

16. Hazard and risk



16. Hazard and risk

This chapter describes the existing environment, potential impacts and mitigation measures related to hazards and risks, and health and safety issues associated with the proposed JRYUP.

16.1 Methodology

16.1.1 Detailed approach to hazard and risk assessment

Overall approach

The risk and hazard assessment methodology is based on AS/NZS4360: 2004 Risk Management and is conducted by systematically reviewing proposed project design and proposed activity information, considering relevant historical industry data (if available) and consultation with site and other QR personnel. The main tasks of the risk assessment process included:

- Establish the criteria against which risk will be evaluated
- Identify risks
- Analyse risks in terms of consequence and likelihood
- Evaluate the risk
- Treat the risk by accepting and monitoring low-priority risks and for other risks, develop and implement specific management plans or actions

The risk assessment spreadsheet model, based on the seven components of the framework identified in AS4360:2004 has a number of components for each major operation:

- A set of risk dimensions (ie context)
- Hazard identification (ie identify risks)
- Consequences associated with the risk dimensions (ie analysis)
- Likelihood of consequences occurring (ie analysis)
- Risk level and score using a risk assessment matrix (ie evaluate)
- A risk band allocation
- A priority that represents the overall (combined) risk assessment

The risk assessment is based on an assessment of the consequences of the impact if no action is taken and the likelihood of the consequences occurring.

The consequences and likelihood ratings are mapped to determine the risk level for each risk dimension. The proposed activity is then allocated a risk band determined as the highest of the risk levels across the risk dimensions. A score is then allocated based on the consequence and likelihood ratings. The total of these scores is the risk priority. Sites are prioritised within the risk band using the risk priority.

Risks associated with potential greenhouse gas emissions are not included in this assessment.

Risk dimensions

The risk dimensions for this assessment are defined in Table 16.1.

Table 16.1 Risk dimensions for the hazard and risk assessment

Risk dimension	Description
Capability	<ul style="list-style-type: none"> Impact on ability to construct and operate.
Occupational health and safety (staff and public)	<ul style="list-style-type: none"> Impact on the physical and psychological well being of QR employees, contractors, and the public in general.
Legislative compliance	<ul style="list-style-type: none"> Compliance with regulatory requirements and the impact of failing to comply. Including but not limited to federal, state, territory, local, foreign treaty and indigenous land use agreements.
Environment and heritage	<ul style="list-style-type: none"> Impact on the environment, including contamination, damage to flora and fauna, fire, soil damage and erosion, greenhouse gas emission, biodiversity, and feral animals. Impact on heritage listed assets.
Financial efficiency	<ul style="list-style-type: none"> An assessment of the potential for increased costs that would be incurred if the hazard was not addressed in the preferred funding year. This includes costs directly related to the project itself and any flow on costs that may result, including capital cost. Short-term cost of prevention vs. long term cost of recovery. This would also cover reductions in costs and return on investment (ie shorter payback period if hazard addressed now, costs now for long term savings).
Reputation	<ul style="list-style-type: none"> Impact on QR's reputation in managing the operation, political and media attention to QR matters, community concerns or actions over activities.

Hazard identification

Hazard identification is essentially what and where are the hazards, hazardous events and scenarios that will impact on the risk dimensions. Each construction or operational activity has a subset of processes or events that cause the hazard or create a risk, including:

- Process or event discharge (ie venting from hazardous storage)
- Accidental spillage
- Wash down

In this broad assessment the major operation or equipment is identified as the hazard source and the risks associated with each subset of operations or events are combined to give an overall consideration.

Collecting and interpreting data for likelihood and consequence

Data is collated from a variety of sources and identifies hazards and pathways. The main information sources and the type of information collected included:

- Review of spatial data (GIS, drawings, etc) - spatial location and number of hazardous activities within rail facilities.
- Stakeholder and other consultation - spatial location, hazards, failure rates of equipment, management of operations, including agreed risk mitigation strategies.
- Existing reports and management plans - potential impact of hazard, location of assets, operational requirements.

Certainty

The semi-quantitative determination of risk is limited by the quality of the data used to make the assessment. The determination is also limited by the experience and knowledge of the risk evaluator as it introduces a degree of subjectivity. To allow for this, we have included a “Confidence level” in the risk analysis as defined in Table 16.2.

Table 16.2 Guide to certainty assessment

Confidence Level	1	2	3	4	5
Description	Perception only, no information to support opinion	Perception based, some information on process but not directly relevant to local region, or information at a regional level has significant limitations	Limited information, information could relate to cause or effect, expert knowledge would lead to this outcome—may be some differences in opinion	Information available and could relate to cause or effect, process has been described and documented at a regional level, experts can verify this position	Information is available and represents the process, and relates to cause and effect, process has been described and documented at a regional level, experts readily agree on this position

The confidence level is informative and is not used directly in the calculation of risk.

Risk dimension consequence guidance

Table 16.3 contains details of consequence guidance for assessing the risks associated with a site. In defining this model, consideration has been given to the comparability of ratings between the dimensions (ie a Severe Capability is comparable with a Severe Reputation). This has been done because of the risk level banding concept used to perform project prioritisation. Guidance has been prepared in such a way to facilitate the comparison of consequence ratings at the same level.

