the need for substantial ongoing stakeholder control, and the generous timeframe for delivery, which limited the relative importance of timeliness in project delivery. As a result, "Cost" related sub criteria including capital costs and appropriate risk transfer were considered to be the primary drivers of differentiation between delivery models. Transaction costs, contract management and lifecycle and maintenance cost sub-criteria were considered of lesser importance, given their likely low-cost implications for TEARC in relative terms to capital cost.

- Scoring Mechanism for Short Listed Detailed Assessment

The PAF, Building Queensland Framework and National PPP Guidelines each provide alternative illustrative scoring mechanisms used to assess the scope for value generation for each assessment criteria.

Table 9.10 illustrates the scoring mechanism agreed during the Delivery Model Methodology workshop for the delivery model analysis for TEARC.

Table 9.10 Delivery Model Scoring Mechanism

RATING CRITERIA	RATING
Delivery model option satisfaction of the criterion is very high	5
Delivery model option satisfaction of the criterion is high	4
Delivery model option satisfaction of the criterion is neutral	3
Delivery model option satisfaction of the criterion is low	2
Delivery model option satisfaction of the criterion is very low	1

9.5.2 Traditional Delivery Model Options (Long List)

Table 9.11 outlines the justification for short-listing the preferred traditional delivery models, where they underwent further assessment on their ability to deliver value for money outcomes for the State.

Table 9.11 Traditional Delivery Model Long List

DELIVERY MODELS	SHORTLISTED	JUSTIFICATION FOR PROGRESSION TO SHORT LIST
Alliance	×	Workshop participants considered that the lack of project complexity, highly prescribed design and build outcomes and limited interface risks, particularly given the low volumes of freight at the connection point to the existing rail network did not lend themselves to a risk sharing arrangement such as an Alliance model. Market sounding feedback also suggested that an Alliance model was not appropriate for TEARC.
Construct Only (CO)	✓	Workshop participants agreed to shortlist the CO model to undergo further assessment. This was due to the view from the market

		sounding process that this may be a viable candidate for project delivery, given TEARC's lack of technical complexity, highly prescribed design and build outcomes and limited interface risks.
Design & Construct (D&C)	✓	Workshop participants agreed to short list the D&C model to undergo further assessment. This was due to the view from the market sounding process that this may be a viable candidate for project delivery, given TEARC's lack of technical complexity, highly prescribed design and build outcomes and limited interface risks.
Design & Construct plus Operate (DC+O)	×	A DC+O was considered not to provide value for money, as operations were expected to be undertaken by QR given the scale of TEARC relative to the rest of the QR operated network.
Design, Construct and Maintain (DCM)	×	A DCM was considered not to provide value for money if it were included in the procurement process, as maintenance was expected to be undertaken by QR given the scale of TEARC relative to the rest of the QR maintained network.
Design, Construct, Maintain and Operate (DCMO)	×	A DCMO was considered not to provide value for money if it were included in the procurement process, as maintenance and operations were expected to be undertaken by QR given the scale of TEARC relative to the rest of the QR operated/maintained network.
Managing Contractor (MC)	×	Workshop participants considered that the Managing Contractor model was not appropriate for TEARC. Managing Contractor models are best suited to agencies who have limited in-house capability to oversee project delivery. TMR, the agency likely responsible for contract management, has significant in-house capacity to deliver projects and manage contractors. Further, TEARC is considered not technically complex, primarily greenfield construction in nature, and has highly prescribed design and build outcomes with limited interface risks, further simplifying the contract management process. This conclusion was supported by the outcomes of the market sounding process.

9.5.3 Traditional Delivery Model Options (Short List Detailed Assessment)

Two traditional delivery model options were taken forward to the shortlist for detailed evaluation against the pre-agreed evaluation criteria. These included:

Construct Only (CO)

Design and Construct (D&C)

- Construct Only

The CO delivery model, as depicted in Figure 9.2, involves a construction contractor contracted under a lump sum / fixed price arrangement for the delivery of project construction. As part of the CO delivery model, design, performance and quality requirement specifications are developed prior to procurement, with changes in possession regimes and scheduling potentially causing contractual variations.

Figure 9.2 Construct Only Delivery Model

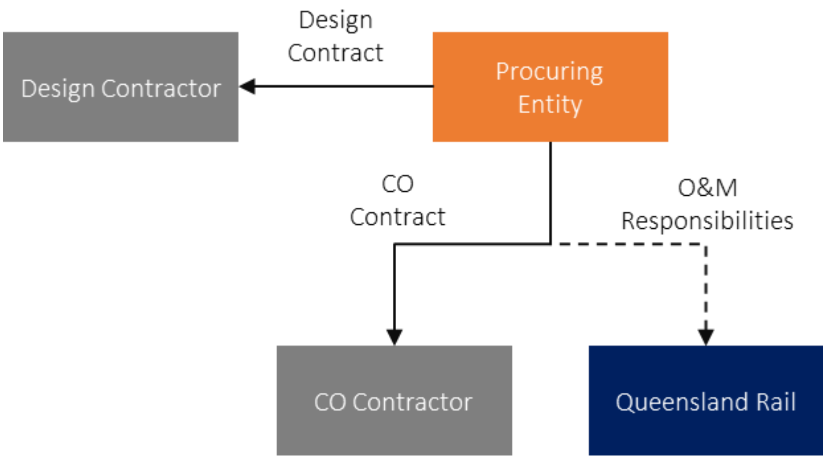


Table 9.12 sets out the advantages and possible challenges in applying the CO delivery model in the context of TEARC.

Table 9.12 Construct Only Delivery Model Advantages and Disadvantages

ADVANTAGES	DISADVANTAGES
▪ Procuring entity retains more control over design outcomes and quality compared to D&C. This would allow QR/State to drive the design and reduce the integration risk for existing operations ▪ Simple for market to understand and tender and doesn't requires any contractor to team with a design expert, which would likely increase tenderer competition ▪ Competitive market exists as both Tier 1 and Tier 2 contractors would tender based on market sounding feedback ▪ Reduced pricing risk for contractors, as risks would be more clearly identified through the design process.	▪ Procuring entity retains design risk ▪ Having procuring entity as the sole input into the design may drive less optimal value for money outcomes as innovation and new techniques may not be sufficiently considered ▪ Longer lead time for procurement through separate design and construct procurement processes.

- Design and Construct

The D&C delivery model involves a D&C contractor been contracted under a lump sum / fixed price arrangement for the preparation of detailed design and project construction. As part of the D&C delivery model, performance and quality requirement specifications are developed prior to procurement, with changes in design / possession regimes and scheduling potentially causing contractual variations.

Figure 9.3 D&C Delivery Model

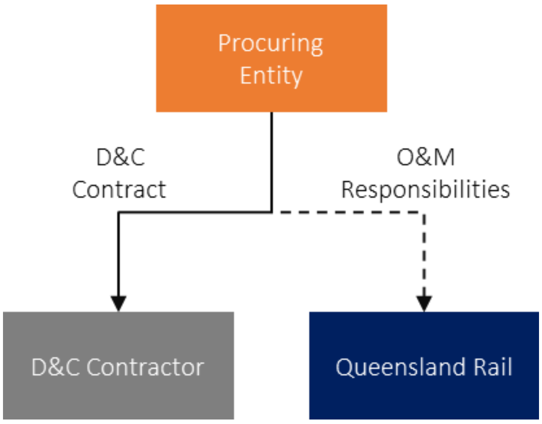


Table 9.13 sets out the advantages and possible challenges in applying the D&C delivery model in the context of TEARC.

Table 9.13 D&C Delivery Model Advantages and Disadvantages

ADVANTAGES	DISADVANTAGES
▪ Contractor has the opportunity to contribute construction experience into the design, resulting in innovation and efficiencies ▪ Single point of accountability for design and construction ▪ Fast track - time saving because construction can commence ahead of full design documentation (provided there is adequate control over design quality) ▪ Contractor normally warrants design, including 'fitness for purpose'.	▪ Principal may pay a premium to transfer design risks to the contractor ▪ Doesn't allow procuring authority to input into the design past following the design brief, unless it seeks a post contract variation ▪ Requires in-house design expertise or for a contractor to subcontract to a designer ▪ Procuring authority doesn't get the opportunity to separately choose the 'best' designer and the 'best' contractor.

9.5.4 Traditional Delivery Model Assessment

Under all traditional delivery models, funding is provided by the public sector and the asset is transferred back to the State at the end of the construction period. The following section summarises the assessment of each selected traditional delivery model against the evaluation criteria.

Table 9.14 and Table 9.15 detail the assessment of Construct Only and Design and Construct delivery models.

Table 9.14 Construct Only Delivery Model Evaluation

CRITERIA	SUB-CRITERIA	ASSESSMENT	EVALUATION
Cost	Capital cost	(+) CO model provides fixed price contractual arrangements and good value for money where the scope is defined and set. (+) Higher competition from Tier 2 contractors may drive better pricing. (-) Full consideration may not be given to construction alignment during design, although this is not considered likely due to the highly prescriptive nature of the regulation and specifications governing TEARC, the fixed corridor and the low technical complexity of the build.	5
	Transaction and contract management costs	(+) CO model has a simple contractual structure that is well understood by the market. (-) Procuring entity needs to procure design separately, which may increase the time taken and add complexity and cost to TEARC, although the design is of limited technical complexity and offers little scope for innovation.	4
	Lifecycle and maintenance costs	(-) CO model is unlikely to incentivise consideration of lifecycle and maintenance cost. (-) Procuring entity still retains the whole-of-life asset risk.	3
	Risk transfer	(+) The procuring entity is able to transfer construction, pricing and timing risks to the contractor. (-) Procuring entity retains design risk. (-) Risk of change in scope post CO award lies with procuring entity. (-) Generically, the procuring entity may not be the most suitable party to manage design-construction-operations interface risk, however, this is offset by TMR's experience in projects of this nature, and the relative technical simplicity of TEARC.	3
Quality	Design outcomes	(+) Procuring entity retains control over design outcomes and quality, which may be relevant to later upgrade and expansion projects affiliated with TEARC. (-) CO model restricts ability for the contractor to innovate due to limited nature of the scope, however, there is limited scope for innovation due to the nature of TEARC. (-) Delinking operations and maintenance contracts removes the opportunity to achieve whole-of-life benefits.	4
	Timeliness	(+) Prescriptive design provides certainty for project delivery. (+) Ability to pay to accelerate construction (-) decoupling design and construction potentially limits efficiencies in construction scheduling.	4

	Flexibility and stakeholder control	(+) Procuring entity retains control of performance and quality requirement specifications. (+) Single point of accountability through construct period. (-) Limited flexibility to adapt to changes in Project requirements – e.g. change in scope, staging.	3

Table 9.15 D&C Delivery Model Evaluation

CRITERIA	SUB-CRITERIA	ASSESSMENT	EVALUATION
Cost	Capital cost	(+) D&C model provides fixed price contractual arrangements and good value for money where the scope is defined and set. (-) May ultimately pay more given bundled design and construction and potential premium and profit margin charged by private sector designers.	4
	Transaction and contract management costs	(+) D&C model has a simple contractual structure, very common and well understood by the market. (-) Shortage of D&C contract administrators may reduce efficiency of contract management under this delivery model. (-) Greater role for contract administrator requiring additional resources, given inclusion of deign component.	3
	Lifecycle and maintenance costs	(-) D&C model is unlikely to incentivise consideration of lifecycle and maintenance cost. (-) Procuring entity still retains the whole-of-life asset risk.	3
	Risk transfer	(+) The contractor manages the risk of design and design-construction coordination. (+) The procuring entity is able to transfer pricing and timing risks to the contractor. (-) Risk of change in scope post D&C award lies with procuring entity. (-) Procuring entity may pay a premium to transfer design risk to contractor. (-) Procuring entity may not be the most suitable party to manage construction-operations interface risk, however, this is offset by TMR's experience in projects of this nature, and the relative technical simplicity of TEARC.	4
Quality	Design outcomes	(+) Contractor normally warrants design including 'fitness for purpose' of asset. (-) Procuring entity may not have adequate control over design outcomes and quality, which may be relevant to later upgrade and expansion projects affiliated with TEARC. (-) Delinking operations and maintenance contracts removes the opportunity to achieve whole-of-life benefits. (-) Nature of TEARC precludes significant opportunities to drive innovation through design.	4
	Timeliness	(+) Certainty of time due to warranties and guarantees on performance. (+) Onus on the contractors to effectively manage delays and technical risk in D&C interfaces.	3

		(-) Required scope variations to optimise whole-of-life considerations may increase project design and construction period. (-) Longer tender period is needed to allow tenderers to assess design risk.	
	Flexibility and stakeholder control	(+) Procuring entity retains control of performance and quality requirement specifications. (+) Single point of accountability through design and construct period. (-) Limited flexibility to adapt to changes in Project requirements – e.g. change in scope, staging.	3

9.5.5 Preferred Traditional Delivery Model

The overall value generation scores for the traditional delivery models are summarised in Table 9.16.

Table 9.16 Traditional Delivery Model Assessment Summary

EVALUATION CRITERIA AND WEIGHTING	CO SCORE UNWEIGHTED	CO SCORE WEIGHTED	D&C SCORE UNWEIGHTED	D&C SCORE WEIGHTED
Capital cost (42%)	5	**2.10**	4	**1.68**
Transaction and contract management costs (3.5%)	4	**0.14**	3	**0.11**
Lifecycle and maintenance costs (3.5%)	3	**0.11**	3	**0.11**
Risk transfer (21%)	3	**0.63**	4	**0.84**
Design outcomes (18%)	4	**0.72**	4	**0.72**
Timeliness (6%)	4	**0.24**	3	**0.18**
Flexibility and stakeholder control (6%)	3	**0.18**	3	**0.18**
Weighted overall score	**N/A**	**4.12**	**N/A**	**3.81**

Based on the traditional delivery model assessment undertaken, it may be concluded that there is only marginal difference between the two delivery models assessed. Both models provided neutral or better alignment to all sub criteria. Notwithstanding that CO was computed as the more viable delivery model, it is arguable that TEARC could be delivered under either model and achieve similar value for money for the State.

Primary and secondary differentiators (by weight) were as follows:

- CO scored “very high” under the capital cost sub criterion relative to D&C, which scored “high”. Workshop participants agreed that TEARC scope reflected minimal opportunity for design innovation to drive improved value for money, given the highly defined corridor, prescriptive regulation over design/build specifications and low technical complexity of TEARC. As such, it was considered that D&C would afford no significant advantage over CO in respect of delivering a lower price, whereas construct only would likely drive the highest competitive tension between bidders. This was the primary driver of differentiation between delivery models, given the 42% weighting applied.
- CO scored “neutral” under the risk transfer sub criterion relative to D&C, which scored “high”. Workshop participants agreed that CO created a new interface between design and construction, and left the State to manage design risk, CO was viewed as scoring lower than D&C. Both models also create interface risk with operations and maintenance. This was the secondary driver of differentiation between delivery models, given the 21% weighting applied

Other, less heavily weighted differentiators included:

- CO scored "high" under the transaction and contract management costs sub criterion relative to D&C, which scored "neutral". Construct only was expected to cost less to procure due to the lack of requirement to develop and run a tender process for the design component, and the shorter procurement lead-time. In addition, it was observed that there was a shortage of skilled D&C contract managers relative to CO contract managers, which may have implications for the efficiency of the contract management process.
- CO scored "high" under the timeliness sub criterion relative to D&C, which scored "neutral". The workshop participants were of the view that CO, given the prescriptive nature of the procurement, allowed most flexibility to ensure project delivery by a specific date, assuming willingness to pay for accelerated delivery.

Whilst both models scored the same on Design Outcomes, which on its face is unusual given the lack of design component in the CO model, workshop attendees considered that the scope of TEARC provided very little opportunity for innovation in design to differentiate bids. As such, it was viewed that there was little to differentiate the models. CO scored highly as the State retained ability to influence design, which was considered important in the context of associated projects, including upgrades to the PoT and the existing North Coast Line.

9.6 Conclusions and Recommendations

9.6.1 Packaging

As highlighted previously, the TEARC Project Team considered the preferred approach to deliver TEARC would be as a single package, to minimise interface risk, maintain competitive tension and drive the best value for money outcomes.

9.6.2 Delivery Model Assessment Results and Recommendation

The delivery model assessment concluded that CO was the preferred delivery model. Notwithstanding that there is not a significant difference between the CO and D&C delivery models in respect of potential value for money delivered to the State, and either model is likely to be a viable choice for delivering TEARC. In addition, the market sounding process confirmed that the market would be equally content to bid for either a D&C or CO delivery model.

It must be noted that the qualitative delivery model assessment had been conducted at a 'point in time' (mid 2017) and concluded a D&C model would suffice for the project. This was carried out to allow the development of the construction program and the cost estimate for the DBC and it was decided to retain the D&C model for the cost estimate purposes. The delivery model workshop was attended by the project cost estimator thus utilising the delivery model assessment to conduct a final check of the program and estimate. The delivery model selection did not impact the design of the Reference Project.

The timeframe for procurement to commence is late 2018 and in the intervening period between delivery of this DBC and procurement, the market conditions may change. It is therefore recommended that additional market engagement be conducted at a later date to confirm the appropriate delivery model for project delivery.

9.6.3 Outcomes of the VfM Assessment

The results of the VfM assessment concluded that a PPP Delivery Model of any form was unlikely to deliver a VfM outcome for the State relative to a traditional model. Key differentiators were the lack of opportunity for a PPP model to drive innovation, which would be required in order to offset the higher financing costs associated with PPP models. It was further expected that market interest in TEARC from the PPP market would be limited, whereas the interest from the traditional market was expected to be significant, as confirmed by market sounding.

The results of this VfM assessment were discussed and agreed with participants at the Delivery Model Methodology and Delivery Model Assessment Workshops. Workshop participants concluded that further analysis of individual PPP delivery models was highly unlikely to result in improved VfM outcomes for the State. A Public Sector Comparator assessment is not required as the delivery of the project via a PPP is not viable.

10 MARKET CONSIDERATIONS

CHAPTER SUMMARY AND CONCLUSIONS:

- Market sounding for the TEARC Project (referred to as TEARC) was undertaken in July and August 2017.
- The market considered TEARC could be delivered as a single package, or split into early works and a primary package.
- The market considered TEARC could be delivered either through a traditional design and construct, or construct-only delivery model.
- The market and other interested parties considered TEARC would not provide Value for Money (VfM) if delivered through a Public Private Partnership (PPP) model due to a lack of scale and limited scope for innovation. A Public Private Partnership would normally allow some risk transfer to the contractor.

In line with Building Queensland's Business Case Development Framework (BCDF) and the Queensland Government's Project Assessment Framework (PAF), a market sounding process was undertaken to inform TEARC's procurement strategy through the packaging and delivery model analyses.

Market sounding is the process of engaging with industry to improve delivery outcomes of a proposed project. It is an opportunity to seek the market's feedback to facilitate development of a procurement strategy that addresses market interest and participation, delivers VfM and appropriately allocates and manages risk.

The purpose of this chapter is to document the objectives, approach and outcomes of the Detailed Business Case market sounding process, including the results from the market sounding interviews and questionnaire responses.

10.1 Market Sounding Objectives

The key objective of the market sounding process will be to seek market feedback on TEARC to enable a procurement strategy to be developed that will generate market interest, deliver value for money and appropriately allocate and manage risk.

This includes obtaining feedback from participants on:

- package structure (single versus multiple packages, potential early works)
- market interest (given the downturn in the mining sector)
- delivery models
- freight demand (raw tonnage)
- project interfaces with North Coast Line at Cluden, Townsville State Development Area and Port of Townsville
- interaction of the policy and regulatory and regulatory environment with port and rail operations procurement timetable.

10.2 Market Sounding Approach

A market sounding methodology was developed during July 2017 to outline the market engagement approach that was implemented. The methodology recommended a two-stage process:

1. one-on-one interviews, whereby a meeting was arranged (approximately one hour in length) to discuss a set of questions with the participants, with notes taken during the meetings
2. optional written questionnaire involving the same questions used in the one-on-one interviews, which was sent out (prior to the interviews) to the participants and requested to be completed by 4 August 2017.

The substance of the market sounding differed depending on the type of stakeholder. Contractors received a different questionnaire to other interested parties, reflecting their differing roles and interests in TEARC.

10.2.1 Documentation

Prior to the one-on-one interviews, the participants were provided with a briefing pack that outlined:

- objectives of the market sounding process
- background to the TEARC Project
- project scope
- questionnaire.

The questionnaire covered the following topics:

- contract packages and delivery models
- bidding process
- programme and process
- interface and risks
- pricing and regulatory policy
- other considerations.

10.2.2 Participants

The methodology identified a total of 21 potential industry participants for the market sounding process based on the following criteria:

- appetite for civil and rail projects with a substantial size, scale and complexity
- activity within the Australian civil and rail construction or operations and maintenance market
- market knowledge
- other interest in TEARC.

A shortlist of twelve potential industry participants were selected for one-on-one interviews based on the following criteria:

- balance of domestic, international and tier two contractors
- balance of operations experience in the existing regulatory and pricing policy environment
- interest in shortlisting or success in recent Queensland projects

- interest in TEARC
- recent relevant project won.

Eleven of the twelve shortlisted industry participants responded to the invitation to participate in the market sounding process.

10.3 Market Feedback

Outlined below is a summary of key themes arising from the market sounding interviews and written responses received from the industry participants. The themes are summarised into the primary market sounding topics. Market sounding topics were contract packages and delivery models, bidding process, programme and process, interface and risks and other for contractors while the topics for other market sounding participants were contract packages and delivery models, bidding process, interface and risks, pricing and regulatory policy and other.

10.3.1 Contract Packages and Delivery Models – Contractors and Others

The lack of scope for innovation and conservative risk profile of TEARC were key characteristics that shaped the themes of the discussion for contract packages and delivery models.

Table 10.1 summarises the themes related to contract packages and delivery models.

Table 10.1 Contract packages and delivery models

THEME	DESCRIPTION
Packaging	Most participants noted the potential for early works to be packaged separately to the civil and track laying works. Many participants were of the view that QR may have an appetite to undertake some part of TEARC and track laying and signalling would be the appropriate components to be packaged for QR to perform. It was noted that the importance of including civil works and track laying in the same package as this would remove interface risk regarding unnecessary lags in possession and allow the line to be progressively built, ensuring more timely delivery. Other possible packaging options contemplated, such as a split between the road and rail components, or a geographical split, were not considered to be able to deliver value for money.
Early works	It was noted that an early works package consisting of activities such as pre-loading of the site and reconfiguration of public utilities and plant (PUP) for subsequent construction of the rail line could be split from the primary works package of rail line construction. Most participants noted this early works package could be led by a local contractor that could form a joint venture with a proponent. Tier 1 contractors noted they could undertake the early works package and sub-contract to a local contractor to enable a single package and reduce interface risk.
PPP consideration	Participants noted the defined corridor for alignment and relatively short length of the track as key factors that suggested a PPP was not appropriate to drive VfM. In addition to bid costs relative to Project size, these factors were referenced to discredit further consideration of a PPP delivery model.
Operations and maintenance	All participants noted operating the rail line was not economically feasible given the scale of TEARC and the likely duplication of QR systems. Some participants noted they would consider maintenance if the maintenance of the Mount Isa Rail Line was included in the scope of TEARC and one noted they would consider operations and maintenance but did not identify any value they could offer the State in doing so.

THEME	DESCRIPTION
Design and/or construction	The two components of TEARC identified by some participants as having some degree of complexity were the soil composition and the bridge across the Ross River. Some participants noted these two components justified the delivery of TEARC as a design and construct contract while others noted that regulatory specifications and requirements negated any potential for design innovation in these two components and a construct-only construct would be optimal. Broadly, participants noted difficulty in differentiating between the value a construct-only delivery model would offer compared to a design and construct delivery model. The most commonly preferred delivery model was design and construct. Some participants noted that from a non-project specific perspective, construct-only would result in poor quality and an over-emphasis on the least costly bid in tender evaluation.
Other delivery models	Participants expressed the need for a collaborative approach. Most participants were of the view that collaboration could best be facilitated through the use of early contractor, or tenderer involvement procurement methods.
QR involvement	Many participants expressed the view that QR may wish to undertake the entire scope of TEARC and all requested clarification of QR's position.

10.3.2 Bidding Process – Contractors and Others

There was limited variance in views regarding the optimal bidding process.

Table 10.2 summarises the themes related to the bidding process.

Table 10.2 Bidding process

THEME	DESCRIPTION
Lead procurement agency	While participants expressed confidence in TMR's ability to lead TEARC's procurement, some participants noted this would create an additional interface with QR.
Collaborative procurement	All participants strongly supported the use of a collaborative procurement method with most preferring competitive early tender involvement with bid reimbursement for the unsuccessful tenderer if a design and construct delivery model was used.
Appetite to bid	All contractors expressed a strong appetite to bid for TEARC.

10.3.3 Programme and Process - Contractors

A variety of views on future market conditions and their impact on TEARC and the proposed programme were expressed.

Table 10.3 summarises the themes related to programme and process.

Table 10.3 Programme and process

THEME	DESCRIPTION
Delivery timeframe	Notwithstanding possible delays in procurement and delivery such as weather events, many participants noted there was scope for TEARC to be delivered prior to the completion date in 2022, given commencement in late 2018.
Market capacity	The local and national market's capacity during delivery produced varying views. Most Tier 2 contractors and some Tier 1 contractors noted somewhat similar potential projects including Inland Rail, Galilee Rail, Melbourne Metro and Cross River Rail may monopolise resources in a national context while somewhat similar projects that could be categorised as local such as the Townsville Stadium and Haughton River and Pink Lily Lagoon Upgrade projects may do so in a local content. Of the participants that were of the view that these projects would affect market capacity, all noted that capacity constraints would affect price rather than appetite to bid. Some contractors noted that from a local perspective, the Townsville Stadium and Haughton River and Pink Lily Lagoon Upgrade projects would require labour with a different skill set to that of TEARC while other participants were of the view that there would competition for local labour to some extent While views on the market's capacity during delivery varied, all participants noted that uncertainty regarding future projects, market and economic conditions required continued market engagement.

10.3.4 Interface and Risks – Contractors and Other

Integration with the existing rail network and surrounding infrastructure shaped the key themes of the discussion of interface and risks.

Table 10.4 summarises the key themes related to interface and risks.

Table 10.4 Interface and risks

THEME	DESCRIPTION
Key risks	Participants were generally of the view that risks in design were mitigated by existing rail regulation and could be further reduced through a collaborative procurement process. Risks in delivery and operation were also viewed as negligible due to the relative simplicity of TEARC, lack of existing or future passenger services, relatively low freight traffic volumes and the contractor market, TMR and QR's sophisticated understanding of TEARC and experience with similar projects.
Interface with the existing rail network	Some participants identified rail signalling and interface with the existing network as a possible area of complexity however QR was strongly of the view that it would undertake these works.

10.3.5 Pricing and Regulatory Policy – Others

Participants provided key insights into competition between road and rail for freight and the implications of the broader policy environment for road and rail regulation and pricing for TEARC.

Table 10.5 summarises the key themes related to pricing and regulatory policy.

Table 10.5 Pricing and regulatory policy

THEME	DESCRIPTION
Road and rail regulation	Participants noted the disparity in cost-recovery mechanisms for road and rail routes that compete for freight cargo. Discussion centred on the collective cost recovery for road use, while rail use costs were individually recovered through a far more prescriptive regulatory regime.
Road and rail pricing	The use of long-term take or pay contracts that required not only user profitability but balance sheet strength for rail was identified as a key factor that reduced rail's competitiveness compared to relevant road routes. In the context of a changing resources sector in the North-West Minerals Province that has an increasing number of relatively small mining entities that often required ad hoc services, these commercial arrangements acted as a key barrier to the use of rail. Some participants noted that an appropriate access charge framework was needed, as they would be concerned if a separate set of rail access charges for the Port of Townsville was established. It was suggested that pricing and access terms and conditions be determined in a manner consistent with the regime for the Mt Isa Line and the North Coast Line.
Whole of supply chain infrastructure	While road and rail regulation and pricing was noted as an area that could be further investigated for reform to increase the efficiency of freight movements and provide societal benefits, whole of supply chain infrastructure planning was also noted as key to facilitating a modal shift from road to rail for freight cargo. Better planning and prioritisation of infrastructure such as intermodal hubs to alleviate last mile constraints associated with rail would be part of this solution.

10.3.6 Other – Contractors and Others

Participants expressed consistent views on the long-term economic contribution of TEARC and TEARC's role in addressing Queensland's current and future economic challenges.

Table 10.6 summarises the key themes related to other matters.

Table 10.6 Other

THEME	DESCRIPTION
Local content	Local content was a focus of the packaging, delivery model and project delivery discussions. Participants noted the cost-effectiveness of using local sub-contractors in the Townsville region that had a high degree of capability for projects such as TEARC. If an early works package of pre-loading and PUP reconfiguration were used, participants noted it was highly likely a local contractor would bid for this role and contractors would joint venture with them.
Economic enablement	While participants noted TEARC might currently have limited demand, its role in enabling the economic development of the region was a consistent theme. Participants viewed the relatively small piece of rail infrastructure as playing a key role in improving logistics to the port and providing an ongoing opportunity for economic growth in a northern region that is a strategic priority for the federal and State governments.

10.4 Summary and Conclusions

All construction sector market sounding participants indicated a strong interest to participate in TEARC. Some participants noted the timing relative to comparable projects may marginally affect market capacity and bid prices, but would not affect appetite to bid. Some participants contemplated an early works packaging consisting of activities such as reconfiguration of PUP and pre-loading of the site. There was no consensus on this packaging split with Tier 1 contractors generally viewing TEARC as best procured as a single package.

Participants noted the lack of scope for innovation in design and lack of scale or network synergies that could deliver value for money by tendering operations and maintenance. While the majority of contractors preferred a design and construct delivery model, other participants including QR, TMR the Port of Townsville and some Tier 2 contractors noted the lack of differentiation between a construct-only and design and construct delivery model in the context of TEARC. All participants identified the need for a collaborative procurement process with dual competitive early contractor involvement with bid reimbursement being the preferred method. All participants noted QR's proposed involvement as a key matter for resolution as the packaging and delivery model assessment progresses.

Participants were of the view TEARC could be delivered within the timeframe allocated regardless of ambiguity with regard to commencement. Views on market capacity within this timeframe varied with some participants noting possible constrained capacity, some noting a perception of constrained capacity with varying skill sets required negating any constraints and some noting the high utilisation of the market could produce synergies. Outside of generic risk categories (i.e. force majeure), no project specific risks were identified as having a need for management through the procurement strategy taken to market.

Structural issues relating to road and rail pricing and regulation were noted, as the primary reason TEARC would not be the catalyst for a modal shift from road to rail for freight cargo.

11 LEGAL AND REGULATORY APPROVALS ASSESSMENT

CHAPTER SUMMARY, RECOMMENDATIONS AND CONCLUSIONS:

The existing legal and regulatory regime provides a framework that would allow the Department of Transport and Main Roads (TMR) to deliver Townsville Eastern Access Rail Corridor (TEARC).

