
23.1 Impact evaluation methodology

In order to determine EMP requirements, a qualitative evaluation of potential impacts likely to be associated with the proposed sand mining operations has been carried out by URS based on Australian Standard AS/NZS 4360:2004 Risk Management and the information contained in this draft EIS.

AS/NZS 4360:2004 assesses environmental risks based on both the likelihood and the consequence of a particular impact occurring and compares the results to a pre-defined qualitative matrix to ascertain significance. Matilda has adopted this standard to assess the environmental risks and corresponding environmental management requirements for the proposed operations on the Tiwi Islands.

Likelihood and consequence ratings applied in the risk assessment process, were measured on five-point scales. Consequences were assessed on a scale of 1 to 5 and likelihood was assessed on a scale from A to E. Likelihood and consequence categories were specifically tailored to relate to the activities proposed. The types of risks considered are described in Tables 23.1 and 23.2. Environmental, health and safety, cultural, and socio-economic impacts and consequences have been considered.

Assessments were undertaken by URS and reviewed by Matilda. Assessors undertook an initial literature review, analysed baseline survey data, reviewed design layouts and the Draft EIS Guidelines, and analysed the impacts of the proposed operations based on information provided by Matilda and past experience.

In order to assess the significance of impacts the team were posed the following questions:

- What impacts can occur?
- What is the likelihood of these events?
- What are the consequences of the event?
- What are the overall risks (likelihood x consequence)?

Level	Descriptor	Example Detail Description				
		Safety	Cultural	Socio-economic	Business	Environment
1	Insignificant	Minor injury	None to minimal impact on Indigenous or non-Indigenous heritage sites or values.	None to minimal reported complaints about Project. No socio-economic impacts.	<\$10,000	Minor Non-Conformance – no impact, minor breach in procedure.
2	Minor	Medical attention required	Minor impact on Indigenous or non-Indigenous heritage sites or values (e.g., restricted access to recreation areas).	Some inconvenience to stakeholders, minimal adverse impact on socio-economic environment, and some intervention required.	\$10,000 to \$100,000	Minor Impact – minimal impact outside the local area.
3	Moderate	Disability/Lost Time Incident (LTI)	Moderate impact on Indigenous or non-Indigenous heritage sites, which can be managed under normal procedures. Some negative media coverage could be expected.	Moderate disruption or inconvenience to stakeholders. Require careful management to restore trust.	\$100,000 to \$500,000	Moderate Impact – external to local area, generally contained on site.
4	Major	Permanent Disability / Fatality	Major disturbances to significant Indigenous or non-Indigenous heritage sites or values. Major breach of statutory obligation, access to resource denied in the medium to long-term.	Significant adverse impacts to sectors of the community and stakeholders. Long-term social disruption, diminished quality of life of large or specific sectors of the community.	\$500,000 to \$1M	Major Impact – harm or breach of license conditions or obligations, discharges off site.
5	Catastrophe	Multiple Fatalities	Major disturbances to a number of significant Indigenous or non-Indigenous heritage sites or values. Major breach of statutory obligation, access to resource permanently denied.	Irreversible damage to the socio-economic environment. Potential for civil commotion or riot and major damage to Matilda property.	>\$1M	Catastrophe – long term, significant legal implications and potential to affect community.

Table 23.1: Risk Assessment Criteria for Consequence

Table 23.2: Criteria for Likelihood of Events

Level	Measure	Description	Guide
E	Rare	Issue has not occurred in the past and there is a low probability that it may occur in exceptional circumstances.	Once per life of facility.
D	Could Occur	Issue may have occurred in the past and there is a moderate probability that it could occur at some time.	Once per 10 years
C	Should Occur	Issue may have arisen in the past and there is a high probability that it should occur at some time.	Once per year
B	Likely to occur	Issue has been a common problem in the past and there is a high probability it will occur in most circumstances.	Once per month
A	Will Occur	Issue will occur, is currently a problem or is expected to occur in most circumstances.	Weekly

