4.13 HAZARD AND RISK

4.13.1 Description of Values

The values related to people and property that could be affected by any hazardous materials and actions associated with the proposal are described in this section. This includes all relevant environmental and social impacts that mining (from construction to decommissioning) and associated transport of coal could potentially cause. Listed below are the key aspects under consideration:

- Noise and vibration levels – the existing noise and vibration levels at the site are typical of a rural environment and are of value to local residents and employees;
- Air quality – the existing air quality of the site is typical of a rural environment and is of value to local residents and employees;
- Cultural Heritage – the land within the Project area contains values in regards to historical practices;
- Land Value – the natural soil and sub-soil within the Project area is typical of a rural environment and is of value to landholders and the community;
- Land Use Value – the land within the Project area is of agricultural value, particularly for livestock production, for local landholders;
- Potable Water quality – potable water supply quality to the Project is of value to the health of the workforce;
- Waterway health – the water quality in Horse Creek and its associated tributaries is of environmental and community value at the Project site and downstream;
- Groundwater quality – some groundwater aquifers potentially impacted by mining are of value to the existing landholders and the environment;
- Visual amenity – the visual amenity of the natural landscape is of value to the landholders and the broader community;
- Social values of local community and liveability – the existing social values are typical of a rural community with some influence of mining and other resource development in the region;
- Social Values of the workforce – the existing values of employees are typical of a mining Project in regards to work opportunity aspects; the lifestyle of the future workforce is of value to employees and their families;
- Community health – the health and well-being of the surrounding landholders and community members is of value; and
- Health and Lifestyle values of the workforce – the existing health and lifestyle values of the workforce are of value.

4.13.2 Potential Impacts and Mitigation Measures

Methodology of Hazard and Risk Assessment

AARC conducted an Environmental Risk Assessment of the Elimatta Project which is contained in Appendix AP. The risk assessment was a review of risks based on the level of detail available for the Project at approval stage. Mitigation strategies were described for the risks identified and a discussion of the residual risk was provided where necessary. The risk assessment was based on the methodology provided in *AS/NZS ISO 31000:2009 Risk Management – Principles and Guidelines* and *HB203:2006 Environmental Risk Management Principles and Processes*.

The risk assessment presents all environmental risks associated with the Project operations. This document is inclusive of risks to people and property, which have formed the basis for this section of the EIS.

The objectives of this risk assessment are to:

- Qualitatively assess the risks posed to the human, social and biophysical environment in the locality by all activities associated with the Project; and
- Determine whether any significant risk remains after the Project design factors (including all appropriate risk mitigation measures) are considered.

The risk assessment for the Project included the following:

- Activities during the construction, operational and rehabilitation / mine closure phases;
- Assessment of the potential environmental impacts from the Project; and
- Assessment of environmental risks arising from normal operating practices and accidents, emergencies and natural disasters.

Health, safety and financial impacts were not included in the scope of the assessment.

Legislative Requirements

The principal legislative requirements relevant to hazard identification and risk assessment which are applicable to the Project relate to:

- Workplace health and safety legislation to protect the construction and mine workforce and members of the public who might be affected (*Workplace Health and Safety Act 1995*);
- Transport infrastructure legislation that governs the use of public roads (*Transport Infrastructure Act 1994* and the *Transport Infrastructure (State-controlled Roads) Regulation 2006*);
- Dangerous goods legislation that ensures that dangerous goods are handled, stored and used safely (*Work Health and Safety Act 2011*);
- Petroleum and Gas legislation that outlines the safety measures in dealing with petroleum and gas as well as the production measures (*Petroleum and Gas (Production and Safety) Act 2004*); and

- Natural Hazard Management legislation which describes measures to be used to minimize natural hazard potential (former *State Planning Policy 1/03 (SPP1/03): Mitigating the Adverse Impacts of Flood, Bushfire and Landslide*).

The health and safety of persons potentially affected by the mining operation (whether on or off the mining leases) is regulated under the *Coal Mining Safety and Health Act 1999* (CMSHA).

Nearby Sensitive Places

There are 60 properties that are considered to be sensitive receivers located within the vicinity of the Project. However, only 8 of these properties are predicted to be impacted by modelled noise and air impacts associated with operations within the MLA areas. Predicted noise and air levels associated with operation of the Rail and Services Corridor may potentially impact upon one property situated closest to the alignment. Five receivers may be temporarily impacted by noise emissions during construction of the Rail and Services Corridor.

A number of these residences were unoccupied at the time of assessment or located within land targeted by other resource development projects. Sections 4.6 and 4.7 provide detailed description of proposed controls for protection of these values. Two sensitive receivers, a school and camping reserve, are located in proximity to the proposed Rail and Services Corridor. The mining camp is also considered a sensitive receiver and is located 1.7 km to the north of the CHPP.

