Appendix 2

Analysis of Environmental Risk

(Total No. of pages including blank pages = 9)

1. Introduction

Risk is the chance of something happening that will have an impact upon the objectives or the task which, in this case, is the safe and environmentally responsible construction and operation of the Project. Risk is measured in terms of consequence (severity) and likelihood (probability) of the event happening. The allocation of a qualitative consequence ranking of the potential impact(s) occurring for each risk source was based on the definitions defined **Table A2.1** whilst the qualitative likelihood or probability ranking was defined in accordance with **Table A2.2**. The risk ranking was established based upon the matrix presented in **Table A2.3**. These tables have been developed generally in accordance with Standards Australia "HB 203:2012 Managing environment-related risk".

Table A2.1
Qualitative Consequence Ratings

Level	Descriptor	Description
1	Catastrophic	The potential to cause significant permanent regional environmental impact/ecosystem damage or human health impact with impacts causing mine or business closure, e.g. major off-site release of a contaminant with long-term detrimental effects.
2	Major	The potential to cause substantial permanent regional/local environmental damage or human health impacts which could result in major financial loss and/or prosecution, e.g. off-site release of a contaminant resulting in local ecosystem damage.
3	Moderate	The potential to cause substantial temporary or minor long-term damage, e.g. a large water or moderate hydrocarbon off-site release with outside clean-up assistance required. May potentially result in a legal non-compliance and/or prosecution.
4	Minor	The potential for a temporary or minor damage. No legal breach but may be non-compliant with internal environmental target, e.g. minor hydrocarbon spill.
5	Insignificant (I)	No detrimental effect, negligible environmental impact.

Table A2.2
Qualitative Likelihood Ranking

Level	Descriptor	Description
A	Almost Certain	Is expected to occur in most circumstances.
B	Likely	Will probably occur in most circumstances.
C	Possible	Could occur.
D	Unlikely	Could occur but not expected.
E	Rare	Occurs only in exceptional circumstances.

Table A2.3
Risk Rankings

		Likelihood				
		A - Certain	B - Likely	C - Possible	D – Unlikely	E - Rare
Consequence	1 – Catastrophic	1	2	4	7	11
	2 – Major	3	5	8	12	16
	3 – Moderate	6	9	13	17	20
	4 – Minor	10	14	18	21	23
	5 – Insignificant	15	19	22	24	25

Low Medium High Extreme

Table A2.4 presents the identified risk sources and the potential consequences of the identified risk and the risk rankings assuming standard controls together with the location of the proposed management and control measures identified within Section 6 of the EIS. In a number of cases, the standard controls would be appropriate to achieve an acceptable level of impact whereas for some cases, additional project or site-specific controls are required to achieve the required level of impact.

The four risk rankings are defined as follows.

Low (L): requiring a basic assessment of proposed controls and residual impacts. Any residual impacts are unlikely to have any major impact on the local environment or stakeholders.

Medium (M): requiring a medium level assessment of proposed controls and residual impacts. It is unlikely to preclude the development of the Project but may result in impacts deemed unacceptable to some local or government stakeholders.

High (H): requiring in-depth assessment and high level documentation of the proposed controls and mitigation measures. Ultimately, this level of risk may preclude the development of the Project.

Extreme (E): requiring in-depth assessment and high level documentation of the proposed controls and mitigation measures and possible preparation of a specialised management plan. Unless considered to be adequately managed by the controls and/or management plan, this level of risk is likely to preclude the development of the Project.