Table 16.3 Guide to consequence rating

Consequence					
Rating	Severe	Major	Moderate	Minor	Negligible
Capability	Rail facility construction and operation ceases AND resumption does not occur within 3 months	Rail facility construction and operation ceases AND resumption does not occur within 1 month	Some rail facility construction and operation is curtailed AND resumption not possible within 1 week	Rail facility construction and operation is not curtailed but there is minor performance degradation requiring increased operational requirements	Minimal impact on rail facility construction and operation

Consequence					
Rating	Severe	Major	Moderate	Minor	Negligible
Occupational Health and Safety	One or more fatalities or life threatening injuries or illness OR Public or staff exposed to a severe, adverse long-term health impact or life-threatening hazard	One or more major injuries or illness requiring major surgery or resulting in permanent disablement OR Public or staff exposed to a hazard that results in major surgery, permanent disablement or adverse health effects	One or more injuries or illness requiring treatment by a physician or hospitalisation OR Public or staff exposed to a hazard that could cause injuries or moderate adverse health effects	One or more injuries or illness requiring treatment by a qualified first aid person OR Exposure of public and staff to a hazard that could cause minor injuries or minor adverse health effects	Minor injury or ailment that does NOT require medical treatment by a physician or a qualified first aid person
Legislative Compliance	Potential large-scale class action, AND/OR prosecution with maximum fine imposed	High profile legal challenge AND/OR prosecution with 50% to maximum fine imposed	Some legal constraints imposed with up to half of maximum fine imposed	Minor technical legal challenge OR legal breach	Negligible legal impact OR legal breach
Environment and Heritage	Irreversible and extensive damage caused to a Heritage Listed area OR Irreversible and extensive damage is caused to a Matter of National Environmental Significance or to the environment under the EPBC Act OR Contamination levels may result in acute toxicity to receptors (users and environment) OR Severe impact on the rail facility's ability to create a sustainable environment for future use. OR Causing material and serious environmental harm potentially leading to prosecution under the Qld EP Act.	Irreversible and extensive damage is caused to a non Heritage listed non environmentally significant area or asset OR Significant damage is caused to a Heritage Listed area, asset or to the environment (as defined by the EPBC Act s528) from which it will take up to 10 years to recover OR Contamination levels may result in perceived major impacts on receptors OR Impact on the rail facility's ability to manage the environment in a sustainable manner OR Causing environmental nuisance potentially leading to an environmental protection order under the Qld EPA Act being imposed.	Moderate damage to the environment (as defined by s528 of the EPBC Act) or a heritage listed asset, which is repairable. The resource or asset will take up to 5 years to recover OR Contamination levels may result in perceived moderate impact on receptors OR Possible impact on the rail facility's ability to manage the environment in a sustainable manner OR Causing environmental nuisance potentially leading to a complaint and investigation by the EPA	Minor damage to the environment (as defined by s528 of the EPBC Act) or heritage asset that is immediately contained on-site. It will take less than 2 years for the resource or asset to fully recover OR Water contamination levels may result in perceived minor impact on receptors OR Soil contamination levels exceed Health Investigation Levels (HILs) or Ecological Investigation Levels (EILs) as defined by the NEPM OR Minor impacts on the rail facility's ability to manage the environment in a sustainable manner OR Causing minor but evident damage to the environment on site	Negligible damage that is contained on-site AND The damage is fully recoverable with no permanent effect on the environment or the asset, It will take less then 6 months for the resource to fully recover OR The sustainable use of the rail facility land questioned

		Consequence			
Rating	Severe	Major	Moderate	Minor	Negligible
Financial Efficiency (excludes Legal Costs)	Cost Risks (these include management of the site, remediation now and in the future and loss of capability) associated with the site would be severe (> \$1.0 m)	Cost Risks (these include management of the site, remediation now and in the future and loss of capability) associated with the site would be major (\$100,000 up to \$1 m)	Cost Risks (these include management of the site, remediation now and in the future and loss of capability) associated with the site would be moderate (\$50,000 up to \$100,000)	Cost Risks (these include management of the site, remediation now and in the future and loss of capability) associated with the site would be minor (\$10,000 up to \$50,000)	Cost Risks (including mgt of the site, remediation now and in the future and loss of capability) associated with the site would be negligible (< \$10,000)
Reputation	Detrimental international media reports OR Subject of international government attention	Sustained detrimental national or state media reports OR Subject of a number of parliamentary questions and Ministerials OR Sustained community outrage	Limited detrimental national or state media reports OR Subject of a parliamentary question or ministerial OR Organised community concerns/ complaints	High profile detrimental local media reports OR Subject of local government action OR Random substantiated complaints from the community	Low profile detrimental local media reports OR Trivial substantiated complaints from the community

Likelihood of risk guidance

The risk assessment must include an assessment of the likelihood of an event occurring that would result in the consequences identified (refer Table 16.4). This assessment is to be made on all six risk dimensions.

Table 16.4 Guidance for determining likelihood ratings

Rating	Description
Almost Certain	Has happened several times in the past year and in each of the previous 5 years OR has a > 90% chance of occurring in the next 24 months if the risk is not mitigated
Likely	Has happened at least once in the past year and in each of the previous 5 years OR has a 60-90% chance of occurring in the next 24 months if the risk is not mitigated
Possible	Has happened during the past 5 years but not in every year OR has a 40-60% chance of occurring in the next 24 months if the risk is not mitigated
Unlikely	May have occurred once in the last 5 years OR has a 10-30% chance of occurring in the future if the risk is not mitigated
Rare	Has not occurred in the past 5 years OR may occur in exceptional circumstances, ie less than 10% chance of occurring in the next 24 months if the risk is not mitigated

Risk level and risk score

This risk assessment model has been determined in accordance with guidance from Australian Standard AS/NZS 4360. The risk level for each risk dimension is determined by mapping the consequence and likelihood rating in accordance with the following risk assessment matrix. The risk score for each risk dimension is determined by adding the consequence and likelihood rating numerical value in accordance with Table 16.5. The lower the value, the higher the priority.

