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.

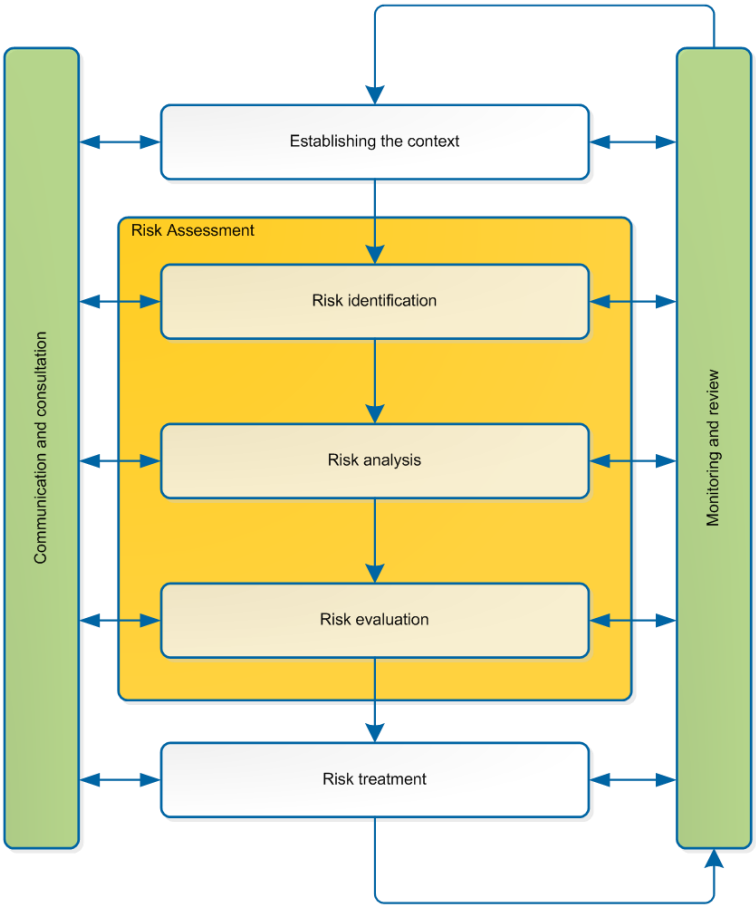
6.2.1 Initial Risk Workshop

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

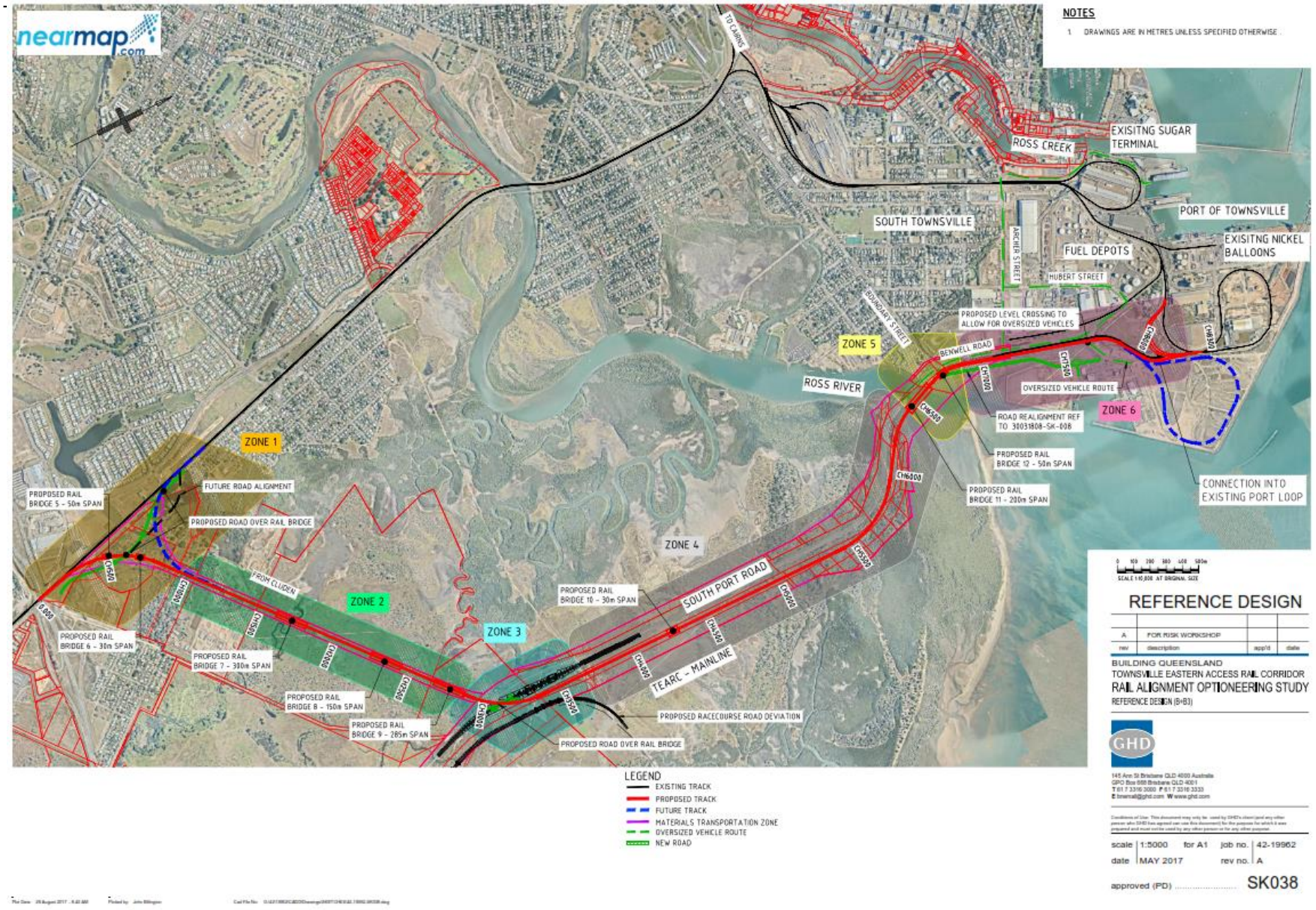


Table 6.3 Reference Design Risks (High Risks only)

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.