APPENDIX 5 HAZARD ANALYSIS AND RISK ASSESSMENT

Hazard Identification:

Activity	Frequency	Equipment	Hazards
Vegetation and topsoil stripping	Infrequently	Dozer, excavator, dump trucks.	• Excessive noise impact on neighbours. • Excessive dust impact on adjacent vegetation and visual impact. • Soil erosion and sediment discharge into natural water courses • Hydrocarbon spill to ground or water course. • Natural vegetation damaged adjacent to areas cleared. • Area of vegetation cleared in excess of that required for the work. • Weed and disease spread into natural vegetation. • Windrows slump through poor placement or steep side slopes. • Sediment transport affects watercourse smothering aquatic habitat for threatened species.
Road maintenance	Periodically through operational phase	Dozer, excavator, dump trucks, grader.	• Excessive dust impact on adjacent vegetation and visual impact. • Soil erosion and sediment discharge into natural water courses • Hydrocarbon spill to ground or water course. • Inadequate culvert number, size and inappropriate placement. • Vertical alignment does not promote truck noise attenuation.
Over burden removal and stockpile construction	Periodically through operational phase	Dozer, excavator, dump trucks, wheel loader.	• Excessive noise impact on neighbours. • Excessive dust impact on adjacent vegetation and visual impact. • Hydrocarbon spill to ground or water course. • Stockpiles slump through poor placement or steep side slopes. • Runoff from stockpiles cause siltation in natural vegetation
Face development	Frequently through operational phase	Drilling machine and explosives, excavator.	• Excessive impact from air blast overpressure and vibration on neighbours. • Excessive dust impact on adjacent vegetation and visual impact. • Soil erosion and sediment discharge into natural water courses • Hydrocarbon spill to ground or water course. • Poor face location and progression cause visual impact.

Shot rock processing	Frequently through operational phase	Mobile crusher screener, wheel loader, excavator, crushing plant.	• Excessive dust impact on adjacent vegetation and visual impact. • Hydrocarbon spill to ground or water course. • Mobile crusher noise nuisance to neighbours • Fixed crushing plant noise nuisance to neighbours.
Loading out from stockpiles and transport	Frequently through operational phase	Wheel loader, on road truck and trailer combinations.	• Soil erosion and sediment discharge into natural water courses • Hydrocarbon spill to ground or water course. • Excessive speed causes dust and noise emissions (engine brakes) • Poor timing of trucks causes excessive traffic impact • Inadequately covered or damped loads cause dust impact.

TABLE OF RISK ASSESSMENT

Likelihood		
A	Almost certain	Event expected in 12 month period
B	Likely	Event likely to occur in 12 month period
C	Possible	Event may occur (but not likely) in 12 month period
D	Unlikely	Event not expected in 12 month period
E	Rare	Event extremely unlikely to occur in a 12 month period
F	Extremely rare	May only occur in extreme and exceptional circumstances over a 12 month period

Consequence		
1	Insignificant	Negligible or no environmental harm or nuisance e.g. • Contained oil spill <20 litres. • Incidental and local impact on flora and fauna.
2	Minor	Material environmental harm or nuisance, but prosecution unlikely, local publicity only, local nuisance impacts on community e.g. • Technical breaches of legal requirements regardless of harm or nuisance. • Spills to waterways <100 litres where dispersal/cleanup is simple.
3	Moderate	Serious environmental harm, possible prosecution, local state publicity possible temporary permit and lease restrictions e.g. • Significant oil spill (4000 litres to land, >100 litres to water). • Ecosystem impact requiring expert remedial action and follow up.
4	Major	Serious environmental harm, prosecution probable, national publicity, reputation impacts, probable temporary permit and lease restrictions e.g. • Significant ecosystem impact with residual effects after follow up.
5	Extreme	Serious environmental harm, prosecution certain, severe reputation impact, national publicity, probable permanent permit and lease restrictions e.g. • Significant impact on regional ecosystem, with significant residual effects likely.
6	Catastrophe	Serious environmental harm, prosecution certain with jail terms, permanent damage to reputation, certain loss of permit and mining lease e.g. • Significant and permanent impact on regional ecosystem.