- One of the key risks for TEARC will be issues in relation to land, particularly those specified in sections 11.1.6 (Land Acquisition), 11.1.7 (Native Title) and 11.1.8 (Aboriginal Cultural Heritage). Provided these issues are proactively managed, there are no particular concerns in relation to these land risks. The planned and unplanned risk provisions have made allowances for these risks.
- TMR has the power to negotiate to purchase land required for TEARC, or compulsorily acquire land under the *Transport Planning and Coordination Act 1994* (Qld) (TPC Act) and the *Acquisition of Land Act 1967* (Qld) (AL Act).
- An analysis of all of the properties impacted by TEARC will need to be carried out, with a view to ascertaining whether native title continues to exist.
- TMR will need to ensure there is compliance with the cultural heritage duty of care, including that there is no unlawful harm to Aboriginal cultural heritage. There are well understood strategies to address these issues.
- Subject to technical assessments, referral of TEARC under the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act) is recommended to provide certainty for TEARC, including providing protection from a future listing event.
- Regulatory approvals may be required for the construction, delivery and operation of TEARC (Table 11.1). In addition to the EPBC Act approval, approvals are likely to be required as construction proceeds, and will not be required before construction starts.
- Construction contracts will need to be carefully prepared to ensure the Principal Contractor has management and control over the workplace on which any physical works are carried out so that it has the primary work health and safety obligations, as outlined in Section 11.1.4.
- A key consideration for managing the costs and impacts of TEARC is the protection of the corridor from surrounding incompatible development. The fact the majority of TEARC is located within the TSDA provides some protection against proposed development on the corridor as any application for a material change in use will have to be approved by the Coordinator-General. There are a number of measures which may be taken to protect the corridor including community infrastructure designation, gazettal of land as “future railway land” under the TI Act and inclusion of that part of the corridor within the Port of Townsville in the master plan and port overlay.

This chapter outlines the key legal and regulatory issues and risks, identified by Clayton Utz, which will need to be considered and managed for TEARC including:

- legislative issues pertaining to planning approvals, environmental legislation, industrial relations, land acquisition, native title and cultural heritage
- approvals required to be considered and completed
- other legal matters relating to procurement and delivery.

11.1 Legislative issues

11.1.1 Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act)

The Australian Minister for the Environment has previously determined the earlier Townsville Port Access Road and Rail Project, Eastern Access Corridor (reference number 2003/1011) was a "controlled action" and assessment and approval under the EPBC Act was required.

Although the rail alignment was referred, the assessment and approval is for the road component only. A new referral may be required to determine whether the TEARC is a "controlled action" requiring assessment and approval under the EPBC Act.

The requirement for a referral depends on whether TEARC is likely to have a significant impact on a 'matter of national environmental significance' (MNES).

The TEARC Detailed Business Case (DBC) Environmental Assessment Report dated August 2017, concludes that referral of TEARC is likely as the previous referred project did not include the rail alignment (only road) and the site may contain the following MNES:

- 1 threatened ecological community
- 41 Listed Threatened Species
- 63 Listed Migratory Species.

The Report also notes that TEARC is proximate to the Great Barrier Reef Marine Park (2.3 km) and Bowling Green Bay, a Ramsar Wetland, which are also MNES.

It will need to be assessed whether the potential impacts of TEARC on MNES require a referral.

To mitigate the risk of delay to TEARC including providing protection from a future listing event (as defined in the EPBC Act, which includes a new species being listed), referring TEARC under the EPBC Act to the Federal Minister for Environment and Energy is recommended.

If a referral is made and TEARC is determined to be a 'controlled action', then an environmental assessment process will need to be followed under the EPBC Act. If approved, the approval conditions will likely require the preparation of management plans for approval by the Federal Minister for the Environment and Energy and requirements for direct offsets. Active management of this process will be required to ensure it does not delay TEARC timetable.

As stated in chapter 13 (Environmental Assessments and Approvals), TEARC will trigger a referral and approval of a controlled action under the EPBC Act that is likely trigger assessment by an EIS process.

11.1.2 Planning issues in relation to the Port of Townsville

The reference design locates part of TEARC on land within the Port of Townsville (PoT), which is an identified priority port under the *Sustainable Ports Development Act 2015* (Qld) (SPD Act).

As a priority port, the Minister for State Development must develop a:

- master plan for the PoT, which amongst other things, identifies the master planned area for the port
- port overlay to implement the master plan, as soon as practicable after the master plan takes effect.

The master plan and the port overlay for the PoT have not yet been released.

The port overlay may state:

- matters an affected local government must consider in making or amending a local planning instrument (such as a planning scheme)
- the level of assessment for development in the master planned area for the Planning Act
- the matters an assessment manager must consider in assessing a development application for the Planning Act or
- the matters a port authority must consider in making or amending a land use plan.

Under the SPD Act:

- If there is an inconsistency between a port overlay and a planning instrument under the Planning Act, the port overlay prevails to the extent of the inconsistency.
- If the PoT's Land Use Plan made under the Transport Infrastructure Act 1994 (Qld) is inconsistent with the port overlay, the port overlay prevails to the extent of the inconsistency.
- While a port overlay cannot override a development scheme for a State development area, the Coordinator-General must consider whether the development scheme is inconsistent with the port overlay, and decide whether to amend the development scheme to remove the inconsistency.

11.1.3 Planning and environmental assessment

Table 11.1 contains a list of regulatory approvals that may be required for construction, delivery and operation of TEARC. The necessity for particular approvals will depend on the particular activity or land on which TEARC is carried out.

Apart from the EPBC Act approval, a number of State approvals may be triggered. The approvals are likely to be required as construction proceeds, and generally will not be required before construction starts.

A compliance management plan may be approved under the TI Act that could displace the need for a number of State approvals.

Table 11.1 Approvals Matrix

APPROVAL	TYPE	DESCRIPTION	TIMING	RESPONSIBLE AUTHORITY
EPBC Act referral	Approval	Determination as to whether TEARC is a 'controlled action' requiring assessment and approval under the EPBC Act.	Controlled action determination is six weeks from lodgement of the referral. If TEARC is a controlled action, subsequent approvals processes will follow, with timing depending on the assessment process decided by the Minister.	Federal Minister administering the EPBC Act

APPROVAL	TYPE	DESCRIPTION	TIMING	RESPONSIBLE AUTHORITY
State Development Area (SDA) approval	Approval	SDA approval under the *State Development and Public Works Organisation Act 1971* (Qld) may be required as triggered by the development scheme for the Townsville State Development Area (TSDA). The development scheme does not apply to a material change of use for certain community infrastructure (including rail transport infrastructure) under the now repealed Sustainable Planning Regulation, where the development is undertaken by a public sector entity, or to development under a designation under the Sustainable Planning Act. Despite the repeal of the Sustainable Planning Act, in our view these exemptions will continue.	Depends on the referral and notification process. Allow 3-6 months.	Coordinator-General
Development approvals	Approval	Development approvals under the *Planning Act 2016* (Qld) (PA) may be required, including for clearing of native vegetation, tidal works, waterway barrier works, removal of marine plants and development on strategic port land. Planning Scheme approvals will not be required if TEARC is government supported transport infrastructure (noting that there is some doubt whether TEARC falls within this definition given it is a freight line and the new requirement in the PA is for the infrastructure to be for "public use"), to the extent the land is subject to a designation or if a specific exemption is included in the *Planning Regulation 2017* (Qld). There is a designation for the TEARC gazetted on 27/06/2003. To the extent this designation applies to the same corridor and remains applicable to the corridor, then it will not require assessment under the Townsville Planning Scheme. <u>Clearing of native vegetation</u> The development will be exempt if TEARC is transport infrastructure under a designation (see above), or government supported transport infrastructure. <u>Strategic Port Land</u> A development approval may be required for development on strategic port land if either: (a) it is assessable under the Land Use Plan for the PoT or (b) the development is a material change of use that is inconsistent with the Land	Based on the assumption that any applications would be code assessable, allow three to six months from lodgement.	Chief executive administering the *Planning Act 2016.* Port authority for approvals triggered by the land use plan on Strategic Port Land

APPROVAL	TYPE	DESCRIPTION	TIMING	RESPONSIBLE AUTHORITY
		Use Plan and the port overlay for the master planned area does not state a different category of development for the development.		
Clearing permits	Permit	Permits for clearing of native plants that are protected under the *Nature Conservation Act 1992* (Qld) (NCA) may be required.	Allow three months from lodgement.	Chief executive administering the NCA
Queensland Heritage Act 1992 (Qld)	Approval	Development on or adjoining a registered heritage place will require approval unless the development is carried out by the State or an exemption certificate has been issued. It is assumed this will follow the process of development by the State under the *Queensland Heritage Act 1992* (Qld).	Depends on process but allow three to six months from lodgement.	Queensland Heritage Council and Minister proposing the development.
Material change of use and environmental authority	Approval	Development approval under the PA will be required for making a material change of use for an environmentally relevant activity (ERA) for a concurrence ERA. An environmental authority will be required under the *Environment Protection Act 1994* (Qld) (EP Act).	Allow three to six months from lodgement.	Chief executive administering the PA
Building work	N/A – accepted development	Building work carried out by or for the State or a public sector entity, to the extent the building work complies with the relevant provisions in the *Building Act 1975* (Qld) is accepted development that does not require a development approval. Although development approval is not required, applicable codes (e.g. the Building Code of Australia and Queensland Development Code) must be complied with.	N/A	N/A
Transport Infrastructure Act 1994 (Qld)	Approval	Compliance management plans may be required to be approved for works that would otherwise cause unlawful environmental harm (e.g. noise from construction works) or otherwise require an approval.	Allow three months from lodgement.	Chief executive administering the TI Act
Local Government Act 2009 (Qld)	Approval, unless carried out by the State (where the LG Act is not expressed to bind the State)	Required in relation to local government roads and footpaths.	Allow three months.	Relevant local government

Any environmental assessment and approval process requires proactive management of potential issues including:

- Achievement of Timeframes—Delays to TEARC may be caused by the adequacy of environmental assessment documentation, public submissions, agency responses, negotiation of approvals and legal challenges. Whilst difficult to quantify the delay associated with these risks, particularly given that the extent of possible delays is determined by resourcing and response times of third parties outside the control of TMR, the active management of environmental approvals is required throughout the development of TEARC. If in the event an environmental approval decision is subject to legal challenge, a 12-month delay in receiving a determination by the court should be expected.
- Approvals Risks and Conditions—The risk of an environmental approval not being granted or that conditions imposed on approvals will be restrictive resulting in adverse impacts to TEARC is a possibility. This risk can be managed by thoroughly preparing assessment documentation, preparing a detailed stakeholder management plan, investing in the EMP process, design solutions, preparing draft conditions and liaising with the regulator.
- Community Issues—Further community consultation may need to be undertaken during subsequent phases of the TEARC, such as the detailed design stage. Issues may include restrictions on future land use, construction impacts (noise, vibration and dust), material/spoil haulage and impacts on the road network, flooding and groundwater movement. These community issues will be addressed in the implementation stage of TEARC.

11.1.4 Industrial relations and work health and safety

During the construction phase of TEARC, TMR will contract a specialised construction company to build the required scope of works. This is likely to be a privately-operated company (or companies) falling under the Australian Government employment regime. Depending on the contractor, there may be Federal and State government work health and safety-related legislation with which to comply.

Being engaged as the Principal Contractor for the purposes of the work health and safety legislation, the Contractor will bear the primary obligations to ensure TEARC is constructed safely, in accordance with good practice and in compliance with work health and safety legislation. The Contractor would also ordinarily engage relevant personnel and bear the ongoing employment and industrial risks, including delay, during this phase.

TMR would continue to hold work health and safety obligations, as they cannot be delegated to another party. This includes an obligation to consult, cooperate and coordinate with other parties who owe health and safety duties in relation to these matters. TMR will need to take steps to satisfy these obligations through its framework for managing contractors, including:

- exercising due diligence in the appointment of a suitably experienced and competent Contractor/s
- ensuring any contractual documents impose clear work health and safety obligations on the Contractor/s
- undertaking audit and review of the Contractor's safety performance and compliance.

TMR will need to ensure the Principal Contractor is appropriately managing these safety risks, as well as the risks of protracted industrial disputes and potential delays, throughout the contract period. The risks can be reduced (to the extent possible) by:

- having a rigorous procurement process to select the Contractor, ensuring it is appropriately experienced and competent to perform the works

- ensuring the Contractor is effectively engaged as the Principal Contractor in a manner which complies with work health and safety legislation (for example, ensuring a deed of engagement is entered into and the Principal Contractor is authorised to have management or control of the workplace)
- assessing and auditing the Contractor's industrial relations strategy, including the industrial arrangements it has in place, to ensure TEARC is delivered without delay attributable to industrial disputes
- assessing the Contractor's track record for project delivery through, for example, referee checks
- including contractual clauses to ensure compliance with any applicable federal or state Building Codes depending on whether there is Australian Government and/or Queensland Government funding (e.g. the 2016 Building Code)
- subject to TEARC receiving Australian Government funding, ensuring any Contractor is accredited under the federal Work Health and Safety Accreditation Scheme
- including contractual clauses for assessing the Contractors compliance, such as reporting obligations for safety matters and industrial disputes or wages complaints, as well as enabling audits to be performed to check compliance
- undertaking audit and review of the Contractor's safety performance and taking steps to address non-compliance, for example, issuing warnings or terminating the contract in the event of serious breach.

11.1.5 Rail safety and accreditation

Under the *Rail Safety National Law* (RSNL) a person must not carry out any railway operations (which includes the construction of a railway) unless the person is:

- a 'rail transport operator' who is accredited under the RSNL or is exempt from the requirement to be accredited
- carrying out the railway operations for or on behalf of a 'rail transport operator' who is accredited under the RSNL or is exempt from the requirement to be accredited or
- exempt under the RSNL from the requirement to be accredited.

A person can be accredited as a 'rail transport operator' as either or both:

- a ‘rail infrastructure manager’ (RIM), which means the person who has effective control and management of the rail infrastructure, whether or not the person owns the rail infrastructure, or has a statutory or contractual right to use, control or provide access to it
- a ‘rolling stock operator' (RSO), which means a person who has effective control and management of the operation or movement of rolling stock on rail infrastructure for a railway, but does not include a person only because that person drives the rolling stock or controls the network or network signals.

The party carrying out TEARC will need to be accredited in accordance with the process in the RSNL. The criteria for accreditation includes having the competence and capacity to manage risks to safety associated with the railway operations and also the financial capacity (or public risk insurance arrangements) to meet reasonable potential accident liabilities arising from the railway operations. The Office of the National Rail Safety Regulator is responsible for accrediting RIMs and RSOs under the RSNL.

The RSNL imposes obligations on rail transport operators to implement a safety management system and duties to ensure that rail safety is not affected by the carrying out of railway operations. These duties extend to contractors undertaking railway operations on behalf of a rail transport operator.

Rail transport operators are required to identify risks to the safety of persons arising, or potentially arising, from railway operations carried out by different rail transport operators and reasonably seek to enter into interface agreements to manage those risks.

11.1.6 Land acquisition

This section outlines TMRs power to acquire land for TEARC, requirements for compensation and alternative acquisition mechanisms.

- Power to Acquire Land—The land required for TEARC has been identified and is owned by TMR, the Coordinator-General, the PoT, the Townsville City Council, Ergon Energy Limited and one freehold property is privately owned.

  The land owned by the Coordinator-General can be dealt with in accordance with the Queensland Government Land Transaction Policy (or as advised by the Queensland Treasurer).

  TMR can negotiate to purchase the other land required for TEARC or can compulsorily acquire land using its power under the TPC Act and the process under the AL Act.
- Compensation for Acquisition of Land—If land is compulsorily acquired, every person with an interest in it can claim compensation. Compensation is assessed under the AL Act
- Alternative Acquisition Mechanisms—Given the nature of TEARC, it is unlikely alternative acquisition mechanisms will be required.

11.1.7 Native title

It is necessary to consider whether there are any 'future acts' to be done in association with TEARC and, if so, what is required for such acts to validly affect native title. Under the Native Title Act 1993 (Cth) (NT Act), a 'future act' includes any 'act' (for example, the grant of a statutory approval or of land tenure) that takes place after 1 January 1994 and 'affects native title rights and interests' in relation to land or waters. To the extent, a future act affects native title rights and interests (whether by extinguishing them or by conferring rights or creating interests that are otherwise wholly or partly inconsistent with their continued existence, enjoyment or exercise), the future act will be valid only if it is covered by, and done in accordance with Part 2, Division 3 of the NT Act.

In short, if there are any future acts to be done in connection with the undertaking of TEARC, they will be invalid to the extent they affect native title, unless either the:

- parties to a registered Indigenous Land Use Agreement (ILUA) have consented to the doing of the relevant future acts or
- future acts are done in accordance with an alternative (and applicable) provision of Part 2, Division 3 of the NT Act.

However, because an act can only be a 'future act' if it would affect native title, this would affect TEARC only if there remain land or waters within the project area where native title has not been extinguished.

In this regard, it appears that the properties impacted by TEARC include Crown leases, road reserves, estates in fee simple and unallocated State land.

The valid grant of a freehold estate will extinguish native title as it confers on the proprietor rights of exclusive possession that are wholly inconsistent with the continued existence of native title rights and interests.

During the land acquisition process, an analysis of all of the properties impacted by TEARC should be carried out, with a view to ascertaining how many have been the subject of "tenure" or "public works" (PEPAs).

11.1.8 Aboriginal cultural heritage

The *Aboriginal Cultural Heritage Act 2003* (Qld) (ACH Act) prescribes a cultural heritage duty of care that will require TMR (or its Contractor) to take all reasonable and practicable measures to ensure its activities do not harm Aboriginal cultural heritage.

Failure to comply with the cultural heritage duty of care is an offence. It is also an offence under the ACH Act to unlawfully harm, excavate, relocate, take away or possess Aboriginal cultural heritage. However, there are certain circumstances in which TMR will be taken to have complied with the cultural heritage duty of care (and not otherwise to have committed any of the above ACH Act offences). These would include where TMR carries out its activities under either:

- an approved Cultural Heritage Management Plan (CHMP) under Part 7 of the ACH Act that applies to the Aboriginal cultural heritage
- a native title agreement such as a registered ILUA, or another agreement with an Aboriginal party, unless the Aboriginal cultural heritage is expressly excluded from being subject to the agreement. These other agreements are commonly referred to as Cultural Heritage Management Agreements (CHMA).

11.1.9 Conclusion

One of the key risks for TEARC will be issues in relation to land, particularly those specified in sections 11.1.6 (Land Acquisition), 11.1.7 (Native Title) and 11.1.8 (Aboriginal Cultural Heritage). These potential issues will require proactive management, including early engagement with stakeholders, up-front consideration of preferred approaches, following relevant legislative processes and building sufficient time into TEARC timetable to ensure vacant possession of all necessary land by the date required.

Provided these risk issues are proactively managed, there are no particular concerns anticipated.

11.2 Regulatory issues

11.2.1 Third-Party access agreements and regulation

The below-rail services which are currently supplied by Queensland Rail for the Mount Isa Line are regulated under Part 5 of the *Queensland Competition Authority Act 1997* (Qld).

On the 11th October 2016, the Queensland Competition Authority (QCA) approved a new access undertaking for Queensland Rail (QR). The new access undertaking has a termination date of 30 June 2020.

There are likely to be a number of access agreements in existence that allow third party operators to use the Mount Isa Line.

QR, as the expected final operator, will need to carefully review the applicable access undertaking and access agreements (both current and future) to determine the extent to which the access afforded under those arrangements will be affected by TEARC. In particular, consideration will need to be given to:

- any consultation requirements which are triggered by the proposed changes to the Mount Isa Line
- whether current access holders will be entitled to any compensation in the event of changes to existing freight path times due to the impact of TEARC (unlikely given that existing arrangements will in all likelihood expire in advance of project delivery)
- changes to new contracts in the event of an operator taking up additional freight paths

- whether the cost of any new rail infrastructure can be included in Queensland Rail's regulatory asset base under its approved access undertaking
- the extent, if at all, that access holders can be required to bear some of the costs associated with changes to the Mount Isa Line.

11.2.2 Competition and consumer law

QR is subject to the *Competition and Consumer Act 2010* (Cth) (CCA) that includes the competition provisions in Part IV and the *Australian Consumer Law* (ACL). The ACL prohibits a number of practices when engaged in trade or commerce, including:

- engaging in misleading and deceptive conduct
- making false representations
- engaging in unconscionable conduct
- engaging in other unfair practices (as proscribed by the ACL).

Judicial decisions under the CCA have held that silence can constitute misleading or deceptive conduct where the circumstances are such that another party would have a reasonable expectation that if a particular fact or circumstance existed, it would be disclosed.

Accordingly, if a decision is made to proceed with TEARC, Queensland Rail should fully advise all existing users of its below-rail network and any access seekers with whom it is then negotiating terms and conditions of access, of the impacts of implementing TEARC. Further advice/updates would also need to be provided by Queensland Rail in the event that any material changes are made to the scope of TEARC.

11.3 Other legal matters

11.3.1 Project procurement and delivery

The Delivery Model Analysis Chapter (Chapter 9) identifies and assesses the potential project delivery options. The options under consideration are well known in the market and there are no particular legal or legislative impediments to delivery of the project on that basis.

11.3.2 Corridor protection

A key consideration for managing the costs and impacts of TEARC is the protection of the corridor from surrounding incompatible development. The fact that the majority of TEARC is located within the TSDA provides some protection against proposed development on the corridor as any application for a material change in use will have to be approved by the Coordinator-General.

Further, the following measures may be taken to protect the corridor:

- Community Infrastructure Designation

Amending the existing community infrastructure designation to ensure that it applies to the alignment corridor will mean that an approval under a planning scheme will not be required. Additionally, the current TSDA Development Scheme does not apply to a material change of use in accordance with a community infrastructure designation. Further the community infrastructure designation should prompt Council to refer any inconsistent development application inconsistent to TMR.

The designation also triggers the ability of affected landowners to request hardship acquisitions.

- Gazettal of land as "future railway land" under the TI Act

The corridor could be gazetted as "future railway land" under the TI Act. This requires the chief executive administering the TI Act to notify the local government in writing and in the gazette, indicate that the land is to be used for a railway.

Declaration of the corridor as "future railway land" under the TI Act will trigger concurrence agency powers for the chief executive administering the Planning Act for some approvals, and to some extent provides for corridor protection from incompatible development.

- Inclusion of that part of the corridor within the Port of Townsville in the master plan and port overlay

  As explained in section 11.1.2 above, the part of the TEARC alignment within the PoT should be included in the master plan and port overlay for the PoT once made under the SPD Act.

11.3.3 Government contributions

Funding contributions from different levels of government raise different legal and legislative issues.

If the Australian Government were to provide a funding contribution, it is likely to require the Queensland Government to enter into an agreement setting out the terms upon which that funding would be provided. These would likely include matters such as compliance with the 2016 Building Code and the Australian Government Building and Construction WHS Accreditation Scheme.

11.3.4 Claims by third parties

There are several administrative remedies third parties may seek to pursue that could impact upon TEARC. These may include members of the public seeking judicial review of administrative decisions, investigations of complaints against Queensland Government, third party claims, common law nuisance and statutory nuisance.

11.4 Conclusion

The existing legal and regulatory regime provides a framework that would allow TMR to deliver TEARC, provided TMR adopts the various processes required by the regime.

One of the key risks will be issues in relation to land, particularly those specified in sections 11.1.6 (Land Acquisition), 11.1.7 (Native Title) and 11.1.8 (Aboriginal Cultural Heritage). Provided these issues are proactively managed, there are no particular concerns.

TMR has the authority to negotiate to purchase land required for TEARC, or compulsorily acquire land under the TPC Act and the AL Act.

An analysis of all of the land impacted by TEARC will need to be carried out, with a view to ascertaining whether native title continues to exist.

Referral of TEARC under the EPBC Act can provide certainty, including providing protection from a future listing event.

A number of regulatory approvals may be required for the construction, delivery and operation of TEARC (Table 11.1). Apart from the EPBC Act approval, they are likely to be required as construction proceeds, and will not be required before construction starts.

TMR will need to take steps to ensure there is compliance with the cultural heritage duty of care, including that there is no unlawful harm to Aboriginal cultural heritage. There are well-understood strategies to address these issues.

The construction contracts for TEARC will need to be carefully prepared to ensure the Principal Contractor has management and control over the workplace on which any physical works are carried out so that it has the primary work health and safety obligations, as outlined in Section 11.1.4.

12 PUBLIC INTEREST CONSIDERATIONS

CHAPTER SUMMARY AND CONCLUSIONS:

- Townsville Eastern Access Rail Corridor (TEARC) will be delivered in an urbanised and industrial environment on State Development, Port of Townsville (PoT) and private sections of land. The project will be impacting roads, bridges, public utilities, existing and planned developments and public and private land.
- Prior to the DBC, limited to no engagement with the community had been undertaken on the Project. Inclusion of the delivery of the TEARC DBC as part of the *Townsville City Deal (2016)* announced in late 2016 accounted for a residual low level of community awareness of TEARC among stakeholders and the community.
- Key stakeholders for TEARC have been identified and engaged throughout the development of this Detailed Business Case.
- Formal community consultation for TEARC has been undertaken to determine Social License to Operate and attitudes towards project delivery. This involved communicating the proposed alignment options for the project, identifying potential impacts on the community and stakeholders and seeking community feedback.
- Analysis undertaken for this business case demonstrates that TEARC is in the public interest and provides, on balance equitable outcomes for all stakeholders. TEARC will alleviate pressure on local road network by diverting freight rail movements away from North Coast Line and improve overall urban amenity and safety.
- To ensure efficient delivery of the project, information will need to be continuously provided to potentially affected stakeholders, or there is a significant risk of some parts of the community withdrawing Social Licence to operate.
- TEARC has been, and will continue to be, developed to address public interest considerations identified in this assessment.
- The assessment undertaken demonstrates that the project is in the public interest and provides, on balance, equitable outcomes for all stakeholders.

12.1 Community and stakeholder engagement

The purpose of this chapter is to assess whether the Reference Project is in the public interest to ensure, on balance it provides equitable outcomes for stakeholders.

This chapter provides an overview of stakeholders and public interest issues assessed as part of the development of the detailed business case and the reference project. TEARC has been assessed against key areas including:

- Engagement approach and outcomes
- Stakeholder impacts
- Public access and equity
- Accountability and transparency

- Consumer rights
- Safety
- Security
- Privacy.

The concept of 'public interest' was defined by the New South Wales Ombudsman in November 2010 as:

> *Referring to considerations affecting the good order and functioning of the community and government affairs, for the wellbeing of citizens. The expression 'for the common good' is also used…Every policy decision, such as a decision to build a road or to approve a development application, requires a balancing of interests, at least to some extent. In most cases there will be winners and losers. The decision-maker needs to consider all of those who may be affected as individuals but more importantly, how the community at large may be affected.*[1]

Unlike financial and economic assessments that focus principally on the overall net impact, a key theme of a public interest assessment is to consider the distributional consequences of implementing the activity or project.

On larger, complex projects or activities, transparency of process is particularly important given the number of individuals which may benefit or be impacted upon, and the need for society to be able to participate in the development of the project or activity.

The TEARC public interest assessment is based on the outcomes of the project's community and stakeholder engagement.

Engagement with the community and key stakeholders has played an important role in the development of the Detailed Business Case for the TEARC, allowing these groups to provide feedback and raise concerns throughout the engagement period.

To support the development of the TEARC DBC, Building Queensland implemented a phased program of communication and engagement activities targeted at informing and engaging with key stakeholders and the broader Townsville community. The overall goal of the program was to address stakeholder concerns regarding the Project, resolve the known issues, and gain an understanding and acceptance of the TEARC alignment within the five months (March – July 2017) of engagement.

The engagement program was undertaken in two phases, with activities based on specific milestones, allowing for outcomes of engagement to help inform the development.

The key stakeholders with respect to public interest and social license to operate are listed in Table 12.1.

[1]Public interest – Public Sector Agencies Fact Sheet, Crown Copyright, NSW Ombudsman, November 2010, Reprinted March 2012. https://www.ombo.nsw.gov.au/_data/assets/pdf_file/0014/3713

Table 12.1 Key Stakeholders with respect to public interest and social license to operate

STAKEHOLDER CATEGORY	INTEREST IN THE PROJECT
Port of Townsville	Key beneficiary of the project and member of the PSC and PCG; will be interested in connectivity issues around existing road and rail
Townsville City Council	SAG member and will want to ensure a positive outcome for the city and community; high interest in job creation and economic benefits
Adjacent stakeholders - Cluden	Residents will receive new rail line; high interest in project impacts including noise, amenity, property impacts and property values
Adjacent stakeholders – near the Port	Residents will receive new rail line; high interest in project impacts including noise, property impacts and property values
Adjacent stakeholders – North Coast line	Residents will be interested in potential removal of existing North Coast line and level crossings including timeframes and rehabilitation or reuse of the area
Residents and action groups	Residents and local action groups will have a general interest in Townsville and its economic prosperity; including any social and financial impacts on residents
Elected representatives - State	Alignment runs through a number of electorates with local elected representatives interested in job creation and state election
Elected representatives - Federal	Alignment runs through a number of electorates with a high level of interest in project in relation to City Deal
Queensland Rail	As the owner of the North Coast and Mt Isa lines, Queensland Rail has a high level of project interest; particularly surrounding the potential removal of the North Coast line through Townsville and removal of four level crossings
Rail operators	Operators on the North Coast and Mt Isa line are currently supportive of the project
Industry	Industry groups will have some level of interest in the project, particularly how it affects their freight
Peak industry associations	Local industry associations will want to be informed about the impacts the Project will have on local amenity and future development opportunities
Energy providers	Impacts on existing utilities
Queensland Government Agencies	There are several state agencies that will be involved in the options assessment and any impacts on community, infrastructure and existing transport networks
Department of Transport and Main Roads	Project owner
Australian Government Agencies	There are several Australian Government agencies that will be involved in the options assessment, with particular interest in delivery of the City Deal, Project cost and funding
Traditional Owners	The Native Title Representative Body

STAKEHOLDER CATEGORY	INTEREST IN THE PROJECT
Environmental and community groups	There are a number of environmental groups that have active campaigns to protect the Great Barrier Reef from Port expansion activities.
Media	As well as being part of the City Deal, this will be a significant Project for Townsville that will attract both local community and media attention

12.1.1 Engagement approach

A range of traditional and online engagement activities were used to inform community members and key stakeholders about the proposed alignment for the TEARC reference project. The Project Team liaised directly with potentially impacted landowners and residents, key stakeholders and the Townsville community, and provided information where possible to mitigate issues.

Figure 12.1 and Table 12.2 outline the engagement approach and activities.