Table 16.5 Guide to risk assessment rating

Likelihood Rating	Consequence Rating				
	Severe 1	Major 6	Moderate 11	Minor 16	Negligible 21
Almost Certain 1	Critical 2	Critical 7	High 12	Medium 17	Low 22
Likely 3	Critical 4	High 9	Medium 14	Medium 19	Low 24
Possible 5	Critical 6	High 11	Medium 16	Medium 21	Low 26
Unlikely 7	High 8	Medium 13	Medium 18	Low 23	Low 28
Rare 9	High 10	Medium 15	Low 20	Low 25	Low 30

For example:

- A risk assessed as “Major” Consequence with a “Possible” likelihood is allocated a Risk Level of **HIGH** and a Score of **11**
- A “Severe” Consequence with an “Unlikely” likelihood is also a Risk level of **HIGH** but has a Score of **8**

Risk banding

The risk band for proposed activity will be determined from the highest risk level of the risk levels of the risk dimensions. If a project has one critical level and six low levels it is still included in the critical band.

Risk priority

The risk priority is determined by totalling the risk scores for each risk dimension. The risk priority is used to assist in prioritising actions.

16.1.2 Health and safety methodology

The assessment of health and safety issues has been based on:

- A review of available information
- Field investigations (eg air quality)
- Consultation with relevant stakeholders
- Review of Sarina Shire Council Planning Scheme

16.2 Description of hazards and risks

16.2.1 Hazard identification

As described in the methodology, each major activity or equipment for both construction and operation of the rail yard is identified as the hazard source, and the risks associated with each subset of activities or events are combined to give an overall consideration. For this assessment, the hazard sources are listed below.

1.0 Bypass and Provisioning Lines

1.1 Provisioning Shed

1.1.1 Spill of sewage while decanting from locomotive

- 1.1.2 Spill of sand while filling locomotive
- 1.1.3 Rupture of fuel storage
- 1.1.4 Visual impact
- 1.2 Rail Lines**
 - 1.2.1 Visual impact of cuttings and masts
 - 1.2.2 Derailment
 - 1.2.3 Power failure due to damage from severe weather
 - 1.2.4 Line closure due to extreme heat (weakening the rail)
 - 1.2.5 Line closure due to damage from flooding
 - 1.2.6 Collision with stock
 - 1.2.7 Environmental nuisance (noise, dust)
- 1.3 Road Intersections**
 - 1.3.1 Collision between road and rail traffic
 - 1.3.2 Derailments
- 1.4 Construction**
 - 1.4.1 Collision between construction and rail traffic
 - 1.4.2 Collapse of batters in new cuttings due to heavy rainfall
 - 1.4.3 Spillage of oils/lubricants
 - 1.4.4 Environmental nuisance (noise, dust)
- 1.5 Decommissioning**
 - 1.5.1 Contaminated land and waste
 - 1.5.2 Environmental nuisance (noise, dust)
- 2.0 Wagon Maintenance Lines**
 - 2.1 Wagon Washdown**
 - 2.1.1 Overflow of stormwater treatment/containment system
 - 2.1.2 Fire in waste coal stockpile
 - 2.2 Wagon Maintenance Sheds**
 - 2.2.1 Spillage of oils/lubricants
 - 2.2.2 Visual impact
 - 2.2.3 Spillage from handling of hazardous materials
 - 2.3 Waste Storage**
 - 2.3.1 Spillage of hazardous waste material
 - 2.3.2 Fire in stored waste
 - 2.4 Parts Store**
 - 2.4.1 Fire in the parts store
 - 2.5 Oil and Lubricant Storage**
 - 2.5.1 Rupture of one or more storage containers
 - 2.5.2 Fire within the major storage area
 - 2.5 Non-operational facilities (control room, offices)**
 - 2.5.1 Litter and other domestic or commercial type wastes
 - 2.5.2 Environmental nuisance (air or noise, eg from air conditioners)
 - 2.6 Construction**
 - 2.6.1 Collapse of batters in new cuttings due to heavy rainfall
 - 2.6.2 Spills and leak of oils and lubricants relocated to new facility
 - 2.6.3 Environmental nuisance (noise, dust)
 - 2.7 Decommissioning**
 - 2.7.1 Contaminated waste
 - 2.7.2 Environmental nuisance (noise, dust)

