

The background is a solid teal color with several large, overlapping, irregular shapes in a lighter shade of teal. These shapes are arranged in a roughly circular pattern, creating a sense of depth and movement. The shapes are smooth and rounded, resembling stylized waves or organic forms.

APPENDIX 12

Environmental Risk Analysis

Preliminary Environmental Risk Analysis

To assist in identifying the key environment and social issues that require detailed assessment as part of the Environmental Impact Statement (EIS), a preliminary environmental risk analysis has been completed for the Project. The preliminary environmental risk analysis has been undertaken in general accordance with the principles outlined in Australian Standard AS/NZS ISO 31000:2009. The environmental and social risks have been categorised with a Risk Ranking of high to low.

Table 1 – Likelihood Criteria and Risk Matrix

Basis of Rating	E - Rare	D - Unlikely	C - Possible	B - Likely	A – Almost Certain
LIFETIME OR PROJECT OR TRIAL OR FIXED TIME PERIOD OR NEW PROCESS / PLANT / R&D	Unlikely to occur during a lifetime OR Very unlikely to occur OR No known occurrences in broader worldwide industry	Could occur about once during a lifetime OR More likely <u>NOT</u> to occur than to occur OR Has occurred at least once in broader worldwide industry	Could occur more than once during a lifetime OR As likely to occur as not to occur OR Has occurred at least once in the mining / commodities trading industries	May occur about once per year OR More likely to occur than not occur OR Has occurred at least once within Glencore	May occur several times per year OR Expected to occur OR Has occurred several times within Glencore
5 Catastrophic	15 (M)	19 (H)	22 (H)	24 (H)	25 (H)
4 Major	10 (M)	14 (M)	18 (H)	21 (H)	23 (H)
3 Moderate	6 (L)	9 (M)	13 (M)	17 (H)	20 (H)
2 Minor	3 (L)	5 (L)	8 (M)	12 (M)	16 (M)
1 Negligible	1 (L)	2 (L)	4 (L)	7 (M)	11 (M)

Table 4 – Preliminary Environmental Risk Analysis

Aspect	Potential Impact	Status and Proposed Control	Risk Assessment			Further Assessment Requirements	Further Assess. Required
			C	L	R		
Noise	Degradation of noise amenity (including cumulative impacts). Potential impact of road traffic noise based on the traffic movements associated with the extension of the mine life as a result of the proposed Project.	Risk that noise from mining (particularly overburden emplacement up to 200m AHD) will impact the residential receptors at Camberwell, Hebden and Falbrook areas. The construction of proposed infrastructure may result in degradation of noise amenity. Controls included as part of the Project to reduce noise impacts include truck fleet management, use of noise attenuated equipment and active management of equipment scheduling/location (e.g. night/day time dump options).	3	B	17 (H)	An assessment of the potential impacts of the Project relating to noise is required.	Yes
Blasting	Vibration impacts on structures and other sensitive receivers. Potential impacts from overpressure. Potential impacts on Road users due to temporary closures for Blasting.	Risk that active mining area is moving closer to sensitive receivers to the north. Controls to be included as part of the Project includes the use of blast design and monitoring procedures, controlled timing and frequency of blasting and notification of blasting times to surrounding residences and mining operations.	2	C	8 (M)	An assessment of the potential impacts of the Project relating to blasting is required.	Yes
Air Quality	Increased dust emissions resulting in degraded air quality and potential health impacts and impacts on amenity, including cumulative impacts. Potential visual and health impacts from blast plume.	Mining may result in degradation of local air quality through both exposure and handling of coal and overburden. In addition cumulative dust impacts associated with the construction of the proposed infrastructure and the operation of other mines in the Hunter Valley is a key issue. Dust impacts will be controlled through measures including mine design, haul road management (including watering), progressive rehabilitation and restricting or ceasing dust-generating activities during adverse meteorological conditions.	3	B	17 (H)	An assessment of the potential impacts of the Project relating to dust generation is required.	Yes