RISK ASSESSMENT MATRIX

Likelihood		Consequence					
		1	2	3	4	5	6
		Insignificant	Minor	Moderate	Major	Extreme	Catastrophe
A	Almost certain	Low	Moderate	High	Extreme	Extreme	Extreme
B	Likely	Low	Moderate	High	Extreme	Extreme	Extreme
C	Possible	Low	Low	Moderate	High	Extreme	Extreme
D	Unlikely	Low	Low	Low	Moderate	High	Extreme
E	Rare	Low	Low	Low	Low	Moderate	High
F	Extremely rare	Low	Low	Low	Low	Low	Moderate

RISK LEVEL ACTION TABLE

Risk rating	Low	Moderate	High	Extreme
Action	Acceptable, activity can proceed, with controls.	Quarry Manager to assess efficacy of controls and authorise activity.	SHE Manager to assess efficacy of controls and authorise activity.	Unacceptable, activity cannot proceed.

HIERARCHY OF CONTROLS

Control		Example
1	Eliminate	Don't proceed with activity or fundamentally rework activity to remove hazard.
2	Substitute	Introduce alternative activity with lower risk rating.
3	Isolate	Install permanent design features to protect against hazard.
4	Engineer out	Change equipment used or introduce features to lower risk rating e.g. improved silencers on equipment.
5	Administrate	Reinforce active controls through documented work procedures and toolbox meetings.
6	Response equipment	Provide workers with equipment to reduce severity of consequences e.g. hydrocarbon spill kits.

RISK ASSESSMENT

Hazard	Likelihood / Consequence	Risk rating	Controls	Risk rating with control
Excessive noise impact on neighbours.	A / 3	High	• Pit development will occur over2 km from nearest receptor (3) • Modern quiet equipment for drilling and processing (4) • Slow vehicle speeds (5)	(D / 3) Low
Excessive dust impact on adjacent vegetation and visual impact.	A / 2	Moderate	• State of art crushing / screening equipment (4) • Use water cart and sprays on windy days (6) • Slow vehicle speeds (5)	(D / 2) Low
Soil erosion and sediment affects watercourse smothering aquatic habitat for threatened species	B / 4	Extreme	• Minimise extent of disturbance (3) • Install sediment retention basins on drains and work areas and clean out regularly (4) • Construct defined drainage paths separate from traffic paths and maintain to high standard (4) • Moderate slope on stockpiles and windrows (5)	(D / 4) Moderate
Hydrocarbon spill to ground or water course.	B / 3	High	• Use modern well maintained equipment (4) • Maintain defined drainage paths separate from traffic paths (4) • Reinforce accidental spill procedure (5) • Have spill kits on hand at all times (6)	(D / 3) Low
Natural vegetation damaged adjacent to areas cleared.	B / 2	Moderate	• Flag work areas before clearing commences (5) • Reinforce best practice clearing procedures (5)	(D / 2) Low
Weed and disease spread into natural vegetation.	C / 4	High	• Adopt ‘Wash Down Guidelines’ for equipment working adjacent natural vegetation (5) • Maintain defined drainage paths separate from traffic paths (4) • Implement weed management plan (5)	(D / 4) Moderate

Excessive impact from air blast overpressure and vibration on neighbours.	D / 4	Moderate	• Blasting only during restricted hours (1) • Number of holes per blast controlled (4) • Overburden thickness maintained (4) • Stemming height restricted (4) • Power level controlled (4) • Professional blasting subcontractor used for all blasts (5) • Do not blast when poor weather conditions prevail (5)	(E / 4) Low
Poor timing of trucks causes excessive traffic impact	A / 2	Moderate	• Delays on weighbridge cause truck releases to be staggered 1 or 2 minutes (3) • Driver awareness (5)	(C / 2) Low
Fixed crusher equipment noise nuisance to neighbours.	D / 4	Moderate	• Crushing only during normal working hours (1) •	(E / 4) Low