Hazard Identification Process

The hazard identification process involved a systematic assessment of each activity proposed by the Project, considering the equipment, tools, materials and reagents required. For each activity an assessment of the potential hazards was made.

Description of Natural Hazards

Extremes of climate (drought, floods, cyclone etc.) present natural hazards to mining projects in Australia. This section identifies those natural hazards relevant to the Project. Section 4.1 Climate, provides detailed descriptions of climatic extremes and the relative frequency and magnitude of such events.

Requirements of the former SPP 1/03, *Mitigating the Adverse Impacts of Flood, Bushfire and Landslide*, have been considered in the assessment of hazards for the Project.

Floods

The proposed Elimatta Project is located within the Fitzroy River catchment area. The Project site can be susceptible to flood events following heavy rainfall episodes due to the significant upstream catchment of Horse Creek. Flood modelling was undertaken for the MLA areas, the findings of which are provided in further detail in Section 4.5 of the EIS.

Within the southern MLA area (MLA 50254), flood design peaks have been modelled for a range of scenarios including Average Recurrence Interval (ARI) 2, ARI 50, ARI 100, ARI 1,000 and the post-mine probable maximum flood (PMF). PMF modelling was undertaken for MLA 50254 to assess the flood immunity of the residual voids.

Modelling indicated the PMF level to be highest at the upstream boundary of MLA 50254 with levels reaching a maximum of 255 m AHD and lowest at the downsteam boundary of MLA 50254 with flood levels reaching a maximum of 237.5 m AHD.

The PMF level is considered the mitigation benchmark for the southern MLA area to avoid inundation of the active and residual voids. To protect the mining areas from potential inundation the following flood protection measures will be implemented to provide flood immunity against the PMF in the southern MLA:

- Three levees as part of the Stage 1 diversion to prevent flood waters from inundating mine infrastructure on MLA 50254;
- An additional levee as part of the Stage 2 diversion, located on the western side of Horse Creek; and
- As part of the final diversion, levees along the eastern side, southern side, and part of the western side of the south-western mining void to prevent inundation of flood water.

Within the northern MLA area (MLA 50270), flood design peaks were modelled for 100 year ARI and 1,000 year ARI levels. Modelling showed that MLA 50270 is partially inundated (7% of the total MLA extent) for the 100 year ARI flood scenario with water levels between 220 m AHD and 235 m AHD. These results indicate, across the majority of the floodplain, flood depths do not exceed 2 m in either scenario. As expected, the proposed rail alignments create isolated incidents of upstream afflux in the modelled 100 year ARI event.

Infrastructure within the northern MLA has been designed to achieve a 100 year ARI flood immunity to mitigate the risk of flooding.

Bushfires

Bushfire risk maps obtained by the Queensland Rural Fire Service indicate that the Project lies within an area that has a low – medium bushfire risk. Due to the large expanses of non-remnant grazing land in the region, fires are generally restricted to grass fires during periods of drought.

Landslide

The topography across the MLA areas, Rail and Services Corridor and adjoining areas is relatively flat; therefore the risk of landslides is likely to be minimal or non-existent. A discussion of the geology of the area is presented in Section 4.2.1.2.

Description of Man-Made Hazards

The following man-made hazards were identified for each phase of the Elimatta Project.

Hazards associated with the construction phase include:

- Transport of personnel, equipment and materials to site (including air travel);
- Construction of required infrastructure;
- Clearing vegetation, stripping and removal of soil;

- Transport, storage and use of dangerous goods on-site; and
- Equipment maintenance.

Hazards associated with the operational phase:

- Transport of mine personnel, equipment and materials to site (including air travel);
- Dangerous goods storage on-site;
- Equipment maintenance;
- Open-cut mining operations, including blasting;
- Excavation and management of voids;
- Coal handling, stockpiling and washing;
- Overburden management;
- Water management;
- Waste disposal;
- Power generation; and
- Transport of coal via rail; and
- Transport of waste off-site.

Hazards associated with the decommissioning phase:

Once mining operations have been completed, the mine and associated infrastructure will be remediated and decommissioned.

Activities undertaken during this phase will include:

- Making final voids and other remaining landforms safe;
- Returning the area to an agreed usable form;
- Ensuring the area's water quality remains at the same level as it was prior to any Project operations; and
- Removing mine infrastructure from the site.

Hazardous Materials Storage and Use

Hazardous materials and dangerous goods are a source of risk for the Project, contributing to risks to both human health and safety and the environment.

Types of dangerous goods

Materials that have the potential to become, or be involved in hazardous incidents, that might be present during the various phases of the Project are:

- Fuels (petrol, diesel, natural gas);
- Lubricants;
- Other construction and maintenance-related materials (e.g. industrial gases, adhesives, paints and solvents);
- Explosives and their constituents (ammonium nitrate, fuel oil and emulsion);
- Coal;
- Tailings; and
- Other wastes (such as lubricants, wastewater).

