FORTESCUE METALS GROUP Ltd

RISK ASSESSMENT

IMPACT of FMG Project on the FORTESCUE MARSH ECOSYSTEM

FINDINGS and RECOMMENDATIONS

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1 INTRODUCTION

FMG conducted a risk assessment looking at the potential impact on the Fortescue Marsh ecosystem as a result of the proposed Stage B Iron Ore and Infrastructure Project. The risk assessment was commissioned by Laura Todd – Head of Environment as part of the preparation of the Stage B Public Environmental Review.

The scope of review covered only the impact on the Fortescue Marsh ecosystem and primarily focussed on water abstraction (water supply and mine dewatering), the potential disruption to surface water flows and any impacts on water quality or habitats due to the introduction of foreign materials or by-products of the mining process into the area.

The work was carried out as a team-based risk assessment on 27th October 2004.

2 METHODOLOGY

The assessment was specific in that it focussed on the Fortescue Marsh ecosystem only and utilised the findings from several related specialist hydrology and hydro-geological studies.

The environmental impacts were listed and the risks assessed by a team of specialists using a model based on AS/NZS 4360: 1999 “Risk Management” and utilising risk criteria specifically developed from the guidelines within HB 203: 2000 “Environmental Risk Management”.

Initially, the impacts were assessed on the basis of no specific control measures being in place (defined as “inherent risk”), followed by a re-evaluation of the expected risk with the proposed management procedures and safeguards in place (defined as the “residual risk”).

The risk evaluations, controls and any opportunities for improvement were identified and described on the “Fortescue Metals Group - Environmental Risk Assessment” record form, with detail explanations provided below.

3 PARTICIPANTS:

Identification of environmental impacts, operating practices, control measures and evaluation of the risks were undertaken by personnel with specialist knowledge in the various disciplines. The process was facilitated by Doug Barclay (minRISK).

Personnel involved in the major part of the assessment process included;

NAME	COMPANY	AREA of INVOLVEMENT
Nicky Hogarth	FMG	General environmental impacts
Duncan Storey	Aquaterra	Hydro-geological assessment
Andy Ball	Aquaterra	Hydro-geological assessment
Vince Piper	Aquaterra	Hydrology
Michi Maier	Biota	Flora and fauna
Brian Bell	ENVIRON	General environmental impacts
Ed Heyting	FMG	Project engineering
Doug Barclay	minRISK	Facilitator

4 FINDINGS:

The overall residual risk to the Fortescue Marsh eco-system as a result of the proposed Fortescue Metals Group Project was found to be minimal when control measures were considered.

The initial, uncontrolled (inherent) risk levels were found to be low in most instances - due to the geographical separation of the mining, railway and borefield facilities from the Fortescue Marsh area resulting in an insignificant impact on the surface or groundwater flows. Modelling of the groundwater reserves predicts minimal drawdown on water table levels within the

immediate marsh area – and within the current range of variations due to normal rainfall effects.

The surface water catchment area will be reduced to a small degree, but this reduction is considered to be very small with regards to the total catchment area that flows to the marsh. Disruption to surface water flows has been minimised by the provision of culverts and spillways within the design for the railway embankment formation.

Introduction of foreign plant or fauna species is considered unlikely and will be managed through specific procedures and monitoring programs.