- 3.0 Locomotive Maintenance lines**
 - 3.1 Locomotive Washdown**
 - 3.1.1 Environmental nuisance (dust, aerosols and noise)
 - 3.1.2 Discharge of untreated washwater
 - 3.2 Locomotive Maintenance Shed**
 - 3.2.1 Shorting of the overhead wires due to bird nesting
 - 3.2.2 Spillage of oil/lubricant during maintenance operations
 - 3.2.3 Environmental nuisance (dust, aerosols and noise)
 - 3.3 Oil and Lubricant Storage**
 - 3.3.1 Rupture of one or more storage containers
 - 3.3.2 Fire within the major storage area
 - 3.3.3 Spillage from diesel tank storage
 - 3.4 Sewage Treatment Plant**
 - 3.4.1 Discharge from poorly operating wastewater treatment system
 - 3.4.2 Environmental nuisance (air or noise discharge)
 - 3.5 Pollution Treatment Plant**
 - 3.5.1 Discharge from poorly operating wastewater treatment system
 - 3.5.2 Environmental nuisance (air or noise discharge)
 - 3.5.3 Spillage of process chemicals during maintenance
 - 3.5.4 Fire in chemical storage shed
 - 3.5.5 Rupture of aeration tanks
 - 3.6 Construction**
 - 3.6.1 Disturbance of asbestos facade
 - 3.6.2 Spills and leak of oils and lubricants relocated to new facility
 - 3.6.3 Environmental nuisance (noise, dust)
 - 3.7 Decommissionings**
 - 3.7.1 Contaminated waste
 - 3.7.2 Environmental nuisance (noise, dust)
 - 3.7.3 Discharge of remaining, untreated wastewater (STP and PTP)
- 4.0 Other**
 - 4.1 Construction**
 - 4.1.1 Failure to obtain Licences or Approvals
 - 4.1.2 Failure to promote awareness of key environmental constraints
 - 4.1.3 Disturbance of ecology due to regulatory compliance failure
 - 4.1.4 Groundwater pollution from construction activities
 - 4.1.5 Introduction of noxious weeds
 - 4.1.6 Disturbance to cultural heritage
 - 4.1.7 Environmental nuisance (construction activities)
 - 4.1.8 Soil erosion on significant slopes
 - 4.1.9 Working at heights
 - 4.1.10 Working over water
 - 4.1.11 Working in the vicinity of heavy equipment
 - 4.1.12 Working in confined spaces
 - 4.1.13 Working with electricity
 - 4.1.14 Working with chemicals and dangerous goods
 - 4.1.15 Working with tools
 - 4.1.16 Heavy lifting
 - 4.1.17 Snakes and dangerous fauna from canefield and rural areas

4.2 Operation

- 4.2.1 Cyclone
- 4.2.2 Fire
- 4.2.3 Flood
- 4.2.4 Seismic event
- 4.2.5 Explosion (gas or other)
- 4.2.6 Sabotage of line or equipment
- 4.2.7 Bomb or arson threat
- 4.2.8 Working with electricity
- 4.2.9 Working in the vicinity of heavy equipment
- 4.2.10 Working in confined spaces
- 4.2.11 Working with chemicals and dangerous goods
- 4.2.12 Working with tools
- 4.2.13 Heavy lifting
- 4.2.14 Power failure due to damage from severe weather

The main hazards associated with rail track operations as described in the *QR Emergency Plan* are:

- Level crossing emergency
- Person hit by train
- Derailment
- Collision
- Fire
- Track obstructions
- Dangerous goods emergency
- Environmental emergency

Potential safety hazards associated with construction activities include:

- Working at heights – risk of falls, risk of falling debris/objects
- Working over water – risk of drowning
- Working in the vicinity of heavy equipment – risk of accident/injury
- Working in confined spaces – risk of suffocation
- Working with electricity – risk of electrocution
- Working with chemicals/dangerous goods – risk of spillage and/or injury
- Working with tools – risk due to unsafe work practices
- Heavy lifting – risk of injury

16.2.2 Risk identification

Risks associated with the construction hazards as listed in Section 16.2.1 include:

- Fire
- Explosion
- Gas leak or imminent explosion
- Structural collapse
- Act of sabotage
- Accident, serious bodily injury or illness
- Environmental nuisance
- Environmental harm
- Electrocution

The main risks associated with rail and rollingstock repair facilities as described in the *QR National Emergency Plan* are:

- Fire
- Explosion
- Gas leak or imminent explosion
- Structural collapse
- Natural disaster
- Bomb or arson threat
- Act of sabotage
- Accident, serious bodily injury or illness
- Chemical or dangerous goods spill
- Electrocutation

Additional operational risks for rail and rollingstock repair facilities include:

- Environmental nuisance
- Environmental harm

16.2.3 Previous network incidents

Table 16.6 provides a profile of historical accidents and incidents that have occurred on QR coal network between years 2001 and 2005. The accident profile is worked out based on an estimate track haul length of 2,040 km (this is an approximate only and does not include passing loops and yard sidings). No direct data was available for the existing Jilalan Rail Yard at the time of this assessment.

The majority of the train derailments that occur within the network are as a result of the loading and unloading of coal as opposed to the transport of coal. The Goonyella System experiences derailment incidents from loaded coal trains travelling down steep coastal ranges into Mackay.

Table 16.6 QR system wide coal haul accident profile rating

Obstruction type	Average number of accidents/incidents per km per year						Total
	Accidents			Safety incidents [#]			
	Collisions	Derailment	Others	Collisions	Derailment	Others	
Level crossings							
Livestock							
Motor vehicles/cyclist/pedestrians	0.001			0.007			0.008
Others*	0.001						0.001
On track							
Livestock	0.017			0.037			0.053
Motor vehicles/cyclist/pedestrians				0.004			0.004
Others*	0.010	0.003		0.003			0.015
Yard/sidings							
Livestock							
Motor vehicles/cyclist/pedestrians							
Others*	0.006	0.031		0.001			0.038

Obstruction type	Average number of accidents/incidents per km per year						Total
	Accidents			Safety incidents [#]			
	Collisions	Derailment	Others	Collisions	Derailment	Others	
Other areas							
Livestock							
Motor vehicles/cyclist/pedestrians							
Others*		0.001					0.001
Total number/km track/year	0.034	0.034		0.051			0.120

Table Notes:

These include Near-Miss incidents, potential safety situations

* Others include objects on track, natural obstructions, other animals, other rollingstocks, etc

16.2.4 Potential network incidents

There is an additional 50.3 km of track associated with the Project, which has been designed to incorporate:

- Three new bypass lines, which will run the length of the project area (approximately 7 km).
- Two provisioning lines, which will also run most of the length of the project area.
- Nine provisioning lines that will run parallel to each other and access the expansion of the wagon maintenance yard.
- A new turning angle track.