Dangerous goods inventory

A list of dangerous goods that are likely to be used at some point during the Project, together with the maximum likely quantities in storage and storage locations for each, has been developed, as shown in Table 4.149.

Table 4.149 Australian Dangerous Goods Inventory

Dangerous good potentially stored	Dangerous goods class	U.N. Number	Packaging Group	Storage location	Maximum likely quantity in storage (aggregate)
Detonators, primers, boosters, cord	1	0029, 0030, 0042, 0065		Magazine	2 tonnes
ANFO: Explosive, Blasting, Type B: Or Agent, Blasting, Type B	1	0082, 0331		Magazine	Mixed/Sourced as required
LPG	2.1	1075	n/a	MIA	minimal
Acetylene (Acetylene Dissolved)	2.1	1001	n/a	MIA	1 tonne
Petrol (Motor Spirit)	3	1203	PGII	MIA	zero
Paint Related Materials	3	1263	PGII or III	Workshop / flammables store	Not more than 2, 000 L
C1 Combustible liquids – Diesel	3	1202	PGIII	Bunded above ground storage tanks	300,000 litres
C2 Combustible liquids – Petroleum Distillates, N.O.S. or Petroleum Products, N.O.S.	3	1268	PGIII	Bunded above ground storage tanks	30,000 litres Oil and grease
Ammonium nitrate emulsion	5.1	3375	PGII	Magazine	40 tonnes
Ammonium nitrate (Ammonium Nitrate with not more than 0.2 % total combustible material, including any organic substance calculated as carbon, to the exclusion of any other added substance)	5.1	1942	PGIII	Magazine	80 tonnes
Batteries (Batteries, Wet, Filled with Acid, electric storage)	8	2794 – 2797	PGII	MIA	5 tonnes

Storage Details

Fuel Storage

Fuel for mining equipment will be transported to the site by road and stored in a tank farm. The fuel storage facilities will be designed in accordance with the Australian Standard 1940-2004: *The storage and handling of flammable and combustible liquids*. In particular, the tank farm will be fully bunded to minimise the risk of leaks and spills and will be in accordance with the previously mentioned Australian Standard.

Chemical Storage

All chemicals will be stored, handled and used according to provisions in their Material Safety Data Sheets (MSDS). Copies of all MSDS chemicals and materials to be used at the mine site will be stored on-site at all times.

Explosives Storage

The explosives needed for the mining process will be stored within an approved explosives magazine. The storage units will conform to the relevant regulations and standards regarding the storage of explosives. The magazine area will be bunded and access to the magazine will be restricted to authorised personnel only.

Other materials used in the operation

It is likely that other materials that could be used on site which are not listed as dangerous goods would have a low risk attached to them.

For the duration of the Project, existing storage protocols for all materials on site and handling procedures will be updated to incorporate the Project's operations and advances in best practice techniques.

Consultation

Consultation with representatives from hospitals at Taroom and Wandoan, Ambulance Services at Taroom and Wandoan, the Western Downs Regional Council Community Services department, Taroom Fire and Rescue, and the Police Service at Taroom and Wandoan was undertaken to assist in identification of values, hazards and risks, as well as development of mitigation measures. A summary of the consultation is presented in the Social Impact Assessment (SIA) in Appendix H, the Social Impact Management Plan (SIMP) in Appendix G and the Consultation Report in Appendix E.

Hazard Assessment and Management Strategies

The descriptors used for the risk assessment and the environmental, legal, public and financial impacts associated with each level of risk are outlined in Table 4.150. Table 4.151 describes the qualitative measures of likelihood used for the risk assessment, ranging from 'rare' to 'almost certain'. Table 4.152 presents the Qualitative Risk Analysis Matrix which illustrates the scale of assessment used for the hazard and risk assessment, and Table 4.153 provides the outcome of those assessment values. For each hazard identified, the degree (or sensitivity) of the associated risk has been quantified using the risk matrix. To reduce the degree of risk, management strategies have been proposed for certain hazards.