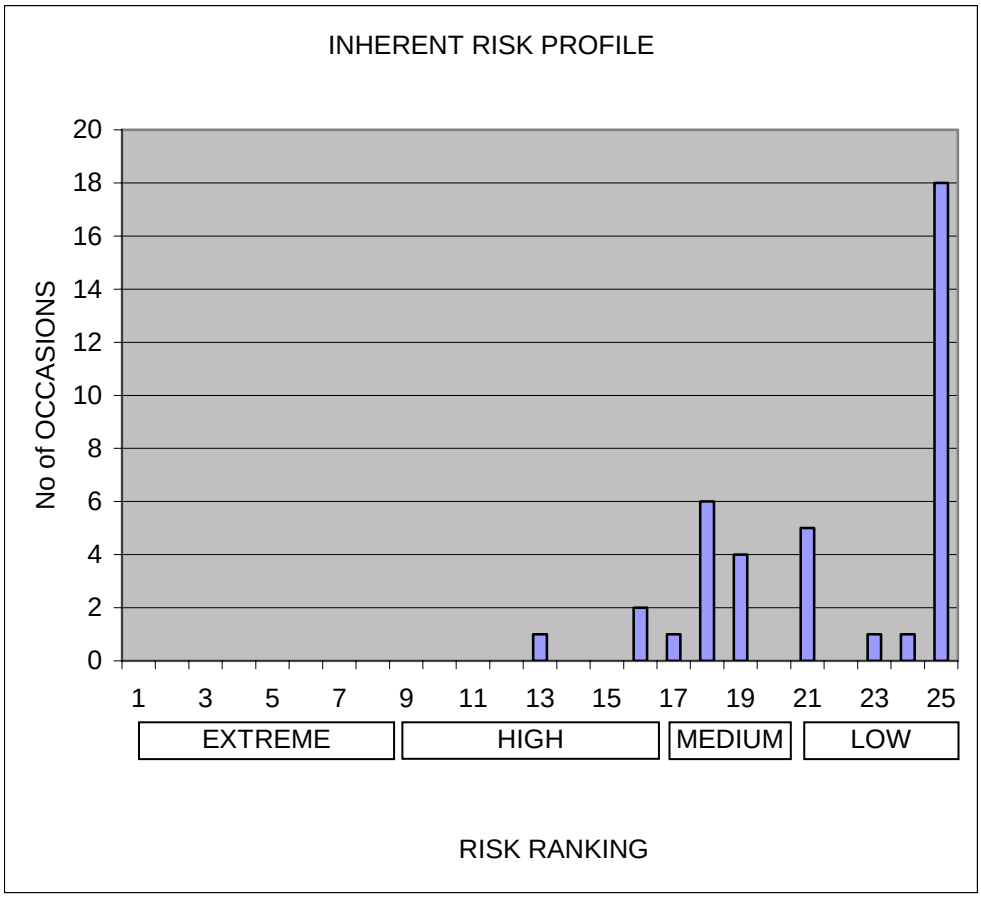
Environmental damage resulting from unexpected events (eg. Hydrocarbon spills) was assessed as a low risk, due to the improbability of the event (on the basis of the routine practices demonstrated regularly elsewhere) and the emergency response plans proposed to mitigate any impacts.

Seepage or spillage from within the proposed mining and processing areas was determined to be outside the area of influence for the marsh, and, additionally, was to be minimised through bunding, process controls or localised catchments.

4.1 Inherent Risks

The summary of the inherent risk assessment rankings was found to be;

Risk Level	*No. of Events*	*Percentage*
Extreme (E)	0	0
High (H)	3	7.7
Moderate (M)	11	28.2
Low (L)	25	64.1
Total	**39**	**100%**



INHERENT RISK PROFILE OF FORTESCUE MARSH AREA

The highest ranked inherent risks were assessed as being associated with:

1. Potential changes in water quality as a result of increased sediment loading as a result of clearing;
2. Potential contamination following loss of hydrocarbons due to road transport accident; and
3. Potential contamination following loss of hydrocarbons due to derailment of locomotives or fuel loads.

In addition to the three high ranked inherent risks, there were another 11 issues where the inherent risks were medium and primarily associated with:

1. potential groundwater impacts (water supply and dewatering);
2. potential surface water impacts (clearing, diversion, loss of catchment);
3. dust generation arising from mining/transport activities;
4. fire management;
5. loss of ecosystem due to clearing and mining activities; and
6. impacts arising from the mining camp and facilities.

The high and medium inherent risks were reviewed by the risk assessment team and potential design and management measures were considered to define the residual risk.

4.1.1 Land Clearing

The working group considered that the highest inherent risk was associated with land clearing due to the loss of vegetation cover and the potential increase in sediment loading in surface water impacting on the marsh area. The proposed management measures including:

1. completing flora & fauna surveys;
2. using land clearance permits;
3. ensuring that all legal obligations are met;
4. supervision of contractors; and
5. undertaking progressive clearing and rehabilitation

will reduce the inherent risk such that the residual risk is low.

4.1.2 Hydrocarbon Management

The transport of hydrocarbons was considered to present the next greatest inherent risk to the Fortescue Marshes which arise from spillages. The proposed management measures including:

1. using licensed dangerous goods haulage contractors;
2. compliance with the dangerous goods act;
3. developing and implementing emergency response plan for the project including transport; and
4. developing and implementing preventative maintenance programmes for the roads, railway and rolling stock.

will reduce the inherent risk such that the residual risk is low.

