

YOONGARILLUP MINE CLOSURE RISK ASSESSMENT



Last Updated: May 2014				Risk Assessment Prior to Controls being Established			Risk Assessment Controls / Procedures Established to Manage Risks							
Item No.	Risk	Hazard	Possible Causes	Potential Impacts	Worst Case Scenario	Likelihood	Consequence	Risk Rating	Control	Likelihood	Consequence	Risk Rating	Responsible Person	Control Status
MINE CLOSURE PLANNING / CORPORATE RISK														
1	Compliance	Legal Obligations and Commitments not Achieved	1. Failure to plan to meet legal obligations. 2. Failure to implement / undertake legal obligations. 3. Failure to understand, or difference in interpretation, of obligations.	1. Prosecution with associated penalties. 2. Delay to relinquishing land tenure, involving management time and cost. 3. Cost of rework. 4. Deterioration of public reputation. 5. Failure to get bonds released.	Earthworks are required to rework final landform(s) to meet an obligation.	Unlikely	Major	High	1. Legal obligations and commitments identified and included within MCP. 2. MCP includes tracking of how obligations and commitments are being met. 3. 'Decision making stakeholder' review and acceptance of how obligations are being met, prior to closure. 4. AER includes discussion on closure and rehabilitation 5. Update and maintain Legal Compliance Register	Rare	Major	Medium	Mine Manager	
2	Cost	Inadequate Financial Provision set aside for Decommissioning and Rehabilitation	1. Underestimate of costs 2. Specific items required at and post-closure are not costed. 3. Assumptions used prove to be inaccurate. 4. Schedule blows out.	1. State government pursues Doral owners for costs. 2. Deterioration of public reputation.	State government pursues Doral owners for costs	Likely	Catastrophic	Extreme	1. Annual review of MCP and cost estimates, with continual improvement in the level of detail contained. 2. Feedback from actual rehabilitation expenditure is utilised in updates to rehabilitation cost estimates and provisioning. 3. Assumptions used in cost estimates to be included within the MCP and reviewed annually.	Unlikely	Catastrophic	High	General Manager Mine Manager	
3	Closure Plan	Time to complete Mine Closure and Revegetation works extends beyond scheduled program	1. Closure implementation not planned for. 2. Closure implementation schedule not based on learnings from progressive rehabilitation. 3. Schedule is not location specific.	1. Cost overrun due to increased duration of activities. 2. Deterioration of public reputation. 3. Contractual dispute with landowners due to inability to hand back land in the agreed condition within agreed timeframe. 4. Impact on neighbouring landowners and community due ongoing delays (e.g. ongoing road closures, noise impacts, irrigation channel control)	Cost overrun due to increased duration of activities	Almost certain	Catastrophic	Extreme	1. MCP and rehabilitation schedule annually updated. 2. Ongoing consultation with landowners regarding handback of land and contractual obligations. 3. Ongoing consultation with stakeholders regarding planned implementation of closure.	Rare	Major	Medium	Mine Manager	
EFFECTIVE REHABILITATION														
ALL DISTURBED AREAS														
4	Completion Criteria not achieved	Contaminated Sites	1. Dry plant tails not adequately covered with low radiation soils. 2. Diesel (or other hydrocarbon) spill or leak. 3. Acid Sulphate Soils are oxidised creating acidity.	1. Elevated radiation levels at the final landform surface. 2. Hydrocarbon contaminated soil and/or water. 3. Acidified soil and/or water.	Contaminated site prevents relinquishment of land and incurs significant costs for ongoing treatment	Possible	Major	High	1. Undertake hydrocarbon site contamination assessment. 2. Decontaminate any hydrocarbon contamination identified. 3. Pre- and post-mining radiation surveys. 4. Dry plant tailings is capped with 5 metres of sand, clay, overburden and/or soil. 5. Water and soil monitoring to detect acidification resulting from ASS. 6. If required implementation of the ASS Management Plan.	Unlikely	Moderate	Medium	Mine Manager	