Table 4.150 Qualitative Consequence Values

Level	Descriptor	Environmental Impacts	Legal	Public/Media Attention	Financial Impact
1	Catastrophic	Significant extensive detrimental long term impacts on the environment, community or public health. Catastrophic and / or extensive chronic discharge or persistent hazardous pollutant. Damage to an extensive portion of aquatic ecosystem. Long term impact on water resource.	Licence to operate likely to be revoked or not granted.	Probable public or media outcry with national / international coverage. Significant green NGO campaign.	>$1 million
2	Major	Off-site release contained with outside assistance. Short to medium term detrimental environmental impact off-site or long term environmental damage on-site.	May involve significant litigation and fines. Specific focus from regulator.	May attract attention of local and state media and local community groups.	$500,000 – $1 million
3	Moderate	Onsite release contained with outside assistance. Significant discharge of pollutant, a possible source of community annoyance. Non persistent, but possible widespread damage to land. Damage that can be remediated without long term loss or very localised long persistent damage.	Probably serious breach of regulation. Possible prosecution and/or fine. Significant difficulties or delays experienced in gaining future approvals.	May attract attention from local media, heightened concern by local community.	$50,000 – $500,000
4	Minor	On site release immediately contained without outside assistance. Ongoing or repeat exceedances of odour, dust or noise / vibration limits.	Minor on the spot fines or formal written correspondence from regulator.	Local community attention or repeated complaints.	$5,000 – $50,000
5	Insignificant	Negligible environmental impact. Minor transient release of pollutant including odour, dust and noise / vibration.	No serious breach of regulation. Minor licence non-compliances.	Local landholder verbal discussion / complaint.	Less than $5,000

Source: modified from: Environmental Risk Management – Principles and Process. HB 203:2004. (Standards Australia/Standards New Zealand, 2004).

Table 4.151 Qualitative Measures of Likelihood

Level	Descriptor	Example	Frequency
A	Almost certain	Is expected to occur in most circumstances	> Once per year
B	Likely	Will probably occur in most circumstances	Once per year
C	Possible	Could occur	Once every 5 years
D	Unlikely	Could occur but not expected	May happen within Project life
E	Rare	Occurs in only exceptional circumstances	Not likely to happen with Project life

Source: modified from: Environmental Risk Management – Principles and Process. HB 203:2004. (Standards Australia/Standards New Zealand, 2004).

Table 4.152 Qualitative Risk Analysis Matrix – Level of Risk

Likelihood	Consequences				
	1 Catastrophic	2 Major	3 Moderate	4 Minor	5 Insignificant
A - Almost certain	E	E	E	H	H
B - Likely	E	E	H	H	M
C - Possible	E	E	H	M	L
D - Unlikely	E	H	M	L	L
E - Rare	H	H	M	L	L

Table 4.153 Risk Map Colour Code

E = Extreme
H = High
M = Moderate
L = Low

Exploration drilling (Pre-construction phase):

- Noise and dust emission potentially resulting in short-term noise and dust nuisance for the local community during the pre-construction phase was given a consequence of 3 and likelihood of A, resulting in a risk rating of Extreme prior to mitigation strategies being applied. After the proposed mitigation measures of conducting community consultation and having specific landholder agreements, the risk rating became Low.

- Land clearing potentially resulting in long-term soil erosion which could impact on the land stability and land use of people living locally, was given a consequence rating of 5 and a likelihood value of D, resulting in a risk rating of Low prior to mitigation measures being applied. After the proposed mitigation strategies to minimise the drill pad footprint and sumps for drill water, the risk rating remained Low.

- Fuel / drill lubricant spills potentially resulting in long-term land contamination which could impact on the quality of soil in the local areaand reduce the land use options for local landholders, was given a consequence of 5 and likelihood of B, resulting in a risk rating of Moderate prior to mitigation strategies being applied. After the proposed mitigation measure of having a procedure to prevent engine oil spills, a risk rating of Low was achieved.

- Drill water spills potentially resulting in long-term land contamination which could impact on the quality of soil in the local area which would reduce the land use options for local landholders, was given a consequence of 5 and likelihood of A resulting in a risk rating of High prior to mitigation measures being applied. After the proposed mitigation strategy to install drill sumps for all wet drilling holes the risk rating of Low was achieved.

Closure and diversion of local roads surrounding the Project (Construction phase):

- Noise and dust emission potentially resulting in short term noise and dust nuisance to the local community during the construction phase of the Project was given a consequence rating of 4 and a likelihood rating of C, resulting in a risk rating of Moderate, prior to mitigation strategies being applied. After the proposed mitigation measures of conducting community consultation and undertaking work in day light hours only, a risk rating of Low was triggered.

- Land clearing potentially resulting in long-term soil erosion which could impact on the land stability and land use for people living locally, was given a consequence rating of 3 and a likelihood value of C, resulting in a risk rating of High prior to mitigation measures being applied. After the proposed mitigation strategy of having appropriate sediment control measures to be adhered to, the risk rating became Low.

- Changes to the road network potentially resulting in long-term nuisance to local residents was given a consequence of 4 and a likelihood of C, resulting in a risk rating of Moderate prior to mitigation measures being applied. After the proposed mitigation strategy of conducting community consultation, the Low risk ranking was triggered.