4.1.3 Fire Management

Fire was considered to present a medium inherent risk to the Fortescue Marshes due to the loss of flora and fauna and the potential increase in sedimentation following the fire. The proposed management measures including:

1. development and implementation of a fire management/prevention plan;
2. inclusion of fire control procedures into the emergency response plan; and
3. development and implementation of operational procedures to reduce fire risk (e.g. use of spark arresters into track grinding and welding activities)

will reduce the inherent risk such that the residual risk is low.

4.1.4 Groundwater Impacts

Potential impacts resulting from mine-dewatering and water supply were considered to present a medium inherent risk to the Fortescue Marshes. The proposed management measures including:

1. detailed hydrogeological modelling to assess the potential water table drawdown on the marsh system;
2. development and implementation of a detailed monitoring programme;
3. third party review of monitoring data including groundwater level and quality to assess the actual impacts of the Project on the groundwater system and confirm that the marsh system is surface water driven; and

4. development of contingency plans for aquifer recharge or alternative abstraction areas that can be implemented in the event that the monitoring programme shows unacceptable (or potentially unacceptable) impacts occurring

will reduce the inherent risk such that the residual risk is low.

4.1.5 Surface Water Management

The development of the Project was considered to present a medium risk to the Fortescue Marshes due to the potential loss of volume of surface water and increased sedimentation loading. Review of the surface water catchment areas indicates that the Project will disturb only a very small proportion of the overall catchment that flows to the Fortescue Marsh area. Nevertheless, FMG recognises the potential for localised impacts and the risk assessment team considers that the proposed management measures including:

1. diversion of surface water run-off around the mining areas;
2. use of surface water collected within the pits within the process;
3. development of contingency plans including the potential to discharge water collected in the pit to the environment downstream of the pits;
4. implementation of the progressive rehabilitation programme to reduce sediment loading.

will reduce the inherent risk on the Fortescue Marshes such that the residual risk is low.

4.1.6 Ecosystem Management

The development of the Project was considered to present a medium risk to the Fortescue Marshes due to the potential loss of ecosystem function due to the introduction of weeds and/or ferrel animals. The proposed management measures including:

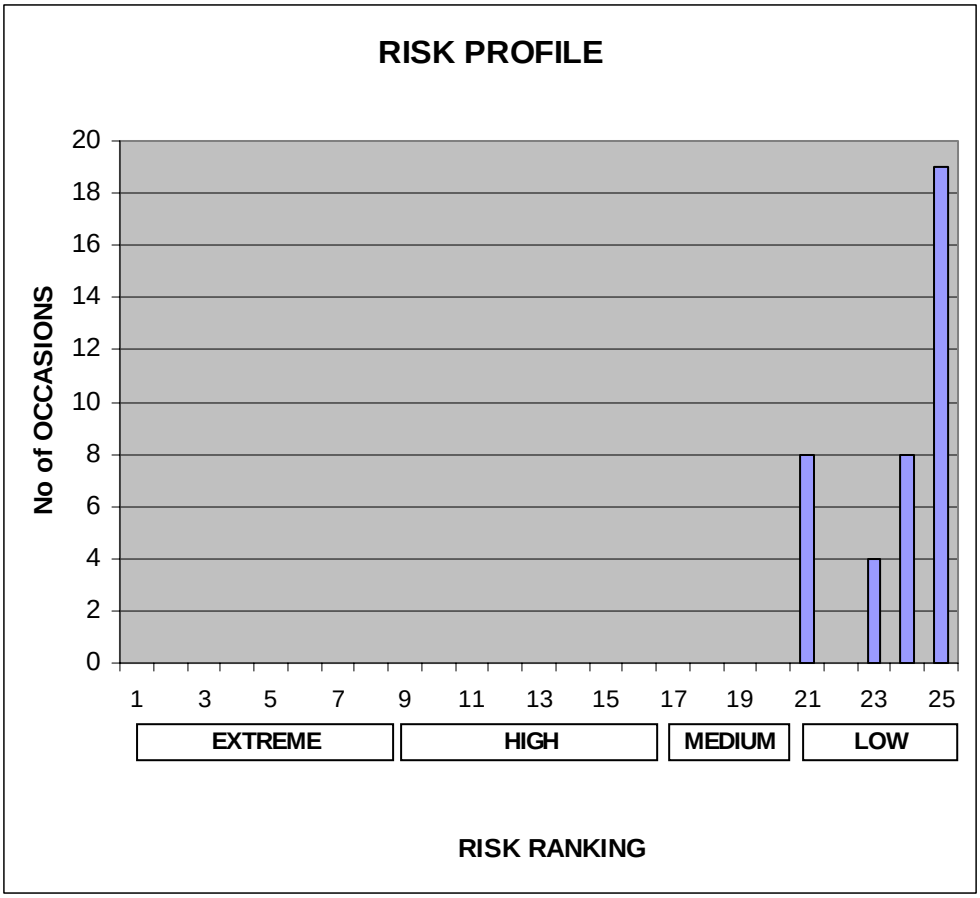
1. restricting access to the marsh area;
2. development and implementation of:
3. weed control programme;
4. vehicle hygiene procedures;
5. education and training programmes for staff and contractors;
6. feral animal control programme; and
7. waste management procedures