Based on the data in Table 16.6 and the configuration of the proposed trackwork, the potential incidents associated with the additional track are shown in Table 16.7.

Table 16.7 Potential accident/incident level for additional track at Jilalan Rail Yard

Obstruction type	Average number of accidents/incidents on additional track per year						Total
	Accidents			Safety Incidents [#]			
	Collisions	Derailment	Others	Collisions	Derailment	Others	
Yard/sidings							
Livestock							
Motor vehicles/cyclist/pedestrians							
Others*	.302	1.56		0.05			1.91
Total number/year	0.302	1.56		0.05			1.91

Table Notes:

These include near-miss incidents, potential safety situations

* Others include objects on track, natural obstructions, other animals, other rollingstocks, etc

16.2.5 Description of affected communities

The Sarina Shire Council Planning Scheme denotes adjoining areas as predominately 'Rural', with a small area of 'Open Space' to the north. The existing rail yards are located in the Community Purposes Zone.

Multiple sensitive receptors have been identified within the vicinity of the project area, specifically residential properties along Gurnetts Road, Armstrong Beach Road and Smyths Road.

The main community value for public health and safety that may be affected by the Project is air quality due to construction activities and coal dust emissions. The EPP(Air) goals as described in Section 9.2 of this EIS are used to assess potential air quality impacts at sensitive locations.

Dust levels in Jilalan area are currently below levels likely to cause adverse health effects. The existing air quality in the Jilalan area is further described in Chapter 9.

16.2.6 Disease vectors

In Queensland, mosquitoes are carriers of Ross River fever, Barmah Forest virus, dengue fever, malaria, Japanese encephalitis and Murray Valley encephalitis. Breeding sites include fresh, brackish and polluted water in natural and constructed ground sites as well as artificial containers such as water storage tanks and constructed drains.

It is essential that the implementation of water recycling does not enhance mosquito breeding and the transmission of disease. The Local Government Association of Queensland has produced a Mosquito Management Code of Practice (LGAQ 2002) that contains detailed advice on mosquito control in Queensland.

The proposed rail infrastructure is unlikely to create additional mosquito breeding areas. All potentially contaminated water from these areas will drain to oil and grit separators. Site areas outside of buildings will drain into the existing drainage systems.

At the completion of construction the site will be graded to remove hollows that may allow ponding of water.

Sewage from the JRYUP will be treated in an onsite wastewater treatment plant.

16.2.7 Risk assessment

A detailed risk assessment is shown in Appendix N. The risk assessment is carried out for each major piece of equipment or construction and operational event. It is anticipated that a full hazard and operability study (HAZOP) will be carried out in the detailed design phase of the rail facility.

The table in Appendix N also shows the potential impact on the various risk dimensions assessed in this study. In terms of the *overall or average risk* for each of the 87 identified events, there were 54 medium level risk events and 34 low level risk events. There were no major or critical overall risk events identified in this review.

In terms of the individual risk dimensions, major risk events were identified for capability (5), health and safety (7), legislative compliance (1) and financial (11). No critical events were identified.

Based on the risk assessment, the most significant environmental hazards or risks for the proposed rail facility upgrade are shown in Table 16.8.

Table 16.8 Significant risk events for construction and operation

Event	Risk Level	Comment
Capability – operation		
Derailment along rail lines	Major	Due to rail line issues, stock crossing or equipment failure
Power failure due to extreme weather	Major	Disruption to production
Line closure due to extreme heat	Major	Disruption to production
Line closure due to flooding	Major	Disruption to production
Capability – construction		
Failure to obtain licenses or approvals	Major	May stop construction
Health and Safety - operation		
Derailment along rail lines	Major	Due to rail line issues, stock crossing or equipment failure
Collision between road and rail traffic	Major	
Derailment along rail lines at intersections	Major	Due to collision with car
Explosion (gas or other)	Major	
Working on the vicinity of heavy equipment	Major	
Health and Safety – construction		
Collision between road and rail traffic	Major	
Working on the vicinity of heavy equipment	Major	
Legislative compliance - operation		
Nil		
Legislative compliance – construction		
Failure to obtain licenses or approvals	Major	Construction phase is where the most significant disturbance to the existing environment will occur.
Financial - operation		
Derailment along rail lines	Major	Injury and disruption to production
Power failure due to extreme weather	Major	Disruption to production
Line closure due to extreme heat	Major	Disruption to production
Line closure due to flooding	Major	Disruption to production
Derailment along rail lines at intersections	Major	Injury and disruption to production
Fire within the major storage area (wagon maintenance)	Major	Injury and disruption to production
Fire within the major storage area (loco maintenance)	Major	Injury and disruption to production
Cyclone	Major	Injury and disruption to production
Flood	Major	Disruption to production
Seismic event	Major	Injury and disruption to production
Financial – construction		
Failure to obtain licenses or approvals	Major	Fines and cost to address

16.3 Emergency management plan

QR has multiple levels of emergency management depending on the scale and location of the emergency. A local instruction for the Jilalan Rail Yard (document number JIL.078) sets out the procedure to be followed where there is a need to evacuate the service delivery area and surrounds in the event of an emergency.