Aspect	Potential Impact	Status and Proposed Control	Risk Assessment			Further Assessment Requirements	Further Assess. Required
			C	L	R		
Odour	Increased odour due to fumes from blasts and fumes from spontaneous combustion	Spontaneous combustion is not an issue for the current Mount Owen Complex and is not expected to be for the proposed Project. No incidents of blast fume outside project area at Mount Owen or Glendell. Hebden Road will be in closer proximity to Glendell Pit Extension than current operations.	2	D	5 (L)	Risks associated with blast fumes will be assessed as part of the blasting and air quality assessment. An assessment of the potential impacts of spontaneous combustion the Project relating to odour is not considered a key issue of the Project.	No
Microclimate	Impact of changes in terrain may affect climate	Changes in terrain will affect climate in the immediate vicinity of emplacement areas, however the impacts are localised and restricted to areas close to overburden emplacement areas. Any impacts will be limited to the Project Area and are of small magnitude.	1	C	4 (L)	Risks associated with microclimate are not considered to warrant a detailed assessment.	No
Surface Water – Water Quality	Runoff from disturbed areas has potential to increase turbidity. Runoff from areas in contact with coal, tailings or workshops has the potential to affect water quality. Pit lake water quality has the potential to have elevated salinity.	The proposed mining activities will interact with and potentially impact on surface waters including through changes to the mine water management system, water use and catchment area changes. A range of surface water management measures, including erosion and sediment structures will be incorporated into the project design and will be discussed as part of the detailed surface water assessment for the EIS.	3	C	13 (M)	An assessment of the potential impacts of the Project on surface waters will be undertaken. Assessment to include consideration of design principles for Yorks Creek Diversion and final landform drainage design	Yes

Aspect	Potential Impact	Status and Proposed Control	Risk Assessment			Further Assessment Requirements	Further Assess. Required
			C	L	R		
Surface Water - Water Availability	<p>Potential impact to surface water quantity and availability</p> <p>Final landform has potential to alter catchments relative to pre mining environments</p> <p>Diversion of Yorks Creek will affect flows in Yorks Creek</p> <p>Removal of upper catchment of Swamp Creek will affect flows to Swamp Creek</p>	<p>During mining operations, catchments will be reduced.</p> <p>Final landform will alter catchment sizes relative to approved operations</p> <p>Yorks Creek diverted</p> <p>Reduced catchment size to be covered by licensing</p>	3	B	17 (H)	<p>An assessment of the potential impacts of the Project on surface waters will be undertaken.</p> <p>Assessment to include consideration of design principles for Yorks Creek Diversion and final landform drainage design</p>	Yes
Water Balance	<p>Potential excess of water for ongoing mining operations and risk of spill</p>	<p>Existing site water balance model developed to identify water demand. Mount Owen Complex currently has water sharing arrangements with other Glendell owned mines as part of the Greater Ravensworth Area Water and Tailings Scheme.</p>	3	C	13 (M)	<p>Water balance model to be updated and included within the EIS.</p>	Yes
Groundwater	<p>Interactions and potential impacts on aquifers</p>	<p>The proposed mining activities will intercept groundwater and may result in impacts to groundwater users and flows.</p> <p>Glendell Pit Extension will have a localised depressurisation effects on groundwater systems. This may affect bores and alluvial aquifers in Bowmans Creek. Aquifer systems already impacted by existing operations in area.</p> <p>The current concept design of the Glendell Pit Extension maintains a minimum standoff of 200 metres from the high bank of Bowman's Creek.</p> <p>Alluvial cut-offs in Yorks creek to prevent direct connectivity of pit to Bowmans Creek alluvial aquifer</p> <p>Mining of anticline likely to mitigate impacts on Bowmans Creek Alluvial aquifers</p> <p>Groundwater take to be licensed</p>	2	B	12 (M)	<p>An assessment of the potential impacts of the Project on groundwater will be undertaken.</p>	Yes

Aspect	Potential Impact	Status and Proposed Control	Risk Assessment			Further Assessment Requirements	Further Assess. Required
			C	L	R		
Agricultural Lands	Impacts to Agricultural Land	Disturbance of potential agricultural land, including BSAL Project to be located within Glendell owned property. BSAL areas not impacted by mining and can be returned to grazing capability	2	B	12 (M)	An assessment of the potential impacts of the Project on agriculture and agricultural enterprises will be undertaken.	Yes
Aboriginal Cultural Heritage and archaeology	Potential impact to Aboriginal Heritage sites.	The Project will require areas of additional disturbance which and some known sites of Aboriginal Heritage will be impacted. The Area has significance to local community, Aboriginal knowledge holders and persons. A detailed Cultural Heritage assessment and Aboriginal archaeology assessment will be completed for the Project in partnership with the Registered Aboriginal Parties. The project has been designed to minimise the disturbance area and impacts to known sites of high significance.	3	A	20 (H)	An assessment of the potential impacts of the Project on Aboriginal Cultural Heritage values and archaeology is required.	Yes