Figure 12.1 Communication and Stakeholder Management Roadmap

Project objectives

- Undertake a detailed analysis of all options and alternatives identified during the PE stage
- Provide a comprehensive assessment of the preferred option to a P90 level of confidence
- Deliver the Detailed Business Case on time and within budget
- Ensure all stakeholders have confidence in the outcomes and findings of the Detailed Business Case
- Understand whether the project would be likely to receive a social licence to operate

Communication Strategy

A coordinated communication program to consult key stakeholders, engage with the community, understand key issues and manage social risk

Communication Methodology

- Consult key stakeholders during options assessment to ensure an informed analysis is undertaken for the Project
- Protect the reputation of the project through risk and issue management and an ongoing stakeholder management campaign
- Develop clear and consistent messages and communication protocols to ensure all internal stakeholders are in alignment
- Engage the community to understand the potential Social Licence to Operate for the Project and to identify issues and risks
- Coordinated approach to the timely release of information to all stakeholder groups

Stakeholders and issues

Elected representatives
- Job creation
- Value for money outcomes
- Timeframe for delivery
- Bottleneck reduction/ removing freight from suburbs
- Federal funding/ matched State funding

Government agencies
- Ensuring business case includes agency expertise
- Alignment with state and federal legislation and government objectives

Local government
- Impact of project on city (coal port concerns)
- Interface with local road network, infrastructure and services
- Local economic growth

Port of Townsville
- Connection into the Port
- Connection with the North Coast Line
- Enabling the Port's future development
- Constructability and impact on Port operations

Rail operators
- Operating costs
- Safety
- Meeting tonnage demands
- Integration with network
- Capacity of market to deliver solution

Townsville residents
- Landowners concerned about corridor location and uncertainty of property impacts
- Operational impacts, including noise and flooding
- Local jobs

Peak bodies and industry
- Specialist interests in public access and equity, consumer rights, privacy and security
- Social, environmental and economic impacts and opportunities
- Procurement process

Media
- Project delivery timeframe and viability
- Cost
- Solution risks
- Impact on residents

Timeline

March 2017: Options assessment → Late June 2017 → Mid July 2017 (Control Point 2 milestone)

Engagement focus

EDUCATE AND CONSULT STAKEHOLDERS ON OPTIONS AND IDENTIFY KEY COMMUNICATION RISKS

ENGAGE THE COMMUNITY, ADDRESS ISSUES AND MANAGE EXPECTATIONS

Implementation

Communication approach
- Confirm project objectives with team and develop support for consultation program among internal and inter-agency stakeholders
- Establish feedback mechanisms and communication channels
- Inform elected representatives of the start of the detailed business case
- Identify key stakeholders and brief on the project and the options
- Convene a stakeholder workshop to review options and obtain insights for the MCA
- Review stakeholder consultation to identify key risks moving into next phase

Key activities
- Develop communication strategy
- Establish communication and feedback channels
- Develop narrative and key messages
- Develop media holding statement
- Develop stakeholder analysis
- Brief stakeholders
- Conduct options review workshop with stakeholders

Communication approach
- Brief elected representatives on community engagement plan
- Contact potentially impacted residents before anything is publicly advertised
- Engage the local media
- Engage the broader community about project benefits and alignment and undertake SLO research
- Identify, investigate and evaluate key issues
- Inform project team of feedback that could shape outcomes
- Keep Ministers' office informed of stakeholder issues and project progress
- Deliver a multi-layered consultation program that generates the necessary data to input into Detailed Business Case

Key activities
- Phone calls, door knocks, letters
- Community information sessions
- Community newsletters
- Social License to Operate research activities including surveys and interviews
- Project website and online communication channels
- Issues reports
- Media monitoring and media statements/responses

Table 12.2 Engagement Approach and Activities

ENGAGEMENT ACTIVITIES	AUDIENCE	DETAILS
	Key local stakeholders Community representatives Rail customer, operators and owners	▪ Workshop 1 on 6 April 2017 with 30 participants representing 17 organisations ▪ Workshop 2 on 27 June 2017 with 17 participants representing 9 organisations
	Potentially affected residents	1,000 residents
	Community representatives Potentially affected residents	57,000 distributed
	Local stakeholders	6 organisations briefed: ▪ PoT ▪ Department of Defence ▪ Maritime Safety Queensland, Harbour Master ▪ Townsville City Council ▪ Aurizon ▪ Great Barrier Reef Marine Park Authority (GBRMPA)
	TEARC Project Steering Committee and Project Control Group members	2 meetings
	General community Potentially affected residents	4 local shopping centres on 28 and 29 June 2017: ▪ Thuringowa ▪ Hyde Park ▪ Fairfield Waters ▪ Aitkenvale
	Potentially affected residents General community	Attended by more than 115 people at the above 4 local shopping centres
	Random representative sample of the community	378 residents surveyed
	All stakeholders	14 instances of contact
	Community representatives Residents of potentially impacted local communities	55 completed and submitted
	All stakeholders	Regularly updated ▪ buildingqueensland.qld.gov.au/business-case/Townsville-eastern-access-corridor
	General community Potentially affected stakeholders	▪ Quarter page in the Townsville Bulletin on 17 June 2017
	Minister Assisting the Premier on North Queensland	1 familiarisation site tour to build knowledge and support electorate enquiries about TEARC

ENGAGEMENT ACTIVITIES	AUDIENCE	DETAILS
	TEARC key stakeholders' stakeholders	6 key stakeholders approached to promote TEARC information on owned social media channels and internal communication channels: ▪ Townsville City Council ▪ PoT ▪ Townsville Chamber of Commerce ▪ Townsville Enterprise Limited ▪ Mount Isa Townsville Economic Zone (MITEZ) ▪ Great Barrier Reef Marine Park Authority

12.1.2 Engagement outcomes

The feedback collected from key stakeholders and the local Townsville community was important in understanding the community's sentiment towards the Project as well as identifying the main sources of concern. The results of the engagement program identified a number of key areas of interest and existing issues that need to be addressed during future stages of TEARC to ensure the project secures ongoing community support.

- Key Stakeholders

  Analysis of the feedback collected through two workshops with key local stakeholders found that these groups had a generally positive attitude towards the Project, with perceptions that TEARC would support the growth and contribute to the overall economic development of Townsville. The alignment's location within the Townsville State Development Area (SDA) was also widely supported by key stakeholders as they believed it would reduce rail traffic, and the corresponding negative impacts on amenity, on residents in southern Townsville (i.e. Oonoonba, Idalia, Railway Estate and Townsville).

  The first phase of engagement provided an opportunity for key stakeholders to input into the options assessment process of the Detailed Business Case. Through this process, stakeholder concerns were recorded on three alignment options and considered during the Project Team's assessment to finalise the preferred alignment.

  Once the alignment for the Reference Project was finalised, stakeholders were again provided an additional opportunity to report issues or concerns. Key areas of interest included:

  – Questioned the need for retaining the North Coast Line between Cluden and the PoT

  – Concerns around loss of amenity (noise, air and vibration) for residents in Cluden and South Townsville (those closest to the PoT) and mitigations

  – Concerns around loss of access to the dog beach off Benwell Road.

  In addition, rail operators, customers and owners voiced dissatisfaction with the perceived limited financial and operational benefits of the Project.

- Community

  Prior to the Detailed Business Case stage, limited to no engagement with the community had been undertaken on the Project. There was some level of project awareness within the community resulting from announcements made in December 2016 that the delivery of the TEARC DBC would be part of the *Townsville City Deal (2016)*.

Therefore, the community engagement program was designed to increase awareness of the project and also to inform and provide an opportunity for community members to give feedback on TEARC.

Feedback collected throughout all engagement activities has been collated with key areas of interest identified as:

- Alignment selection
- Public disruption (e.g. noise impacts on residents)
- Timing and cost/funding
- Traffic impacts
- Benefits
- Local industry impacts
- Government transparency.

The key findings from the engagement with the Townsville community regarding the TEARC were:

- The most significant benefit was the potential for jobs, and the long-term economic benefit to the Townsville community. TEARC was also viewed as a catalyst for the Port redevelopment.
- Residents from the most potentially impacted communities, including South Townsville and Cluden, reported significant property impact concerns regarding the proposed alignment. Primarily surrounding noise, dust and safety, many residents believed the proposed alignment's proximity to their properties would negatively impact their quality of life.
- The alignment itself was cause for concern for Cluden and South Townsville residents. Some members of the Cluden community believed they had seen an alternative alignment for TEARC that removed the impact from the locality, and questioned why other potential alignments had not been progressed.
- While there was awareness around the need for additional infrastructure to support the growth of local industry in Townsville, there was negative sentiment towards the project and Government within the community. This was largely due to how the community felt other infrastructure projects had been delivered and the perceived lack of engagement / community consideration during those projects.

Table 12.3 provides a summary of the issues that emerged during the review of all community feedback.

Table 12.3 Summary of Feedback from Community and Key Stakeholder Engagement

KEY AREA OF INTEREST	SUMMARY OF FEEDBACK
Alignment selection	Many stakeholders who engaged the Project Team criticised the selection of the reference project alignment. Previous iterations of TEARC showed the alignment further east of Southern Port Road or crossing the Bruce Highway at Stuart, avoiding the branch at Cluden. Feedback questioned the decision to proceed with an alignment which brought the alignment closer to the community, when compared with other options.
Public disruption	Feedback was provided on a range of issues related to impacts on residents including noise, dust, safety, property values and flooding. Concerns surrounded the negative impact on quality of life for nearby residents, particularly in Cluden and South Townsville. These communities voiced the need to provide residents with adequate mitigation measures. Concern around preventing access to the dog beach off Benwell Road was also frequently cited.
Cultural and Indigenous heritage	Minimal environmental and cultural heritage feedback was received. It was noted as the alignment sits within the Townsville State Development area and within the existing road and rail corridor, most environmental Indigenous heritage concerns had been addressed during earlier project stages.
Timing and cost/funding	There was interest around project delivery timeframes; however, there was limited information to provide. Concerns were raised by rail operators and customers around cost, particularly around costs increasing for rail transport.
Traffic impacts	Limited feedback was provided regarding impacts to existing traffic networks, however many stakeholders cited issues with Boundary Street and noise concerns from increased traffic along Southern Port Road. Residents in South Townsville frequently raised complaints regarding truck movements around the PoT.
Benefits	Feedback from key stakeholders and some community members indicated they wanted the North Coast Line between Cluden and the Port removed if TEARC was constructed. They questioned the need for a second rail line into the PoT.
Local industry impacts	Feedback identified support for the Project as residents and stakeholders believed it would encourage growth and increased local export for local industry in Townsville. Any form of investment in the city was generally supported by the community.
Government transparency	Feedback was provided on a range of issues regarding the State Government and local government departments. Many comments were made about the lack of consultation and poor project delivery of a number of infrastructure projects in Townsville. A group of residents in Cluden provided negative feedback on how this Project would impact their community in terms of amenity. Concerns also existed around maintaining adequate access from Abbott Street into Racecourse Road during and after construction.

It is important to note that approximately 65% of community members who contacted the project team were residents of Cluden or South Townsville. As potentially the most impacted communities, due to their proximity to the TEARC alignment, residents of these local communities were reported to have a negative outlook on and sentiment towards to the Project.

12.1.3 Social licence to operate

Social Licence to Operate (SLO) was measured using a version of the validated social licence tool (Thomson and Boutilier 2011), adapted to apply to the pre-development project stage and tailored to the TEARC project.

The model categorises SLO into four sentiment levels: withdrawal, acceptance, approval and (the highest form of acceptance) endorsement. Overall sentiment is based on community's perceptions of a projects economic legitimacy, social-political legitimacy, trust in stakeholder interactions and the institution more broadly.

The level of SLO granted to TEARC at the time of the survey in early July 2017 was 3.45 out of 5.

The 'approval' level granted to TEARC can be understood to mean that the project is viewed by the community as having the potential to contribute to the Townsville community, local community groups and the local economy. Overall, and within each of the five alignment areas surveyed, the SLO for the project sits on the lower side of approval, closer to acceptance/tolerance rather than endorsement.

The community's approval for TEARC is largely due to the high level of economic legitimacy bestowed on the project by the community (score of 4.12). The expectation that TEARC can be an integral player in supporting Townsville's desired vision and economic growth, including direct economic gain through employment and job opportunities, is a belief commonly shared across suburbs, gender and age groups.

Conversely, institutional trust is the lowest of all the indicators, with a score of 2.93 placing it below 'approval' within the 'acceptance' level. This is supported by both the qualitative feedback and quantitative analysis that show levels of dissatisfaction with the project delivery process of previous major infrastructure projects in Townsville.

Experience with previous projects also impacts SLO more broadly; greater satisfaction with past projects correlated with improved SLO scores. Among satisfied residents, social licence for TEARC was sitting at an endorsement level of 4.05.

The social licence for TEARC varies geographically. The area most likely to be impacted, South Townsville had the lowest SLO level of 3.26. For sampling purposes, Cluden was grouped with Oonoonba and Idalia and that areas overall SLO was 3.48. It is difficult to isolate Cluden due to the small number of residents.

12.1.4 Recommendations for engagement

Throughout engagement, a number of key recommendations for future project stages were identified as detailed in Table 12.4. These recommendations aim to manage the expectations of key stakeholders and the local community, should the project progress:

- Keep impacted residents and property owners updated to ensure they are aware of the project progress and construction timeframes.
- Reinforce benefits by ensuring all community-facing materials include key messages about positive community outcomes as a result of the project.
- Doorknock residents who live in close proximity to the proposed alignment including Cluden and the most impacted parts of South Townsville.
- Nominate a local ambassador to work with the local community at Cluden on the benefits of TEARC to jobs, local amenities etc.

- Make contact and meet with any landowners whose property may be impacted outside the TSDA and existing road and rail corridors.
- Keep the broader community engaged by regularly updating the project page and undertaking letterbox drops to ensure they are aware of the progress and construction timeframes.
- Provide local councillors and community groups with ongoing updates and information as the project progresses through monthly community meetings.
- Continue to use a targeted approach to ensure communication is relevant and appropriate for each group.
- Brief the media regularly as local news is an important source of information for the community.

Table 12.4 Specific Recommendations Regarding Identified Issues and Impacts

KEY AREA	RECOMMENDATION
Impact consultation and mitigation	▪ As noise was the most significant concern raised to the project team, further consultation and education will need to be undertaken around noise, the impacts on residents and proposed mitigation (if relevant). This consultation will need to primarily be undertaken with Cluden and residents in South Townsville (near the Port). ▪ Further consultation and education around flooding and hydrology will also need to be investigated with Cluden residents. As the area is prone to flooding, concern did exist around this not being adequately considered or mitigated appropriately. ▪ There will be a need to work with the contractor and engage Townsville City Council to develop a solution regarding the off-leash dog beach.
TEARC alignment selection	▪ If the project proceeds there will be a need for greater transparency during further engagement with the local community as to around why the previous iterations of the TEARC were not progressed. ▪ Closer engagement with the Cluden community will be required if the project proceeds.
Government transparency	▪ Due to heightened sensitivities and a distrust of Government with the Cluden community, any future engagement needs to be undertaken with the intent of negotiating better outcomes for the community during and after construction. ▪ It will be important to demonstrate that Government is listening and that the community's concerns were addressed where possible.

12.2 Impact on stakeholders

The TEARC Project is a catalyst enabling infrastructure project that will be delivered in a regional urbanised and industrial environment and will impact roads, public utilities, existing and planned developments and public and private land.

The project is expected to negatively impact stakeholders in some communities, within close proximity to the alignment, and decrease negative impacts in other local communities where existing rail infrastructure is situated. Some of the negative impacts are directly related to limited project awareness and the limited to no community consultation undertaken during earlier investigation stages and the PE undertaken in 2011.

Key issues associated with project impacts include:

- Transport – traffic changes, traffic impacts (restrictions, changes, delays) and changed hours of operation
- Land use
- Air quality and dust
- Visual amenity

- Noise and vibration
- Cost and pricing impacts
- Social value and loss of access to a public amenity
- Economic benefits and impacts
- Sustainability and natural hazards
- Potential land resumption.

The construction and delivery of the TEARC is expected to have a range of impacts on a small subset of the Townsville community and key stakeholders. The alignment's location through the TSDA, approximately 6km south-east of the Townsville CBD and 2km south of the PoT, will minimise significant operational and construction impacts of the TEARC.

Based on the feedback received through the stakeholder and community engagement program, a range of issues were identified for consideration and require further investigation and management during future project stages.

12.2.1 Property impacts

The preserved corridor for TEARC mostly traverses the TSDA and is government owned. The TSDA Development Scheme zones the TEARC corridor as a Materials Transportation/Services Corridor Precinct. TEARC is anticipated to help activate and encourage new industry to locate to the TSDA by providing a strategic freight link with direct access to the PoT, Mount Isa Line and North Coast Line.

During the community engagement and consultation activities, the TEARC Project team identified a single property located outside of the SDA that may need to be fully or partially resumed. Negotiations with the directly impacted landholder will need to be undertaken during future stages of the project.

With major new residential development planned for the south of Townsville, and potential future growth in freight rail demand, road and urban amenity impacts are likely to increase in this part of Townsville.

The Townsville City Waterfront Priority Development Area (PDA) adjoins the existing Jetty Branch into the port. The PDA and adjoining residential precinct currently incur negative urban amenity impacts from rail operations. These impacts will increase with potential future growth in rail freight demand. TEARC offers the potential to:

- in the long-term to divert freight rail movement away from the Jetty Branch
- helping to alleviate pressure on the road network
- improve freight efficiency
- deliver improvements to urban amenity and safety.

However, residents from the most potentially impacted communities, including South Townsville and Cluden, reported significant property impact concerns regarding the proposed alignment. Primarily in relation to noise, dust and safety, many residents believed the proposed alignment's proximity to their properties would negatively impact their quality of life and also questioned impact on property values.

12.2.2 Environmental concerns

Community engagement and consultation identified air quality and dust as the two major project issues to be considered and actively managed during future stages of the project. The preferred alignment for TEAC was identified to have the least impact on the marine and coastal environment; however, in future stages, the impact of the project on the Ross River will need to be considered.

12.2.3 Access or use changes

During future stages of the TEARC Project, there are likely to be traffic changes during construction which will temporarily restrict and delay motorists using roads in and around the Port, Boundary Street, Southern Port Road, Abbott Street and Racecourse Road. There is also the potential to impact access to the water treatment plant to the east of the Southern Port Road. Engagement with this stakeholder will need to be undertaken during future stages of the project.

Traffic changes during construction in and around the Port could potentially impact operations of port customers.

Rail customers are likely to experience potential impacts and changes to operations in and outside of the port.

12.3 Recommended engagement during future project stages

The engagement undertaken during the development of the DBC indicated stakeholder and residents have high levels of interest in the project. It will be important to continue this level of engagement should the project progress.

Table 12.5 provides a summary of key stakeholder impacts and recommendations for engagement actions for future project stages.

Table 12.5 Summary of Stakeholder Impacts and Recommended Future Engagement Approach

STAKEHOLDER GROUP	STAKEHOLDER IMPACTS	ENGAGEMENT APPROACH
Cluden residents and businesses	▪ Permanent and temporary access changes to Abbott Street and/or Racecourse Road. ▪ Potential impacts to community amenity such as: noise, vibration, visual changes, dust and hours of rail operation.	▪ Establishment of a Community Reference Group for the Department of Transport and Main Roads to directly engage with residents and property owners. ▪ Future direct engagement through meetings and briefings with the intent to negotiate better outcomes for this community. ▪ Engagement will be consistent and regularly scheduled to keep these communities updated on project progress.
Freehold Landholders affected by the TEARC alignment	▪ Potential full or partial resumption of land. ▪	▪ Direct engagement with freehold landowner via a meeting with the Department of Transport and Main Roads and the Coordinator-General's Office ▪ This will continue through future stages of the project.

STAKEHOLDER GROUP	STAKEHOLDER IMPACTS	ENGAGEMENT APPROACH
South Townsville residents	▪ Potential impacts to community amenity such as: noise, vibration, visual changes, dust and hours of rail operation. ▪ Potential traffic impacts and changes to Boundary Street and temporary impacts to Southern Port Road. ▪ Potential impacts to community amenity (noise, dust and vibration) and safety from proposed oversize vehicle routes through Archer Street and Hubert Street to the PoT.	▪ Establishment of a Community Reference Group for the Department of Transport and Main Roads and the PoT to directly engage with residents and property owners. ▪ Working Group to be established to discuss transport related concerns and issues around the Port. There is an opportunity to manage and potentially mitigate the potential truck related traffic impacts with community input. ▪ Engagement will be consistent and regularly scheduled to keep these communities updated on project progress.
Port customers (e.g. South32, Cement Australia)	▪ Potential traffic impacts and changes to Boundary Street and temporary impacts to Southern Port Road. ▪ Traffic changes during construction in and around the Port could potentially impact operations.	▪ Establishment of a Working Group dedicated to communication between Port customers, Department of Transport and Main Roads, PoT and the nominated contractor for the construction phase. ▪ Stakeholder Management Plan (SMP) and Concept Design and Impact Management Plan (CDIMP) and Communication to be developed for future project stages.
Rail operators and customers (e.g. Aurizon, Glencore, Pacific National)	▪ Potential impacts and changes to operations in and outside of the PoT. ▪ Cost and pricing impact	▪ Initial impacts and concerns have been identified during workshops and the Stakeholder Advisory Group meetings. ▪ Direct engagement in the next phase of the project through meetings and briefings to discuss concerns around operational impacts and outcomes. ▪ Opportunities exist in improving operational outcomes and mitigating issues to ensure the support of the operators and customers.
Broader Townsville community	▪ Loss of access to dog beach off Benwell Road. ▪ Motorists may experience potential traffic impacts and restrictions to access and delays associated with road network changes and resulting congestion. ▪ Changes to Boundary Street and temporary impacts to Southern Port Road.	▪ Stakeholder Management Plan (SMP) and Concept Design and Impact Management Plan (CDIMP) and Communication to be developed for future project stages. ▪ Directly engage Townsville City Council via the Stakeholder Advisory Group to discuss opportunity for alternative local dog park.

STAKEHOLDER GROUP	STAKEHOLDER IMPACTS	ENGAGEMENT APPROACH
Key local stakeholders (e.g. Townsville City Council, Townsville Enterprise Limited, MITEZ, State elected representatives, Townsville Chamber of Commerce)	▪ Potential local traffic changes and impacts in South Townsville and Abbott Street. ▪ Loss of access to dog beach off Benwell Road (Townsville City Council managed asset).	▪ Stakeholder Advisory Group has been established as part of the Detailed Business Case. ▪ Future engagement will involve regular meetings to work on mitigating potential impacts to the wider Townsville community.

12.4 Public access and equity

TEARC has a responsibility to identify the nature and extent of public access needed throughout all project stages and to determine how this will be addressed. Legal and regulatory requirements, third-party access and mechanisms to address potential access deficiencies must all be considered.

The 2011 Australian Government Access and Equity Panel stated:

> *Access means that Australian Government services should be available to all Australians who are to receive them. Equity means that the Australian Government should respond to and cater for diversity of clients' needs to achieve equitable outcomes. Equity recognises that cultural diversity principles should be incorporated into the design and implementation of program and service delivery.*

Technical specifications for TEARC must comply with specific statutory requirements and government policy standards.

As TEARC progresses to the procurement phase, a safety accreditation process will be undertaken. This will ensure compliance with the access and egress requirements of TMR.

TEARC must also protect third-party access to essential major infrastructure and services. The project design provides for emergency parking and emergency incident access and evacuation for essential service providers and others that contribute to the sustainability of the system. TEARC is also committed to ensuring construction and operational impacts do not unreasonably impinge on access to essential third-party infrastructure or emergency services. (Essential infrastructure includes power, rail, water, sewerage and the road network).

Table 12.6 summarises safeguards for TEARC that would be put in place for ensuring infrastructure and vehicle access for the community, customers and users as the project develops.

Table 12.6 Summary of TEARC Safeguards

ACCESS REQUIREMENTS	SAFEGUARD
	▪ Ongoing rail modelling ▪ Identification of interest groups
	▪ Project delivery ▪ Performance criteria
	▪ Third party needs have been identified through normal business and contingency processes and access assured under different scenarios

ACCESS REQUIREMENTS	SAFEGUARD
	▪ Incentives and penalty regimes agreed in the contract for both infrastructure and service delivery
	▪ TEARC specifications and process will ensure compliance to all relevant codes and statutory standards

To be in the public interest, it is important there is equity between the recipients of benefits and bearers of costs associated with TEARC.

TEARC is an enabling infrastructure project that will benefit the Townsville and North-West Minerals Province but has impacts on local Townsville communities. These impacts are highest around:

- change of access for Cluden residents from Abbott Street during the construction of the street's realignment
- changes to Southern Port Road, during the construction of the road over rail bridge
- disruption then change of access for businesses within the Townsville Marine Precinct, PoT, due to the realignment of Boundary Street during construction of the alignment
- access to the Townsville Marine Precinct after completion will be restricted to oversize loads only through a locked gate level crossing
- permanent disruption of access through a freehold landholder in Cluden, partial land resumption was acquired by the State in 2001
- Cluden and parts of South Townsville will be impacted during the construction phase, these impacts will be managed accordingly
- access during the construction period.

These communities will experience a change in amenity such as visual and environmental (air, noise and vibration), with any impacts to be mitigated using appropriate environmental management measures such as noise monitoring and attenuation (if required).

During the construction period, there will be a need to manage construction activities to minimise disruptions to the network and to continue to make it available for operations.

TEARC, however, has a variety of long-term positive impacts for many local Townsville communities which are impacted during construction. These include:

- transport benefits for rail and road users
- potential increases in property values in some Townsville communities
- increases in local amenity
- improvements to local infrastructure
- increased accessibility to employment opportunities and increased local economic benefits.

There may still be individuals who over time experience more cumulative negative impacts than positives because of operational or construction impacts. Mitigations in design and processes that are developed as part of the procurement process and project delivery will ensure that any negative impacts are reasonable and justifiable.

Equity considerations also influence the choice of appropriate funding mechanisms. Specifically, the level of any additional charges levied, needs to be appropriate and related to the benefits received by users. The key potential funding mechanisms that would impact directly on the public can be placed into two key categories:

- Taxpayer contributions

  The final contribution from taxpayers will not be determined until government consideration of this DBC has been undertaken and a detailed cost-sharing arrangement has been agreed. TEARC costs will be significantly borne by government funding, with more detail provided in Chapter 8. The final funding model for TEARC may contain a mix of contributions from various levels of government. The Australian Government has committed $150m to TEARC and $3m of this commitment has been approved to co-fund the development of this DBC, subject to a matching contribution from the Queensland Government. The quantifiable benefits are summarised in the economic appraisal cost benefit analysis in Chapter 7.

- Value sharing

  Issues related to the value sharing mechanisms considered in this DBC have a number of associated public interest issues, which are discussed in Chapter 8.

There are a number of third party operators who require access to the rail network including, for example, Aurizon and Pacific National. As a result, interoperability arrangements will need to be in place to continue to allow them to have safe access to the network.

12.5 Consumer rights

TEARC is not anticipated to have any potential adverse impacts for consumers in the broader community, or for those whom government has a higher duty of care.

Consumers in the broader community are also expected to be positively impacted via increased economic benefits from future project delivery. Future rail users will also enjoy these benefits.

12.6 Safety and security

The implementation of TEARC is forecast to reduce the risk of road and pedestrian incidents for the at grade level crossings with the stepped reduction in train numbers utilising the existing lines into the PoT. In addition, most dangerous goods being moved by rail would now utilise TEARC this reducing the risk of an incident along the existing urban corridors.

The engineering design of TEARC will build upon the safety in design approach taken during the DBC and flow through to the construction phase and operations.

TEARC will be developed to address applicable security, health and safety requirements.

TEARC is not expected to adversely impact existing Queensland Rail security standards or practices.

12.7 Privacy

If TEARC is implemented it will need to comply with the legislation relating to information privacy and must comply with the information privacy principles in the *Australian Government Privacy Act 1988*. Queensland's *Privacy Information Privacy Act 2009* and the *Right to Information Act 2009* also provide safeguards for the handling of personal information in the public sector environment.

Any potential impacts and interactions with stakeholders and interest groups must be managed under these privacy principles.

The Queensland Government's Information Standard 18: Information Security, sets out the principles for addressing information security risks, including classification and control of material, personal security and physical and environmental security.

As part of probity requirements, all participants in the DBC development process have completed statements requiring them to maintain the confidentiality of designated confidential information. These obligations continue after cessation of involvement – until participants are advised otherwise or until the information becomes public (other than through a breach of the obligations).

Any information supplied by the community, industry and stakeholders as part of the DBC development process will be used solely for the purpose of developing TEARC in accordance with the Queensland Government's privacy of guidelines. This information will not be disclosed to any third parties without the consent of the individual, unless otherwise required by law.

13 ENVIRONMENTAL ASSESSMENTS AND APPROVALS

CHAPTER SUMMARY AND CONCLUSIONS:

- An Environmental Assessment Report (EAR), including a Review of Environmental Factors (REF) and Environmental Management Plan (planning) (EMP (P)), have been prepared for the project according to the Department of Transport and Main Roads' (TMR) Environmental Processes Manual (2013).
- The majority of the TEARC corridor is accommodated on freehold land owned by the Co-ordinator General and designated for the purposes of materials transportation / services corridor precinct within the TSDA. The corridor includes unallocated state land associated with Ross River crossing, Crown leasehold lands near and within the port of Townsville and road reserves.
- Extensive sections of the project study area are heavily impacted by clearing, fire and weed infestation from past or current adjoining land uses.
- Unless native title is to be resumed, carrying out the Project in these areas will require compliance with Part 2, Division 3 of the Native Title Act 1993 (Cth). There are two registered Native Title Claims covering the extent of the project area, namely the Bindal People #2 (QC2016/005) and the Gurambilbarra Wulgurukaba People (QC2016/007).
- There are a number of sites within the broader project area that are of cultural significance to the local Aboriginal and Torres Strait Island Peoples. Most notable being the landscape features and sand dunes around the Ross River. Three areas of European (post-contact habitation) Heritage including the former Townsville City Council sewerage treatment works (abandoned), the heavy anti-aircraft gun station installation and camp sites and the Ross River tidal flats where Japanese bombs impacted during WW2.
- Liaison with the registered native title claimants for Bindal people #2 and Gurambilbarra Wulgurukaba will be required to determine the requirements for complying with the cultural heritage duty of care under the Aboriginal Cultural Heritage Act 2003.
- If an EIS is to be required for the Project, this liaison will need to include development and approval of cultural heritage management plans under Part 7 of the Aboriginal Cultural Heritage Act 2003 with each of the registered native title claimants for Bindal people #2 and Gurambilbarra Wulgurukaba.
- Potential residual sources of land contamination from past or present activities have been identified and there is a risk of unexploded ordnances (UXO) from the first Japanese air raid in 1942 near the mouth of Ross River.
- Due to the diversion of freight rail traffic to the Project line Rail, 765 sensitive receivers on the existing rail line are expected to receive a typical 3 dB decrease in rail noise. Increased rail noise is expected within the Cluden residential area and some areas of South Townsville near to the port however none of the 927 assessed sensitive receptors are expected to experience noise impacts that exceeds the Queensland Rail Code of Practice LAeq 24hour rail noise criteria targets.
- Based on the predicted freight movements, it is expected that there will be negligible impacts on existing air quality including particulate emissions or gaseous pollutants and emissions are not expected to exceed the Air EPP criteria at the nearest sensitive receptor.

- Potential construction and operational impacts addressed in the EAR include:
  - Impacts to terrestrial and aquatic flora and fauna through clearing of vegetation and loss of habitat, fauna injury/mortality, disturbance of fauna and fish passage and management of weeds.
  - Impacts to the ambient environment.
  - Impacts to surface, wetland and marine water resources sources through degradation of water quality and disruption of coastal processes and downstream flows.
- Unavoidable impacts as a result of the TEARC project mainly include the loss of marine vegetation, migratory bird and fauna habitat, the restriction of movement of aquatic species, and the disturbance of areas that may contain potential acid sulfate soils (particularly the land reclamation within the port area and near the eastern side of SPR at the mouth of the Ross River).
- The EMP (P) provides a broad range of mitigation measures to protect environmental values in the Project area, inclusive of offsets. These strategies will require further investigations, field work and management plans to be developed at various stages of the Project.
- The Project will trigger a Referral and Approval of a controlled action under the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act), as well as a number of tier two statutory approvals.

13.1 Overview

An environmental assessment was undertaken to ensure that the project fulfilled its legal responsibilities and appropriately managed environmental risks. An Environmental Assessment Report (EAR), including a Review of Environmental Factors (REF) and Environmental Management Plan (planning) (EMP (P)), have been prepared for the TEARC project in accordance with the Department of Transport and Main Roads' (TMR) Environmental Processes Manual (2013). The purpose of the EAR was to undertake selected desktop and site environmental investigations to provide recommendations to inform the development of the business case, detailed design and implementation phases of this major infrastructure project.

The Environmental Assessment Review delivers:

- Detailed information on the existing environmental factors of the site relevant to the project (Review of Environmental Factors (REF)), and a comprehensive assessment of the likely impacts of the project on those factors.
- Recommendations for design and construction management (EMP(P)) to sufficiently avoid, mitigate, manage or offset the impacts of the project that have been identified within the (REF).
- Legislative approvals triggered by the project and actions required.
- Other legislative requirements and compliance strategy.

The environmental review was also separately supported by the following reports:

- Noise and Vibration Assessment
- European Cultural Heritage Report
- Indigenous Cultural Heritage Desktop Study and Cultural Heritage Risk Assessment.