Creek Diversion of Horse Creek (Construction phase):

- The diverted water from Horse Creek passing through spoil could potentially result in the failure of drop structures and levee. However, any failed structures will fail into the mine void and any impacted water would naturally drain to the mine void. This event was given a consequence of 3 and a likelihood of C resulting in a risk rating of High, prior to mitigation measures applied. After the proposed mitigation strategies of having an engineered design

including a staged approach to allow progressive revegetation and stability as well as regular monitoring, the risk rating of Low was achieved.

Clearing / Topsoil Stripping (Construction phase):

- Noise and dust emission potentially resulting in short term noise and dust nuisance for the local community during construction was given a consequence of 3 and likelihood of A, resulting in a risk rating of Extreme prior to mitigation strategies being applied. After the proposed mitigation measures of undertaking work only during day light hours, haul road watering and speed limiting, the risk rating became Low.

- Land clearing potentially resulting in soil erosion which could impact on the land stability and land use for people living locally, was given a consequence of 3 and a likelihood of B, resulting in a risk rating of High prior to mitigation measures being applied. After the proposed mitigation strategies of minimising land clearing, installing sediment ponds and contour banks, the risk rating Low was achieved.

Drill and Blast (Operational phase):

- Noise and dust emission potentially resulting in noise and dust nuisance for the local community during the Project's operational phase was given a consequence of 3 and likelihood of A, resulting in a risk rating of Extreme prior to mitigation strategies being applied. After the proposed mitigation measures of community consultation on blast times, noise-minimising blast designs, warning alarms for blasts and community consultation for dust nuisance, the Low risk rating was triggered.

- Vibration and overpressure effects potentially resulting in intermittent vibration and overpressure nuisance for the local community during mine operation was given a consequence of 4 and a likelihood of A resulting in a risk rating of High prior to mitigation measures applied. After the proposed mitigation strategies of community consultation on blast times, vibration-minimising and overpressure-minimising blast designs, warning alarms for blasts and having specific landholder agreements, the risk rating of Low was achieved.

- Fly rock potentially resulting in fly rock incidents during the operational phase of the Project was given a consequence of 1 and a likelihood of E resulting in a risk rating of High prior to mitigation measures applied. After the proposed mitigation strategies of conducting community consultation,having specific landholder agreements, having an appropriate blast design, warning alarms for blasts and blast clearance buffers, the risk rating became Moderate.

Coal / Waste Loading (Operational phase):

- Noise and dust emission potentially resulting in intermittent noise and dust nuisance for the local community was given a consequence of 3 and likelihood of A, resulting in a risk rating of Extreme prior to mitigation strategies being applied. After the proposed mitigation measures of regular maintenance of trucks (especially exhaust), speed limiting, no reversing alarms at night (flashing light instead) and dust suppression systems, the risk rating of Low was achieved.

- Fuel spills potentially resulting in long-term land contamination, which could impact on the quality of soil in the local area and reduce the land use options for local landholders, was given a consequence of 5 and likelihood of B, resulting in a risk rating of Moderate prior to

mitigation strategies being applied. After the proposed mitigation measures of a spill procedure being in place and removal of contaminated material, the risk rating became Low.

- Pit stability issues potentially resulting in wall failure which would impact on the soil stability in the local area, was given a consequence of 1 and likelihood of C resulting in a risk rating of Extreme prior to mitigation measures being applied. After the proposed mitigation strategies for geotechnical studies to be undertaken, having an engineered pit design, making exclusion zones and having Rollover Protection Systems (ROPS) on vehicles, the risk rating of Moderate was achieved.

Road Transport / Haul ROM and Waste (Operational phase):

- Noise and dust emission potentially resulting in intermittent noise and dust nuisance for the local community during Project operation was given a consequence of 3 and likelihood of A, resulting in a risk rating of Extreme prior to mitigation strategies being applied. After the proposed mitigation measures of regular maintenance of trucks (especially exhaust), speed limiting, no reversing alarms at night (flashing light instead) and dust suppression systems, the risk rating Low was achieved.

- Spills of fuel potentially resulting in long-term land contamination which could impact on the quality of soil in the local area and reduce the land use options for the land holders, was given a consequence of 5 and likelihood of B, resulting in a risk rating of Moderate prior to mitigation strategies being applied. After the proposed mitigation measures of having a spill procedure in place and removal of contaminated material, the risk rating of Low was triggered.

Conveyor (Operational phase):

- Noise and dust emission potentially resulting in intermittent noise and dust nuisance for the local community was given a consequence of 3 and likelihood of A, resulting in a risk rating of Extreme prior to mitigation strategies being applied. After the proposed mitigation measures of regular maintenance of trucks (especially exhaust), speed limiting, no reversing alarms at night (flashing light instead) and dust suppression systems, the risk rating Low was achieved.