Other QR documentation relating to emergency management is the 'Emergency Response and Disaster Recovery Planning Standard' (STD/0008/WHS) and 'Roles and Responsibilities for Safety and Environmental Management (STD/0028/WHS).

For both the construction and operation of the rail yard, the QR Emergency Management Plans that will be implemented during the construction and operation stages of the proposed development and include:

- Emergency Management - Master Contents
- Emergency Management – General Requirements
- Level Crossing Emergency
- Person Hit by Train
- Overhead Line Equipment Emergency
- Passenger Door Emergency
- Derailment
- Collision
- Threats
- Evacuation of Trains
- Fires
- Defective Rollingstock and Unsafe Loads
- Track Obstructions
- A Signal Passed at Danger
- Wrong Side Signal Failure
- Dangerous Goods Emergency
- Serious Injury or Illness on Trains
- Environmental Emergency
- Emergency Management – Requirements for Train Crew
- Onsite Management Procedures

The following strategies will be implemented during the construction phase:

- Dangerous goods shall be stored, handled and signed as per AS1940 and relevant legislation.
- Material Safety Data Sheets (MSDS) shall be located at the Site Office for all hazardous and dangerous goods stored and used during construction.
- Spills of hazardous materials or hydrocarbons or will be contained and collected for treatment at a licensed waste disposal facility.
- Spill containment and treatment equipment and materials shall be available near storage areas of hazardous materials and hydrocarbons.

16.4 Mitigation measures

16.4.1 Design

All design is to be to relevant Australian Standards, Sarina Shire Council and regulatory requirements. For North Queensland, this includes allowance for severe climatic events such as cyclones and flooding.

Design is to minimise interaction with the general public through minimal rail crossings and access to the Jilalan Rail Yard.

Consideration should be given to potential mosquito breeding in the design stage. Queensland Health (2002) has published Guidelines to minimise mosquito and biting midge problems in new development areas. This document provides advice on how to prevent or minimise the impact of mosquitoes and other biting insects in new development areas.

Constructed wetlands, water impoundments, grass swales and open earth drains can all be designed so as to minimise mosquito breeding. The Australian Mosquito Control Manual (Mosquito Control Association of Australia 2002) has helpful advice on mosquito control. This manual can be purchased through the Association's website.

16.4.2 Construction

The type of management strategy implemented to mitigate the risks is dependent on the risk dimension being addressed. As noted above, the "most impacted" risk dimensions are environment and heritage, legislative compliance and financial. Table 16.9 provides management strategies for the highest priority medium level risk items focus on these risk dimensions.

Table 16.9 Environmental hazard and risk management strategies during construction

Risk or hazard event	Potential management strategies
Failure to obtain licenses or approvals for works and operations	<ul style="list-style-type: none"> Identify and arrange for completion, all relevant applications to obtain the necessary approvals Internal audit to assess compliance
Collision between construction and rail traffic	<ul style="list-style-type: none"> Existing QR site requirements to be enforced
Working in the vicinity of heavy equipment	<ul style="list-style-type: none"> Existing QR site requirements to be enforced Alliance Construction Team to develop a construction Safety Management Plan to be reviewed and approved by QR before implementation

A summary of general health and safety risks and associated mitigation measures for the construction phase of the Project are outlined in Table 16.10.

Table 16.10 General workforce health and safety risks and mitigation measures

Health and safety risks	Mitigation measure(s)
Construction workplace accidents	Alliance Construction Team to develop a construction Safety Management Plan to be reviewed and approved by QR before implementation
Occupational noise exposure	Alliance Construction Team to identify areas where occupational noise will reach levels where hearing protection is required and to ensure hearing protection is used within these areas
Hazardous chemicals and materials exposure	Alliance Construction Team to develop a construction Safety and Environmental Management Plan to be reviewed and approved by QR before implementation
Dust exposure	Alliance Construction Team to employ dust mitigation methods such as regular watering of construction access roads during dry and windy periods Refer to Chapter 9

To increase general site safety and to assist in preventing minor injuries during project construction all persons on site will wear appropriate Personal Protective Equipment (PPE) including:

- Hard hat
- Safety glasses
- Steel capped boots
- High visibility clothing
- Ear protection when conditions warrant their use
- Dust masks when conditions warrant their use

Potential air quality and noise impacts in the surrounding community are discussed in Chapters 9 and 10, respectively.

Construction and installation of water storages should be carried out in accordance with Part 8, Mosquito Prevention and Destruction of the Health Regulation 1996. Where a risk assessment process has identified that there is a significant risk of mosquito borne disease, holding tanks for recycled water should be designed so as to prevent entry of mosquitoes.

16.4.3 Operation

The type of management strategy implemented to mitigate the risks is dependent on the risk dimension being addressed. Table 16.11 provides management strategies for the highest priority major level risk items. Table 16.12 provides management strategies for other significant operational risk events.