13.2 Methodology

The method adopted for the Review of Environmental Factors (REF) was based on the Business Case guidelines and TMR Environmental Processes manual. Desktop assessment involved searches of available databases and reviews of previous studies and background reports. This information also informed a number of field surveys. The review, alongside a field validation ecology survey and noise monitoring, have helped to classify the project's potential environmental risks and identify relevant environmental legislation. These risks, as well as the significance of their likely impacts, are summarised below.

13.3 Key findings

The key potential impacts of the construction and operation of TEARC are summarised below.

Table 13.1 Environmental Impacts Summary

ASPECT	CONSIDERATIONS
Legislation and Permit Requirements	The project has considered the approvals and compliance requirements to undertake this project. Relevant Acts include: ▪ *Aboriginal Cultural Heritage Act 2003* ▪ *Biosecurity Act 2014 and Biosecurity Regulation 2016* ▪ *Coastal Protection & Management Act 1995* ▪ *Environmental Offsets Act 2014* ▪ *Environmental Protection Act 1994* ▪ *Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)* ▪ *Fisheries Act 1994* ▪ *Native Title (Queensland) Act 1993* ▪ *Nature Conservation Act 1992* ▪ *Planning Act 2016* ▪ *State Development and Public Works Organisation Act 1971* ▪ *Transport Infrastructure Act 1994*

ASPECT	CONSIDERATIONS
LEGISLATION AND PERMIT REQUIREMENTS (CONTINUED)	The TEARC Project will trigger a Referral and Approval of a controlled action under the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act). Due to the nature and scale of the project, and the sensitivities of the receiving environment, the EPBC Act approval will likely trigger assessment by an EIS process. Matters of National Environmental Significance (MNES) expected to be impacted by the Project include: ▪ The Great Barrier Reef World Heritage Area as a World Heritage property and National Heritage place ▪ The Great Barrier Reef Marine Park ▪ Listed threatened species (41) and threatened ecological community (1) ▪ Listed migratory species (63). The TEARC rail and road infrastructure is located predominantly within the designated materials transportation/services corridor precinct of the Townsville State Development Area (TSDA); with a portion, north of the Ross River located within the Strategic Port Land. South of the Ross river the rail is positioned within the designated materials transportation/services corridor precinct of the TSDA development scheme 2013 and is consistent with the preferred land use intent. North of the Ross river the rail line is consistent with the future rail identified within the Port of Townsville Land Use Plan 2013 maps within the Port Industry land zone. It is therefore unlikely that the TEARC Project would require an MCU approval under the TSDA development scheme 2013 or the Port of Townsville Land Use Plan 2013. Further engagement and consultation with the Department of State Development and Port of Townville should be undertake during the next project phase to confirm. The following tier two statutory approvals are likely to be triggered by TEARC: ▪ Operational works for tidal works (prescribed tidal works) ▪ Operational works for waterway barrier works ▪ Self-assessable waterway barrier works ▪ Operational work that is the removal, destruction or damage of a marine plant. The project also has the potential to trigger environmental offset obligations. Further evaluation of the triggered environmental offset obligations is required, particularly within the context of the biodiversity management environmental reserves established under the EPBC Act approval and wider infrastructure corridor planning for the TSDA as part of the SPR project.

ASPECT	CONSIDERATIONS
Planning and Land Use	Freight heavy haul railway infrastructure that activates future development precincts within the Townsville SDA and improves rail access to the Port of Townsville and its future eastern expansion areas is very important to the region. This form of infrastructure development is consistent with the region's objectives to become a prime future industrial transportation and distribution services centre for north Queensland, and improve urban amenity values within the city's southern fringes. The TEARC corridor aligns with land designated for the purposes of materials transportation / services corridor precinct within the TSDA. The project is adjacent to other existing linear infrastructure including SPR, Powerlink 132KV powerline, large intact environmental conservation / reserve land areas, industrial uses, vacant future industrial uses and within 350m of existing residential land near Cluden, Oonoonba and South Townsville. There are also a number of national parks and protected areas in proximity to the alignment including Cleveland Bay, part of Bowling Green Bay National Park, which is a Ramsar convention listed site (a wetland of international significance), and the Great Barrier Reef World Heritage Area. Special care must be taken to identify any Unexploded Ordinances (UXOs) – remnants from WWII – that may possibly lie within the rail corridor. Survey of UXOs should be undertaken prior to development, as the removal of any discovered UXOs may require detonation, potentially disturbing soils, vegetation and surrounding fauna. The project is consistent with the preferred land use intent for the TSDA development scheme, and it is anticipated that the rail line and road works will be consistent with the Port of Townsville Land Use Plan 2013.
Property and Tenure Impacts	The majority of the TEARC corridor aligns with the existing transport corridor, which runs through the TSDA. This corridor is freehold land owned by the Co-ordinator General. The only unallocated state land impacted will be associated with Ross River crossing. The corridor also includes state leasehold lands near and within the port of Townsville and road reserves. There is likely to be the need for some property acquisition near the Cluden Y junction, along Racecourse Rd and within the Port precinct. Property impacts are described in more detail in the Reference Project (Chapter 5). To the extent that the Project will be undertaken in areas where native title may continue to exist, including in relation to the natural waterways crossed by the alignment (including Ross River), compliance with an applicable provision of Part 2, Division 3 of the *Native Title Act 1993* (Cth) will be required. There are two Native Title Claims covering the extent of the project area including the Bindal People #2 (QC2016/005) and the Gurambilbarra Wulgurukaba People (QC2016/007).
Topography, Geology and Soils	The rail corridor traverses the generally low-lying, flat floodplain of the Ross River and tidally influenced areas. The project area is prone to erosion due to storm event inundation and long-term trends including sediment supply deficit and channel migration. It is likely that some of the expansive soft clay and grey sand around Ross River will require lime treatment if disturbed to preserve the integrity of structures positioned upon them. Due to the low coastal elevations, there is high likelihood of the presence of potential or actual acid sulphate soils. Detailed site investigations and an Acid Sulphate Soil Management Plan will be required at or prior to the detailed design phase of the project. Some sources of contamination were also identified via desktop assessment, and will require further investigation at the detailed design phase.

ASPECT	CONSIDERATIONS
Hydrology and Water Quality	The project corridor crosses the mouth of the Ross River and tributaries of Gordon Creek and Stuart Creek, extending through coastal saltmarsh flood plain areas. The placement of the rail embankment across waterways and the associated tidal floodplain has the potential to affect hydrological flows and flood inundation. Waterway crossings and potential diversions may lead to changes in hydrological flow volumes and velocities, diverted channels, and altered tidal influence and inundation areas on either side of the rail embankment. However, the appropriate use of bridges and culverts for waterway crossings should minimise alterations to patterns of freshwater flow and tidal inundation, thereby reducing risks to upstream areas and ecosystems across the floodplain. Water quality impacts during the construction and operation phases of the project will also require management. The greatest risks arise from construction activities, and the possibility of sedimentation caused by disturbance and erosion.
Flora and Fauna	The Project intersects eight regional ecosystems (RE), the majority of which are severely affected by weed invasion. One of these REs (RE 11.2.1) 'of concern' is also a listed essential habitat area. The reference design will intersect a total of 1.9hectares (within a 13.4hectare parcel) of RE 11.2.1. A total of 35 flora species, including four vulnerable species, listed under the Nature Conservation Act (NC Act) and EPBC Act have been identified within the Project area through desktop studies. Due to the large weed infestation within the project area, removal of flora in certain areas may not cause any considerable damage, and could in fact improve the remnant vegetation through weed removal. The removal of weeds off-site will need to follow weed hygiene protocols. The EPBC Act and NC Act searches produced 239 fauna species that may potentially be present within the Project area. This includes 45 migratory species, five of which are listed as threatened. There is potential to disturb and remove the habitats of vulnerable and endangered fauna species, and injure or kill fauna during construction. These risks will need to be managed. The Project impacts on the black-throated finch are considered minimal as the existing weed infestation is such that the project has the capacity improve the existing habitat through rehabilitation of the surrounding area. Impacts on the water mouse, if it is present, would include loss of nesting habitat, loss, and fragmentation of foraging habitat. The project corridor intersects these areas to some degree in the broad intertidal area that extends south of Ross River. The project corridor has the potential to impact mudflats to the east of the mouth of the Ross River that currently provide high value foraging habitat for Great Knot, Red Knot, Eastern Curlew and the Western Alaskan bar-tailed godwit. However, the impact is unlikely to be long-term given the dynamic nature of intertidal environments. If the rail bridge has no impediment to tidal flows, the impact on foraging habitat is likely to be negligible in the long-term. The impacts of the construction of the bridge over Ross River on aquatic ecology was also studied. The rail bridge will be supported by piles driven into the riverbed and adjacent intertidal areas. It is likely that a number of sensitive species will be affected in the short term during this construction activity, which may disturb Acid Sulfate Soils (ASS) and local flora and fauna, as well as generate noise. Underwater noise can impact the Snubfin and Humpback dolphins that use the area adjacent to the mouth of the Ross River intensively throughout the year for calving and other activities. Cross drainage structures will require detailed consideration of local hydrological regimes to mitigate changes to stream conditions during peak flow periods and maintain fish passage.

ASPECT	CONSIDERATIONS
Air Quality	Construction emissions include pollutants from equipment emissions and dust from the disturbance, exposure and transportation of soils. Potential operational emissions include the running of the trains along the tracks, increasing local air emissions. Air emissions associated with trains are predominantly from diesel exhausts along the railway line. The project is predominantly located near areas planned mainly for emission intensive industrial activities, such as a highway, bulk materials handling or processing as well as port related industry precincts. Based on the predicted freight movements, it is expected that there will be negligible impacts on existing air quality including particulate emissions or gaseous pollutants from diesel engine exhausts, emissions from load, and recirculated dust beyond 50m of the alignment. Therefore, adverse air quality impacts are not expected to exceed the Air EPP criteria due to the separation distance from the rail alignment and the nearest sensitive receptor being more than 350 metres.
Noise and Vibration	There are a number of sensitive receptors within proximity to the alignment who will receive freight traffic closer to their properties, resulting in potential disruptions. However, TEARC will divert a significant amount of freight rail traffic away from the Abbott Street corridor, which will reduce noise and other impacts for residents in that area. The primary impacts will likely encompass: ▪ Increased noise and vibration during construction and operation, affecting developed areas around Cluden and the Port of Townsville. ▪ Increased noise and vibration during construction and operation, impacting natural vegetated areas and fauna habitats between the existing SPR and Cluden. ▪ Increased noise and vibration during construction of the bridge across Ross River, potentially impacting marine fauna and nearby shorebird habitat. Predictive noise modelling of rail noise levels at 927 sensitive receivers at Cluden and South Townsville near the port was undertaken for six freight traffic scenarios. Outputs indicate that the 765 sensitive receivers on the existing rail line are expected to receive a typical 3 dB decrease in rail noise due to the rail traffic diverted to the Project line; while rail noise levels are predicted to increase within the Cluden residential area and some areas of South Townsville near to the port. However, noise level increases are still predicted to remain well below the 65dB LAeq 24hour average daily criteria target per the Queensland Rail Code of Practice.
Landscape and Visual Amenity	Many of the aesthetic values along the project alignment are derived from areas of open space and environmental conservation – particularly the mangrove communities along the shoreline, which provide essential habitat for shore fauna. Therefore, the construction of a railway line will affect the visual amenity of the area to some extent. The nearest residence will have an obscured view of the alignment due to an industrial site and an area of remnant vegetation separating the tracks from the residential area.
Waste Management	All contaminated land to be removed off site will be disposed of appropriately and in accordance with relevant legislative and/or policy requirements including the *Environmental Protection Act 1994*.

ASPECT	CONSIDERATIONS
European Cultural Heritage	There are a number of European (post-contact habitation) Cultural Heritage sites adjacent to the project corridor. These include: ▪ The former Townsville City Council sewerage treatment works (abandoned). ▪ The former heavy anti-aircraft gun station installation and camp sites. ▪ The Ross River tidal flats impacted by Japanese bombs dropped during WWII. The corridor does not pass through locations that are currently listed in the Townsville City Council, National Trust, Queensland Heritage Register or National Heritage Registers. As the project runs largely within a defined corridor that has already experienced some clearing and disturbance from previous developments, it is unlikely that significant artefacts will be unearthed during the construction phase.
Aboriginal Cultural Heritage	There are a number of culturally significant sites within the project area. The area would have been used as a valuable resource for food and stone collection up until European settlement. The cultural heritage surveys undertaken for the Townsville Port Access Road project identified several sites of Aboriginal Cultural Significance present in the area, including a low-density shell scatter, a scatter of stone artefacts and a small cluster of bone (later identified as macropod bone). Further field studies undertaken in 2005 identified additional sites along the beach ridges that run along the east and south coast of the Ross River. The sand dunes on the south bank of the Ross River and the Ross River crossing hold great cultural significance to the traditional owners and are therefore, highly sensitive areas. The boundary between the two Native Title Claim Areas is the mid-point of the Ross River, which is a culturally significant site relating to the creation story. Careful cultural heritage management will be required at this site, in particular, to facilitate the rail bridge construction across this river. Liaison with the registered native title claimants for Bindal people #2 and Gurambilbarra Wulgurukaba will be required to determine the requirements in meeting for complying with the cultural heritage duty of care guidelines under the Aboriginal Cultural Heritage Act 2003. If an EIS is to be required for the Project, this liaison will need to include development and approval of cultural heritage management plans under Part 7 of the Aboriginal Cultural Heritage Act 2003 with each of the registered native title claimants for Bindal people #2 and Gurambilbarra Wulgurukaba.

<table>
<tr><th>ASPECT</th><th>CONSIDERATIONS</th></tr>
<tr><td>Environmental Management</td><td>Potential impacts associated with Project activities have been managed in two ways. Following the REF framework to protect environmental values within the project area, the MCA option selection process recommended the alignment with the least environmental disturbance. Secondly, mitigation and/or management measures, as described in the EMP (P), have been incorporated into the reference design.

The EMP (P) provides a broad range of mitigation strategies to protect environmental values specific to the Project area, inclusive of offsets. This plan has identified a number of future environmental activities, recommendations and forward work plans which will likely be required during the next phases of the project. These include:
▪ Species management plans (likely to be for dolphins, dugongs, turtles, shorebirds and potentially others)
▪ Queensland Offsets Development Plan
▪ EPBC Act Offsets strategy
▪ Stakeholder engagement plan
▪ Erosion and sediment control plan
▪ Acid sulfate soils management plan
▪ Contaminated land Stage 1 Site Investigations and management plan
▪ Vegetation management plan
▪ Cultural heritage management plan
▪ Noise and Vibration Management Plan
▪ Air quality Management Plan
▪ Site based stormwater management plan
▪ Waste management plan
▪ Weed management plan
▪ Fauna management plan

The EMP (P) also provides a summary of impacts and associated risk ratings. Residual risk ratings are assigned to impacts based on the full implementation of the recommendations provided.</td></tr>
<tr><td>Climate Change</td><td>Flood Immunity (Vertical Grade) Provisions

TEARC design planning levels have been established based on the following:
▪ Within the coastal areas, design level criteria have been based on TCCs adopted Design Storm Tide event levels in accordance with the City Plan 2014 provisions. The current City Plan 2014 provisions necessitate design planning levels which are higher compared to what otherwise applied under the former 2005 scheme; and
▪ In floodplain areas, design planning levels are based on TCCs DFE but which additionally includes conservative allowances made in respect to climate change (2100 planning timeframe), un-mitigated catchment development and inclusion of the ultimate TSDA strategy. The TEARC design planning levels have been established to “future proofing” the TEARC infrastructure and is considered appropriate.</td></tr>
</table>

14 SOCIAL IMPACT EVALUATION

CHAPTER SUMMARY AND CONCLUSIONS:

- Townsville's population is expected to grow by around 42,500 people over the next decade and up to around 288,500 people by 2036. Local, State and Federal Governments have in place a range of planning to support the economic and urban development of the region.
- Townsville has grown around the Port of Townsville (PoT), with urban and industrial land uses co-located in the city centre. As the city continues to grow, these uses become increasingly incompatible as amenity related impacts, such as noise, dust and potential safety hazards from hazardous cargo, impact urban land uses.
- Rail freight access to the PoT is currently via the existing North Coast Line, which runs through urban areas of Townsville such as Idalia, Oonoonba, Railway Estate and South Townsville. Some dwellings are located within 50 metres of the railway in these suburbs.
- Urban amenity has a significant bearing on the liveability, urban development opportunity and competitiveness of a city. Currently, freight movements to and from the port are through urban areas that results in amenity impacts and limits the opportunities for urban renewal and uplift.
- The existing rail freight network in Townsville is subject to time delays and capacity constraints. These inefficiencies increase costs for industry and reduce their competitiveness. The network is also constrained to shorter train lengths which impacts efficiency, increases cost and limits future opportunities.
- Current master planning for the PoT seeks to consolidate port activities to core areas in the eastern and southern precincts, while allowing for transition zones towards the Townsville CBD.
- While the North Coast Line would remain operational with Townsville Eastern Access Rail Corridor (TEARC) in place. The implementation of TEARC would reduce the number of trains using existing rail network which would reduce current amenity and safety related impacts and limit future amenity impacts associated with rail traffic growth. This would also limit the amount of time that open level crossings are closed, reducing delays for road traffic.
- The TEARC alignment is located largely in undeveloped, unpopulated areas, however it is recognised that some areas of Cluden and South Townsville may experience new rail related amenity impacts, though dwellings in these areas are 350 – 400 metres from the proposed TEARC alignment.
- TEARC is expected to strengthen direct employment opportunities associated with port related industries. TEARC will also positively impact indirect employment opportunities in the wider Townsville region, contribute to a stronger economy and act as a catalyst for further private and public sector investment in the region.
- Construction related impacts such as noise, dust etc. would be managed via a suitable environmental management plan.
- Ongoing stakeholder and community engagement with the Townsville community will continue as TEARC moves into future project phases.

14.1 Purpose and Overview

Implementation of the Townsville Eastern Access Rail Corridor (TEARC) has the potential to impact the social environment. This chapter provides a Social Impact Evaluation (SIE) of the TEARC project. The SIE assesses the social impacts of the TEARC project that cannot be monetised to ensure that social impacts and benefits are clearly identified and accounted for in the decision-making process.

The SIE includes a social baseline that provides an overview of the current social environment in and around the TEARC project area and an assessment of potential social impacts (positive and negative) against the identified baseline conditions. Where social impacts are deemed to be material, mitigation and management actions have been proposed to reduce social impacts as much as possible.

14.1.1 Methodology

The SIE has been developed in accordance with Building Queensland's Social Impact Evaluation Guide (2016) which includes the SIE three step process as shown in Figure 14.1.

Figure 14.1 The SIE three step process (Building Queensland, 2016)

Step 1 - Identify social impacts

- Develop a social impact baseline
- Identify and describe social impacts for options
- Identify key drivers and assumptions
- Identify all social impacts that can be monetised for inclusion in the cost benefit analysis

Step 2 - Impact risk assessment

- Identify likelihood and severity of social impacts
- Use impact risk assessment to identify material social impacts
- Apply mitigation of enhancement strategies to identified material impacts
- Repeat impact risk assessment and use outputs to inform risk registers and economic and financial analyses

Step 3 - Summary of results

- Identify metrics for quantifiable material social impacts
- Complete the appraisal summary table
- Conduct sensitivity analysis
- Prepare SIE reporting

The approach to the SIE is described in the following sections which address:

- TEARC project service needs.
- Study areas.
- Data sources.
- Scenarios.
- Stakeholder and community engagement.

Project Service Needs

To ensure the SIE addresses relevant aspects of the social environment, the SIE has been structured to address the project service needs defined for the TEARC project. These are:

- improve urban amenity for Townsville
- cater for increased demand on rail and port network
- reduce bottle necks within the Port of Townsville
- facilitate longer trains.

Study Areas

A number of study areas have been identified for use in the SIE. These areas utilise relevant Australian Bureau of Statistics (ABS) 2016 Census geographic structures to approximate areas relevant to the TEARC project. These include:

- TEARC project area: A combination of nine ABS Mesh Block areas that approximate the TEARC project corridor, shown in red in Figure 14.2.
- SIE study area: The area comprises 39 Statistical Area 1 (SA1) areas that includes areas around the existing North Coast Line (North Coast Line) and the proposed TEARC corridor alignment, shown in blue in Figure 14.2.
- Local government area: Defined by the ABS as the Townsville Local Government Area. The TEARC projects sits within the Townsville Local Government Area (LGA). LGA level data will be used for comparative purposes and to provide context about the broader region, shown in green in Figure 14.4.
- State: Defined by the ABS as the State of Queensland. State level data will be referenced for comparative purposes, shown in orange in Figure 14.3.

Figure 14.2 TEARC project area (red) and SIE study area (blue)

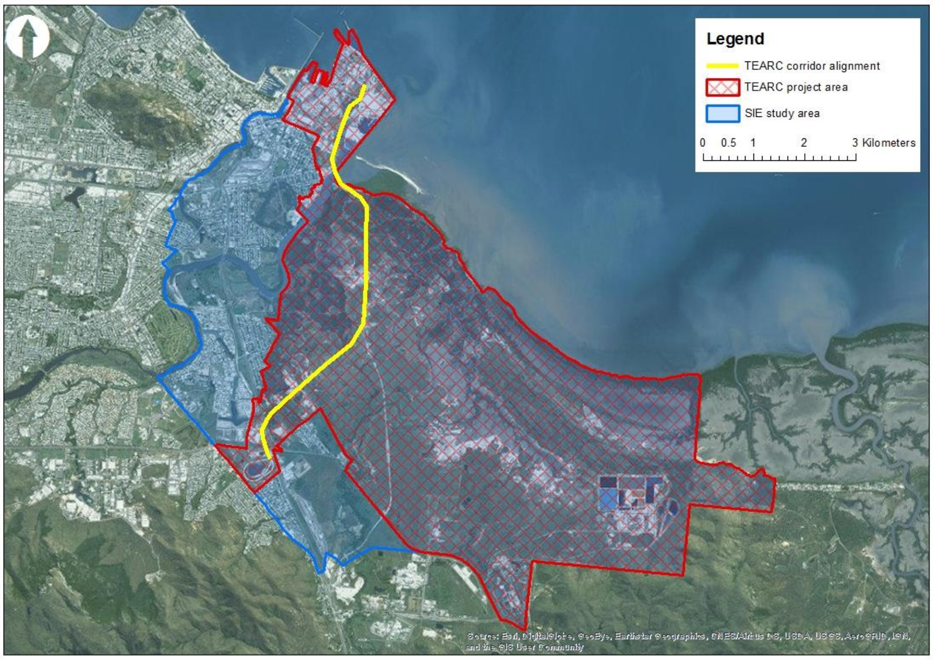
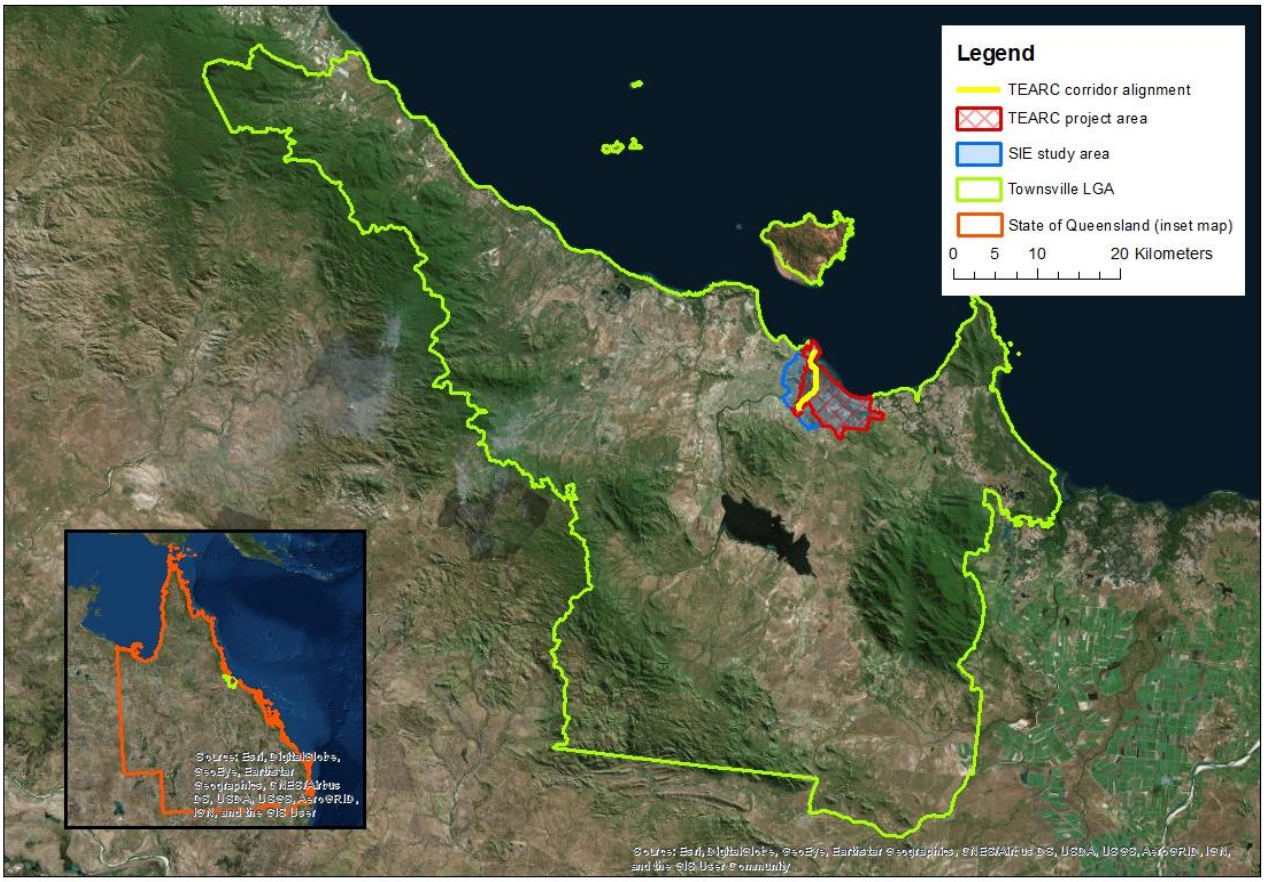


Figure 14.3 Local Government Area and State Area



Data Sources

Information used in this SIE was drawn from a variety of primary and secondary sources. These include:

- Meetings and discussions with Building Queensland and other consultants involved in the preparation of the TEARC Detailed Business Case.
- Australian Bureau of Statistics (ABS) Census 2016 and 2011 and other data publications as relevant.
- Other chapters of this Detailed Business Case.
- Relevant legislation, policy and planning documentation.
- Outcomes of stakeholder and community engagement.

Scenarios

The following scenarios are used in the SIE:

- Base case – existing North Coast Line is used to access the Port of Townsville (i.e. do-minimum, without the project).
- TEARC project – TEARC alignment is used to access the Port of Townsville (i.e. with the project).

Stakeholder and community engagement

Building Queensland has undertaken a range of stakeholder and community engagement activities for the TEARC project. This includes:

- Community information sessions:
  - 28 June 2017 Willows Shopping Centre
  - 28 June 2017 CastleTown Shopping Centre
  - 29 June 2017 Fairfield Central Shopping Centre
  - 29 June 2017 Stockland Shopping Centre
- 1800 line and project email, with eight emails and five phone calls received.
- Survey (online feedback form), with one response received with the survey open for four weeks from 16 June to 14 July 2017.
- Letters distributed to more than 1,000 properties in close proximity to the project, outlining information regarding the project, and inviting residents to attend the community information session or one-on-one meetings with the project team.
- Webpage providing an overview of alignment, contact details of the team and engagement activities.
- One-on-one meetings offered to adjacent residents in Cluden and South Townsville.
- Key stakeholder briefings attended by:
  - Port of Townsville
  - Department of Defence
  - Maritime Safety Queensland - Harbour Master
  - Townsville City Council
  - Aurizon
  - Great Barrier Reef Marine Park Authority
- Advertisement on the 17 June 2017 in the Townsville Bulletin

Chapter 12, Public Interest Considerations, provides full details of this engagement. Where relevant, the outcomes of engagement activities have been incorporated into the SIE.

14.2 Social Impact Baseline

The social impact baseline section describes the base case scenario for the SIE (i.e. the existing North Coast Line continues to be used to access the Port of Townsville).

Table 14.1 provides a summary of the social impact baseline for the proposed TEARC alignment and identifies existing problems, opportunities and key drivers.

Table 14.1 Summary of social impact baseline

Name of Project/Option	Townsville Eastern Access Rail Corridor (TEARC) Project
Problem/opportunity/need	Address future freight demand on the Mount Isa Rail System and North Coast Line by improving access and reducing bottlenecks into the Port of Townsville.
Description	A proposed new freight rail link connecting the Mount Isa Line and North Coast Line, through the Townsville State Development Area (TSDA) to the Port of Townsville.
Social Impact Baseline (summary)	Townsville's population is expected to grow by around 42,500 people over the next decade and up to 288,500 people. To cater for this population growth, the Local, State and Federal Governments have in place a range of planning to support the economic and urban development of the region. The PoT is a significant economic generator for the region. Rail freight access to the PoT is currently via the existing North Coast Line, which runs through urban areas of Townsville such as Idalia, Oonoonba, Railway Estate and South Townsville. This railway line separates the port from the Townsville CBD. Urban amenity has a significant bearing on the liveability, urban development opportunity and competitiveness of a city. Currently, freight movements to and from the port are through urban areas which results in amenity impacts and limits the opportunities for urban renewal and uplift. Freight rail movements through residential areas exposes residents to noise, dust and potential safety hazards from hazardous cargo. As the city expands around the existing rail corridors, these issues are expected to grow. The existing rail freight network in Townsville is subject to time delays and capacity constraints. These inefficiencies increase costs for industry and reduce their competitiveness. The network is also constrained to shorter train lengths which impacts efficiency, increases cost and limits future opportunities.
Key drivers/ service needs	**Problems/opportunities identified in the Social Impact Baseline Key Drivers**
Urban amenity	▪ Current local, State and Federal government strategies and planning documents focussing on strengthening urban development in the Townsville CBD and the Townsville Waterfront PDA. ▪ Townsville Port master planning focusing on a transition of port activity to the south away from urban areas – the existing North Coast Line is a key barrier to this transition. ▪ Opportunity to improve urban amenity in residential areas along the Abbott Street and existing North Coast Line corridor in suburbs such as Idalia, Oonoonba, Railway Estate and parts of South Townsville. ▪ Focus on consolidating industrial development to the TSDA with a dedicated materials transportation corridor for the TEARC alignment. Branching the TEARC alignment from the existing North Coast Line through the TSDA to the Port of Townsville will enable more efficient movement of freight via rail to and from the Port to access wider regional, interstate and overseas markets.
Cater for demand	▪ PoT has provided economic development opportunities to the Townsville region and beyond through enhanced access to overseas and interstate markets. Opportunity for improved access to and from port. ▪ Greater employment demand in Townsville for construction, project management and operational workforces. Opportunity to utilise existing resources within the Townsville population.

Name of Project/Option	Townsville Eastern Access Rail Corridor (TEARC) Project
Reducing bottlenecks	▪ Opportunity for the TEARC alignment to relieve congestion inside the PoT in order to optimise export and supply chains. ▪ Existing freight train queuing in residential areas along the Abbott Street corridor.
Facilitate longer trains	▪ Constraints along the North Coast Line and within the PoT to accommodate longer trains up to 1,000m in length. ▪ Should longer trains be introduced, the TEARC alignment presents opportunity to enable their use.

The SIE uses the Project Service Needs to structure the social baseline and subsequent impact assessment. The following sections provide detailed information about the baseline social environment within the TEARC project area and SIE study areas.

14.2.1 Urban Amenity

The Port of Townsville is centrally located to the east of the Townsville CBD in close proximity to urban areas such as South Townsville and Railway Estate, and is situated in the southwest of Cleveland Bay between Ross River and Ross Creek. It is situated to serve the North-West Queensland region, and is the terminus for the Mount Isa Line and strategically located to serve the activities of the Townsville State Development Area (TSDA) to the south-east of the port.