- Spills of coal potentially resulting in long-term land contamination which could impact on the quality of soil in the local area and reduce the land use options for the landholders, was given a consequence of 5 and likelihood of B, resulting in a risk rating of Moderate prior to mitigation strategies being applied. After the proposed mitigation measure of having a covered conveyor, the risk rating of Low was triggered.

Rail Transport / Haul Coal (Operational phase):

- Noise and dust emission potentially resulting in intermittent noise and dust nuisance for the local community during use of the transport corridor and Rail and Services Corridor was given a consequence of 3 and likelihood of C resulting in a risk rating of High prior to mitigation strategies being applied. With the proposed mitigation strategies of community consultation and specific landholder agreements in place, this risk is rated as Moderate.

- Spills of coal potentially resulting in long-term land contamination which could impact on the quality of soil in the local area and reduce the land use options for land holders, was given a consequence of 5 and likelihood of B, resulting in a risk rating of Moderate prior to mitigation

strategies being applied. After the proposed mitigation measures of having computer controlled loading and water sprays, the risk rating became Low.

Spoil Dumps (Operational phase):

- Dust emission potentially resulting in short-term dust nuisance for the local community during mine operation was given a consequence of 5 and likelihood of C resulting in a risk rating of Low prior to mitigation strategies being applied. After the proposed mitigation measure of progressive rehabilitation, the risk rating remained at Low.

- Acid Mine Drainage (AMD) potentially resulting in long-term land, surface water and/ or groundwater contamination which would impact on the various resources in the local area for the community, was given a consequence of 3 and a likelihood of D resulting in a risk rating of Moderate prior to mitigation measures applied. After the proposed mitigation strategies of progressive rehabilitation, developing sediment ponds and implementing a surface water / groundwater monitoring programme, the risk rating remained at Moderate.

- Surface water runoff anderosion potentially resulting in the sedimentation of creek lines impacting on the soil stability and water quality in the local area for community usage downstream, was given a consequence of 3 and likelihood of A resulting in a risk rating of Extreme prior to mitigation measures being applied. After the proposed mitigation strategies of progressive rehabilitation, developing sediment ponds and contour banks, the risk rating became Low.

- Slope stability potentially resulting in mass failure which would impact on the soil stability of the local area in the long-term, was given a consequence of 2 and a likelihood of C resulting in a risk rating of Extreme prior to mitigation measures applied. After the proposed mitigation strategy of having an engineered spoil dump design, the risk rating of Moderate was achieved.

ROM stockpile (Operational phase):

- Noise and dust emission potentially resulting in intermittent noise and dust nuisance for the local community during mine operation was given a consequence of 3 and likelihood of A, resulting in a risk rating of Extreme prior to mitigation strategies being applied. After the proposed mitigation measures of regular maintenance and checklist for vehicles, regular inspections of vehicles and road watering, the risk rating of Low was triggered.

- Surface water runoff and erosion potentially resulting in the sedimentation of creek lines and land contamination impacting on the soil stability / quality and water quality in the local area for community usage, was given a consequence of 3 and likelihood of A resulting in a risk rating of Extreme prior to mitigation measures being applied. After the proposed mitigation strategies of progressive rehabilitation, developing sediment ponds and contour banks and elevated ROM Pad, the risk rating became Low.

Crushing (Operational phase):

- Noise and dust emission potentially resulting in intermittent noise and dust nuisance for the local community for the duration of mine operation was given a consequence of 3 and likelihood of B resulting in a risk rating of High prior to mitigation strategies being applied. After the proposed mitigation measure of having the area for these works partially enclosed, the Low risk rating was triggered.

Tailings Storage Facilities (Operational phase):

- In pit tailings storage potentially resulting in long-term land and / or groundwater contamination was given a consequence of 4 and likelihood of C resulting in a risk rating of Moderate prior to mitigation measures applied. After the proposed mitigation strategies of undertaking groundwater studies and monitoring piezometers the risk rating remained at Moderate.

- Acid Mine Drainage potentially resulting in long-term land, surface water and / or groundwater contamination which would impact on the various resources in the local area for the community, was given a consequence of 3 and likelihood of C resulting in a risk rating of High prior to mitigation measures applied. After the proposed mitigation strategies of covering along with progressive rehabilitation, developing sediment ponds and developing a surface water / groundwater monitoring programme, the risk rating was reduced to Moderate.

- Dust emission potentially resulting in dust nuisance for the local community during mine operation was given a consequence of 5 and likelihood of D resulting in a risk rating of Low prior to mitigation strategies being applied. After the proposed mitigation measure of progressive rehabilitation, the risk rating remained at Low.

- Seepage potentially resulting in long-term groundwater contamination which could impact the livelihood of the region was given a consequence value of 4 and likelihood of C resulting in a risk rating of Moderate prior to mitigation measures applied. After the proposed mitigation strategy of monitoring piezometers, the risk rating became Low.