Table A2.4
Analysis of Environmental Risks

Risk Source	Consequence / Hazard	Risk with Standard Control Measures	Proposed Control Measures EIS Section Ref.	Residual Risk
GROUNDWATER				
Interception and take of groundwater by open cut and underground mining.	Reduced groundwater levels and availability for existing groundwater users (upper aquifer).	24 (D5)	6.2.4	24 (D5)
	Impacts to groundwater dependent ecosystems.	15 (A5) ALARP		15 (A5) ALARP
Contaminated discharge/groundwater to upper aquifers.	Reduced groundwater quality for existing groundwater users.	25 (E5)		25 (E5)
	Impacts to groundwater dependent ecosystem (upper aquifer).	25 (E5)		25 (E5)
	Impacts to groundwater influenced ecosystem (upper aquifer).	13 (C3)		17 (D3)
Contaminated discharge to or reduced pressure in deep aquifers.	Reduced groundwater quality or groundwater pressure for existing groundwater users (deep aquifers).	21 (D4)		21 (D4)
BIODIVERSITY				
Planned clearing of vegetation communities	Significant localised impacts upon habitat for listed fauna species (or the species themselves).	18 (C4)	6.3.6	21 (D4)
	Significant localised impacts upon threatened or rare native vegetation, vegetation communities or biodiversity values.	3 (A2)		13 (C3)
	Direct injuries to native fauna during clearing / earthworks.	18 (C4)		23 (E4)
Site establishment and mining operations.	Indirect impacts to fauna communities due to light, noise, etc.	21 (D4)		21 (D4)
Inappropriate maintenance/management of weeds and pest species.	Weeds and/or pests propagating from the Mine Site impact the productivity of surrounding agricultural land or the biodiversity values of retained native vegetation communities.	18 (C4)		21 (D4)
	Weeds and/or pests impede successful rehabilitation.	9 (B3)		21 (D4)

Table A2.4 (Cont'd)
Analysis of Environmental Risks

Risk Source	Consequence / Hazard	Risk with Standard Control Measures	Proposed Control Measures EIS Section Ref.	Residual Risk
LAND AND SOILS				
Inappropriate soil stripping.	Incorrect/degraded soil stripped, resulting to less successful rehabilitation and increased rehabilitation costs and maintenance.	8 (C2)	6.4.5 and 6.4.6	17 (D3)
	Inadequate soil stripped leading to a shortfall in soil resources, less successful rehabilitation and increased rehabilitation costs and maintenance.	13(C3)		17 (D3)
Inappropriate soil stockpiling.	Degradation of soil in stockpiles leading to less successful rehabilitation and increased rehabilitation costs and maintenance.	13 (C3)		17 (D3)
	Erosion and loss of materials from soil stockpiles.	13 (C3)		20 (E3)
Insufficient soil resources	Timing issues for soil stripping/spreading or poor soil accounting / balance management results in insufficient soil resources for progressive rehabilitation	13 (C3)		17 (D3)
Inappropriate soil spreading.	Poor soil handling or inappropriate amelioration leading to less successful rehabilitation and increased rehabilitation costs and maintenance.	8 (C2)		13 (C3)
Changes to land uses impacting soil and land resources.	Reduction of the land and soil capability class	8 (C2)		13 (C3)
ABORIGINAL CULTURAL HERITAGE				
Destruction of known Aboriginal artefacts during salvage and storage.	Loss of Aboriginal cultural heritage values and reduction of archaeological record.	6 (A3)	6.5.8	15 (A5) ALARP
Inadvertent removal or destruction of known Aboriginal sites and/or artefacts.	Loss of Aboriginal cultural heritage values and reduction of in situ archaeological record.	13 (C3)		20 (E3)
Removal or destruction of currently unidentified Aboriginal sites and/or artefacts.	Loss of Aboriginal cultural heritage values and reduction of in situ archaeological record.	13 (C3)		20 (E3)