The PoT has played a significant role in the development of the city and wider North Queensland region. The port was established in 1864 to service the newly settled rural hinterland, with Townsville developing around the harbour to become the largest urban centre in North Queensland. The PoT plays an important role in the economy in a local, regional and state context, and over time has seen growth in rural/agricultural production to extractive minerals, manufacturing and mineral processing. This has led to increased social and urban development in and around Townsville and its hinterland.[36]

Townsville's urban core is poised for redevelopment in the Townsville City Waterfront Priority Development Area (PDA). The Townsville Waterfront PDA Development Scheme plans for redevelopment of a significant tract of land at Ross Creek adjacent to the Port of Townsville. With expected population growth for the Townsville region, an increased demand for housing will occur. The Townsville City Council Plan[37] seeks to focus new mixed-use developments (e.g. commercial/residential) in the Townsville CBD, with a mix of newer and older housing in suburbs such as Oonoonba, Idalia and Cluden, while new residential developments are planned for the city's outlying areas. In suburbs, such as South Townsville and Railway Estate, there is a focus on the maintenance of existing housing architectural character.

The TEARC alignment seeks to improve direct access to the port, by diverting current freight traffic away from the Abbott Street portion of the North Coast Line to alleviate pressure on the rail network and reduce amenity and safety impacts associated for residents within South Townsville, Oonoonba, Idalia and Cluden.

Improving urban amenity is one of the TEARC project's service needs. The following sections provide details of the current urban environment, and the influence the Port has on this environment, within the SIE study area.

[36] AECOM/WBM BMT/POTL 2013
[37] TCC 2014

14.2.2 Urban Areas within the SIE Study Area

Population

Townsville is the largest city in Northern Australia with a population of more than 190,000 people. Table 14.2 provides an overview of the population at 2011 to 2016, including median ages and the age profile of the population.

Table 14.2 Selected population trends for study area, Townsville LGA and Queensland

STUDY AREA CATEGORY	POPULATION (2011)	POPULATION (2016)	MEDIAN AGE (YEARS) (2016)	ESTIMATED RESIDENT POPULATION (AS AT 30 JUNE 2015)									
				0-14		15-24		25-44		45-64		65+	
				NO.	%	NO.	%	NO.	%	NO.	%	NO.	%
Townsville LGA	180,114	195,914	33.5	40,300	20.8	30,877	15.9	56,317	29.0	45,199	23.3	21,253	11.0

The population is projected to grow by around 42,500 people over the next decade, up to 288,500 people by 2036. This expected population growth is considered to be critical to driving economic development in Australia's north.[38] This anticipated population growth will be driven by economic development associated with the PoT and its associated industry, including minerals and agricultural exports, defence activities and tourism related services and development. The population projections for the region indicate that Townsville LGA is likely to experience an average annual growth rate (AAGR) of 1.9 percent between 2016 and 2036, which is slightly higher than Queensland's AAGR (see Table 14.3).

Table 14.3 Population projections for Townsville LGA and Queensland

STUDY AREA CATEGORY	POPULATION PROJECTIONS			PROJECTED AVERAGE ANNUAL GROWTH RATE (2016 – 2036) %
	2016	2026	2036	
Townsville LGA	199,358	241,872	288,593	1.9
Queensland	4,853,048	5,730,062	6,763,153	1.7

Suburb profiles

The residential areas of Cluden, Oonoonba and South Townsville are located to the south and west of the TEARC project area. Figure 14.4 shows the locations of the suburbs in close proximity to the study area. Areas directly adjacent to TEARC project area consist of urban and non-urban land uses and major transport corridors including the existing North Coast Line and the Southern Access Road (SAR).

The closest residential properties to the TEARC project area are approximately 350 – 400 metres away from the alignment. However, it is noted for the TEARC project that these dwellings sit within an environment of industrial and transport related activities related to the PoT and the existing North Coast Line.

[38] DPMC 2016

Figure 14.4 Suburbs located within the SIE study area

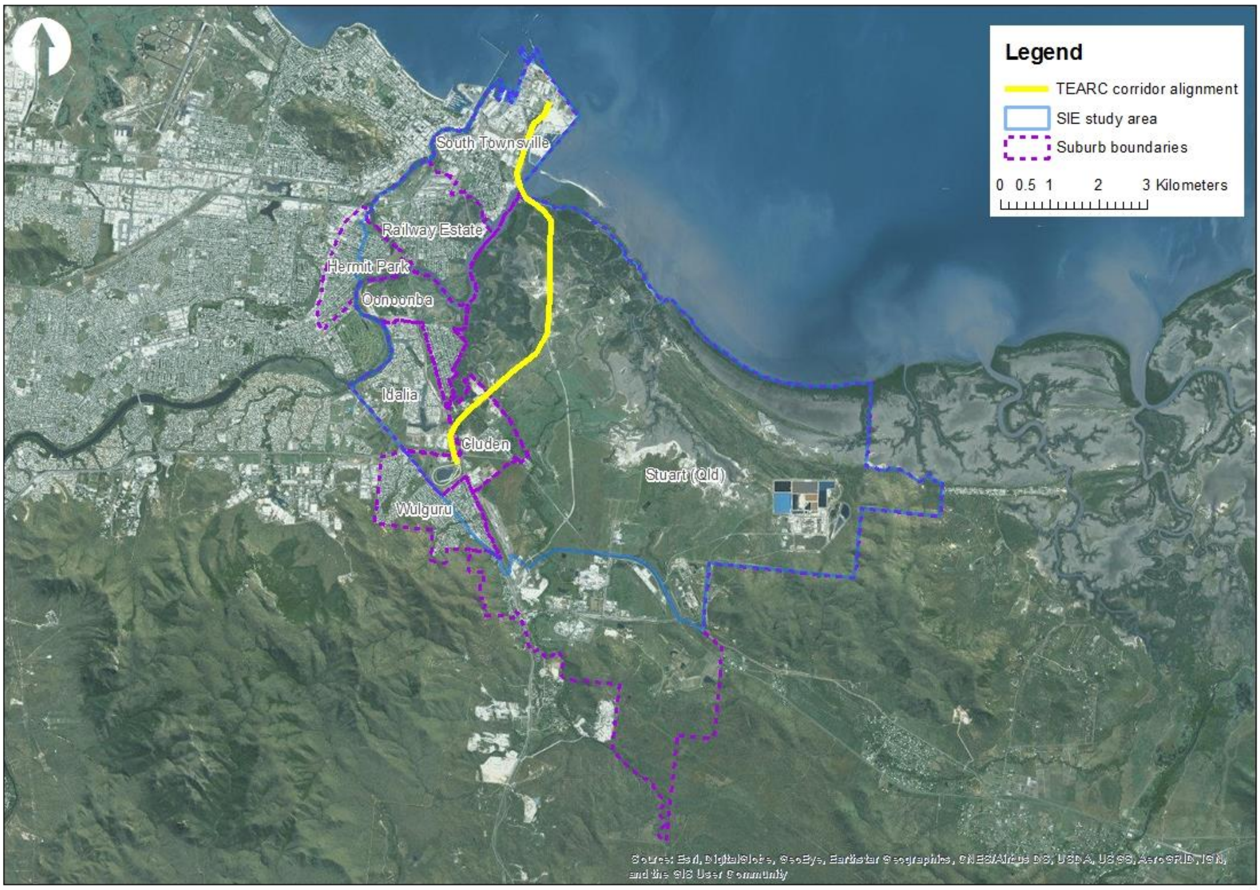


Table 14.4 provides further detail on the suburbs within the SIE study area.

Table 14.4 Suburb profiles

SUBURB	OVERVIEW	POPULATION (2016)	DISTANCE FROM NORTH COAST LINE
SOUTH TOWNSVILLE	South Townsville is located adjacent to the PoT. Originally settled by workers associated with the PoT, the suburb is predominantly residential with commercial and industrial uses. Features many older residences known for their 'heritage character' values (1890s and early 1900s). South Townsville acts as a continuation to the Townsville CBD, with hotel accommodation and restaurants located along Palmer Street.	2,353	50 metres
IDALIA	Originally a light-industrial area, situated adjacent to the existing North Coast Line. Recent subdivisions have developed it into a general residential area with a district centre, community facilities and open space.	4,438	120 metres

SUBURB	OVERVIEW	POPULATION (2016)	DISTANCE FROM NORTH COAST LINE
CLUDEN	Located to the east of the Abbott Street corridor and to the north of the recent Bruce Highway interchange upgrade. Features predominately low density residential and light industrial development. Areas within the suburb of Cluden are included in the Townsville State Development Area (TSDA).	427	550 metres
OONOONBA	Oonoonba is bounded to the west by the Abbott Street and North Coast Line corridor. Oonoonba is a Priority Development Area (PDA) approximately six kilometres south of the Townsville CBD and is predominantly a low density residential area. Oonoonba is planned to provide a range of housing choices for the Townsville community.	1,675	50 metres
HERMIT PARK	Hermit Park features a mixture of residential development, commercial and light-industrial businesses. It also contains a number of public services. The eastern most extent of the suburb is located to the west of the existing North Coast Line.	3,414	550 metres
RAILWAY ESTATE	Railway Estate is one of the oldest residential suburbs of Townsville, bounded by Ross Creek to the south-west and Ross River to the south-east. The existing North Coast Line runs through the suburb. The north of the suburb is occupied by railway yards.	2,852	50 metres
STUART	A large suburb with pockets of residential areas, industrial uses and undeveloped land. Areas within the suburb of Stuart are included in the Townsville State Development Area (TSDA). The Partington Rail Yard is located within Stuart.	1,386	50 metres
WULGURU	Wulguru is an older residential area with many Queenslander-style houses. The Partington Rail Yard is located adjacent to Wulguru, approximately 200 metres from residences.	4,570	50 metres

Community Values

The Townsville Community Plan (2011-2021) outlines the local community vision for the Townsville LGA to be a northern gateway to Queensland, connecting people with their community and encouraging an active lifestyle. The community seeks to be strong and connected, focused on an environmentally sustainable future, seeking sustained economic growth and identifying options to shape Townsville for future generations.

Local communities within close proximity to the Port, such as South Townsville, value their local areas for its access to local recreational areas (e.g. local parks, off-leash dog beach at Benwell Road), close proximity to the Port and employment opportunities in close proximity to the Townsville CBD. In particular, stakeholder consultation undertaken to date indicates that open space areas such as mangrove communities and the recreational dog beach are of value to the local community, particularly given the beach is the only off-leash location in the local area.

Informed by the community themes identified in the Townsville Community Plan, the Townsville Planning Scheme (2014) plans for the strengthening of Townsville's strategic regional position in North Queensland, driven through the port and transport sectors, the North-West Minerals Province and agricultural sectors. The TEARC project aligns with the community values 'connected', 'economic growth' and 'shaping Townsville' and supports the strategic outcomes of the Townsville Planning Scheme by improving transport links to the Port in order to access wider interstate and overseas markets.

In terms of visual amenity values, existing areas of open space and environmental conservation, such as mangrove communities, beach areas and local parklands, are valued by the community.

Social infrastructure

A desktop review identified the following social infrastructure within close proximity to the proposed TEARC alignment:

- Townsville South State School, Tully Street.
- Townsville South Preschool, Cannan Street.
- South Townsville Bowls Club, Bell Street.
- Off Leash Dog Exercise Area, Benwell Road.
- Victoria Park, Cnr Boundary Street, Bell Street and Morey Street.
- Unnamed reserve off Cannan Street and Bell Street, South Townsville.
- St John's Anglican Church, Macrossan Street.
- Townsville Fire and Rescue Service, Morey Street.

These facilities are shown in Figure 14.5. It is noted that no education, community or health buildings are located within 500 metres of the TEARC alignment.

Figure 14.5 Community facilities

14.2.3 Future Planning for Urban Growth

It is anticipated that economic development associated with the Port of Townsville, including minerals and agricultural exports, Department of Defence activities and the region's tourism related services and development will drive population growth in the Townsville LGA in the coming years.[39] Many State and local government policies and strategies have been developed to help facilitate and appropriately manage the growth of Townsville. The following section provides a summary of key strategies associated with Townsville's future urban growth.

Townsville City Plan 2017

> The Townsville City Plan sets out Townsville City Council's vision for how Townsville should grow in for the next 25 years, and is council's key document for determining development in the city. While planning and development of the PoT sits outside of Council's jurisdiction as per the Sustainable Ports Development Act 2015, the City Plan recognises the PoT as a key precinct within the city and aims integrate surrounding areas with compatible and complementary land uses.

[39] DPMC 2016

North Queensland Regional Plan

The first North Queensland Regional Plan is currently being prepared by the State Government with input being sought from North Queensland residents. The plan covers five LGAs including Townsville, Burdekin, Charters Towers, Hinchinbrook and Palm Island. The regional plan will focus on:

- protecting the region's unique lifestyle.
- providing well-connected transport, communication and social networks.
- safeguarding the natural environment.
- embracing diversity through a range of community, housing, employment and development styles.

The State government will finalise and release the draft North Queensland Regional Plan for formal notification and community consultation in the mid-late 2017, with a view to finalising the plan in early 2018.[40]

Priority Development Areas (PDA)

There are two Priority Development Areas (PDA) located within the SIE study area – the Townsville Waterfront PDA and the Oonoonba PDA.

The Townsville Waterfront PDA includes close to 100hectares of land on both sides of Ross Creek, located between the Townville CBD and the PoT. The area will be developed into a mixed-use precinct that will accommodate tourist facilities, marine industries and port support services. The PDA aims to also deliver an active public realm and open space network to enhance lifestyle and natural elements of the Townsville CBD.[41] The Townsville Waterfront PDA boundary abuts the North Coast Line in to the south and north of the area as shown in Figure 14.6.

The Oonoonba PDA is an 83-hectare site is an 83hectare site located approximately three kilometres south of the Townsville CBD, bounded by the Ross River to the north and west, the North Coast Line and Abbot Street road corridor to the east, and established residential areas along Riverwood Drive and Viewpoint Terrace to the south (as shown in Figure 14.7).

Development on the site will provide a range of housing choices to cater for the diverse needs of the Townsville community through a mix of densities, types, designs, price points and home ownership and rental options.

[40] DILGP 2017
[41] POTL, EDQ & TCC 2015

Figure 14.6 Priority Development Areas (PDA)

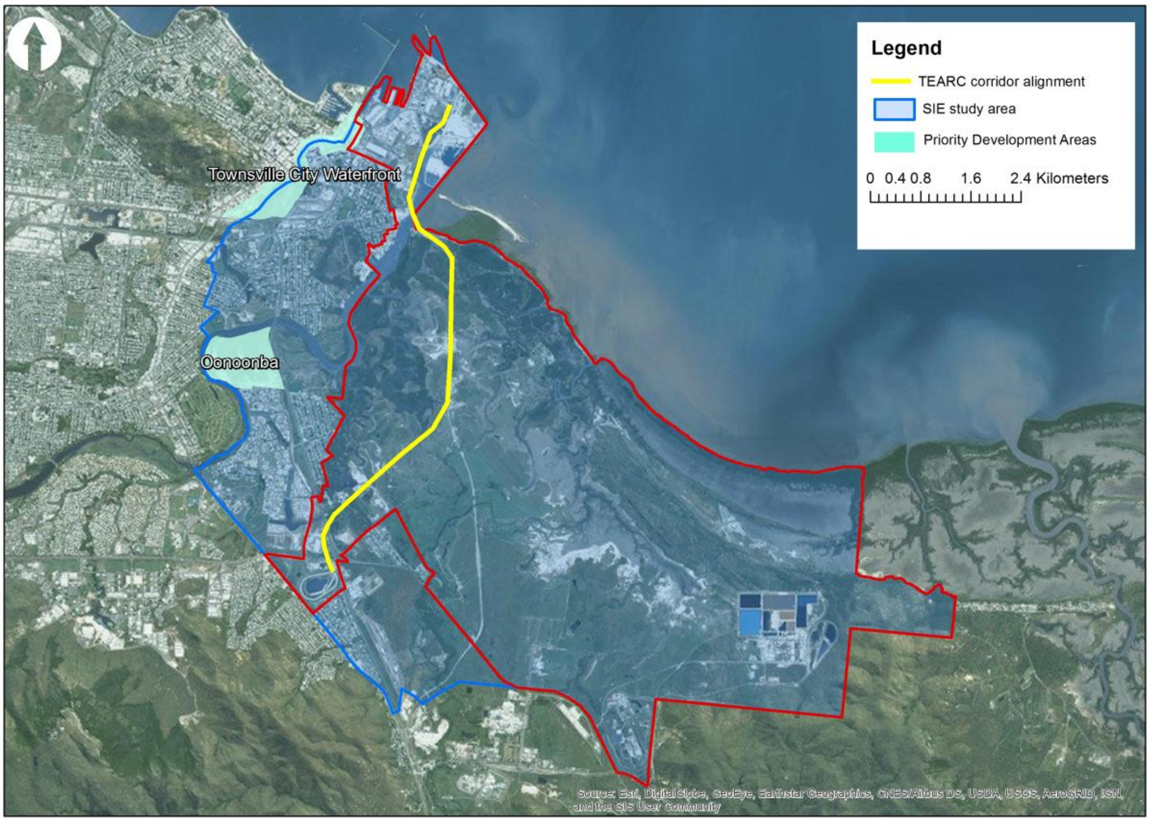
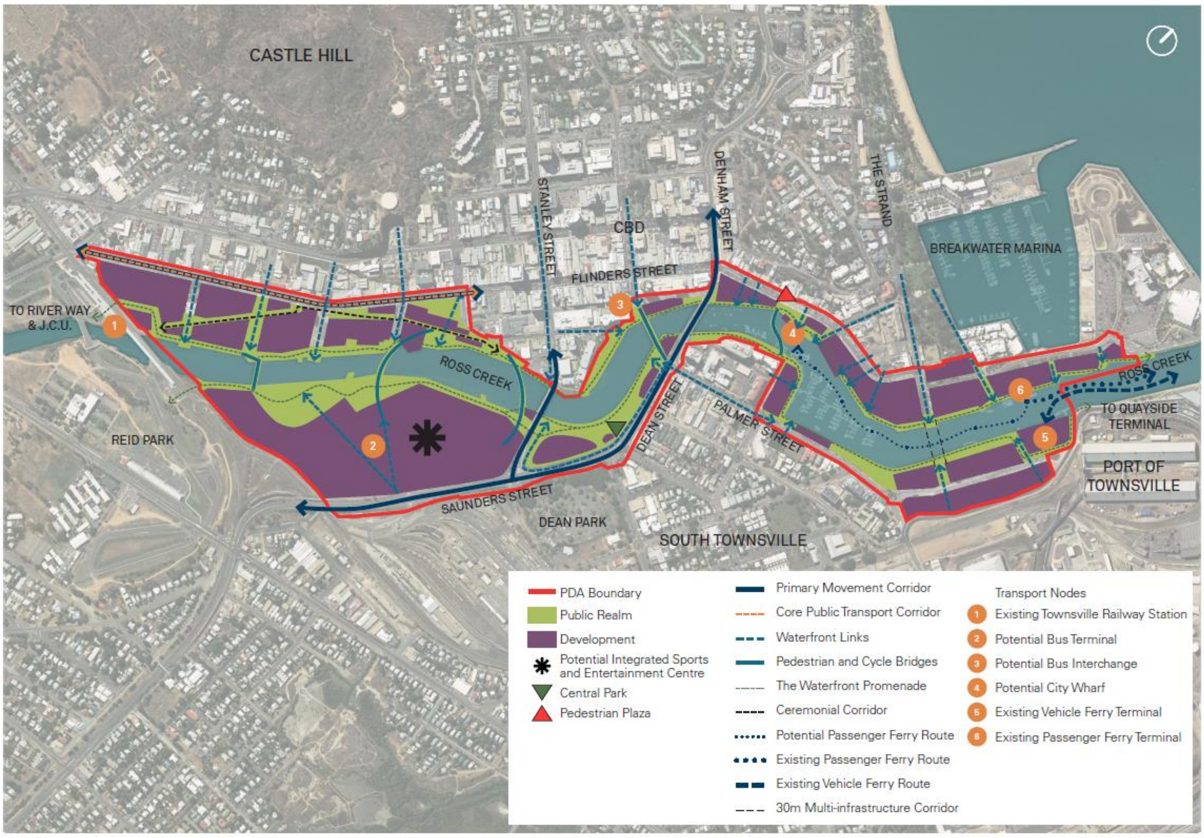


Figure 14.7 Townsville Waterfront Priority Development Area (PDA)



Townsville Stadium

The proposed Townsville Stadium is a key initiative identified in the Advancing North Queensland: Investing in the future of the north plan.[42] The stadium is proposed to be located adjacent to Ross Creek, which is approximately one kilometre west of the proposed TEARC alignment. The proposed stadium is located within close proximity to the Townsville CBD and will contribute to the urban renewal and revitalisation for the CBD and South Townsville.

Opportunities for construction, tourism, retail and hospitality industries are expected as a result of the development. This will also benefit the wider Townsville region through job growth and local skills network development. The development of the proposed stadium is also expected to stimulate development and economic opportunities in the areas surrounding the stadium.

14.2.4 Influence of the Port on Urban Areas

The PoT currently operates eight berths and is the largest container and automotive port in Northern Australia. The port handled more than $10 billion in trade during the 2015/2016 financial year.[43] Further discussion on current port demand is provided below.

PoT Land Use Plan and master planning process

The PoT is currently constrained by a congested port layout. The inability to expand operations within the current port footprint means that it cannot accommodate new customers, and is unlikely to meet expected growth in containerised shipments. The current rail alignment to and through the port has numerous at-grade road crossings, leading to potential safety issues both within and outside the port.

While both the Port and the existing railway can continue to operate as they currently are, opportunities for freight network efficiency and synergies are lost, compromising Townsville’s competitive export position.

A Priority Port Master Plan is currently being prepared for the PoT. The Department of State Development is leading the master planning process, working with the PoT, Townsville City Council and other key stakeholders. The master planning process is considering land and marine areas critical to the port’s sustainable development, economic opportunities and relevant environmental and cultural heritage values.[44] It is also considering the interface with land use planning for the adjacent Townsville Waterfront PDA. As part of the PoT’s existing Land Use Plan (LUP), land use planning has sought to concentrate port activities to central core zones, with an interface precinct at the port boundary leading towards the Townsville City Waterfront PDA. The PoT LUP allows for the grouping of compatible land uses to achieve synergies to maximise existing and planned port infrastructure. With future proposed expansions of the Port, core port uses would be concentrated to the east and north-east of the port in areas zoned as Strategic Port Land and Future Strategic Port Land.[45]

Townsville Port Expansion Project

The PoT expansion project aims to deliver to the port:

- A new deep water outer harbour.
- 6 additional berths in the new harbour.

[42] Department of State Development, 2017
[43] POTL 2017
[44] DSD 2017
[45] AECOM/WBM BMT/POTL 2013

- Deepening and widening of existing approach channels.
- Reclamation of 152 hectares of existing harbour for new berths, bulk cargo storage and a rail loop.

The expansion project responds to the immediate need to cater for larger ship sizes in the channel and swing basins as well as address the medium and long-term need for additional berths as trade increases.

An EIS has been prepared and was made available for public comment in 2013. The Queensland Coordinator General is currently finalising the EIS evaluation report.

Current rail access to Port

The existing North Coast Line runs adjacent to/through urban residential areas of Townsville including the suburbs of Idalia, Cluden, Oonoonba, Railway Estate and South Townsville.

Based on 2017 data, 4,470 trains use the North Coast Line to access the Port of Townsville each year, resulting in 8,940 train movements (in and out of the Port). The North Coast Line corridor between the suburbs of Cluden, Idalia and Oonoonba is currently constrained due to Open Level Crossings (OLCs), or at-grade road-rail crossings, which intersect key road intersections along Abbott Street, such as Oonoonba Road and Lakeside Drive. It has been anecdotally reported that safety impacts to road users are known to occur along Abbott Street due to the presence of two OLCs, which is further impacted by long freight trains that require longer duration shut-downs of level crossings. Data shows that OLCs in this area are currently 'closed' an average of 3-4 minutes per hour, though it is recognised that train movements are not necessarily spread evenly throughout the day and there are peak activity times, such as sugar crushing season.

Travel time on the road network is impacted by disruptions caused by freight trains accessing the PoT which results in OLCs being closed to road traffic. It is estimated that the road network is disrupted on average for up to 10 hours per week from freight trains activating the OLCs. Between 2017 and 2047 it is forecast that the time the road network will be disrupted will increase by 3 hours 35 minutes due to the growth in railway traffic.

As part of the investigations undertaken for the TEARC attended noise monitoring at four locations within the TEARC project area was undertaken, including near residential properties at Cluden, to determine the existing noise environment (background and ambient noise levels) and to measure noise levels and characteristics of rail traffic operating on the existing rail line. The findings of the noise assessment indicated that while the nearest residential properties to the TEARC project area are approximately 350 – 400 metres away, these properties are currently affected by surrounding industrial activities or transport related noise along the North Coast Line, Abbott Street or at the port.

Current port activity impacts urban amenity in neighbouring residential areas predominantly through rail and road transportation associated with port activity. Activity at the Port is considered to be adequately buffered from residential areas.

Southern Access Road

The Southern Access Road (SAR) was developed in response to the increasing trade growth through the PoT and the need for appropriate infrastructure to accommodate increased road traffic from the south and west freight routes into the future.[46] The road was constructed to reduce a growing reliance on the use of Abbott Street (from the south) and Boundary Street into the port. The road enables heavy road transport to directly access the port through the TSDA, avoiding the Townsville CBD and local streets. This

[46] AECOM/WBM BMT/POTL 2013

has improved the urban amenity in areas such as South Townsville, Oonoonba, Idalia and Cluden, while reducing safety impacts to road users due to less heavy vehicle traffic running along local streets.

Subject to additional need generated from increased trade in bulk commodities, the TEARC alignment is proposed to co-locate with the SAR within a dedicated service and materials transport corridor designated as part of the Townsville State Development Area (TSDA) Development Scheme.

Townsville State Development Area

The TSDA was declared in 2003 with a development scheme approved in 2005 and subsequently amended in 2013. The 4,900-hectare industrial area is located approximately six kilometres south east of the Townsville City Centre and targets industries including manufacturing, minerals processing, intermodal freight and logistics and bulk storage. The TSDA features a dedicated service and materials transport corridor in which the SAR and the proposed TEARC alignment runs through.

14.2.5 Cater for Demand

Current Port activity

The PoT has played a significant role in the economic development of Townsville and has provided economic development opportunities to the region through enhanced access to overseas and interstate markets.

In the last 14 years, cargo vessel arrivals to the PoT have remained steady, varying from 694 in 2002/03, to a peak of 747 in 2011/12, to 618 cargo vessels in 2015/16.[47] The port imports a range of products including mineral concentrates and refined mineral products, petroleum, nickel ore and general cargo (see Table 14.5). Large volumes of export products through the port include sugar, fertiliser, livestock cattle, mineral concentrates, and refined mineral products.

Table 14.5 Comparative 2010/11 to 2015/16 cargo trade to Port of Townsville

PRODUCT	IMPORT (T)		EXPORT (T)	
	2010/11	2015/16	2010/11	2015/16
Cement	466,668	364,178 (22% decrease)	0	0
Fertiliser	87,775	94,453 (8% increase)	828,105	964,580 (16% increase)
General Cargo	211,621	233,394 (10% increase)	148,663	141,563 (5% decrease)
Livestock cattle	0	0	51,076	130,776
Meat & By-Products	0	0		7,396
Mineral Concentrates	258,309	415,715 (61% increase)	1,664,714	1,353,357 (19% decrease)
Molasses	0	0	233,710	308,748 (32% increase)

[47] POTL 2017

PRODUCT	IMPORT (T)		EXPORT (T)	
	2010/11	2015/16	2010/11	2015/16
Motor vehicles	19,329	26,247 (36% increase)	0	150
Nickel ore	3,719,507	1,640,915 (56% decrease)	0	0
Petroleum products	941,103	1,064,100 (13% increase)	0	0
Refined mineral products	43,942	35,737 (19% decrease)	827,592	967,485 (17% increase)
Sugar	0	0	958,720	1,345,331 (40% increase)
Sulphur/Sulphuric acid	127,813	91,508 (28% decrease)	0	44,933

Source: POTL 2016; AECOM/BMT WBM 2013

Labour force and employment

As shown in Table 14.6, the most recent labour force and unemployment statistics available (March quarter 2017) indicate that of the 92,742 people in the labour force in Townsville LGA, 10,055 people were unemployed, equating to an unemployment rate of 10.8 percent. Compared with the state of Queensland, of the 2,506,666 people in the labour force, 156,627 people were unemployed, equating to an unemployment rate of 6.2 percent.

Table 14.6 Labour force and unemployment

STUDY AREA CATEGORY	UNEMPLOYED	LABOUR FORCE	UNEMPLOYMENT RATE (%)
Townsville LGA	10,055	92,742	10.8
Queensland	156,627	2,506,666	6.2

14.2.6 Reducing Bottlenecks at Port

The PoT has infrastructure to support the import and export of more than 30 different types of cargo and commodities. In 2014/2015, more than $11 billion in trade passed through the port.[48] Through infrastructure upgrades over the past five years, including the construction of the Southern Access Road and upgrades to berths, it is expected that by 2017 the port's infrastructure capacity will double its existing container movement numbers to more than 100,000 boxes (TEU) per year.

There is a weekly average of 175 train movements on the North Coast Line Branch into the PoT. This figure represents an average weekly number of movements (derived from TEARC BAC demand and rail simulation modelling) and does not reflect the higher peak number of train movements during at peak sugar harvesting

[48] POTL 2017

season. This is projected to increase to an average of about 206 train movements per week by 2017 (an increase of about 17 percent between 2017 and 2047).

Rail access to the PoT is currently subject to time delays and capacity constraints.

14.2.7 Longer Trains

While the Mt Isa line can accommodate trains up to 1,000m in length, there are constraints on the North Coast Line and within the PoT network of customer sidings and loops that cannot accommodate trains at this length. Currently, trains of up to 650m metres can run on the North Coast Line and within the port's rail network.

This means that trains are currently operating at this shorter length along the Mt Isa line, or have to be split at the Partington Yard at Stuart to enable shorter shunt transfer operations.

Inefficiencies of the current rail system, resulting in higher haulage costs, are reducing the PoT's competitiveness, which in turn is suppressing regional economic development opportunities. This has flow on effects to job creation in a region where the unemployment rate is higher than the state average.

14.3 Impact Identification

The impact assessment has been undertaken in line with Building Queensland's Social Impact Evaluation Guide and provides a qualitative risk-based assessment of the potential impacts of the TEARC project on the social environment of the study area. This risk-based approach assists in identifying potential measures to mitigate negative consequences, and also identify opportunities to consider the enhancement of social benefits.

Impacts have been assessed against the characteristics of the social environment identified in the social impact baseline. The following sections provide an assessment of the potential social impacts and benefits that may come about because of TEARC's construction and operation.

14.3.1 Urban Amenity

Community and lifestyle

Implementation of TEARC would not directly impact on the population within and adjacent to the TEARC project area, SIE study area or broader Townsville region. This is due to the TEARC alignment being largely contained within the TSDA and existing railway corridors, with some additional, non-residential land potentially required for the alignment. TEARC may have an indirect impact on the local population by enabling economic development associated with the Port, which in turn may help to drive forecast population growth.

People's lifestyles are not expected to be significantly impacted by TEARC given that the alignment is mostly located in non-urban areas. Where the TEARC alignment passes through more urban areas, the closest dwellings are located 350-400m from the proposed railway. Potential amenity impacts during TEARC's construction and operation are discussed below.