The combination of the likelihood and consequence ratings was then compared to the qualitative risk analysis matrix, providing an indication of the magnitude or significance of the impact (ranging from low to high priority). The adopted risk level matrix is presented in Table 23.3:

Table 23.3: Risk Matrix

LIKELIHOOD	CONSEQUENCE				
	1 – Insignificant	2 – Minor	3 – Moderate	4 – Major	5 – Critical
A – Will Occur	S	S	H	H	H
B – Likely to Occur	M	S	S	H	H
C – Should Occur	L	M	S	H	H
D – Could Occur	L	L	M	S	H
E – Rare	L	L	M	S	S

Risk Definitions (AS/NZS 4360:1999)

- High Detailed research and management planning required at senior levels. Immediate action required
- Significant Senior management attention needed.
- Moderate Management responsibility and integration into management plans required.
- Low Manage by routine procedures.

An example summary of risk events and proposed management controls are shown in the next table (Table 23.4). This table is a culmination of the previous tables, and combines the risk assessments and makes suggestions about recommended actions based on the risk definitions included in Table 23.3 and the commitments made in the Draft EIS.

Table 23.4: Example Summary of Extreme and High Risk Events

Section No.	KEY ISSUES	KEY POTENTIAL IMPACTS	CONSEQUENCE RANKING	LIKELIHOOD RANKING	RISK RANKING	RISK MANAGEMENT ACTIONS/PLANS RECOMMENDED
Section 5	Post - Mining Landform	Land disturbance from clearing for mineral sands mining operations.	3	A	H	Minimise areas to be cleared. Mining operations and rehabilitation works will be undertaken progressively. Rehabilitation and Mine Closure Plan.
Section 6	Storm Surge	Flooding of the cleared mining area. Erosion of shorelines. Destruction of vegetation and fauna habitat and temporary salinisation of surface water bodies and shallow groundwater.	3	D	M	Risk not considered to be significantly increased by proposed sand mining activities from those that exist currently. Cyclone and imminent flooding procedures. Rehabilitation and Mine Closure Plan.
Section 7	Surface Water	Increased top soil erosion. Sedimentation throughout local water courses. Contamination from hydrocarbon use. Changes to surface water dynamics.	4	D	S	Minimise areas to be cleared. Surface Water Environmental Management Plan. Hydrocarbons and Hazardous Substances Management Plan. Rehabilitation and Mine Closure Plan.
Section 8	Ground Water	Groundwater level drawdown from borefield operation. Seawater Intrusion caused by borefield operation.	3	C	S	Risk not considered to be significant under planned borefield operation. Groundwater Environmental Management Plan . Detailed modelling of Letbridge to be undertaken.
Section 9	Flora	Loss of floristic diversity. Loss of threatened and/or endangered species. Loss of habitat. Introduction of weed species. Natural resource degradation and ecological damage.	4	C	H	Minimise areas to be disturbed. Avoidance of areas with high conservation value. Quarantine procedures. Flora Environmental Management Plan. Pest, Weed and Disease Environmental Management Plan. Rehabilitation and Mine Closure Plan.
Section 10	Fauna	Loss of fauna diversity. Loss of threatened and/or endangered species. Loss of habitat. Introduction of pest and feral animals. Natural resource degradation and ecological damage.	4	C	H	Minimise areas to be disturbed. Avoidance of areas with high conservation value. Quarantine procedures. Fauna Environmental Management Plan. Pest, Weed and Disease Environmental Management Plan. Rehabilitation and Mine Closure Plan.