5	Completion Criteria not achieved	Geotechnical stability (subsidence)	1. Backfill in mine pits consolidation pattern is unknown or not as expected. 2. Post-mining land owners build structures on backfilled mining voids.	1. Cost of rework to correct (e.g. maintenance backfilling of shallow slumps). 2. Compensation (cost) to future land users if structures fail. 3. Changes to surface water drainage if not corrected. 4. Restrictions to post-mining agricultural management (e.g. hazards to livestock or restriction to vehicle and equipment movement). 5. Structural failure of road (built over mine pit). 6. Reduced land value at time of sale.	Cost to correct or remedy structure (i.e. road, house or shed) built on backfilled mine pit which fails due to ground subsidence.	Unlikely	Major	High	1. Mined out road tenure (i.e. areas where post-mining land use is road reserve) is backfilled with materials that meet compaction specifications. 2. Subsidence monitoring and rework to correct. 3. Land is monitored by Doral for at least 3 years prior to return to landowner. 4. Map rehabilitated mine pit backfill types and depth.	Unlikely	Moderate	Medium	Mine Manager	
6	Completion Criteria not achieved	Mining Infrastructure removal (failure to completely remove)	1. Not enough money available at closure to remove all infrastructure. 2. Not all infrastructure identified and costed. 3. Recovery/Sale value assumed in cost estimate overly optimistic.	1. Delay in handover / relinquishment of land until infrastructure removed. 2. Ongoing liability to public safety for any infrastructure left on site. 3. Deterioration of public reputation.	Delay in handover / relinquish of land resulting in ongoing cost incursion.	Possible	Major	High	1. Closure cost estimates and provisioning includes removal of infrastructure. 2. Closure cost estimates are prepared by suitably qualified professionals experienced in produce mine closure cost estimates. 3. Closure cost estimates and provisioning is reviewed and updated on annual basis.	Unlikely	Moderate	Medium	Mine Manager	

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7	Completion Criteria not achieved	Groundwater (does not return similar to pre-mining functioning)	1. Groundwater patterns and flows on site not understood. 2. Groundwater flows and quality not considered in rehabilitation planning. 3. Backfill of mine pits with sand or overburden/tails locally changes the groundwater behaviour (i.e. localised waterlogging / flooding occurs, or soil suffers springtime 'drought').	1. Amenity / use of land is compromised. 2. Agricultural productivity is reduced. 3. Land not able to sustain target native vegetation growth. 4. Neighbours water bores dry up at or post-closure.	Neighbours water bores dry up at or post-closure.	Possible	Moderate	High	1. Groundwater investigation, modelling and assessment undertaken, including post-mining groundwater recovery. 2. Groundwater monitoring includes neighbouring landowners bores. 3. Post-mining soil profiles on coastal plain include 'duplex' soils within top 1 metre, which recreates perched watertable which supplies water for agricultural species.	Unlikely	Moderate	Medium	Environmental Manager	
8	Completion Criteria not achieved	Weeds (agricultural, environmental and declared)	1. Failure to identify, monitor and control weeds	1. Cost of control. 2. Compliance (declared weeds, revegetation composition). 3. Deterioration of public relations. 4. Competition from weeds results in failure of revegetation.	Competition from weeds results in revegetation failure (either native or agricultural revegetation).	Almost certain	Moderate	Extreme	1. Pre-disturbance surveys 2. Regular monitoring 3. Removal and spraying of weeds in rehabilitated native vegetation areas 4. Implement weed control in agricultural areas	Unlikely	Minor	Low	Environmental Manager	
9	Completion Criteria not achieved	Landforms (do not support agreed landuses)	1. Design landforms and soil profiles do not support agreed landuse. 2. Performance of landforms and soil profiles not well understood and assumptions prove incorrect. 3. Landforms and soil profiles are not created (implemented) as designed.	1. Delay in handover / relinquishment of land as it is not fit for new landuse 2. Cost to rework to meet agreed landuse.	Cost of rework / remediation.	Possible	Major	High	1. Landform and soil profile design based on industry experience, good science and site specific information. 2. Adequate supervision of rehabilitation activities so that landforms and soil profiles are created as designed. 3. Monitor/measure performance of landforms and soil profiles in rehabilitated areas, and incorporate any learnings/lessons into future rehabilitation design.	Unlikely	Major	Medium	Mine Manager	
ROAD / ROAD RESERVE REINSTATEMENT														