- Facility overflow potentially resulting in long-term land, surface water and / or groundwater contamination, which would impact on the various resources in the local area for the community, was given a consequence of 2 and likelihood of B resulting in a risk rating of Extreme prior to mitigation measures applied. After the proposed mitigation strategies of an engineered TSF design, operational procedures in place, regular inspections, annual engineering inspection by a registered engineer and an engineered spillway, the risk rating High was achieved.

- Tailings pipeline rupture potentially resulting in long-term land, surface water and / or groundwater contamination which would impact on the various resources in the local area for the community was given a consequence of 3 and a likelihood of B resulting in a risk rating of High prior to mitigation measures applied. After the proposed mitigation strategies of pipelines protected from vehicles, daily inspections, regular pipeline maintenance, fortnightly monitoring of surface water and weekly monitoring of groundwater, the risk rating was reduced to Moderate.

- Wall failure potentially resulting in long-term land, surface water and / or groundwater contamination and community property damage, which would impact on the various resources in the local area and community property, was given a consequence of 1 and a likelihood of C resulting in a risk rating of Extreme prior to mitigation measures applied. After the proposed mitigation strategies of havingan engineered TSF design, operational procedures in place, regular inspections, an annual engineering inspection by a registered engineer and an engineered spillway, the risk rating was reduced to High.

- Erosion of embankments / spillway potentially resulting in sedimentation, impacting on the soil stability / quality and water quality in the local area for community usage in the long-term, was

given a consequence of 4 and likelihood of B resulting in a risk rating of High prior to mitigation measures being applied. After the proposed mitigation strategies of having an engineered TSF design, operational procedures in place, regular inspections, an annual engineering inspection by a registered engineer and an engineered spillway the risk rating was reduced to Low.

Bulk Storage of Diesel, Chemicals (Operational phase):

- Spills whereby the whole tank is ruptured potentially resulting in long-term land, surface water and / or groundwater contamination which would impact on the various resources in the local area for the community, was given a consequence of 3 and likelihood of C resulting in a risk rating of High prior to mitigation measures applied. After the proposed mitigation strategy to bund all chemical / hydrocarbon storages to the Australian Standard 1940, the risk rating was reduced to Low.

- Minor spills during refuelling (50 – 100 litres) potentially resulting in long-term land contamination which would impact on the land use options for the land holders, was given a consequence of 4 and a likelihood of B resulting in a risk rating of High prior to mitigation measures applied. After the proposed mitigation strategies of having safety procedures, training and spills clean-up kits, the risk rating became Moderate.

Waste Disposal – on site burial domestic and industrial (Operational phase):

- Food scraps left uncovered potentially resulting in short-term odour nuisance during mine operation, which would impact on the natural landscape character, was given a consequence of 4, a likelihood of C and risk rating of Moderate prior to mitigation strategies being applied. After the proposed mitigation measure to ensure that landfill is pushed and covered monthly the risk rating became Low.

- Food scraps left uncovered can also potentially result in vermin which would impact on the natural landscape character and ecology during the operational phase. This event was given a consequence of 4, a likelihood of B and risk rating of High prior to mitigation measures applied. After the proposed mitigation strategy to ensure the landfill is pushed and covered monthly the risk rating was reduced to Moderate.

- Wind-blown rubbish potentially resulting in land contamination which would impact on the soil quality of the area and land use options for land holders, was given a consequence of 4 and likelihood of C resulting in a risk rating of Moderate prior to mitigation measures applied. After the proposed mitigation strategy to ensure the landfill is pushed and covered monthly, the risk rating was reduced to Low.

Sewage Disposal – sewage treatment plant (Operational phase):

- Discharge / overflow potentially resulting in long-term land, surface water and / or groundwater contamination,which could impact on the various resources in the local area for the community, was given a consequence of 4 and likelihood of C resulting in a risk rating of Moderate prior to mitigation measures applied. After the proposed mitigation strategies of daily checks of the sewage treatment plant, weekly monitoring of the plant by trained operators and a design to accommodate major rainfall events, the risk rating of Low was triggered.

Workshops / wash down pads (Operational phase);

- Spills potentially resulting in long-term land, surface water and / or groundwater contamination which would impact on the various resources in the local area for the community was given a consequence of 4 and likelihood of C resulting in a risk rating of Moderate prior to mitigation measures applied. After the proposed mitigation strategies of having concrete pads at the workshop, grease oil trap separators on wash down pads and at the workshop, spill procedures in place, emergency response procedures and bunding of oil storages at the workshop, the risk rating was reduced to Low.