Table A2.4 (Cont'd)
Analysis of Environmental Risks

Risk Source	Consequence / Hazard	Risk with Standard Control Measures	Proposed Control Measures EIS Section Ref.	Residual Risk
TRAFFIC AND TRANSPORT				
Upgraded public roads and intersections	Upgraded public roads and intersections fail to comply with required design standards.	16 (E2)	6.6.5	16 (E2)
	Upgraded public roads and intersections fail to comply with required construction standards, thereby requiring additional maintenance compared with the existing road network.	16 (E2)		16 (E2)
Site establishment and construction traffic.	Road works and traffic control operations result in increased safety risks.	11 (E1) ALARP		11 (E1) ALARP
	Disruption to motorists as a result of construction operations.	15 (A5) ALARP		15 (A5) ALARP
Operational traffic on the public road network.	Additional operational traffic results in increased safety risks for motorists.	11 (E1) ALARP		11 (E1) ALARP
	Additional operational traffic results in increased travel time for motorists.	22 (C5)		22 (C5)
	Deterioration of road condition and serviceability as a result of increased traffic.	21 (D4)		21 (D4)
New roadside fencing impacts on neighbours	New fencing restricts farm operations impacting negatively on neighbouring businesses	21 (D4)		21 (D4)
SURFACE WATER				
Release of sediment-laden water to natural catchments	Impacts on water quality (sedimentation).	24 (D5)	6.7.3	24 (D5)
Release of chemical water to natural catchments.	Adverse impacts on aquatic ecosystem function and limitations upon use by current water users.	24 (D5)		24 (D5)
Release of salt-laden water to natural catchments	Adverse impacts on aquatic ecosystem function and limitations upon use by current water users.	24 (D5)		24 (D5)

Table A2.4 (Cont'd)
Analysis of Environmental Risks

Risk Source	Consequence / Hazard	Risk with Standard Control Measures	Proposed Control Measures EIS Section Ref.	Residual Risk
NOISE				
Site establishment and construction activities	Noise emissions exceeding the relevant criteria at residential receptors – daytime.	25 (E5)	6.8.5	25 (E5)
	Noise emissions exceeding the relevant criteria at residential receptors – evening and night.	25 (E5)		25 (E5)
Mining-related operations.	Noise emissions exceeding the relevant criteria at residential receptors – daytime.	21 (D4)		21 (D4)
	Noise emissions exceeding the relevant criteria at residential receptors – evening and night.	8 (C2)		13(C3)
Road traffic noise from offsite transportation operations (including Broken Hill).	Noise emissions exceeding the relevant criteria at residential receptors along the transportation routes.	25 (E5)		25 (E5)
Rail Facility operational noise	Noise emissions exceeding the relevant criteria at residential receptors – daytime.	21 (D4)		21 (D4)
	Noise emissions exceeding the relevant criteria at residential receptors – evening and night.	21 (D4)		21 (D4)
AIR QUALITY AND GREENHOUSE GAS				
Emissions of TSP/PM_{10}/$PM_{2.5}$/ Deposited dust from site establishment and construction activities within the Mine Site	Health and/or amenity impacts on occupants within the nearby privately-owned residences and other sensitive receptors.	21 (D4)	6.9.7	23 (E4)
Emissions of TSP/PM_{10}/$PM_{2.5}$/ Deposited dust from mining-related operations within the Mine Site.	Health and/or amenity impacts on occupants within the nearby privately-owned residences and other sensitive receptors.	21 (D4)		21 (D4)
Emissions of TSP/PM_{10}/$PM_{2.5}$/ Deposited dust from Rail Facility operations within the Mine Site.	Health and/or amenity impacts on occupants within the nearby privately-owned residences and other sensitive receptors.	21 (D4)		21 (D4)
On-site generation of Greenhouse Gas (GHG) emissions.	Climate change impacts from the Project, locally, regionally, and worldwide.	19 (B5)		19 (B5)