Preliminary Risk Assessment

SECTION 23

Section No.	KEY ISSUES	KEY POTENTIAL IMPACTS	CONSEQUENCE RANKING	LIKELIHOOD RANKING	RISK RANKING	RISK MANAGEMENT ACTIONS/PLANS RECOMMENDED
Section 11	Sea Turtles	Impact on sea turtle nesting behaviour. Impacts from lighting causing turtles to move inland. Loss of threatened and/or endangered turtle species.	4	C	H	Establishment of a 200-m buffer between the Spring High Water Mark and mining operations. Prohibiting staff from access to sea turtle monitoring beaches unless for monitoring purposes. Mineral sands mining activities conducted during daylight hours only. Sea turtle Environmental Management Plan.
Section 12	Air Quality	Additional dust generation creating adverse impacts on health of personnel.	3	A	H	Minimise areas of disturbance. Particles are relatively coarse and with high moisture content (4-5%) and will produce little dust. Haul roads will be regularly water-sprayed to prevent dust. Mining operations and rehabilitation works will be staged progressively. Dust and Noise Environmental Management Plan.
Section 13	Noise	Increased noise emissions. Effect on humans and fauna.	3	A	H	All vehicles and machinery under the control of Matilda will be fitted with silencers to reduce the amount of noise emitted. Maintenance of equipment. Generators will be located away from camp areas. Ear protection will be readily available. Establishment of a 200-m buffer between the Spring High Water Mark and mining operations. Mining operations and rehabilitation works will be staged progressively. Dust and Noise Environmental Management Plan.
Section 14	Radiation	Adverse impacts on personnel and/or environment. Increase in radon levels from pre to post mining.	5	D	H	Baseline studies undertaken at Andranangoo, indicate radon and gamma levels not considered hazardous. Thorium and uranium levels of concentrate are such that they are not considered to be radioactive ores. Radon and gamma monitoring program to be established for first year of operation. Radiation Environmental Management Plan.

Preliminary Risk Assessment

SECTION 23

Section No.	KEY ISSUES	KEY POTENTIAL IMPACTS	CONSEQUENCE RANKING	LIKELIHOOD RANKING	RISK RANKING	RISK MANAGEMENT ACTIONS/PLANS RECOMMENDED
Section 15	Fire	Hydrocarbon contamination of the local area. Threatening local communities and infrastructure. Loss of flora/fauna.	3	A	H	Raising awareness of need to protect infrastructure and assets with local community. Emergency Response Procedures. Fuel hazard reduction techniques. Fire Environmental Management Plan.
Section 16	Hydrocarbons and Hazardous Substances	Spill or leaks of hydrocarbons. Contamination of soil, surface water, groundwater and marine environment.	4	B	H	Appropriately banded storage areas and readily available spill kits. Spillage Response Procedures. Emergency Response Procedures. Hydrocarbon and Hazardous Substances Environmental Management Plan.
Section 17	Waste Management	Adverse effects on human health. Detract from the visual amenity. Contamination of soil, surface water, groundwater and marine environment. Emission of odours. Attract wildlife and vermin to the immediate site.	3	B	S	Implement practices to minimise waste. Waste Environmental Management Plan.
Section 18	Biting Insects	Biting insect breeding sites are created by construction and operational activities. Excessive numbers of larvae and/or mature biting insects are evident on-site. Significant incidences of bites are reported.	3	A	H	Biting Insect Environmental Management Plan.
Section 19	Socio-economic	Disturbance of amenity in relation to noise and vibration. Creation of dust. Increased traffic between the Project site and Port Melville. Potential for spillage of mineral sands. Potential for an accident resulting in injury or fatality. Continued access to recreational areas. Preservation of the natural environment.	4	D	S	Continued community consultation through the approval process and into the operational phases. Consultation strategy. Employment strategy. Road transport strategy. Cultural awareness program. Rehabilitation and Mine Closure Plan.

Preliminary Risk Assessment

SECTION 23

Section No.	KEY ISSUES	KEY POTENTIAL IMPACTS	CONSEQUENCE RANKING	LIKELIHOOD RANKING	RISK RANKING	RISK MANAGEMENT ACTIONS/PLANS RECOMMENDED
Section 20	Cultural	Disturbance of background scatter of shell at Lethbridge West. Potential (albeit low) for subsurface archaeological material to be found. Potential for unknown Aboriginal archaeological sites to be disturbed.	3	C	M	Obtain AAPA certificate for the areas to be disturbed. Continued community consultation through the approval process and into the operational phases. Procedures to mitigate any loss of subsurface archaeological material. Cultural Heritage Management Plan.