The operation of TEARC would remove some traffic from the North Coast Line, resulting in fewer freight trains using this section of the rail network. This is likely to improve amenity for residents, especially in suburbs where dwellings are located within 50 metres of the railway. Table 14.7 provides an overview of the impact of the TEARC alignment on suburbs within the SIE study area.

Table 14.7 Suburb overview

SUBURB	OVERVIEW	PROXIMITY TO TEARC ALIGNMENT	DISTANCE FROM NORTH COAST LINE
SOUTH TOWNSVILLE	The TEARC alignment crosses into South Townsville at the suburb's southern boundary. Dwellings on Eight Avenue would now be the closest dwellings to the railway.	350 metres	50 metres
IDALIA	The TEARC alignment branches off the North Coast Line at the southern corner of the suburb of Idalia.	350 metres	120 metres
CLUDEN	The TEARC alignment would pass through the northern part of the suburb through an undeveloped area.	600 metres	550 metres
OONOONBA	The TEARC alignment would pass to the south of the suburb.	600 metres	50 metres
HERMIT PARK	The TEARC alignment would not impact this suburb.	More than one kilometre	550 metres
RAILWAY ESTATE	The TEARC alignment would not impact this suburb.	More than one kilometre	50 metres
STUART	TEARC alignment is mostly located within the suburb of Stuart, within the TSDA. TEARC would traverse a currently an unpopulated and undeveloped area within this suburb.	More than five kilometres	50 metres
WULGURU	TEARC alignment does not impact this suburb – North Coast Line remains in place.	n/a	50 metres

Impacts to existing social infrastructure due to the TEARC project are also not expected, given that no community, health or education facilities are located within 500 metres of the TEARC alignment.

TEARC supports and aligns with local, State and Federal Government economic development initiatives and strategies for the Townsville region, including the *Townsville City Deal (2016)*.[49] The TEARC project seeks to improve freight rail access and connectivity from the North-West Minerals Province and other regional industries such as agriculture to the Port of Townsville to access import and export markets regionally, interstate and overseas. The TEARC project also aligns with local community values by seeking to consolidate industrial development within the TSDA away from urban residential areas, and improving transport links to the Port from the existing North Coast Line to TEARC alignment via the TSDA.

As a result of the TEARC project, the increased role of the PoT and the development of other projects within the Townsville region, there is the potential for positive indirect economic benefits with potential increased investment in the region. Benefits may be felt in other industries such as tourism development and increased social infrastructure spending to support the projected population growth.

[49]DPMC 2016

Consolidation of urban development

The North Coast Line currently creates a barrier between the PoT and Townsville's urban areas. While the North Coast Line will remain operational even with TEARC in place, a reduction in freight traffic on this line is expected once TEARC is operational. This would reduce existing amenity related impacts associated with current rail traffic the North Coast Line, such as noise and vibration, reduced air quality and low visual amenity, and mitigate an increase in amenity impacts that would otherwise have come about with increasing rail traffic overtime. With many dwellings currently located within 50 metres of the North Coast Line, a reduction in rail traffic on the North Coast Line will improve amenity for many people.

Improved amenity along the North Coast Line is also consistent with the vision for the Townsville City Waterfront PDA that aims to consolidate urban development in the Townsville CBD and provide a mixed-use precinct with an active public realm and open space network.

Current master planning for the PoT is also seeking to consolidate port activities to core areas in the eastern and southern precincts, while allowing for transition zones in the western portion of the port towards the Townsville Waterfront PDA.

The TEARC alignment approaches the PoT from the south, rather than the existing route to the north of the site. This would assist in centralising core port activities to the east and south of the Port. This enables focused consolidation of urban development to the west of the port closer to the Townsville CBD to preserve urban amenity.

Community health and safety

Construction impacts

With the construction of the TEARC project, there is the potential for increased noise, vibration and dust impacts on nearby residential properties in suburbs such as Cluden and South Townsville. As outlined in Chapter 13, Environmental Assessments and Approvals, an assessment of the environmental impacts associated with the TEARC project has been undertaken. With regard to air quality, emissions are possible from diesel equipment and dust generation due to the distance, exposure and transportation of soils. Air quality impacts are not expected to exceed air quality criteria and are therefore considered to be minor in nature. During construction of the TEARC project, dust suppression and other air quality measures will be implemented to manage potential air quality impacts.

It was noted that while residential areas in Cluden and South Townsville may experience local noise, vibration and dust impacts during construction of the TEARC project, it was considered that these residential areas are currently subject to existing industrial and port related uses that may also generate noise, vibration and dust. During construction of the TEARC project, it is envisaged that noise, vibration and dust will be managed through the adoption of environmental management measures.

During project construction, there is the potential for temporary disruptions to local accesses around worksites. Also, the construction and operation of the TEARC alignment would impact on publicly accessible recreation areas such as the off-leash dog beach at Benwell Road. It is recommended that regular consultation with affected stakeholders and local communities are undertaken with regard to appropriate traffic management procedures and consideration of options for re-instatement of recreation areas if possible at completion of the TEARC project.

Operation impacts

Once TEARC is operational, residents in suburbs such as Idalia, Oonoonba, Railway Estate and parts of South Townsville would experience improved amenity due to less freight rail traffic along the North Coast Line. With TEARC, potential amenity impacts may occur near Cluden and South Townsville with the introduction of the TEARC alignment in existing open space and environmental conservation areas to the east. Recent community consultation activities have indicated that South Townsville and Cluden residents are particularly concerned about the TEARC project's impacts to them, such as operational noise, dust, safety, property values and flooding. (Refer Chapter 15 Sustainability Assessment).

Residences nearest to the proposed TEARC alignment located approximately 350 – 400 metres away are expected to have an obscured view of the TEARC project, as they are buffered by either industrial uses or remnant vegetation that separates the alignment from residential areas. As outlined in Chapter 13, Environmental Assessments and Approvals, these properties are currently affected by surrounding industrial activities or transport related noise along the North Coast Line, Abbott Street or at the PoT. There is the potential for increased noise, vibration and dust impacting Cluden and South Townsville residents, however, it was found that impacts are considered to be minimal as follows:

- There is the potential for an increase in local air emissions due to the operation of trains along the TEARC alignment such as diesel train engine exhausts. However, adverse air quality impacts are not expected to exceed applicable air quality criteria due to the separation distance from the TEARC alignment to the nearest residential area (approximately 350m away).
- Predictive modelling of rail noise levels near sensitive receivers at Cluden and South Townsville indicated that the Queensland Rail target of 65 dB(A) LAeq 24hr is met outside of the sensitive receptor boundaries.
- Once further Low Impact Industry (light industrial) land use associated with the TSDA is established between the TEARC materials transportation corridor and residents at Cluden, the light industrial development is expected to further mitigate adverse impacts from the rail air and noise emissions.

14.3.2 Cater for Demand

Stimulate economic development

With the development of the TEARC project, a more direct route to connect freight traffic to the PoT will enable increased throughput of bulk goods and minerals from the North-West Minerals Province and agricultural industries to wider interstate and overseas markets. The placement of the TEARC alignment within a consolidated infrastructure corridor in the TSDA acts as a catalyst for future industrial development surrounding the corridor leading towards the Port. In addition, the TEARC alignment has been located to efficiently connect the PoT to the existing North Coast Line.

It is envisaged that the TEARC project will result in the stimulation of import and export markets within the Townsville region, and lead to potential indirect stimulation of the services industry due to the strengthening of the Port's economic position in North Queensland. From this, it is likely that increased employment opportunities will be generated.

Employment opportunities

Strengthening of direct employment opportunities associated with port-related industries as well as indirect employment opportunities in the wider Townsville region is likely to positively contribute to a stronger economy and act as a catalyst for further private and public sector investment in the region.

The TEARC alignment is envisaged to enhance regional development and wider state economic prosperity by moving increasing volumes of freight, while improving urban amenity and congestion impacts associated with future increases in rail freight moving through the Townsville urban area.

During TEARC's construction, 207 full time equivalent positions are expected to be created each year (2017 – 2022). Given the current labour force availability in Townsville (e.g. unemployment rate of 10.8 percent in Townsville LGA), there may be an opportunity to use existing resources within the Townsville population. Alternatively, people from outside of Townsville may be attracted to the region in search of employment given the TEARC project and other wider economic opportunities in Townsville anticipated in the future.

On its own, the TEARC project's requirement for construction workers is unlikely to require additional housing for workers, as it is assumed that the construction workforce would be sourced from local resources already in Townsville.

14.3.3 Reduce Bottlenecks

Access and connectivity

With the plans to divert some of the current rail freight traffic away from the Abbott Street portion of the North Coast Line, the TEARC project would assist in alleviating pressure on the rail network, and reduce safety impacts to residents and road users within the South Townsville area. The TEARC alignment will enable improved access and connectivity to the PoT via a dedicated corridor through the TSDA. It would also assist in facilitating improved processing and circulation of freight within port boundaries.

With the re-direction of freight trains along the TEARC alignment, this would see a reduction in train queuing and shunting through urban areas, thereby benefiting local residential areas along the Abbott Street corridor and in the vicinity of the Partington Rail Yard. In addition, there would be fewer freight trains along the North Coast Line which would result in reduced OLC closure times. This would result in safety benefits to road users by reducing interaction of rail freight with OLCs.

It should be noted that without the TEARC alignment, but with ongoing port development, there is the potential for increased bottle necks and queuing along the Mt Isa Line and the North Coast Line. This has the potential for flow-on effects to the existing North Coast Line through Townsville's urban areas in terms of noise and to OLCs in terms of train queuing.

The TEARC alignment would directly contribute to improvements in access to the PoT via the North Coast Line and the Mt Isa Line. Stakeholder consultation undertaken as part of the TEARC project has indicated that stakeholder believe the TEARC alignment would relieve congestion inside the Port of Townsville in order to optimise export and supply chain opportunities.

As an enabler for accommodating future demand through the port, the TEARC alignment would allow for improved access and processing of freight volumes to port via a dedicated freight rail line, rather than the current situation where freight rail shares the North Coast Line with passenger trains through Townsville CBD.

14.3.4 Longer Trains

As part of the State Infrastructure Plan (DILGP 2016), the North Coast Line Capacity Improvement Project seeks to increase the productivity and efficiency of freight transport along the corridor and accommodate growth in demand. As part of increasing productivity and efficiency of freight transport, the requirement for longer freight trains has been considered by the Queensland Government.

As part of the rail modelling undertaken for the TEARC alignment, the design has allowed for the project to facilitate longer trains of 1,400m to cater for potential increased rail freight capacity. During stakeholder consultation for the TEARC project, it was identified that the use of longer trains will be at the discretion of operators and customers. The development of the TEARC alignment does not preclude the option to cater for longer 1,400m trains in the future.

The existing North Coast Line is constrained in its ability to support the introduction of longer trains. Should the use of longer trains be instigated on the wider freight network, it will enable greater freight capacity with faster transport times to/from port. Given the uncertainties with regards to the introduction of longer freight trains in the wider freight network, the TEARC alignment has been designed so that it will not preclude the introduction of longer trains in the future.

It should be noted that if longer trains are introduced to the freight network in the future, and the TEARC alignment has not been constructed, the existing North Coast Line along the Abbott Street corridor into the Port would likely experience an increase in road user wait times at OLCs and greater duration of noise impacts to residents along the North Coast Line due to shunting operations. Therefore, the TEARC project would support the introduction of longer trains and encourage the re-direction of freight rail from the North Coast Line through Townsville to the TEARC alignment.

14.3.5 Summary of Social Impact and Benefits

Table 14.8 provides an overview of the social impact and benefits associated with the TEARC project.

Table 14.8 Identified Positive and Negative Social Impacts with Codes and Brief Descriptions

IMPACT AREA	SOCIAL IMPACT	SIE CODE (P = POSITIVE, N = NEGATIVE)	DESCRIPTION
Urban Amenity			
Community and lifestyle	Contribution to community and economic growth objectives for Townsville Positive impact on urban amenity due to improved access to Port via TEARC alignment	PSoc1	▪ Contributes to the anticipated growth of Townsville and the role of the Port, allowing for consolidated development around the Port to preserve urban amenity closer to the Townsville CBD. ▪ Aligns with community values and development strategies for Townsville. ▪ Caters for growing demand of the Port and the transfer of imports and exports to regional, interstate and overseas markets. ▪ The TEARC alignment within the TSDA supports the consolidation of port activities to core areas east and south of Townsville. ▪ Potential indirect benefits of economic development leading to increased investment in the Townsville region, including tourism and social infrastructure.

IMPACT AREA	SOCIAL IMPACT	SIE CODE (P = POSITIVE, N = NEGATIVE)	DESCRIPTION
Community health and safety	Reduction of freight train traffic through the Abbott Street portion of the North Coast Line	PHea1	▪ Diverting some freight rail traffic from the Abbott Street portion of the North Coast Line to the TEARC alignment will result in improved local urban amenity at Idalia, Oonoonba, Railway Estate and South Townsville during operation of the TEARC project. ▪ Safety benefits to road users by reducing interaction of rail freight with OLCs and running these trains along the TEARC alignment.
Community health and safety	Construction noise, vibration and dust impacts	NHea1	▪ Potential impacts during construction as a result of noise, vibration and dust, and increased construction traffic in the vicinity of worksites. ▪ Potential changes to the noise environment in Cluden and South Townsville due to the operation of TEARC. However, these properties are previously affected by port activities (South Townsville) and light industrial uses (Cluden and South Townsville). ▪ Potential visual amenity impacts to residents in Cluden and South Townsville.
Community health and safety	Impact to urban amenity in new areas	NHea2	▪ Increased rail traffic in suburbs (Cluden and South Townsville) in areas not previously impacted by rail operations. However, these properties are previously affected by port activities (South Townsville) and light industrial uses (Cluden and South Townsville).
	Potential temporary impacts to local access	NHea3	▪ Potential temporary disruptions to local accesses during project construction around worksites. ▪ Impact to publicly accessible areas (e.g. dog beach at Benwell Road and recreational opportunities).
Cater for demand			
Economic	Positive economic benefit	PEc1	▪ TEARC provides opportunities for additional trade to be facilitated through the Port of Townsville.
	Increased employment opportunities	PEc2	▪ Increased employment opportunities will be generated from construction and operation of TEARC. ▪ The TEARC project's requirement for construction workers is unlikely to require additional housing for workers, as it is assumed that the construction workforce would be sourced from local resources already in Townsville.

IMPACT AREA	SOCIAL IMPACT	SIE CODE (P = POSITIVE, N = NEGATIVE)	DESCRIPTION
Community and lifestyle	Change in demographic structure	PCom1	▪ Due to increased construction jobs, this project and other projects, potential attraction of people of working age using existing resources in the region (given the current labour force availability – e.g. unemployment rate of 10.8 percent). ▪ Should insufficient resources be available within the Townsville region, people outside of Townsville may be attracted to the region in search of employment, given the TEARC project and other wider economic opportunities in Townsville.
Reduced bottle necks			
Access and connectivity	Improved freight access to Port of Townsville	PEc3	▪ The TEARC alignment will enable improved access to the Port of Townsville and the processing of freight volumes via a dedicated corridor through the TSDA. ▪ Reduced freight train queuing and shunting in urban areas that is re-directed along the TEARC alignment.
Longer trains			
Community health and safety	Improved efficiency and future capacity	PHea2	▪ Enable longer trains to access the PoT – improving efficiency and providing capacity for the future.

14.4 Impact Risk Assessment

14.4.1 Diagrammatic Representation Pre-mitigation/Enhancement

From the previous social impact descriptions, a risk assessment of the impacts is illustrated in Table 14.9 below.

Table 14.9 Impact Risk Assessment (IRA) Scatter Diagram

			Consequence				
			Low	Medium			High
			Insignificant	Minor	Moderate	Major	Significant
Likelihood of Occurring	High	Almost Certain					
	Medium	Likely		NHea1 NHea3	PHea1 PHea2 NHea2 PEc1 PEc2	PSoc1 PEc3	
		Possible		PCom1			
		Unlikely					
	Low	Rare					

14.4.2 Suggested Mitigation/Enhancement and Impact Outcomes

Table 14.10 outlines the pre-mitigated social impact outcomes, and the proposed mitigation and enhancement measures. With the application of the mitigation and enhancement measures, the post mitigation impact outcomes have been confirmed.

Table 14.10 Social Impact Outcomes and Suggested Mitigation/Enhancement Measures

IMPACT AREA	SOCIAL IMPACT	SIE CODE	PRE-MITIGATION IMPACT OUTCOME	MITIGATION AND ENHANCEMENT MEASURES	POST MITIGATION IMPACT OUTCOME
Urban Amenity					
Community and lifestyle	Contribution to community and economic growth objectives for Townsville Positive impact on urban amenity due to improved access to Port via TEARC alignment	PSoc1	High	▪ Key economic growth strategies for the Townsville region are directly supportive of the TEARC project and may be realised with subsequent government approvals and DBC process. ▪ Regular community and stakeholder consultation to ensure awareness of project progress and construction timeframes.	High
Community health and safety	Reduction of freight train traffic through the Abbott Street portion of the North Coast Line	PHea1	High	▪ Regular community and stakeholder consultation to ensure they are aware of project progress and construction timeframes.	High

IMPACT AREA	SOCIAL IMPACT	SIE CODE	PRE-MITIGATION IMPACT OUTCOME	MITIGATION AND ENHANCEMENT MEASURES	POST MITIGATION IMPACT OUTCOME
	Construction noise, vibration and dust impacts	NHea1	Medium	▪ Development of appropriate environmental management measures prior to construction for inclusion in the Project Environmental Management Plan (EMP) to minimise adverse noise, vibration and dust impacts during construction and operation. ▪ Develop a Communication Plan prior to the commencement of construction with affected communities to manage negative amenity impacts during construction and operation of the Project. ▪ Regular community and stakeholder consultation to ensure they are aware of project progress and construction timeframes.	Medium
Community health and safety	Impact to urban amenity in new areas	NHea2	High	▪ Early consultation and engagement with local affected communities through the development of a Communication Plan to manage negative amenity and access impacts during construction of the project. ▪ Regular community and stakeholder consultation to ensure they are aware of project progress and construction timeframes.	Medium
	Potential temporary impacts to local access and publicly accessible areas	NHea3	Medium	▪ Development of Traffic Management Plan prior to construction. ▪ Seek to reinstate temporary and permanent access to publicly accessible areas, for instance re-instate an off-leash recreation area. ▪ Regular community and stakeholder consultation to ensure they are aware of project progress and construction timeframes.	Medium

IMPACT AREA	SOCIAL IMPACT	SIE CODE	PRE-MITIGATION IMPACT OUTCOME	MITIGATION AND ENHANCEMENT MEASURES	POST MITIGATION IMPACT OUTCOME
Cater for demand					
Economic	Positive economic benefit	PEc1	High	▪ The project on its own will have a positive low to medium economic benefit for the region, but this would be more significant in the context of wider economic development in the region. ▪ The presence of the construction workforce also has potential to generate increased business activity in the area.	High
	Increased employment opportunities	PEc2	High		High
Community and lifestyle	Change in demographic structure	PCom1	Medium	▪ Existing labour force availability in Townsville is unlikely to result in a significant change in demographic structure.	Low
Reduced bottle necks					
Access and connectivity	Improved freight access to Port of Townsville	PEc3	High	▪ Key economic growth strategies and port development for the Townsville region are directly supportive of the TEARC project to provide improved freight accessibility and efficiency to the Port of Townsville. ▪ Consultation and communication with relevant stakeholders. ▪ With the re-direction of freight trains along the TEARC alignment, there will be a positive benefit in the reduction of freight train queuing and shunting through urban areas along the Abbott Street corridor.	High
Longer freight trains					
Community health and safety	Improved efficiency and future capacity	PHea2	High	▪ Potential to implement improved road safety measures at OLCs.	High

14.4.3 Diagrammatic Representation Post-mitigation/Enhancement

Table 14.11 diagrammatically summarises the social impact outcomes from the Impact Risk Assessment (IRA) for the TEARC project after the application of mitigation and enhancement strategies.

Table 14.11 RA Scatter Diagram after implementation of mitigation and enhancement strategies

			Consequence				
			Low	Medium			High
			Insignificant	Minor	Moderate	Major	Significant
Likelihood of Occurring	High	Almost Certain					
	Medium	Likely		⇔ NHea3 ⇐ NHea2	⇔ PHea2 ⇔ PHea1 ⇔ NHea2 ⇔ PEc1 ⇔ PEc2	⇔ PSoc1 ⇔ PEc3	
		Possible	⇐ PCom1	⇓ NHea1			
		Unlikely					
	Low	Rare					

⇔ Same risk rating

⇐ Decreased consequence

⇓ Decreased likelihood

14.4.4 Metrics for Quantifiable Material Social Impacts

Table 14.12 presents a number of metrics that can be used to quantify the positive material social impacts of the TEARC project.

Table 14.12 Identifying and Defining Metrics for Social Impacts

MATERIAL SOCIAL IMPACTS	METRIC (DESCRIPTION)	METHODOLOGY AND SOURCE
Positive economic and employment benefits of the TEARC project	▪ Number of people employed for construction ▪ Number of people employed during operation ▪ Number of people employed in wider Port and industrial occupations	▪ Employment forecasts for the Project ▪ Australian Bureau of Statistics ▪ Industry surveys
Improved freight access to PoT	▪ Improved freight rail travel time to PoT from North Coast Line and Mt Isa Townsville rail line	▪ Traffic modelling
Reduction of freight traffic through urban areas along Abbott Street Positive impact to urban amenity and economic growth of Townsville	▪ Minimal complaints of freight rail noise	▪ Rail operator records of complaint data
Improved road safety due to less OLC closures	▪ Road safety incident numbers at OLCs on North Coast Line in Townsville	▪ Road/rail incident data

14.5 Conclusion

This SIE has been undertaken to assess the potential direct and indirect social impacts (both positive and negative) of the TEARC Project on the surrounding social environment. The evaluation has been informed by the TEARC Project's environmental assessment and the community consultation and stakeholder reports prepared to inform the DBC.

Key positive and negative impacts identified through the SIE were defined as follows:

Positive impacts

- Contribution to the community and economic growth objectives for Townsville, with the facilitation of additional trade through a dedicated corridor through the TSDA, which is a more direct route to/from the PoT.
- Improved urban amenity along Abbott Street corridor due to re-direction of freight rail traffic along the TEARC alignment to access the PoT.
- Less interaction of freight trains with the North Coast Line along the Abbott Street corridor will reduce the length of time that OLCs are closed, resulting in improved road safety and access.
- Increased employment opportunities will be generated from construction, project management and operations for the TEARC Project.

Negative impacts

- Impact to local urban amenity in suburbs not previously affected by rail (e.g. Cluden and South Townsville) and uncertainty about partial and full property resumptions.
- Potential impacts to local access and recreational areas (e.g. off-leash area at Benwell Road).
- Potential localised noise, vibration and dust impacts during construction and operation.

From the IRA, a number of mitigation and enhancement measures have been recommended to address the positive and negative social impacts. A key strategy for the TEARC Project will be to ensure that clear, regular communications and engagement with impacted stakeholders is undertaken throughout subsequent project approval processes to ensure consistent messaging for the Project.

The IRA has identified a number of localised social impacts such localised noise, vibration and dust, and impacts to local property accesses and publicly accessible areas. This is envisaged to be managed through the adoption of early engagement with affected property owners, adoption of environmental management and traffic management measures during construction and operation and re-instatement of local and public accesses as early as possible, ensuring this is adequately communicated to stakeholders.

Table 14.13 summarises the relevant information considered in the SIE. Social impacts have been included in the table with an applicable qualitative label of 'small, medium or large' where no quantifiable value could be obtained.

Table 14.13 Appraisal Summary Table

IDENTIFIED IMPACTS	QUALITATIVE ASSESSMENT				PRESENT VALUE (CBA)
	METRIC	SHORT-TERM (5 YEARS)	MEDIUM-TERM (10 YEARS)	LONG-TERM (20 YEARS)	
ECONOMIC					
Efficiency in improved freight access to Port of Townsville	Traffic modelling	See Economic Chapter Sensitivities			Not quantified in the base case
Economic and employment benefits	Employment data Industry surveys	207 (FTE pa)	87 (FTE pa)	68 (FTE pa)	NA
Reduction in OLC closures	Road safety incident numbers	See Economic Chapter			$0.04 million
CAPEX and OPEX costs	$	$210 million	$263 million	$266 million	$269 million
ENVIRONMENT AND COMMUNITY HEALTH					
Air, noise and vibration	Air, noise and vibration emissions during construction within modelled limits Air, noise and vibration emissions during operation within modelled limits Noise, vibration and air quality complaints during construction and operation	Low - Medium	Low	Low	Qualitative
COMMUNITY AND LIFESTYLE					
Positive impact to urban amenity along Abbott Street corridor	Minimal complaints of freight rail noise	Low	Low	Low	Qualitative
Temporary impacts to local access and publicly accessible areas	No. of road closures during construction Re-instatement of recreation areas (e.g. off-leash area)	Low – Medium	Low	Low	Qualitative
Uncertainty surrounding property resumptions	No. of partial/full property resumptions required	Low	Low	Low	Qualitative
			CBA Summary	NPV:	-$226 million
				BCR:	0.16

15 SUSTAINABILITY ASSESSMENT

CHAPTER SUMMARY AND CONCLUSIONS:

- The sustainability assessment draws on analysis undertaken throughout the Detailed Business Case (DBC), including but not limited to the economic analysis, environmental assessment and social impact evaluation.
- The sustainability assessment documents sustainability considerations relevant to the Reference Project in order to understand and, where possible, avoid or mitigate immediate and long-term impacts.
- The sustainability assessment demonstrates the Townsville Western Access Rail Corridor (TEARC) Project will contribute to positive economic, environmental and social outcomes.
- All sustainability principles scored a rating of Compliant or higher.
- The strategic context and service need of the project, links to local, regional and state planning outcomes performed most strongly.
- The project is located in a sensitive environment, and the construction and operation of TEARC has the potential to impact these sensitive areas. Further consideration should be given to avoiding impacts and rehabilitating degraded areas.
- Social impacts include direct disturbance to the communities of Cluden and South Townsville as a result of construction and operational activities. Overall, the project is anticipated to contribute to community and economic growth objectives for Townsville and have a positive impact on urban amenity due to improved access to Port via the TEARC alignment.

15.1 Introduction

The purpose of this chapter is to identify sustainability considerations relevant to the Townsville Western Access Rail Corridor (TEARC) project to understand and, where possible, avoid or mitigate immediate and long-term impacts and maximise benefits. The sustainability assessment assists with documenting the economic, social and environmental impacts of the project, not just its financial performance.

This assessment draws upon analysis already undertaken in the preceding chapters of the Detailed Business Case (DBC), including the Economic Analysis, Environmental Assessment and the Social Impact Evaluation.

15.2 Approach

The development of the sustainability chapter for the DBC involved the following activities:

- review the applicability of Building Queensland standard sustainability principles
- review of stakeholders, their interests, and drivers
- collaboration with environment, social and design team
- refinement and completion of sustainability assessment.

15.3 Assessment

The ratings for each criterion are assessed against the Building Queensland criteria presented in Table 15.1.

Table 15.1 Sustainability Assessment Rating

SUSTAINABILITY ASSESSMENT RATING	
LEVEL	CRITERIA
Advanced	▪ Generates significant additional value and new opportunities not previously evident, such as changing a liability into an asset ▪ 'Designs out' the problem up-front rather than relying on managing impacts later ▪ Solutions generate flow-on benefits outside the project boundary
Moderate	▪ Solutions to significant issues result in multiple benefits through economic, social and/or environmental outcomes ▪ Meets immediate community and user needs and will be resilient and efficient into the future ▪ Significant innovation and leading practice incorporated into the project
Basic	▪ Avoids harm and negative effects ▪ Solutions create project efficiencies ▪ Solutions have an immediate or short-term focus
Compliant	▪ Meets legislative and regulatory requirements
Poor	▪ Fails to meet legislative and regulatory standards ▪ Solutions may result in dis-benefits and negative effects

15.4 Project description

TEARC is a proposed new 8.3 km freight rail link, branching off the North Coast Line at Cluden and connecting directly to the Port of Townsville (PoT). The alignment broadly follows the eastern side of

Southern Port Access Road, crossing near the mouth of the Ross River and connecting to the existing inner (Cannington) and outer (Nickel) balloon loops within the Port of Townsville.

The track and supporting infrastructure, which includes roads and bridge structures, will streamline port operations (through reduced shunting, cross-port movements and reorientation of trains for existing handling facilities). It will also improve access and egress.

Additionally, TEARC will provide port access redundancy for rail in the event of infrastructure interruption, enhancing operational flexibility, and reduce the level of interaction between rail and road traffic, thereby improving safety and traffic flows.

TEARC has been designed to facilitate future staged infrastructure upgrades, including the proposed port expansion.

Table 15.2 Governance assessment

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GOVERNANCE	
1. Context All infrastructure projects sit within a broader context, and should be planned, designed and operated to connect with the wider system (including other infrastructure, economic activity, landscapes, population hubs and movements, flows of resources, materials, goods and people). This could occur at neighbourhood, town, city, region or state scales.	Moderate

- What is the service need being addressed by this project? Have social, environmental and economic issues been considered?

  The existing freight network in Townsville is subject to time delays and capacity constraints. These inefficiencies increase costs for industry and reduce their competitiveness. Network inefficiencies are generated by road-rail interfaces as cargo moves through urban areas (e.g. along the Jetty Branch and along the North Coast line). Delays arising from congestion at level crossings and reduced line speeds cost residents, commercial vehicles and freight operators' time and money. Lost productivity and delays in freight transport limit Townsville's appeal to industry.

  The movement of freight through the city generates safety risks for vehicles and pedestrians and slows the flow of traffic, generating an inefficient road network. The blending of industrial, commercial and residential areas around the rail line has also limited the growth of the CBD, and subjects residents to noise, reduced air quality and low visual amenity. Taken together, these factors reduce the city's appeal as a place to live and do business.

  Social, environmental and economic issues associated with the project have been considered during the development of the business case through the conduct of environmental assessment, economic analysis, and during a social impact evaluation workshop.

- What are the key elements, interrelationships and interdependencies of the wider system or network for this project that are fundamental to its long-term effectiveness?

  TEARC is identified as one of suite of major infrastructure investments which will establish a more attractive environment for investment in the Townsville city, by improving export and freight efficiency, and boosting the capabilities of Townsville's competitive industries. In this context, TEARC is seen as a catalyst for future economic growth, by helping to attract new industry and link the minerals rich north-west province to global export markets.

  Key interrelationships of TEARC include:

  – The proposed expansion of the PoT, upgrades to the Mount Isa Line and TEARC are all expected to contribute to regional development, not only to supporting the existing resources sector, but also allow the diversification and strengthening of other economies.
  – TEARC is proposed to improve freight efficiency of the PoT and TSDA and act as a catalyst for future economic growth, by helping to attract new industry and connect regional economic opportunities to global markets.

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– The PoT services two freight links that are of national strategic importance, the Mount Isa Line and North Coast Line. Constructing TEARC to integrate the supply chain between the Mount Isa and North Coast Lines with the PoT will support increased transport volumes, provide a competitive advantage to Townsville for export trade. – Future growth of the port is constrained by infrastructure layout inefficiencies and tenure arrangements with single use berths. TEARC its associated rail loop within the port is a critical enabler for the optimal port layout and port expansion project. – TEARC is anticipated to help activate and encourage new industry to locate to the TSDA by providing a strategic freight link with direct access to the PoT and Mount Isa and North Coast Lines. – TEARC offers the potential to divert freight rail movements away from the North Coast Line, helping to alleviate pressure on the road network, improve freight efficiency and deliver improvements to urban amenity and safety.

- How will the project integrate with, or respond to these elements?