Table 16.11 Environmental hazard and risk management strategies during operation

Risk or hazard event	Potential management strategies
Derailment along rail lines due to rail line issues, stock crossing or equipment failure	<ul style="list-style-type: none"> • Ensure adequate inspection and maintenance of adjacent fence lines • Inspect track and equipment on a regular basis to ensure proper function and fitness
Derailments at road intersections through vehicle collisions	<ul style="list-style-type: none"> • Conduct safety risk assessment, use appropriate safety control devices
Power failure due to extreme weather	<ul style="list-style-type: none"> • Provide backup or redundant power supply where possible. • Minimise power requirements in design. • Alarm systems to be independently powered.
Line closure due to extreme heat	<ul style="list-style-type: none"> • Design to allow for variable temperatures
Line closure due to flooding	<ul style="list-style-type: none"> • Design operating rail lines to be above at least Q10. • Design maintenance areas to be to Council flood level construction requirements.
Explosion (gas or other)	<ul style="list-style-type: none"> • Mechanical design and operation of equipment to be to relevant Australian Standards.
Working in the vicinity of heavy equipment	<ul style="list-style-type: none"> • Existing QR site requirements and procedures to be enforced • Alliance Construction Team to develop a construction Safety Management Plan to be reviewed and approved by QR before implementation
Fire within hydrocarbon storage areas (wagon maintenance)	<ul style="list-style-type: none"> • Fire system to Australian Standards for hydrocarbon storage areas • Drainage and/or site design to capture or control potentially contaminated water from fire fighting • Storage and handling of dangerous or hazardous materials to be within bunded areas
Fire within hydrocarbon storage areas (Locomotive maintenance)	<ul style="list-style-type: none"> • Fire system to Australian Standards for hydrocarbon storage areas • Drainage and/or site design to capture or control potentially contaminated water from fire fighting • Storage and handling of dangerous or hazardous materials to be within bunded areas
Cyclone	<ul style="list-style-type: none"> • Existing QR site requirements and procedures to be enforced • Design of all equipment and facilities to be to relevant cyclone standard

Risk or hazard event	Potential management strategies
Flood	<ul style="list-style-type: none"> Design operating rail lines to be above at least Q10. Design maintenance areas to be to Council flood level construction requirements.
Seismic event	<ul style="list-style-type: none"> Existing QR site requirements and procedures to be enforced Design of all equipment and facilities to be to relevant earthquake standards.

Table 16.12 Other significant hazards and risk management strategies during operation

Risk or hazard event	Potential management strategies
Rupture of fuel storage tanks	<ul style="list-style-type: none"> Storage and handling of hazardous, toxic or dangerous goods to Australia Standards Bunding of equipment where discharge of contaminants is possible Spill kit located near storage areas
General environmental nuisance (noise and dust) from office and control room areas	<ul style="list-style-type: none"> Design of buildings to minimise the need for mechanical ventilation or air conditioning. This may also reduce energy consumption. Quality control in equipment construction Regular equipment maintenance and testing Noise enclosure around operational parts of the system Monitoring of site operations, including monitoring of noise or air quality if a valid complaint is assessed Appropriate PPE gear for all personnel in relevant areas
Spillage or leakage from fuel storage tanks	<ul style="list-style-type: none"> Storage and handling of hazardous, toxic or dangerous goods to Australia Standards Bunding of equipment where discharge of contaminants is possible Spill kit located near storage areas

QR workplace health and safety procedures will be implemented for the operational workforces employed on the Project. A detailed safety operational plan will be enacted for the rail yard.

The following strategies will be implemented to minimise disease vectors:

- Regular maintenance of all structures associated with storage or treatment of recycled water is necessary to minimise mosquito breeding. For example, if mosquitoes are present in open water storage, water plants should be cleared away from the edge of the storage to reduce habitat for larvae. In particular, recent research suggests that dense mats of surface vegetation or fallen decaying material can encourage mosquito breeding (Dale *et al*/2001).
- When recycled water is used for irrigation, surface ponding should be prevented by appropriate irrigation scheduling.
- Open recycled water storages should be monitored regularly to identify presence of mosquito larvae.
- If a potential health risk from mosquito breeding has been identified, biological control using natural predators, such as aquatic invertebrates or native fish known to prey upon mosquito larvae, may be considered.

16.4.4 Relevant QR procedures and documents

Relevant QR procedures and documents for the station area include:

- Management of Hazardous Substances and Lead Hazardous Substances – SAF/STD/0004/WHS

- Management of Chemicals – OPS BI 4068-2.0
- Management of Chemical Spills in Station, Yards and Terminals – OPS BI 4076-1.0
- Minor Spills in Yards and Terminals - PPT .041 00125202.001-ins.
- Dangerous goods minor spill cleanup. 00010874.001-ins.
- Optimum Locomotive Provisioning – OPS OI-JIL .080.3
- Critical Task : Rail Operators Fuelling Diesel Locomotive At The Fuel Point In The New Shops Road At Jilalan – OPS OI-JIL .009-5.0
- Delivery of Sand by Road Transport to the Jilalan Provisioning Facility OPS OI-JIL .097-2.0
- Decanting Toilets at Provisioning Shed OPS OI-JIL .036-3.0
- Environmental Incidents / Complaints and Investigations Reports JO/42 and JO/43
- Emergency Management – OPS BI 4056-2.0
- Emergency Evacuation Plan - OPS OI-JIL .078-1.0
- Site Emergency Response Plan .014
- Emergency Flip Chart .016
- Environmental Awareness Training (3yrs) 00000413.001-ins

Relevant QR procedures and documents for the depot area include:

- Management of Hazardous Substances and Lead Hazardous Substances SAF/STD/0004/WHS
- Acceptance, Handling and Transport of Dangerous Goods SAF/STD/0079/SWK
- GMR-550-28 Management Of Hazardous Substances And Lead Hazardous Substances
- SRD/0076 Hazardous Substance Brochure
- SRD/0077 Hazardous Substance Information Booklet
- BULL-SA-06-037 Guidelines for Shipping Hazardous Materials
- DRAFT of DMM-550-NN Process for Introduction of Chemical Substance for Use in Depot
- FM-1232 – Chemical Risk Assessment Rollingstock Division
- Hazardous Substance Training is given to staff during induction. QRLC Course Code 00001582-001-INS
- Dangerous Goods Awareness Video is given to staff during induction. QRLC Course Code 00001455-001-INS
- Environmental Awareness - Our Duty of Care (Video/CD-Rom) QRLC Course Code 00000413-003-INS is given to staff during induction.
- Environmental Awareness - Our Duty of Care (Video/CD-Rom) QRLC Course Code 00000413-003-INS is given to staff during induction.
- Spill Kit Video Awareness shown during induction.
- FM-2280 – Emergency Spill Kit Inventory Checklist
- FM-1233 – Coal Spill Without Derailment or Door Open in Traffic
- FM-1234 – Coal Spill Leading to Derailment
- GMR-750-09 - Checking of discharge samples from pollution plant at Jilalan Loco Shed
- FM-1077 - Pollution Plant Operator Maintenance Record Sheet
- FM-2056 - Pollution Plant Holding Tanks Ph Test
- FM-2057 – Laboratory Sampling Record (Pollution Plant and Sewerage Plant)
- FM-2058 - Weather Monitoring Form for the Pollution Plant - Rollingstock Depot Jilalan
- FM-2066 - Ph Probe - Calibration Check sheet for Pollution Plant - Rollingstock Depot Jilalan
- FM-2068 - Pollution & Sewerage Record Sheet for Pump Outs
- FM-2069 - Dissolved Oxygen & P.H. Readings for Discharge Water (Pollution Plant) - Rollingstock Depot Jilalan
- FM-2070- Pollution Treatment Plant Malfunction and Maintenance Record - Rollingstock Depot Jilalan
- FM-2215 - Pollution Plant Receiving Tanks PH Test Form - Jilalan Rollingstock Depot
- FM-2219 Steam Clean Chemical Usage Monitoring Form
- DMM-850-01 – Operating Instruction for Chemical Clarification Plant for Jilalan
- GMR-750-07 Operations Manual For Sewerage Treatment Plants

- FM-2055 – Dissolved Oxygen Measurements for Sewerage Aeration Tank
- FM-2057 – Laboratory Sampling Record (Pollution Plant & Sewerage Plant)
- FM-2059 - Monitoring of Dynamic Lifter for Sewerage Solid Build-Up
- FM-2062 – Jilalan Sewerage Treatment Plant Operator's Comments / Report
- FM2064 – Operational Logs for Jilalan Sewerage Treatment Plant
- FM-2068 – Pollution & Sewerage Record Sheet for Pump Outs
- FM2325 – Water Treatment and Sewerage Treatment Plant Daily/Weekly Discharge and Maintenance Record Sheet
- FM-2090- Environmental Incidents Register held in Environmental Management Folder in Bookshelf
- GMR-850-39 Jilalan Flip Chart - Emergency Procedures
- FM-2173 Depot Emergency Call Record Form
- GMR-850-58 Emergency Preparedness and Response Plan Jilalan
- GSA-EPMMI – Emergency Procedures Manual for Major Incidents.
- GMR-850-39 Jilalan Flip Chart - Emergency Procedures
- FM-2173 Depot Emergency Call Record Form
- GMR-850-58 Emergency Preparedness and Response Plan Jilalan
- GMR-350-04 Procedure for Securing Rollingstock During a Cyclone
- GSA-EPMMI – Emergency Procedures Manual
- FM-1096 – QR National Rollingstock Business Unit Risk Management Plans: Audit Checklist.
- FFRMP1000 - Rollingstock Risk Management Plans
- Fire and Emergency Procedures Toolbox Talk QRLC Course Code 00010646-001-INS given during Induction
- Fire Fighting / Extinguisher Training QRLC Course Code 00001447-001-INS
- SAF/STD/0063/RSK Rollingstock Fire Performance

16.5 Conclusion

In summary, the following conclusions have been made regarding the hazard and risk assessment for the proposed Project:

- The potential health and safety risks for the Project relate to construction and operational activities and their potential impact on the Project workforce and nearby community.
- A qualitative hazard and risk assessment indicates the overall risk rating of the proposed facility is low-medium. No overall major or critical issues were identified in this review.
- The “most significantly impacted” risk dimensions in terms of major risk events capability are health and safety, legislative compliance and financial. These are the areas where a risk or hazard will generally have the most significant impact for this facility.
- The most significant risks (major level risk or above) or events identified in this assessment (ie medium level risk or above), include:
 - Operation - Derailment along rail lines due to rail line issues, stock crossing or equipment failure
 - Operation - Derailments at road intersections through collisions
 - Operation - Power failure due to extreme weather
 - Operation - Line closure due to extreme heat
 - Operation - Line closure due to flooding
 - Operation - Explosion (gas or other)
 - Operation - Working in the vicinity of heavy equipment
 - Operation – natural disaster (cyclone, flood or seismic event)
 - Operation - Fire within hydrocarbon storage areas (workshops)
 - Construction - Failure to obtain Licenses or approvals for works and operations
 - Construction - Collision between construction and rail traffic
 - Construction - Working in the vicinity of heavy equipment

- Risk mitigation strategies are available for all significant risks identified in this review. The strategies provided in this chapter are only a guide, and more detailed strategies and design requirements should be assessed in a formal HAZOP study during the detailed design phase. The implementation of workplace health and safety procedures and the EMP (refer Chapter 17) will minimise the potential risks to acceptable levels.
- QR has a comprehensive risk management system and access to Emergency Services at local and state level. Additional procedures will be incorporated into the existing system to cover the new rail infrastructure and maintenance facilities.