will reduce the inherent risk such that the residual risk is low.

4.2 Residual Risks

Following the consideration of available data, preliminary technical studies (e.g. hydrology and hydrogeological reports) and the proposed management measures, the group assessed the potential risks that the Project presents to the Fortescue Marshes. The resultant summary of residual risks and the assessment rankings were as follows:

Risk Level	*No. of Events*	*Percentage*
Extreme (E)	**0**	**0**
High (H)	**0**	**0**
Moderate (M)	**0**	**0**
Low (L)	**39**	**100**
Total	**39**	**100%**



RISK PROFILE OF FORTESCUE MARSH AREA

As illustrated by the above risk profile, the risk assessment group considered that the residual risks of the Project on the Fortescue Marshes was low for all of the identified environmental issues. Many of the impacts with an inherent risk rated as medium were reduced to low primarily as a result of this distance from the Fortescue Marsh.

5 CONCLUSIONS:

Within the scope of this assessment, the risk to the Fortescue Marsh ecosystem as a result of the of the Fortescue Metals Group Mining and Rail Operations at Christmas Creek, Mt Nicholas, and Mt Lewin was determined as being **LOW**.

The ongoing status of the ecosystem will be evaluated through regular monitoring programs and management processes will be implemented to minimise the introduction of any negative impact agents.

RISK ASSESSMENT RECORD SHEETS

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minimise risk – maximise return

ENVIRONMENTAL RISK ASSESSMENT
FORTESCUE MARSH AREA

Insignificant (1)	Almost Certain (A)	Extreme (E)				Insignificant (1)	Almost Certain (A)	Extreme (E)
Minor (2)	Likely (B)	High (H)				Minor (2)	Likely (B)	High (H)
Moderate (3)	Possible (C)	Moderate (M)				Moderate (3)	Possible (C)	Moderate (M)
Major (4)	Unlikely (D)	Low (L)				Major (4)	Unlikely (D)	Low (L)
Catastrophic (5)	Rare (E)					Catastrophic (5)	Rare (E)	

Risk Team Members: Nicky Hogarth, Misha XXX, Brian Bell, Duncan Storey, Andy Ball, Vince Piper, Ed Heyting (part), Doug Barclay (Facilitator)

Date Analysed: 27-Oct-04

Date Reviewed:

SCENARIO			INHERENT RISK (uncontrolled risk)				CURRENT CONTROLS	RESIDUAL RISK (current controls)			
Activity	Issue	Impact	Consequence	Likelihood	Inherent Risk Rating	Inherent Risk No	Description	Consequence	Likelihood	Residual Risk	Residual Risk No.
Borefield operation	Groundwater	Aquifer drawdown - vegetation effect.	Minor (2)	Unlikely (D)	L	21	Monitoring & Measurement / Third Party Hydrological Reports. Develop contingency plans for aquifer recharge or alternative abstraction.	Minor (2)	Rare (E)	L	23
Borefield operation	Groundwater	Aquifer drawdown - vegetation effect in Fortescue River (potential increase in sedimentation within marsh).	Minor (2)	Possible (C)	M	18	Monitoring & Measurement / Third Party Hydrological Reports. Develop contingency plans for aquifer recharge or alternative abstraction.	Minor (2)	Rare (E)	L	23
Borefield operation	Groundwater	Aquifer drawdown - stygofauna effect.	Insignificant (1)	Rare (E)	L	25				L	25
Borefield operation	Groundwater	Aquifer drawdown - effect on stock bores within marsh boundary.	Insignificant (1)	Rare (E)	L	25	Groundwater modelling study shows negligible impact on water table around boundary areas			L	25
Borefield operation	Groundwater	Aquifer drawdown impacting drying cycle.	Minor (2)	Possible (C)	M	18	Monitoring & Measurement / Third Party Hydrological Reports. Develop contingency plans for aquifer recharge or alternative abstraction.	Minor (2)	Unlikely (D)	L	21
Mine Dewatering	Groundwater	Aquifer drawdown - vegetation effect.	Minor (2)	Unlikely (D)	L	21	Monitoring & Measurement / Third Party Hydrological Reports. Develop contingency plans for aquifer recharge or alternative abstraction.	Minor (2)	Rare (E)	L	23
Mine Dewatering	Groundwater	Aquifer drawdown - stygofauna effect.	Insignificant (1)	Rare (E)	L	25				L	25
Mine Dewatering	Groundwater	Aquifer drawdown - effect on stock bores within marsh boundary.	Insignificant (1)	Rare (E)	L	25	Groundwater modelling study shows negligible impact on water table around boundary areas			L	25
Mine Dewatering	Groundwater	Aquifer drawdown impacting drying cycle.	Minor (2)	Possible (C)	M	18	Monitoring & Measurement / Third Party Hydrological Reports. Develop contingency plans for aquifer recharge.	Minor (2)	Unlikely (D)	L	21
Mine Dewatering	Groundwater discharge	Effect of underground disposal of saline water produced from pit dewatering	Insignificant (1)	Rare (E)	L	25	Monitoring & Measurement / Third Party Hydrological Reports. Develop contingency plans for aquifer recharge.			L	25
Mine Dewatering	Groundwater discharge	Flora loss from pipeline failure releasing saline water	Insignificant (1)	Rare (E)	L	25	Bunding, pipeline pressure monitoring and inspections			L	25
Mine Dewatering	Groundwater discharge	Introduction of artificial permanent source of surface water	Insignificant (1)	Rare (E)	L	25	Small catchments and settling sumps, diversion to natural water courses			L	25
Mine Dewatering	Surface water	Potential change of surface water quality	Insignificant (1)	Rare (E)	L	25	Monitoring & Measurement / Third Party Hydrological Reports.			L	25
Mining	Surface water	Water quality changes downstream of pits due to blasting plume	Insignificant (1)	Unlikely (D)	L	24				L	24
Process Plant and Facilities	Surface water	Impact of infrastructure and services on surface water drainage – drainage shadows and ponding, affects vegetation.	Insignificant (1)	Rare (E)	L	25	Divert external run-off, collect and use internal run-off in process			L	25
Railway	Surface water	Loss of volume	Insignificant (1)	Rare (E)	L	25	Runoff diverted through drains and culverts toward natural watercourses			L	25
Railway	Surface water	Increase in sediment loading resulting in reduction in water quality	Minor (2)	Unlikely (D)	L	21	Anti-erosion at culverts and water discharge areas	Insignificant (1)	Unlikely (D)	L	24
Railway	Surface water	Rail formation creating barrier for fauna access to marsh area	Insignificant (1)	Rare (E)	L	25	Culverts and low-height embankments			L	25
Pits	Surface water	Loss of volume	Insignificant (1)	Likely (B)	M	19	Divert external run-off, collect and use internal run-off in process	Insignificant (1)	Unlikely (D)	L	24

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ENVIRONMENTAL RISK ASSESSMENT
FORTESCUE MARSH AREA

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Minor (2)	Likely (B)	High (H)				Minor (2)	Likely (B)	High (H)
Moderate (3)	Possible (C)	Moderate (M)				Moderate (3)	Possible (C)	Moderate (M)
Major (4)	Unlikely (D)	Low (L)				Major (4)	Unlikely (D)	Low (L)
Catastrophic (5)	Rare (E)					Catastrophic (5)	Rare (E)	