  TEARC responds to the wider network need for improved efficiency by:

  – providing additional rail capacity and ability to accommodate longer trains to support the efficiency of the resources sector
  – providing additional access capacity to support new operations within the Port of Townsville, noting that there some latent capacity within the Port of Townsville but not sufficient space for new entrants, which impinges growth and potentially constrains future throughput volumes
  – improving freight efficiency and boost capability of the Port of Townsville by removing bottlenecks within the port caused by road and freight movement conflicts through at grade crossings
  – supporting the activation of the T SDA by providing a strategic freight link with direct access to the Port of Townsville and Mount Isa and North Coast Lines
  – diverting freight rail movements away from the North Coast Line, helping to address road network impacts associated with at-grade crossing and urban amenity impacts from freight rail operations within the urban areas of Townsville.
  – TEARC represents an opportunity to act as both a catalyst and enabler for the proposed port expansion, providing the opportunity to address some of the key constraints within the port, and to support future export growth.

2. Strategic Planning Design infrastructure to be the solution to identified problems taking into consideration strategic goals and objectives. Focus on longer-term use and outcomes so that the infrastructure leaves a positive legacy. Consider adaptability to respond to future changes, challenges and trends.	Moderate/Basic

- Has a full range of options been considered including non-infrastructure solutions?

  In December 2012, key government agencies and stakeholders, including Queensland Rail, Port of Townsville Limited, the Department of Transport and Main Roads and Townsville City Council undertook a joint review of possible alignment options for a proposed future rail link to the port. The study included a high-level assessment of potential opportunities and conflicts for each of the alignments together with preliminary cost estimates.

  The preliminary assessment initially considered four strategic alignment options, which were narrowed to three alignments after the first workshop. These three alignment options were then canvassed with a range of external stakeholders. A further round of assessments then narrowed the focus down to two strategic alignments, with five detailed sub-alignment options. These were then assessed to identify a preferred alignment option (the Reference Project).

  As part of the DBC, the alignment options identified in the preliminary assessment have been examined in greater detail and further refined the options. The DBC involved a MCA options assessment was undertaken over several stages, with key stakeholders engaged throughout the process to help inform the progression through to a preferred option. The MCA developed key criteria and sub-criteria, covering economic, social, environment and engineering considerations. Generally, the key criteria capture triple bottom line needs as well as engineering and sustainability concerns. The sub-criteria adopted generally matched the discipline areas in the business case brief.

- How will the project solve the identified service need? How does it align with departmental and/or state goals and objectives?

  As previously discussed, TEARC is designed to address three core problems. The preferred option is expected to play a role in addressing some, but not all, of the aforementioned problems. Should the project proceed, Townsville will gain a more competitive position as an industry and export hub. Several urban amenity and safety issues would also be mitigated or removed. The problems and benefits are outlined in the table below.

Existing problems	Expected benefits from TEARC
Problem 1 – Existing freight rail configuration does not enable future expanded port operations	▪ Port can meet expected growth in container shipments. ▪ Increased trade volumes can be serviced through the port. ▪ Export-led growth in Townsville.
Problem 2 – Competitiveness of industry is constrained by inefficiencies in the freight network	▪ TSDA activation through improved road and rail connections to port. ▪ Growth in new industry investments. ▪ Reducing freight costs. ▪ Unlocking growth potential of the Northwest Mineral Province.
Problem 3 – Freight rail movements through residential areas are impacting urban amenity and safety	▪ Opportunities for urban renewal ▪ Reduced noise and vibration impacts on urban neighbourhoods ▪ Reduced road network delays ▪ Reduced risk of safety incidents at open level crossings

- Does the project respond to the most significant drivers of change over the next two decades (i.e. those with greatest impact and most probable) including technological, demographic, political, environmental, and economic trends?

  The Australian Government, Queensland Government, and Townsville City Council signed Australia's first City Deal for Townsville on 9 December 2016. The *Townsville City Deal (2016)* will focus on improving the lives of Townsville residents through job creation, economic growth, investment in local infrastructure, a revitalised urban centre, and a more vibrant and liveable city. The City Deal is a 15-year commitment between the three levels of government to work together to deliver transformative outcomes for Townsville and its residents.

  TEARC is anticipated to enhance regional development and economic growth through industrial investment attraction, allow for the development of additional jobs growth and skills, support trade and investment through the Port of Townsville and broaden industry development through enhanced supply chain opportunities.

3. Leadership, knowledge sharing and innovation The leadership team are responsible for implementing, measuring and reporting on the sustainability performance as well as the creation of a culture of innovation and knowledge sharing.	Basic

- How will this project engage a committed leadership team to embed sustainability into the planning, design, building and operation of this infrastructure project?

  The Department of Transport and Main Roads (TMR) will be the project owner if TEARC is approved to proceed. TMR in conjunction with the major stakeholders of Queensland Rail and the Port of Townsville will utilise TMR's project delivery leadership and procedures to ensure the concept design from the DBC continues to deliver on the

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long-term environmental, social and economic benefits of the project. This approach will be outlined in the implementation plan.

- How will a culture of innovation be created across the project life cycle and include both proponent and contractor?

  TMR as project owner will be setting project Key Performance Indicators (KPIs) for the delivery of the project that will include sustainability and innovation. These KPIs will be included in the design and construction contracts to ensure there is alignment of goals from the project through the design and construction activities. The nature of TEARC as an earthworks project does limit the amount of innovation that may be applied.

- How will knowledge and lessons be shared with the project team, other projects and the supply chain? How will lessons learnt from previous projects be incorporated?

  TMR is the project owner and delivered the Southern Port Road (SPR) in 2012. TEARC mostly follows the same corridor as Southern Port Road (SPR), including the Ross River bridge. Lessons learnt and geotechnical information from SPR was utilised in the concept design for TEARC. Although TEARC is generally a rail project there are major road grade separations which TMR has local experience.

  TMR will also utilise the rail experience of Queensland Rail to provide lessons learnt from a rail perspective. This approach will be incorporated into the implementation plan.

- How will the supply chain be prepared for the sustainability and innovation requirements of this project?

  The project KPIs will cascade through the contractors and suppliers to ensure alignment with sustainability and innovation and with the Queensland Government Procurement Policy to any procurement activities.

- How will you consider and respond to local Indigenous and other cultural elements in the design, delivery and operation of this project?

  The area has undergone high levels of modification in the past as a result of clearing for previous land uses, construction of SPR and development of other infrastructure. The TEARC corridor has most likely already been cleared of all intact cultural heritage and may only have fragments remaining.

  Notwithstanding, there are a number of sites within the project area that are of cultural significance to the local groups most notably the sand dunes on the east and south coast bank of the Ross River and the Ross River crossing.

  Potential direct impact on sites of cultural heritage by the Project will generally be because of clearing of vegetation, surface and sub-surface excavation, ground preparation and other associated activities related with rail, associated roads and Ross River bridge embankments and piles.

  To mitigate impacts on potential Aboriginal cultural heritage, liaison with the Bindal people #2 and Gurambilbarra Wulgurukaba will be undertaken and a ground survey is required to determine the requirements in meeting the Duty of Care guidelines under the Aboriginal Cultural Heritage Act 2003. Outcomes from the site survey and engagement with parties will inform the detailed design process where necessary. In addition, a Cultural Heritage Management Plan (CHMP) with both parties may be required to detail the agreed monitoring activities during the works, identify any high-risk locations, or access requirements and outline workforce cultural heritage awareness training required prior to and during construction.

4. Procurement and supply chain Procurement activities are responsible and consider human rights, society and environment.	Not applicable at this project stage – Basic if implemented

- How will sustainable procurement including human rights, society and the environment be incorporated into the project's procurement activities?

  The TEARC Project will apply principles contained in Queensland Government Procurement Policy to any procurement activities. The Queensland Government Procurement Policy is founded on six principles. These

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principles include consideration of, value for money, integrity, and accountability, and advancement of the government's economic, social and environmental objectives. Further to the Queensland Government Procurement Policy, a TEARC specific procurement policy should be developed at a later project stage that meets the detailed requirements of the Infrastructure Sustainability Council of Australia (ISCA) Rating Tool.

Table 15.3 Environmental assessment

ENVIRONMENT	
5. Material use Materials used on the project have a low life cycle impact and have low toxicity.	Not applicable at this project stage – Basic if implemented

- How will this project assess materials used in terms of their environmental life cycle impact and toxicity?

  During later design phases the Project should utilise the IS Rating Tool/or similar to assess lifecycle impact of materials. The IS Rating Tool Materials Calculator evaluates environmental impacts in relation to use of materials on infrastructure projects and assets. This assessment will consider the environmental impacts of products over their entire life, taking into account: raw materials, manufacturing, transport and distribution, construction processes, and maintenance and replacement.

6. Climate change mitigation The project will mitigate climate change through identifying an infrastructure solution to reduce global carbon emissions	Basic

- How will this project mitigate climate change?

  Greenhouse gas emissions from transport come primarily from fossil fuels combusted in vehicles (Climate Change Authority, Opportunities to reduce light vehicle emissions in Australia, 2012). The Project will provide opportunities for modal shift from road to rail and/or for preventing modal shift away from rail, which may result in a reduction of emissions from road vehicles. Rail freight is up to 23 times more energy efficient compared to the road freight transport sector (Australasian Rail Association, 2017).

  The primary sources of energy use during construction will be electricity for ancillary activities such as lighting, workplace cooling and heating and general power requirements, and non-renewable fossil fuels for operating vehicles, plant and equipment. This is both a cost to the project and a source of greenhouse gas emissions to the atmosphere. Consideration should be given to the reduction of energy use wherever possible.

  Opportunities to minimise construction and operational emissions may include balancing cut and fill mass, locally sourcing materials reducing haulage distances, and selecting materials with lower embodied energy. These opportunities should be explored in future design stages.

  There may be some opportunities to source some preloading material (dredge spoil) from the Port.

7. Water management Managing water consumption and discharge according to local conditions now and in the future.	Basic

- Will this project use large amounts of water in construction and operation?

  It is not anticipated that significant water volumes will be required for the construction, nor operation. Specific quantities and water sources have not been identified during the DBC.

  During later design stages a construction water supply strategy should be developed to quantify volumes and identify sources of water for construction activities. During detailed design, consideration should be given to

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designing water management structures to capture sufficient water for use onsite and access to these areas so the water can be collected and used. Subject to environmental approvals.

At this stage of Project development, quantities of construction water are not known.

- Is this project located in an area of water scarcity? If not, how will water scarcity in the future affect its construction and operation?

The project is not located in an area of water scarcity. Operational water requirements are limited and any reduction in water availability in the future is unlikely to impact the project.

- Will this project discharge water to sensitive environments during construction and/or operation?

The project site is located on a floodplain and is subject to flooding during king/storm tides events. There are also expansive tidal wetlands that occur within the project area. The project site is located within proximity to a number of sensitive and protected areas which include:

- the Burdekin – Townsville Coastal Aggregation nationally important wetland, listed on the Directory of Important Wetlands in Australia
- the mouth of the Ross River and coastal waters of Cleveland Bay, including lower reaches of Gordon Creek, Stuart Creek, Sandfly Creek and the unnamed tributary, the Great Barrier Reef World Heritage Area
- a high ecological significance (HES) wetland, mapped as a matter of state environmental significance approximately 250 m northeast of the project area. Other HES wetland protection areas mapped by EHP more than 2 km east of the project area and a HEV wetland (under the EPP (Water) approximately 2.7 km east of the project area
- the Great Barrier Reef Marine Park is approximately 2.3 km east of the project area
- Bowling Green Bay, which is a Ramsar wetland of international significance, located approximately 9 km west of the project site.

The establishment of works areas and general earthworks during construction will result in an increased risk of soil erosion. The mobilisation of soils across the site has the potential to cause temporary impacts to local water quality. Extraction of water from local waterways for construction purposes has the potential to cause temporary impacts to aquatic habitats. To minimise impacts from construction activities the following mitigation measures should be considered:

- Programming of the majority of bulk earthworks to occur during the drier months.
- Completion of construction works in and near waterways, particularly near Stuart and Gordon Creek, between May and October.
- Stabilisation of exposed batters should be reviewed prior to wetter months to determine if additional protection is required.

The implementation plan will include an Environmental Management Plan for the construction phase.

The rail embankment has the potential to affect hydrological flows and flood inundation by creating a barrier to the movement of water across the floodplain. The design will need to achieve minimal change to patterns of freshwater flow and tidal inundation using culverts and bridges (i.e. timing, depth, period of inundation), to minimise the impacts on upstream or downstream areas and on ecosystems across the coastal floodplain. The operation of the project is likely to have negligible impact to local receiving environments.

8. Resource recovery Reducing waste generated and increasing reuse in construction and operation.	Compliant

- How will this project manage waste and resource recovery?

The project will be required to import significant volumes of fill material for the construction of the rail embankment. The most considerable resource use associated with the Project is anticipated to be the materials required for the bridge structures and culverts over Ross River and the smaller creeks. Both will require the importation of material to achieve the required alignment. To minimise raw material inputs the design should consider the use of recycled materials, including recycled water, and optimising the earthwork cut and fill balance,

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which is subject to acid soil considerations. Materials brought to site should be sourced locally to minimise transportation impacts.

Other resources likely to be available which could be considered for recovery during construction activities include:

- Mature vegetation including large timbers that could be recovered for use in fauna furniture and/or mulched for use in landscaping and revegetation.
- Topsoil that could be reused in landscaping and revegetation.
- Earthwork spoil that could be used as fill in locations along the corridor where excess is required.
- Ballast rock whereby the larger rock is cleaned and reused, and smaller rock is crushed and recycled as road base or fill material.

9. Land selection The project is located on previously disturbed land and limits impacts to local habitat.	Basic

- Will this project be located on previously disturbed land?

The project is predominantly located within the TSDA east of the City of Townsville and south of the PoT. The project corridor crosses the mouth of the Ross River and tributaries of Gordon Creek and Stuart Creek, extending through coastal saltmarsh flood plain areas containing least concern remnant vegetation. Extensive areas of the project site are impacted by clearing, fire and weed infestation from past or current adjoining land uses.

The proposed alignment runs parallel to the SPR that has disturbed some areas of the project site. The project site is designated for the purposes of materials transportation/services corridor precinct within the TSDA.

10. Ecology The local and regional habitat and ecology will be enhanced.	Basic

- How will this project improve ecology within the local region?

The site is characterised by low-lying coastal habitats including mangroves, saltpan, coastal woodland and wetlands. Most the project site is mapped as remnant vegetation (least concern), however, is severely impacted by weeds, primarily Chinee Apple (Ziziphus mauritiana), lantana (Lantana camara) and extensive areas of guinea grass (Megathyrsus maximus) dominating the understorey. The project site provides habitat for conservation significant flora and fauna, and migratory species.

The project will require the clearing or disturbance of habitat for protected species and remnant vegetation. Where possible laydown areas for construction will be established in previously cleared areas adjacent to the alignment. Despite the need for clearing of vegetation and loss of some habitat, it is anticipated there is potential to improve the quality of the remaining areas through rehabilitation, specifically weed control.

Other opportunities to enhance the existing environment, including providing habitat restoration for impacted habitats, should be considered as the design progresses.

- Will this project impact critical natural capital (irreplaceable natural features, species, habitats etc.)?

Impacts to any sensitive areas are predicted to be mostly temporary and the resulting residual risk is low to medium. As previously discussed, impacts are likely to be as a result of construction works, specifically generation of noise and vibration, and mobilisation of soils through earthworks, and clearing of habitat.

The operation of the project is likely to have negligible impact to local receiving environments.

11. Green Infrastructure Traditional infrastructure is replaced with natural processes to do the same job.	Compliant

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The term 'green infrastructure' refers to an interconnected network of landscape assets that is intertwined with engineered (grey) infrastructure and buildings (all the natural, semi-natural and artificial networks of multifunctional ecological systems within, around, and between urban areas, at all spatial scales).	

- Describe the opportunities to replace traditional infrastructure (grey) with green infrastructure.

  No opportunities to replace grey infrastructure with green infrastructure have been identified during the design development for the DBC. Some of the following initiatives should be explored during future design stages:

  - Natural ventilation of structures
  - Wetlands for stormwater treatment
  - Permeable and porous surfaces
  - Provide vegetation to reduce heat islanding and increase visual attraction.

Table 15.4 Social assessment

SOCIAL	
12. Social procurement Creating positive social outcomes through using procurement spend and processes.	Basic

- How will this project use procurement spend to create socially and environmentally beneficial outcomes (e.g. the procurement of environmentally friendly products and services)?

  The project will be procured in accordance with Queensland Government Procurement policies. There is an opportunity to include tender evaluation criteria that scores the use of locally sourced materials/labour and socially aware purchasing practices. It is expected that the procurement of the Smithfield Transport Corridor Upgrade Project will be subject to competitive tender practices and application.

13. Employees Supporting and improving the lives of all employees including sub-contractors of the infrastructure project	Compliant

- How will this project support and improve employee outcomes especially marginalised and disadvantaged groups?

  Through procurement processes, all contractors and subcontractors for Project will comply with the national and state laws for equal employment opportunity and anti-discrimination within the workplace.

14. Social Return The project will have a positive social return on investment meaning for every dollar spent, there will be over one-dollar worth of social outcomes.	Moderate

- What will be the social return of this project? Describe how this project will benefit society e.g. reduced travel times, increased well-being, improved air quality, increased social cohesion.

  The benefits to the community include:

  - Contribution to the community and economic growth objectives for Townsville.
  - Improved urban amenity along Abbott Street corridor due to re-direction of freight rail traffic along the TEARC alignment to access the Port of Townsville.
  - Less interaction of freight trains with the North Coast Line along the Abbott Street corridor will reduce the length of time that Open Level Crossings (OLC) are closed, resulting in improved road safety and access

SOCIAL

- Increased employment opportunities will be generated from construction, project management and operations for the TEARC Project.

15. Community and stakeholders Understanding and incorporating community and stakeholder views including marginalised and affected groups, to increase the social licence to operate.	Basic

- How will community and stakeholder views be considered and incorporated into the decision-making processes throughout the project?

Prior to the commencement of the DBC the consultation program was directed towards government departments and officials. There was no direct consultation with the communities potentially impacted by the project.

The communications and stakeholder management strategy for the DBC was designed to:

- provide a coordinated stakeholder management and communication program
- inform stakeholders about the TEARC project and alignment
- manage and mitigate issues during the DBC phase of the Project
- gain understanding and acceptance across key stakeholders and the community for the outcomes of the project.

The DBC stakeholder engagement included the following three phases:

1. Educate and consult stakeholders on options and identify key communication risks, including use of a Stakeholder Advisory Group to discuss options and insights into the MCA.
2. Engage the community, address issues and manage expectations including providing information to the broader community.
3. Report on findings, close the loop, develop forward strategy including reporting, providing feedback to project team and stakeholders.

The following key recommendations are made for future project stages:

- Keep impacted residents and property owners updated on progress and meet landholders face to face.
- Reinforce benefits by ensuring all community-facing materials include key messages about positive community outcomes.
- Doorknock residents who live near the proposed alignment including Cluden and the most impacted parts of South Townsville.
- Keep the broader community engaged by regularly updating the project page and undertaking letterbox drops to ensure they are aware of the progress and construction timeframes
- Continue to use a targeted approach to ensure communication is relevant and appropriate for each group.

SOCIAL

- How will marginalised and affected groups be included in the engagement?

  The groups most likely to be marginalised or affected by the project are the communities of Cluden and South Townsville (particularly those living close to the Port). The proposed alignment passes closest to pockets of these two communities, and residents will likely experience increased public and property disruption (e.g. noise, dust, traffic congestion).

  The Communications and Stakeholder Management Strategy recommends these communities received a high level of direct and focused engagement. During the DBC the potentially impacted residents and landholders were directly contacted via door knocks and letters before any consultation news was publicly released. The purpose of this direct engagement was to engender a feeling of acknowledgment by the Project Team, and to reduce the likelihood of misinformation spreading because of a lack of information.

  In future project stages, the Project Team should undertake further consultation and investigation in relation to noise, dust and traffic congestion. This work should include relevant technical aspects of the project and their likely impacts on residents. The Project Team will continue to use a targeted approach to ensure communication is relevant and appropriate for each group. They will directly consult with impacted groups to keep them updated on project progress.

- What is the legacy left behind beyond the legacy of the project itself (e.g. a bike path to connect two existing bike paths, enhanced community space, restoration of a heritage area etc.)?

  There is an opportunity to facilitate safe public access to the shores of the Ross River or improve amenities at the dog beach.

16. Heritage Protecting indigenous and non-indigenous heritage and sites highly valued by the community.	Basic

- Will this project affect heritage or areas highly valued by the community? Are there any opportunities to enhance heritage?

  – Indigenous heritage

    There are two native title claims over the project area. The Bindal Native Title Claim encompasses the project area on the southern side of Ross River, whilst the Gurambilbarra Wulgurukaba Native Title Claim encompasses the project area on the northern side of Ross River.

    Searches of State and Federal cultural heritage databases were undertaken, no significant indigenous cultural heritage sites or places located within the specific project corridor were identified. DATSIP searches indicated a diversity of significant Aboriginal cultural sites, places and values in the wider area outside of the project footprint (on the surrounding coastal plains, within specific landforms such as sand dunes and beach ridges and along the channel of Ross River).

    Construction of a new rail bridge across the Ross River is likely to be of concern to the indigenous parties and this will require careful cultural heritage management in this High Risk location. As noted, the Ross River retains a high level of Aboriginal cultural significance, as part of the creation story associated with Gabul, the carpet snake. As the major watercourse on the Townsville coastal plain, the Ross River has immeasurable cultural significance to the Traditional Owners as a prominent and important feature of their homelands.

    It is recommended culturally appropriate consultation occur with the Bindal Native Title Applicants and the Gurambilbarra Wulgurukaba Native Title Applicants for their respective areas of interest in the final preferred TEARC project corridor (as delineated by the Native Title Claim boundaries along the centre line of the Ross River).

    It is recommended that the future field assessments in conjunction with the indigenous parties specifically target those areas and landforms assessed in this desktop study as Medium to High Risk areas (namely, the coastal floodplains, saltpan, mudflats, sand dunes, beach ridges and the banks and surrounds of Ross River).

  – Non-indigenous heritage

    TEARC passes through areas of post-contact habitation, including the:

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- former Townsville City Council sewerage treatment works (abandoned)
- former heavy anti-aircraft gun station installation and camp sites
- Ross River tidal flats where Japanese bombs impacted during WW2.

The above mentioned sites are not listed in the Queensland Heritage Register (QHR). The heavy anti-aircraft gun station was nominated in 2006 as a heritage place but not was not entered.

Whilst the potential for unearthing material of potential State significance in the project area is unknown, there exists high potential for unearthing material that will have significance to the local community and will contribute to a greater understanding of Townsville’s history during the period c1870-1945.

Historical monitoring in areas of archaeological and artefact potential is recommended during initial ground disturbance to ensure any archaeological artefacts of local or state significance may be retrieved and their locations adequately recorded.

Table 15.5 Economic assessment

ECONOMIC	
17. Equity Share the benefits and costs of infrastructure development in a fair and equitable way	Basic

- Who are disadvantaged or made vulnerable through this project? How is this being addressed?

  As previously discussed, the communities of Cluden and South Townsville, and some other landholders near the Project are likely to experience direct impacts associated with construction activities and operation of the rail line.

  These impacts include increased rail traffic in areas not previously impacted by rail operations (Cluden and South Townsville). These properties are previously affected by port activities (South Townsville) and light industrial uses (Cluden and South Townsville). Impacts to local urban amenity from noise, dust and vibration. There is uncertainty about need for partial and full property resumptions.

- How are the benefits shared equitably?

  The project will result in improved urban amenity along the Abbott Street corridor due to re-direction of freight rail traffic along the TEARC alignment to access the PoT. There will be less interaction of freight trains with the North Coast Line along the Abbott Street corridor that will reduce the length of time that OLCs are closed, resulting in improved road safety and access. This will provide benefit for the most impacted communities as well as the wider community.

  It is also likely to result in increased employment opportunities generated from construction, project management and operations.

  Overall, the project is anticipated to contribute to community and economic growth objectives for Townsville and have a positive impact on urban amenity due to improved access to the Port via TEARC alignment.

18. Whole-of-life impacts Making decisions based on the whole-of-life impacts and benefits of a project.	Moderate

- How will the whole-of-life impacts and benefits be incorporated into the project’s decision-making processes?

  The project decision-making process relies on the use of detailed economic cost-benefit analysis modelling. This involves consideration of the whole of life costs (e.g. the upfront costs to the transport agency to construct the project and the costs required to sustain the project) and the whole of life quantifiable benefits (e.g. the benefits are assessed over a 30-year period). The consideration of the whole of life impacts produces a benefit-cost ratio (BCR) for use in the decision-making process. The BCR for the project is 0.16 (using a 7% discount rate) which denotes that the project is not economically viable.

ECONOMIC
There are many strategic and community benefits TEARC will enable as explained in Chapter 3 that were unable to be quantified for the BCR. TEARC will in the long-term allow the eventual removal of the Jetty Branch and all trains would use TEARC. This would improve urban amenity along Abbott St and Perkins St and the nearby Townsville Waterfront PDA.

19. Valuing externalities Putting a value on material externalities and incorporating them into the decision-making process	Basic

- What are the material externalities of this project? How will they be valued (monetised and non-monetised values) in the decision-making process?

  The project will reduce negative externalities associated with freight trains travelling through the city of Townsville such as noise and air pollution. The project will also change road user behaviour (e.g. currently road users travelling around level crossings which creates addition air pollution etc.). The reduction in negative externalities associated with freight trains was valued at $113,413 over a 30-year appraisal period using a 7% discount rate, the project will also reduce road user externalities which were valued at $1.3 million.

  The consideration of safety and environmental parameters in economic assessment is considered to be standard practice.

15.5 Summary

The sustainability assessment demonstrates the TEARC Project will contribute to positive economic, environmental and social outcomes. All sustainability principles scored a rating of Basic or Higher.

Sustainability principles that scored a Moderate rating, or higher include:

- Governance
- Strategic planning
- Social return
- Whole of life (process).

This assessment has identified several issues and opportunities that need to be considered as the design is further developed. Of significance are issues and opportunities for maximising the sustainability of the TEARC project in relation to whole of life costs, material use, resource recovery, green infrastructure, climate change mitigation and adaptation, environmental impact and benefit.

It is recommended the TEARC develop and implement a sustainability framework to guide more sustainable decision making in future project phases. This may take the form of an Infrastructure Sustainability Council of Australia (ISCA) Rating or development of a bespoke governance and assessment framework.

16 AFFORDABILITY ANALYSIS

CHAPTER SUMMARY AND CONCLUSIONS:

- Similar to comparable rail projects, TEARC requires a large upfront capital commitment ($391.7 m), accounting for 85.4% of the net risk-adjusted project costs in nominal terms.
- As TEARC is recommended to be delivered as a single works package under a traditional delivery model, staging of TEARC has not been assessed from an affordability perspective as this was identified as a sub-optimal project delivery/value for money outcome through DBC analysis.
- Therefore, the affordability result equals the net P90 risk-adjusted project costs of $458.9m in nominal terms and $370.2m in NPV terms.
- Incremental revenues under the 'with' TEARC case are negative. This is due to the not being any significant uplift in freight demand projected, and NTKs for the purpose of user charging are reduced, meaning less revenues are recovered. The user pays pricing per NTK has been assumed to be unchanged from the current average network rates.
- The Australian Government has allocated up to $150m for the TEARC project, subject to an approved business case. The balance of funding required is yet to be secured but will also be dependent on the recommendations provided in Chapter 20.

This chapter brings together much of the detailed discussion in preceding chapters of the DBC to outline affordability considerations for TEARC.

The purpose is to present all relevant information to allow the Queensland Government to assess the affordability of TEARC over the whole of its life, by considering all of the costs and revenues of TEARC.

This chapter outlines the:

- approach taken to complete the affordability analysis for TEARC
- summary of costs and revenues of TEARC
- nominal net cash outflows required to fund TEARC
- sensitivity analysis on the cash flows and financial model inputs of TEARC.

16.1 Approach

TEARC affordability is measured by the net P90 risk-adjusted project costs to the Queensland Government of delivering TEARC through the preferred traditional delivery model. The impact of different factors on the affordability of TEARC to the Queensland Government were also assessed through sensitivity testing of changes to these factors, including:

- Costs (capital and ongoing costs)
- Revenues
- Escalation rates
- Discount rates.

16.2 Project Costs and Revenues

This section outlines the build-up of the affordability assessment that details the capital costs, ongoing costs and revenues for TEARC over the evaluation period.

Table 16.1 and Table 16.2 set out the P90 risk-adjusted capital and ongoing costs for the affordability analysis for TEARC.

Table 16.1 Capital Costs

CAPITAL COSTS	REAL ($ M)	NOMINAL ($ M)	NPV ($ M)
Capital costs (P90 risk-adjusted)	**345.5**	**391.7**	**340.2**

Table 16.2 Ongoing Costs (Over then 30-year Period)

ONGOING COSTS	REAL ($ M)	NOMINAL ($ M)	NPV ($ M)
Ongoing costs (P90 risk-adjusted)	**36.0**	**65.9**	**29.3**

Table 16.3 Revenues (Medium Revenue Scenario)

REVENUES	REAL ($ M)	NOMINAL ($ M)	NPV ($ M)
Freight access revenue (medium demand scenario) (negative values)	0.8	1.3	0.6

As is evident above, the revenue assumptions described in Table 16.3, incremental revenue is negative as the volume of freight is not projected to increase sufficiently to offset the reduced distance that it would need to travel upon completion of TEARC. The assumptions underpinning the revenue derivation can be found in Chapter 7 Economic Analysis, and a discussion of user funding and access to rail assets is included in Chapter 3 Defining the Service Need for the Project.

16.3 Affordability Summary

TEARC affordability is measured by the net P90 risk-adjusted project costs to the Queensland Government of delivering TEARC through the preferred traditional delivery model.

The affordability results of TEARC are summarised in Table 16.4.

Table 16.4 Affordability Summary

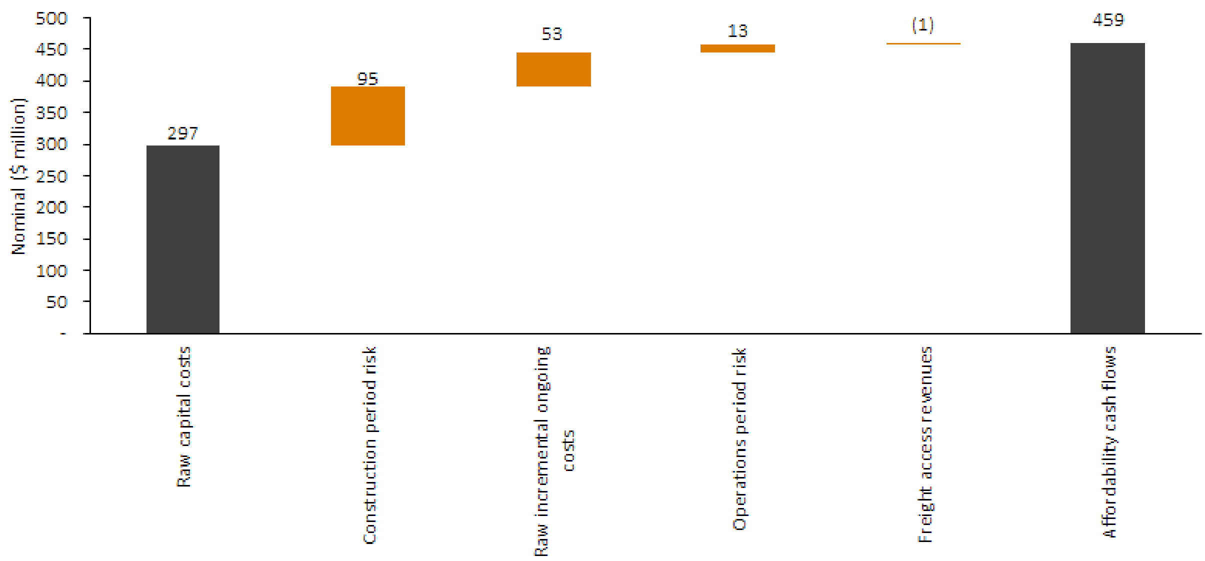
	REAL ($ M)	NOMINAL ($ M)	NPV ($ M)
Capital costs (P90 risk-adjusted)	345.5	391.7	340.2
Ongoing costs (P90 risk-adjusted)	36.0	65.9	29.3
Total P90 risk-adjusted project costs	**381.5**	**475.7**	**369.6**
Revenues (medium demand scenario) (negative values – reflect incremental revenue loss)	0.8	1.3	0.6
TEARC affordability	**382.3**	**458.9**	**370.2**

TEARC affordability is $458.9m in nominal terms and $370.2m in NPV terms. In accordance with the Building Queensland Business Case Development Framework (BCDF), the affordability assessment should also consider various staging options and delivery options, acknowledging that these will have implications for funding profiles of the State.