- Hydrocarbon / sediment contaminated water discharged potentially resulting in long-term land, surface water and / or groundwater contamination which would impact on the various resources in the local area for the community was given a consequence of 4 and likelihood of C resulting in a riskrating of Moderate prior to mitigation measures applied. After the proposed mitigation strategies to concrete pads at the workshop, have grease oil trap separators on wash down pads and at the workshop, spill procedures in place, emergency response procedures and bunding of oil storages at the workshop, the risk rating was reduced to Low.

Explosives Magazine (Operational phase):

- Spill of ANFO / diesel potentially resulting in long-term land contamination which could impact on the soil quality in the area and land use options for land holders, was given a consequence of 4 and likelihood of C resulting in a risk rating of Moderate prior to mitigation measures applied. After the proposed mitigation strategies to bund the diesel tank and have a provision of oil separator for washing mixing equipment the risk rating was reduced to Low.

Rehabilitation (Decommissioning phase):

- Failure of rehabilitation potentially resulting in long-term erosion and a non-aesthetically pleasing visual aspect which would impact on the soil stability / quality and land character for the local area, was given a consequence of 3 and likelihood of C resulting in a risk rating of High prior to mitigation measures applied. After the proposed mitigation strategies of monitoring the rehabilitation, assessment of failure mechanisms and reworking rehabilitation based on amended strategy a risk rating of Low was achieved.

- Failure of rehabilitation also potentially resulting in dust emission causing long-term dust nuisance for the local community was given a consequence of 4 and likelihood of C resulting in a risk rating of Moderate prior to mitigation measures applied. After the proposed mitigation strategies of monitoring the rehabilitation, assessment of failure mechanisms and reworking rehabilitation based on amended strategy, a risk rating of Low was achieved.

Ignition source (village, workshop, process plant and clearing activities) (relevant for all phases):

- Bushfires potentially resulting in the loss of habitat and fauna species which would impact on the visual aspect for the local community and the ecology during all phases of the Project was given a consequence of 2 and likelihood of C resulting in a risk rating of Extreme prior to mitigation measures applied. After the proposed mitigation strategies of fire breaks around lease boundaries maintained annually, having fire extinguishers in all vehicles, adequate water supplies and training for fire-fighting the Moderate risk rating was triggered.

Conclusions

The risk assessment, provided in Appendix AP, identified 85 environmental risks for the Project. Prior to the application of management strategies, the following risks were identified:

- 27 Extreme Risks;
- 26 High Risks;
- 28 Moderate Risks; and
- 4 Low Risks.

Following the application of risk management strategies, no extreme risks remained for the Project. Risks remaining after implementation of mitigation and management strategies included:

- 7 High Risks;
- 19 Moderate Risks; and
- 59 Low Risks.

The mitigation measures identified to reduce the occurrence of hazardous activities will be incorporated into a Safety and Health Management System (SHMS) for the Project which will be updated throughout the Project life. The SHMS will be developed to include emergency response elements and procedures for dealing with hazards and incidents when they occur. This will encompass a process of incident reporting for the mine which will:

- Identify and control potential hazards;
- Investigate and analyse the causes of accidents/incidents to mitigate future risk;
- Implement steps to avoid or remove unacceptable risk;
- Monitor levels of risk and adverse consequences of retained residual risk;
- Mitigate potential adverse effects arising from residual risk; and,
- Regularly review the effectiveness of risk management to implement corrective actions and mitigation controls.

In addition, a Spillage and Emergency Management Plan will be developed for the Project site. The Spillage and Emergency Management Plan will include the use of best practice techniques to control, clean up and remediate any spills that may occur on the Project site.

To ensure the alignment of the Project's SHMS with the principles of natural hazard management detailed in the former SPP 1/03, provision of adequate road access for fire-fighting and other emergency vehicles and safe evacuation will be maintained. Emergency response strategies will be developed with participation from the Queensland Fire and Rescue Service and will include measures to provide water supply on site for fire-fighting purposes.

All management and response procedures and health and safety standards will be reviewed and updated during the life of the mine to incorporate contemporary elements of the Project.

4.13.2.1 Emergency Management Responses

An Emergency Response Plan (ERP) for the Project will include:

- Emergency Response (ER) Procedures;
- Emergency Exercises and Drills Guidelines;
- Site Incident Management Team Guidelines;
- Emergency Assistance to the Community;
- Identification of ER team members, Project support staff and external support agencies and their contact details;
- Identification of opportunities to cooperate with neighbouring communities and organisations;

Responses for a range of emergencies will be developed, including:

- Major fire/explosion;
- Fatalities;
- Natural disasters – bushfire, flood, storm;
- Vehicle incident;
- Loss of communications/information technology;
- Workplace violence;
- Widespread illness;
- Loss of utilities; and
- Loss or potential for loss of structural integrity of mine structures.