10	Completion Criteria not achieved	Reinstated Roads and Road Reserves Road do not achieve required completion standards	1. Failure to plan to reinstate all required infrastructure. 2. Reinstated infrastructure not build to required standard.	1. Unplanned rework cost. 2. Delay in handover / relinquishment of land.	Cost of rework / remediation.	Possible	Major	High	1. Infrastructure to be reinstated is clearly identified and costed for within MCP. 2. Utilisation of Busselton City and Main Roads road standards, 3. Agree required standard for infrastructure in consultation with landowners and include within MCP.	Possible	Major	Medium	Mine Manager	
STATE FOREST AREA														
11	Completion Criteria not achieved	Erosion in Whicher forest sub area	1. Unstable and unvegetated surface soils (i.e. sands) and creeklines. 2. Landform design does not accommodate surface water flows of site.	1. Cost of rework. 2. Deterioration of public reputation. 3. Impacts on neighbours (e.g. road reserves, adjoining landowners)	vegetation fails to establish on either agricultural land of forest sub area	Almost certain	Catastrophic	Extreme	1. When economics are marginal avoid Whicher forest sub area. 3. Soil profiles are established based on recommendation and findings from pre mining soil assessment. 4. Regular inspection and rework to correct smaller issues before escalation to significant damage.	Possible	Minor	Medium	Mine Manager	
12	Completion Criteria not achieved	Sustainability of Native Revegetation is not achieved	1. Planted in areas with too little soil water available (e.g. mine voids backfilled with sand tails). 2. Stock or vermin (e.g. rabbits) eat seedlings 3. Area is unexpectedly waterlogged and seedlings die due to waterlogging. 4. Vegetation succumbs to disease (i.e.. dieback). 5. Erosion 6. Weed competition. 7. Low rainfall seasonal conditions.	1. Forest sub area rehabilitation not able to be achieved (resulting in compliance issue, loss of licence to operate and/or difficulty getting access to new areas). 2. Cost of rework (where rework solution is possible). 3. Change to post-mining landuse.	Whicher forest sub area revegetation fails to establish.	Almost certain	Catastrophic	Extreme	1. Careful reconstruction of soil profile including 150mm of topsoil, 300mm subsoil and minimum of 2500mm of overburden. 2. Seedlings area planted and tree guards installed. 3. Dieback management measures as defined in Rehabilitation Management Plans for rehabilitated whicher forest area. 4. Vegetation species are selected according to agreed revegetation species criteria. 5. Kangaroo fencing and managed culling. 6. Rabbit control baiting. 8. Inspection and adaptive management (response to weeds, grazing pressure, erosion) 9. Undertake infill / secondary plantings as required to achieve required vegetation densities.	Unlikely	Moderate	Medium	Environmental Manager	

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AGRICULTURAL / Paddock AREAS														
13	Completion Criteria not achieved	Agricultural Productivity is less than pre-mining levels	1. Post-mining soil profiles do not support productive pastures 2. Saline ground water contaminates surface soils 3. Poor pasture management practices (e.g. fertiliser use, weed control, stock management)	1. Post-mining land fails to be as productive as pre-mining land. 2. Loss of access to future deposits. 3. Inability to relinquish tenement and return land landowner.	Earthworks are required to rework final landform(s) to meet an obligation.	Possible	Catastrophic	Extreme	1. Design soils profiles for each rehab block with at least 15cm of topsoil and 1 m of subsoil materials on top of sand tails. 2. Keep topsoil and subsoil for use in rehab. 3. Keep no less than 100mm of subsoil when ore is to surface. 4. Measure soil properties and agricultural productivity (pre and post mining). 5. Control of groundwater during operations, such that rehab surface soils are not contaminated. 6. Implement good practice pasture management practices. 7. Develop and obtain landholder agreement to detailed landform designs.	Unlikely	Moderate	Medium	Environmental Manager	
PROVISION OF OFFSET AREAS														
14	Completion Criteria not achieved	Conservation Offset Areas are not sustainable	1. Dieback kills established vegetation 2. Altered water regime (ie local drought)	1. Loss of access to future deposits. 2. Deterioration of public reputation.	Conservation offset vegetation dies shortly after closure and access to future mineral deposits is denied by Government.	Unlikely	Catastrophic	High	1. Legal mechanisms for implementing management controls of Offset areas are established by Doral prior to land transfer. 2. Offset strategy shall incorporate areas of established bushland. 3. Offset Strategy shall incorporate a Management Plan to address issues related to dieback, weed invasion, feral animal exclusion, fire management	Rare	Major	Medium	Environmental Manager	