Table A2.4 (Cont'd)
Analysis of Environmental Risks

Risk Source	Consequence / Hazard	Risk with Standard Control Measures	Proposed Control Measures EIS Section Ref.	Residual Risk
HAZARDS AND PUBLIC SAFETY				
Fire initiated off site.	Threat to operations and impacting on-site stock and infrastructure.	17 (D3)	6.11.6	17 (D3)
Fire initiated on site.	Threat to Mine Site operations.	12 (D2)		16 (E2)
	Fire spreading off site and impacting on privately owned stock and infrastructure.	17 (D3)		17 (D3)
Management of Monazite Product	Adverse impacts to the environment or public safety associated with production and storage of Monazite Product within the Mine Site	17 (D3)	6.11.2	23 (E4)
	Adverse impacts to the environment or public safety associated with transportation of Monazite Product from the Mine Site to the Rail Facility	8 (C2)		20 (E3)
	Adverse impacts to the environment or public safety associated with storage of Monazite Product within the Rail Facility	12 (D2)		23 (E4)
HISTORIC HERITAGE				
Unauthorised destruction of known historic heritage sites.	Loss of heritage items displaying features of previous agricultural, commercial, residential or mining operations.	24 (D5)	6.12.6	24 (D5)
Unauthorised destruction of unknown historic heritage sites within approved disturbance areas.	Loss of heritage items displaying features of previous mining operations.	25 (E5)		25 (E5)
VISIBILITY				
Construction of infrastructure and mining operations within the Mine Site	Amenity impacts through site infrastructure or operations visible from nearby local public roads or vantage points	25 (E5)	6.13.4	25 (E5)
	Amenity impacts through the temporary and permanent change in content and composition of views from nearby roads or vantage points	25 (E5)		25 (E5)
Construction of infrastructure and mining operations within the Rail Facility	Amenity impacts through site operation visible from nearby local public roads or vantage points	15 (A5) ALARP		15 (A5) ALARP
	Amenity impacts through the temporary and permanent change in content and composition of views from nearby roads or vantage points	24 (D5)		24 (D5)
Lighting or sky glow impacts after dusk.	Visual intrusion or a reduction in scenic quality due to direct/indirect lighting or sky glow after dusk at nearby privately-owned residences.	18 (C4)		23 (E4)

Table A2.4 (Cont'd)
Analysis of Environmental Risks

Risk Source	Consequence / Hazard	Risk with Standard Control Measures	Proposed Control Measures EIS Section Ref.	Residual Risk
SOCIAL				
Construction and operation of the Project	Changes to existing visual amenity for residents of surrounding properties that reduces social amenity.	18 (C4)	6.14.6	18 (C4)
	Creation of noise, vibration and dust that reduces social amenity.	18 (C4)		21 (D4)
	Impacts on ecosystem services including water use / availability and biodiversity that is valued by the community.	22 (C5)		24 (D5)
	Relationship between Applicant and landholder adversely impact on existing businesses or individual landholder health.	8 (C2)		25 (E5)
Population increase associated with employment growth.	Changes in way of life.	17 (D3)		17 (D3)
	Changes in the social fabric result in loss of social cohesion or division within the community	17 (D3)		17 (D3)
	Inability of existing community services (i.e. health, education and childcare) in surrounding towns to accommodate additional demand.	13 (C3)		18 (C2)
	Poor relationships between existing community and mine workers / new arrivals.	17 (D3)		17 (D3)
	Reduced housing availability and associated increased housing costs.	17 (D3)		17 (D3)
CLOSURE, REHABILITATION AND FINAL LANDFORM AND FINAL LAND USE				
Closure	Unplanned closure as a result of economic or other factors.	16 (E2)	3.12	16 (E2)
Rehabilitation and final landform.	Failure to shape final landform as designed results in suboptimal final landform.	16 (E2)		16 (E2)
	Failure to spread topsoil as designed results in suboptimal rehabilitation and erosion of the final landform.	17 (D3)		17 (D3)
	Failure to spread seed of the appropriate species results in suboptimal rehabilitation and erosion of the final landform.	13 (C3)		17 (D3)
	Failure to undertake rehabilitation progressively results in inability to optimise rehabilitation procedures and increased risk of suboptimal rehabilitation.	17 (D3)		17 (D3)
	Failure to undertake appropriate rehabilitation maintenance and remediation (as required) results in erosion of growth medium and suboptimal rehabilitation.	17 (D3)		17 (D3)
Final land use	Failure to establish the nominated final land use results in suboptimal agricultural productivity or ecological improvements.	13 (C3)		17 (D3)