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SCENARIO			INHERENT RISK (uncontrolled risk)				CURRENT CONTROLS	RESIDUAL RISK (current controls)			
Activity	Issue	Impact	Consequence	Likelihood	Inherent Risk Rating	Inherent Risk No	Description	Consequence	Likelihood	Residual Risk	Residual Risk No.
Pits	Surface water	Increase in sediment loading resulting in reduction in water quality	Insignificant (1)	Rare (E)	L	25	Run-off generally controlled through settling sumps and diversion drains			L	25
Waste Dumps	Surface water	Loss of volume	Insignificant (1)	Likely (B)	M	19	Divert external run-off,	Insignificant (1)	Unlikely (D)	L	24
Waste Dumps	Surface water	Increase in sediment loading resulting in reduction in water quality	Insignificant (1)	Rare (E)	L	25	Bunds, drains and water diversion through settling sumps			L	25
Stockpiles	Surface water	Loss of volume	Insignificant (1)	Likely (B)	M	19	Divert external run-off, collect and use seepage in process	Insignificant (1)	Unlikely (D)	L	24
Stockpiles	Surface water	Increase in sediment loading resulting in reduction in water quality	Insignificant (1)	Rare (E)	L	25	Bunds, drains and water diversion through settling sumps			L	25
Fuel Transport	Hydrocarbon handling, storage and transport	Soil and water contamination from hydrocarbon spillages due to road transport accident.	Major (4)	Rare (E)	H	16	Licensed haulage / Emergency Response Plan / Preventative Maintenance of equipment and roads / Dangerous Goods management procedures	Minor (2)	Unlikely (D)	L	21
Railway	Hydrocarbon handling, storage and transport	Soil and water contamination from hydrocarbon spillages due to railway derailment	Major (4)	Rare (E)	H	16	Rail transport management procedures, Emergency Response Plan	Minor (2)	Rare (E)	L	23
Fuel Storage	Distribution, storage and handling of lubricants and chemicals	Soil and water contamination due to leakage and spillages from storage and handling practices.	Minor (2)	Unlikely (D)	L	21	Bunded areas / spill absorbent equipment / emergency response plans	Insignificant (1)	Unlikely (D)	L	24
Rejects Storage	Surface and Ground Water	Water (surface and ground) seepage from dam.	Insignificant (1)	Rare (E)	L	25	Rejects Storage Management Plan, Annual Third Party Audits, Emergency Response Plans, daily inspections, QA/QC during dam wall construction and wall lifts / groundwater monitoring			L	25
Clearing	Land Clearance	Loss of flora and fauna habitat when stripping areas to construct pits, railway formation, roads and dumps (potential increase in sedimentation).	Moderate (3)	Possible (C)	H	13	Flora & Fauna Surveys / Land Clearance Permit / Legal Permitting process / Close Supervision of Contractors carrying out the works / progressive clearing program and rehabilitation	Minor (2)	Unlikely (D)	L	21
Mining	Noise	Disturbance of fauna due to mining equipment and blasting activities	Insignificant (1)	Rare (E)	L	25	Approx 5km geographical distance from blast areas			L	25
Mining	Dust generation	Dust generation resulting in increased sediment contamination of surface water	Insignificant (1)	Likely (B)	M	19	Reduced mining areas by progressive rehab plans / dust suppression watercarts	Insignificant (1)	Unlikely (D)	L	24
Railway	Noise	Disturbance of fauna due to rail transport activities	Insignificant (1)	Rare (E)	L	25				L	25
Project	Fire	Increase in sedimentation in surface water following fire in catchment/runoff areas	Moderate (3)	Unlikely (D)	M	17	Fire management plan / emergency response plan / track grinder fire prevention procedures/measures	Minor (2)	Unlikely (D)	L	21
Project	Fire	Fauna deaths within marsh area due to fire	Minor (2)	Unlikely (D)	L	21	Fire management plan / emergency response plan / track grinder fire prevention procedures and safeguards	Minor (2)	Unlikely (D)	L	21
Project	Loss of eco-system	Weeds.	Minor (2)	Possible (C)	M	18	Restrict access into marsh area, vehicle hygiene procedures / education and training	Minor (2)	Unlikely (D)	L	21
Project	Loss of eco-system	Introduced animals.	Minor (2)	Possible (C)	M	18	Feral animal control program / waste management procedures / education and training	Minor (2)	Unlikely (D)	L	21
Mine Closure	Pit Lake	Salinisation of groundwater sink - density driven salt water flow to marsh	Insignificant (1)	Rare (E)	L	25				L	25
Camp and Facilities	Water Quality	Water pollution from greywater	Minor (2)	Rare (E)	L	23	Sewage treatment plant with irrigation system or evaporation ponds	Insignificant (1)	Rare (E)	L	25
Camp and Facilities	Disposal of Waste from Camp Accommodation Rooms and other Facilities at Camp	Loss of aesthetics due to litter from wind blown or inappropriate disposing of waste.	Minor (2)	Possible (C)	M	18	Waste management procedures / education and training	Insignificant (1)	Unlikely (D)	L	24