Given that TEARC is recommended to be delivered under a traditional (Construct Only contract) delivery model (Chapter 9), staging of TEARC has not been assessed from an affordability perspective, as this was identified as a sub-optimal project delivery/value for money outcome through DBC analysis. Therefore, the affordability result equals the net P90 risk-adjusted project costs determined in Chapter 8.

Figure 16.1 outlines the components that make up TEARC affordability in a waterfall chart.

Figure 16.1 Affordability Waterfall (Nominal)



As outlined in the affordability waterfall in Figure 16.1, TEARC has a high upfront capital cost commitment compared to its ongoing costs over the 30-year operations period.

Table 16.5 outlines the annual affordability cash flows, in nominal terms, for the first 10 years of TEARC.

Table 16.5 Affordability Cashflows (Nominal)

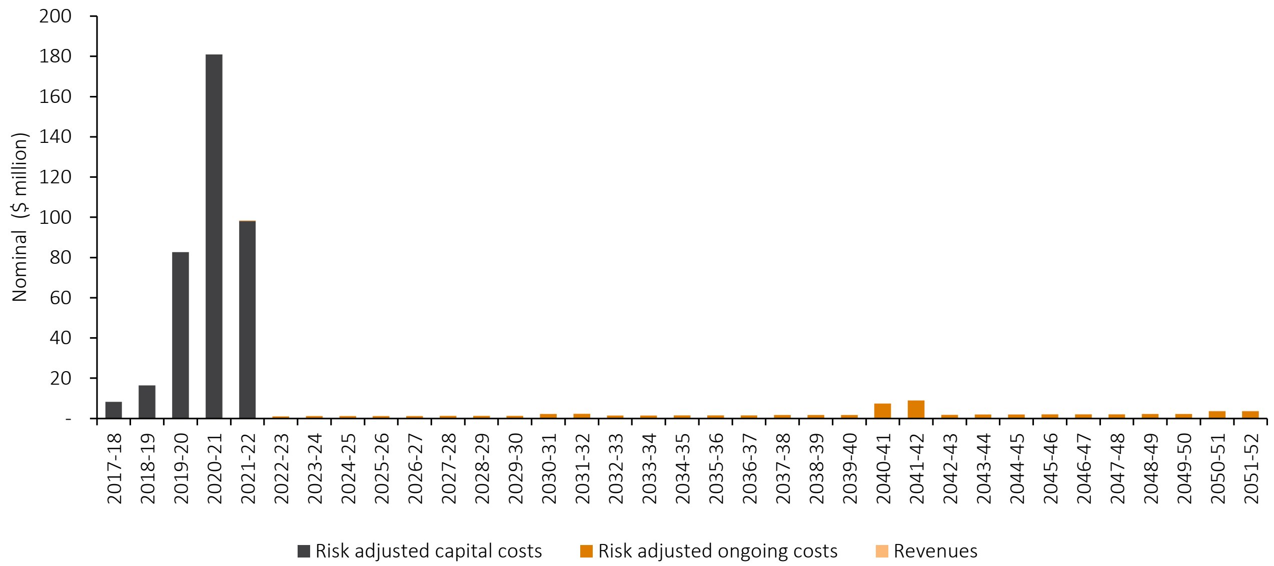
NOMINAL, $ M	FY17	FY18	FY19	FY20	FY21	FY22	FY23	FY24	FY25	FY26	FY27-52	TOTAL
Capital costs (P90 risk-adjusted)	5.3	8.2	16.4	82.7	181.0	98.1	-	-	-	-	-	391.7
Ongoing costs (P90 risk-adjusted)	-	-	-	-	-	0.2	1.0	1.1	1.1	1.2	61.4	65.9
Revenues (medium demand scenario) (negative values)	-	-	-	-	-	0.01	0.03	0.04	0.04	0.04	1.1	1.3
Affordability cash flows	**5.3**	**8.2**	**16.4**	**82.7**	**181.0**	**98.4**	**1.0**	**1.1**	**1.2**	**1.2**	**62.5**	**458.9**

The majority of TEARC costs incurs in FY20 to 22 where the main construction works take place. The ongoing costs over the 30-year period are not significant as compared to the high upfront costs for TEARC. In addition, the revenues are negative, although negligible.

Figure 16.2 outlines the annual affordability cash flows, in nominal terms, for the evaluation period of TEARC.

The shape of the affordability cash flow profile reflects the high upfront capital costs, and lifecycle capital replacement works being scheduled at ten-year intervals.

Figure 16.2 Affordability Cashflows (Nominal)



16.4 Sensitivity Testing

TEARC has been tested against a range of sensitivity factors determined by the TEARC Project team and the financial and commercial advisor.

Table 16.6 demonstrates the impact of changes to key parameters on TEARC affordability in nominal terms.

Table 16.6 Sensitivity Testing on TEARC Affordability (Nominal)

SENSITIVITY ANALYSIS	BASE ASSUMPTION	NOMINAL ($ M)	$ CHANGE	% CHANGE
Capital costs increased by 10%	458.9	498.1	39.2	8.5
Capital costs reduced by 10%	458.9	419.8	(39.2)	(8.5)
Ongoing costs increased by 10%	458.9	465.5	6.6	1.4
Ongoing costs reduced by 10%	458.9	452.3	(6.6)	(1.4)
Revenues increased by 10%	458.9	459.1	0.1	0.0
Revenues decreased by 10%	458.9	458.8	(0.1)	0.0
Capital cost escalation increased by 1%	458.9	477.8	18.8	4.1
Capital cost escalation reduced by 1%	458.9	440.8	(18.1)	(3.9)
Ongoing cost escalation increased by 1%	458.9	476.6	17.6	3.8
Ongoing cost escalation reduced by 1%	458.9	445.2	(13.7)	(3.0)
CPI escalation increased by 1%	458.9	459.2	0.3	0.1
CPI escalation decreased by 1%	458.9	458.7	(0.2)	(0.1)

Table 16.7 demonstrates the impact of changes to key parameters on TEARC affordability in NPV terms.

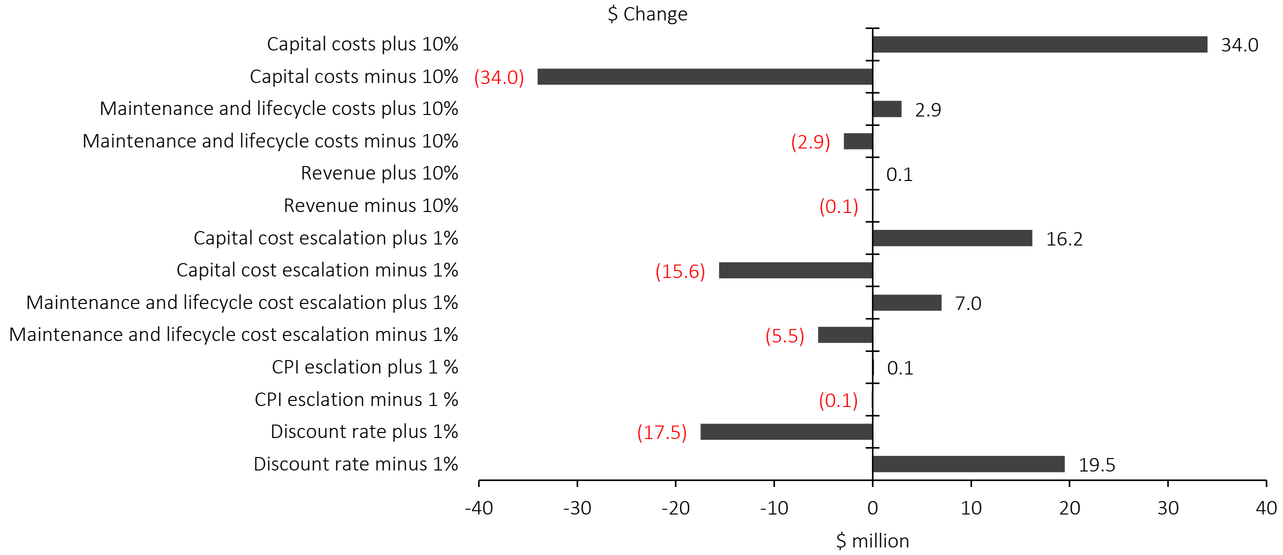
Table 16.7 Sensitivity Testing on TEARC Affordability (NPV)

SENSITIVITY ANALYSIS	BASE ASSUMPTION	NPV ($ M)	$ CHANGE	% CHANGE
Capital costs increased by 10%	370.2	404.2	34.0	9.2
Capital costs reduced by 10%	370.2	336.1	(34.0)	(9.2)
Ongoing costs increased by 10%	370.2	373.1	2.9	0.8
Ongoing costs reduced by 10%	370.2	367.2	(2.9)	(0.8)
Revenues increased by 10%	370.2	370.2	0.1	0.0
Revenues decreased by 10%	370.2	370.1	(0.1)	(0.0)
Capital cost escalation increased by 1%	370.2	386.4	16.2	4.4
Capital cost escalation reduced by 1%	370.2	354.6	(15.6)	(4.2)
Ongoing cost escalation increased by 1%	370.2	377.2	7.0	1.9
Ongoing cost escalation reduced by 1%	370.2	364.6	(5.5)	(1.5)
CPI escalation increased by 1%	370.2	370.3	0.1	0.0
CPI escalation decreased by 1%	370.2	370.1	(0.1)	(0.0)
Discount rate increased by 1%	370.2	352.7	(17.5)	(4.7)
Discount rate reduced by 1%	370.2	389.7	19.5	5.3

Figure 16.3 shows the dollar change of TEARC affordability in NPV terms by adjusting the selected parameters.

All sensitivities undertaken indicate TEARC will still result in a significant NPV, predominately due to the high upfront capital costs.

Figure 16.3 Dollar Change of TEARC Affordability (NPV)



An alternate demand scenario was not considered beneficial, as revenue estimates were marginal relative to the Project costs.

16.5 Conclusion

As at the date of this DBC, the final form of the funding agreement between the State and the Commonwealth Government through the Department of Infrastructure and Regional Development has not been finalised. The TEARC financial assessment has established a net P90 risk-adjusted project cost to the Queensland Government of $458.9m in nominal terms and $370.2m in NPV terms (of which 85.4% of TEARC net costs in nominal terms are upfront capital requirements), which will need to be met should TEARC be approved.

The Australian Government has allocated up to $150m for the TEARC project, subject to an approved business case. The balance of funding required is yet to be secured but will also be dependent on the recommendations provided in Chapter 20.

Following receipt of this DBC, TMR may seek funding for the procurement phase and arrange for funding discussions for delivery phase.

Given that TEARC is recommended to be delivered under a traditional delivery model, staging of TEARC has not been assessed from an affordability perspective as this was identified as a sub-optimal project delivery/value for money outcome through DBC analysis. Therefore, the affordability result equals the net P90 risk-adjusted project costs discussed in Chapter 8, being $458.9m in nominal terms and $370.2m in NPV terms.

Incremental revenues under the 'with' TEARC case are negative. This is because there is no significant uplift in freight demand projected, and NTKs for the purpose of user charging are reduced, meaning less revenues are recovered.

Sensitivity analysis has been conducted on key project parameters. The high upfront capital costs have the most financial impact to TEARC affordability. All sensitivities undertaken indicate that TEARC will still result in a significant net present cost.

17 CONCLUSIONS

TEARC is a strategically important project which will support the progressive development of the Port of Townsville (PoT), the Townsville Priority Development Area (PDA) and Townsville State Development Area (TSDA) whilst at the same time improving urban amenity near the Ross River precinct and adjacent areas.

The Base Case freight rail configuration does not support efficient development of the port through its expansion plans. Competitiveness of Townsville is constrained by freight network inefficiencies and freight rail movements through Townsville is reducing liveability.

The Townsville Eastern Access Rail Corridor Project (TEARC), as a standalone project based on the central case demand forecast, is uneconomic based on a BCR of 0.16 and NPV of negative $226.3m using a 7 percent real discount rate. TEARC's quantifiable benefits are derived through reduced road traffic delays and a marginal increase in rail efficiency.

TEARC is a building block to achieve the longer-term goals of potentially removing the Jetty Branch (timed with the Port Expansion Project (PEP)) and having all trains utilise TEARC thus providing improved urban amenity for the community along Abbott Street and Perkins Street. This would open up the Townsville Waterfront PDA for future development and, redevelopment of the urban areas around Perkins Street thus improving the liveability of Townsville.

The net P90 risk-adjusted project costs are $458.9 million in nominal terms, and $370.2 million in NPC terms when taking into account the whole-of-life costs of the Project.

Investment in the Environmental Impact Statement approval and engineering development would allow the TEARC project to progress, whilst at the same time mitigating risk should the Ports growth exceed the demand forecast. This investment would position the TEARC project to progress into construction when required.

The Port Expansion Project (PEP) schedule should allow the PoT to identify when TEARC will be required to realise any operational or expansion benefits from any associated development within the port. There is not a pressing need for TEARC to be developed immediately based on the PoT timing, the demand forecast or the development of a major mine which would require large tonnages to be railed and shipped. The timing of TEARC will need to balance out the transport versus the strategic needs.

The Australian Government has allocated up to $150 million for the TEARC project, subject to an approved business case. The balance of funding required is yet to be secured.

18 ASSURANCE

CHAPTER SUMMARY, RECOMMENDATIONS AND CONCLUSIONS:

- The Detailed Business Case (DBC) has been developed in consideration of the key assurance objectives of the Building Queensland Business Case Development Framework (BCDF).
- Independent peer reviews for the key project elements: economics, financial and commercial, cost, risk and technical were conducted for the DBC. The peer reviews for the DBC have confirmed the assessment of the project is appropriate and no remaining material issues have been identified. A gateway review was also carried out – Gateway Gate 2 – Readiness for Market Review.
- The DBC draft chapters were shared with the stakeholders for review, their commentary forms were an integral part of the assurance process
- A comprehensive comments register was used to close out agreed actions and updated chapters as required.

18.1 Overview

This DBC has been developed in consideration of the key assurance objectives of the BCDF:

- Is the DBC complete?
- Does the DBC include reliable and reasonable information?
- Are the DBC assessment methods comparable to other business cases?
- Is it transparent and developed without bias regarding project risk and mitigations?
- Does the DBC clearly identify ownership for the development of the business case, engagement of stakeholders and realisation of benefits?
- Is it independently assured?

The alignment of the DBC to these objectives is detailed in Table 18.1.

Table 18.1 Assurance Objectives

ASSURANCE OBJECTIVES	
ASSURANCE OBJECTIVE	ASSURANCE SUMMARY
Complete	The DBC has been developed in line with the Building Queensland BCDF. All key content areas from the BCDF have been addressed.

ASSURANCE OBJECTIVES	
Reliable and reasonable	The baseline assumptions for the assessment of the Project, leverage of these standards and guidelines: ▪ Australian Transport Assessment and Planning Guidelines (ATAP), Transport and Infrastructure Council (2016), Commonwealth Department of Infrastructure and Regional Development. ▪ Assessment Framework: Initiative and Project Prioritisation Process, Infrastructure Australia (IA) (2016). ▪ Guide to Project Analysis Part 4: Project Analysis Data, Austroads (2008). ▪ Capital costs: first principles build-up using the reference design quantities and the TMR Project Cost Estimating Manual (PCEM). ▪ Project benefits: ATAP guidelines (2016). ▪ Economic analysis: ATAP guidelines (2016), Discount Rate advice from Infrastructure Australia. ▪ Financial analysis: Discount Rate advice and Financial Model from QTC.
Comparable	The Preliminary Evaluation (PE) was developed using TMRs OnQ framework which is used by TMR for the evaluation of similar road upgrades and bypasses. The DBC leverages off the PE and has been prepared in line with the Infrastructure Australia, PAF and Building Queensland BCDF guidelines, and is comparable in methodology and assessment to projects of a similar scale and nature.
Transparent	Detailed cost and risk estimates have been prepared and independently peer reviewed.
Ownership	Project Governance and Implementation Plan detail clearly the responsibilities for the DBC development and ongoing phases of the Project.
Independently Assured	Refer Section 18.2

The TEARC Detailed Business Case (this document) complies with the PAF and BCDF. It also addresses requirements of the Infrastructure Australia (IA) Business Case Assessment Framework and the National Public Private Partnership (PPP) Guidelines and Queensland PPP Supporting Guidelines. A DBC typically builds on and reconfirms the findings of the Strategic Assessment of Service Requirements (SASR) and Preliminary Evaluation (PE), including Preliminary Business Case (PBC). The SASR and PBC for TEARC were prepared in 2011, prior to the establishment of Building Queensland, and therefore are consistent with the PAF only.

18.2 Independent Assurance

Independent peer reviews have been undertaken for key Project elements including:

- Economics
- Financial and commercial
- Cost and risk
- Technical assessment

The peer reviews for the DBC have confirmed the assessment of the Project is appropriate and no remaining material issues have been identified.

18.3 Gateway Review

The Gateway Gate 2—Readiness for Market Review was conducted. The primary purpose of a ‘Gate 2—Readiness for Market Review’ is to investigate the assumptions in the DBC and proposed approach for delivering the Project.

18.4 Stakeholder Review

The DBC draft chapters were shared with the stakeholders for review. A comprehensive comments register was used to close out agreed actions and update chapters as required. Each stakeholder is provided with feedback and action taken 'if any' with respect to commentary made by the individual stakeholder. The stakeholder review commentary is an integral part of the assurance process.

The stakeholders who participated in the review were:

- State:
  - Department of Transport and Main Roads
  - Queensland Rail
  - Port of Townsville
  - Department of State Development
  - Queensland Treasury
  - Department of Infrastructure, Local Government and Planning
  - Department of the Premier and Cabinet.
- Commonwealth:
  - Department of Infrastructure and Regional Development
  - Infrastructure Australia.

19 IMPLEMENTATION PLAN

CHAPTER SUMMARY AND CONCLUSIONS

- The proposed Townsville Eastern Access Rail Corridor (TEARC) forms part of the Queensland Rail (QR) network, under the responsibility of the Queensland Government. Should the project proceed, the project will be managed by the Department of Transport and Main Roads (TMR) Far North District officers in accordance with the departments OnQ project management framework. TMR's Regional Director (North Queensland) will be the Project Owner for delivery. The Project will be resourced using a combination of internal TMR personal and external advisors.
- This DBC will be recommending (Chapter 20) that the TEARC project implementation is put on hold, based on the economic assessment.
- The key risks to be considered during the procurement and delivery of the project in the future include complex hydrology, geotechnical constraints, bridge structures, bulk earthworks and approvals.
- TMR Far North District will need to prepare a Communications and Engagement Plan to ensure accurate, timely and relevant information is provided to stakeholders regarding project scope, timeframes, impacts and progress should the project proceed.
- The Benefit Realisation Plan is in draft and will require TMR and other stakeholder review and accept, if the project were to proceed.

19.1 Overview

The Implementation Plan for this project should it proceed will need to outline the key activities and processes required for the implementation of TEARC including:

- governance
- resourcing
- project management and planning
- risk management
- stakeholder engagement
- procurement
- benefits realisation.

20 RECOMMENDATIONS

20.1 Introduction

The Townsville Eastern Access Rail Corridor (TEARC) Detailed Business Case (DBC) has identified the future preferred rail corridor connecting the Mount Isa Line and the North Coast Rail Corridor to the Port of Townsville (PoT). The PoT plays a significant role in the local, regional and State economy, operating as a freight hub for mining and resources, agriculture, fuel import, general cargo as well as supporting defence and tourism activities.

TEARC is identified as an enabling infrastructure investment to support future PoT development. The Project is also identified as a critical enabler for the optimal PoT layout to be achieved. TEARC may be required by the PoT in the future to meet demand and customer requirements. The PoT, rail customer requirements and corresponding demand increases will influence the timing of TEARC and the Port Expansion Project. An ongoing review of customer requirements and demand is required. The designation of the PoT as a Priority Port under the *Sustainable Ports Development Act 2015* ensures increased coordination of the PoT expansion plans with TEARC. TEARC is also strategically consistent with the Townsville development plans, including the development of the Townsville City Waterfront Priority Development Area and the Townsville State Development Area. TEARC provides strongly aligned planning benefits to Townsville and North Queensland.

The development of TEARC is a future logical strategic infrastructure investment to ensure further growth of the North Queensland region and the PoT.

TEARC benefits are derived through reduced road delays and a marginal increase in rail efficiency. The Reference Project for TEARC provides a BCR of 0.16 with a corresponding NPV of negative $226.3 million using a 7 percent real discount rate. The outcomes of the Cost Benefit Analysis need to be considered in the context of the non-monetised benefits which includes:

- contributions to the community and economic growth objectives for Townsville, with the facilitation of additional trade through a dedicated corridor traversing the Townsville State Development Area, which is a more direct route to/from the PoT
- improved urban amenity along the North Coast Line parallel to Abbott Street and the Jetty Branch adjacent to the Townsville Southern CBD, as a result of the re-direction of freight rail traffic along the TEARC alignment to access the PoT
- less interaction of freight trains with the North Coast Line parallel to Abbott Street reducing the length of time which Open Level Crossings are closed, resulting in improved road safety and access
- increased employment opportunities generated from construction, project management and operations for the TEARC Project.

The project has also identified several non-monetised impacts that include:

- impact to local urban amenity in suburbs not previously affected by rail (e.g. Cluden and South Townsville) and uncertainty about partial and full property requirements
- potential impacts to local access and recreational areas (e.g. off-leash area at Benwell Road)
- potential localised noise, vibration and dust impacts during construction and operation.

The economic benefits sought by the TEARC Reference Project are limited due to existing operational rail constraints within the PoT, and the need to maintain both the existing rail alignment and PoT rail customer access to the PoT via the Jetty Branch. The removal of the Jetty Branch (not included in the Reference Project) can only occur after the current configuration and constraints of the sugar loop, and other customers are reconfigured in conjunction with, TEARC and the PoT plans to expand into the Eastern Reclamation Area as part of the future Port Expansion Project. The PoT is in a Master Planning phase with only indicative timing as to when this is likely to occur.

The improved road benefits and the potential land value uplift of the Townsville Priority Development Area adjacent to the Jetty Branch, is constrained until the line is removed.

Several strategic responses and business solutions have been identified that fall out of the scope of the TEARC DBC, but are nonetheless key issues. These include:

- addressing the complexities and inefficiencies of rail operations to and in the PoT
- ensuring future port lease renewals are aligned to the Port Master Plan objectives
- addressing line speed constraints on the Mount Isa Line (including the provision of passing loops and other upgrades)
- regulatory reform to encourage industry growth, reduce input costs and levelling the playing field between road and rail transport
- removal of the Jetty Branch into the PoT which would provide a stepped increase in urban amenity for south Townsville residents.

There are many project interdependencies, within the PoT and adjacent area that are likely to influence a future evaluation of the benefits of TEARC. These include increased trade volume efficiencies expected to flow from stage 1 of the PEP (channel widening project), the opportunity for more effective land use within the PoT from the Port Master Planning phase and the greater availability of land within the PoT following the finalisation of the Eastern Reclamation Area works. These projects will allow further efficiencies in port operation as existing port activities migrate towards more streamlined transport infrastructure through the proposed TEARC Reference Project Alignment.

These efficiencies would be expected to positively influence demand as freight movement through the PoT becomes more cost effective.

20.2 Recommendations

With consideration to the strategic context of the Project, findings, opportunities, risks and mitigation activities identified in the DBC, the recommendations for consideration by the Queensland Government are:

RECOMMENDATION 1

- Preserve the Corridor: The TEARC Project - Reference Project Alignment Corridor Land based on the preferred alignment in the DBC is preserved and protected as the clear and preferred alignment for rail access to the PoT and the Port Expansion Project through the following measures:
  - amending the existing community infrastructure designation so that it applies to the alignment corridor
  - gazettal of the corridor as "future railway land" under the *Transport Infrastructure Act 1994* (Qld)
  - ensuring the part of the corridor within the PoT is included in the master plan and port overlay for the PoT once made under the *Sustainable Ports Development Act 2015* (Qld).

RECOMMENDATION 2

- Note the Project is not economically viable, at the time of completing the DBC.
- Place the implementation of the TEARC on hold pending demand for the project generated by interdependent PoT projects or other requirements determined by the Australian and Queensland Governments.

20.3 Suggested additional actions

In addition to the aforementioned recommendations, it is suggested the relevant Queensland Government agencies consider implementing the following activities to facilitate future development of TEARC:

- Coordinate the review of the TEARC DBC with the implementation of the *Townsville City Deal (2016)* to ensure other actions in the program. Notably the ongoing review of TEARC to inform a freight infrastructure investment program for the region as well as ensuring the future development of the Townsville State Development Area and PoT.
- Progress PoT's critical enabling infrastructure in the Eastern Reclamation Area to connect existing and new customer infrastructure arrangements in preparation of TEARC
- Progress PoT Infrastructure development planning consistently with the findings of the *Port Infrastructure Layout and Land Allocations Study (2016)* and the TEARC DBC
- Progress with legal and regulatory approval processes to facilitate transition to the TEARC Reference Project Alignment and Port Expansion Project infrastructure arrangements for the PoT existing and potential new customers
- Progress transport planning activities to capture end to end (North West Minerals Province to PoT) transport supply chain infrastructure considerations and implementation
- Integrate TEARC Project implementation plans, PoT Port Expansion Project Plans and Queensland Rail Infrastructure Plans to include:
  - the removal of the existing Jetty Branch, upon implementation of the TEARC Project
  - Capture land value uplift in the Townsville City Waterfront Priority Development Area.

21 REFERENCES

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22 GLOSSARY OF TERMS

This chapter provides the glossary of terms used in the DBC.

ACRONYM	FULL TITLE	DESCRIPTION
ABS	Australian Bureau of Statistics	
ACL	Australian Consumer law	
AEIS	Additional Environmental Impact Statement	
AEP	Average Exceedance Probability	
BCDF	Building Queensland Business Case Development Framework	
BCR	Benefit Cost Ratio	
BRP	Benefits Realisation Plan	
CAPEX	Capital Expenditure	
CBA	Cost Benefit Analysis	
CBD	Central Business District	The commercial and business centre of a city
CBD	Townsville Central Business District	
CHMA	Cultural Heritage Management Agreements	
CHMP	Cultural Heritage Management Plan	
CBRC	Queensland Government Cabinet Budget Review Committee	
CHMP	Cultural Heritage Management Plan	
CO	Construct Only	
D&C	Design and Construct	
DBC	Detailed Business Case	The Detailed Business Case prepared by Building Queensland
DFE	Defined Flood Event	
DIRD	Australian Government Department of Infrastructure and Regional Development	
DTC	Direct Train Control	
EAR	Environmental Assessment Report	
ECI	Early Contractor Involvement	
EMP	Environmental Management Plan	
EMP(P)	Environmental Management Plan (Planning)	
EIS	Environmental Impact Statement	
EOI	Expression of Interest	
EPBC	Environmental Protection and Biodiversity Conservation	

ACRONYM	FULL TITLE	DESCRIPTION
EPM	Exploration Permit Minerals	
IA	Infrastructure Australia	
ICC	Infrastructure Cabinet Committee	
IIC	TMR Infrastructure Investment Committee	
ILM	Investment Logic Map	
ILUA	Indigenous Land Use Agreement	
Jetty Branch	At times known as the Perkins Street Line	
LGA	Local Government Area	
LUP	Land Use Plan	
MCA	Multi Criteria Assessment	
MDL	Mineral Development License	
MIL	Mount Isa Line System	The Mount Isa line system consists of over 1,000km of track which extends from Stuart (near Townsville) to Mount Isa and includes the Phosphate Hill branch.
MITEZ	Mount Isa Townsville Economic Zone	
ML	Mining Leases	
MNES	Matters National Environmental Significance	
NCL	North Coast Line	The North Coast line is the principal regional freight and passenger line within the Queensland Rail network, running the length of coastal Queensland between Nambour in the south and Cairns in the north. The line extends over approximately 1400km excluding sections of Aurizon network between Parana and Rocklands in central Queensland and Kaili and Durroburra in north Queensland.
NPV	Net Present Value	
NWMP	North-West Minerals Province	The North-West Minerals Province includes the Flinders Shire, Richmond Shire, McKinlay Shire, Cloncurry Shire and Mount Isa City. Mining and mineral processing contribute significantly to the regional and national economy. The region has globally significant mineral resources, including over one quarter of the world's known lead and zinc reserves. Mineral extraction and processes generate significant wealth for the region and the nation. Agriculture, particularly beef production, is also a significant primary industry, with a long history in the region.
NQRSC	North Queensland Resources Supply Chain	
NT	Native Title	

ACRONYM	FULL TITLE	DESCRIPTION
NTK	Net Tonne Kilometres	
OLC	Open Level Crossings	
OPEX	Operating Expenditure	
PAF	Queensland Government's Project Assessment Framework	
PBC	Project Business Case	
PCEM	Project Cost Estimating Manual	
PCG	Project Control Group	
PDA	Priority Development Area	Townsville Waterfront PDA
PE	Preliminary Evaluation	
PEP	Port Expansion Project	
PEPA	Previous Exclusive Possession Act	
Perkins Street Line	Officially called the Jetty Branch	
PoT	Port of Townsville	The Port of Townsville is a government-owned Corporation of the Queensland Government. It is the third largest seaport in Queensland. It is located south of the mouth of Ross Creek and north of the Ross River.
POTL	Port of Townsville Limited	
PPP	Public Private Partnership	
PSC	Project Steering Committee	
PUP	Public Utility Plant	
QCA	Queensland Competition Authority	
QHR	Queensland Heritage Register	
QR	Queensland Rail	
QTRIP	Queensland Transport and Roads Investment Program	
RSNL	Rail Safety National Law	
RCS	Remote Controlled Signals	
RE	Regional Ecosystems	
REF	Review of Environmental Factors	
RFT	Request for Tender	
RSO	Rolling Stock Operator	
SASR	Strategic Assessment of Service Requirements	
SIE	Social Impact Evaluation	
SIP	State Infrastructure Plan	
SLO	Social License to Operate	
SMP	Stakeholder Management Plan	

ACRONYM	FULL TITLE	DESCRIPTION
SPD	Sustainable Ports Development	
SPR	Southern Port Road	
TCC	Townsville City Council	
TEARC	Townsville Eastern Access Rail Corridor Project	A proposed 8.3km rail line east of the Townsville CBD connecting the existing North Coast Line with the Port of Townsville via the Townsville State Development Area
TMR	Queensland Government Department of Transport and Main Roads	
TPAR	Townsville Port Access Road	A direct link between the Flinders and Bruce Highways to the Port of Townsville. The TPAR corridor provides for future additional traffic lanes, and rail and conveyor infrastructure to the Port. The TPAR comprises the Stuart Bypass and Eastern Access Corridor
TSDA	Townsville State Development Area	A 4915-hectare area of land declared in 2003 located about 6km south-east of the Townsville CBD which is intended to be the preferred location in North Queensland for the establishment of industrial development regional, state and national significance.
VfM	Value for Money	
UXO	Unexploded Ordnances	