Aspect	Potential Impact	Status and Proposed Control	Risk Assessment			Further Assessment Requirements	Further Assess. Required
			C	L	R		
Historic Heritage/ Built Heritage	<p>Predicted impacts to historical heritage features from the Project.</p> <p>Relocation of Ravensworth Homestead</p>	<p>The Project requires relocation of Ravensworth Homestead which is listed as locally significant.</p> <p>An advisory committee has been formed to develop and investigate options for the potential relocation.</p> <p>Consultation with stakeholders not forming part of the committee will continue throughout the EIS process.</p> <p>The Project will require areas of additional disturbance which has the potential for some areas of historic heritage value to be impacted. Potential for impacts on historic heritage values or site as a result of blasting.</p> <p>Predictive Blast modelling is undertaken prior to each blast on site. Modelling incorporates consideration of meteorological conditions.</p>	4	A	23 (H)	An assessment of the potential impacts of the Project on historic heritage values is required.	Yes
Natural Heritage	Impact on natural heritage items	There are no significant natural heritage items in the local areas that are likely to be impacted by the Project.	1	A	1 (L)	Not considered a key issue for the Project.	No
Visual Amenity	Aesthetics of mining operations and surface facilities.	<p>Mining operations and overburden emplacement areas will be visible from New England Highway and Hebden Road. Operations (overburden emplacement) may also be visible at some residences to the south and east.</p> <p>Mine design will be undertaken in consideration of visual amenity requirements.</p> <p>Aspects of the proposed infrastructure will be visible from public viewing points therefore these aspects of the Project will also be included in the visual assessment. Glendell are seeking to design and implement a final landform that will provide undulating aspects to reduce visual impact.</p>	2	B	17 (H)	An assessment of the potential impacts of the Project on the visual amenity of the area is required.	Yes

Aspect	Potential Impact	Status and Proposed Control	Risk Assessment			Further Assessment Requirements	Further Assess. Required
			C	L	R		
Greenhouse Gas	Emission of greenhouse gases from continued mining operations and infrastructure construction and contribution to climate change.	<p>Mining equipment will require use of electricity, diesel and petrol. In addition there will be fugitive emissions from the Project. Scope 3 emissions as a result of burning product coal are also a source of greenhouse gas emissions.</p> <p>The construction works associated with the Project will result in energy use and the generation of greenhouse gas emissions.</p> <p>Mount Owen Complex currently implements a greenhouse gas management plan and energy savings action plan that identify key greenhouse gas reduction measures.</p>	2	A	16 (M)	An assessment of Scope 1, 2 and 3 greenhouse gas emissions from the Project will be undertaken and appropriate management and mitigation measures identified.	Yes
Traffic	<p>Additional traffic associated with the construction phase of the Project and impact on the road network.</p> <p>Potential road closures due to blasting within 500 m of Hebden Road.</p> <p>Potential road closures of Hebden Road during construction and commissioning of the realignment.</p> <p>Potential impact to traffic movements along different section of Hebden Road and at MIA intersections.</p> <p>Additional travel distance associated with the realignment of Hebden Road.</p>	<p>Project design includes construction of a realignment of Hebden Road and construction of a Heavy Vehicle Access Road. These proposed works will result in alterations to the existing traffic conditions and motorists may experience travel delays during construction. The realigned section of Hebden Road will be fully constructed prior to decommissioning of the existing section to minimise the construction impacts on road users.</p> <p>The operational workforce of the Mount Owen Complex will not increase as a result of the proposed Project due to the transition of the workforce from Mount Owen to the Glendell mine as mining ceases in the Bayswater North Pit and North Pit.</p> <p>Traffic and transport impacts associated with the proposed Project such as the adequacy of intersections and traffic routes will be assessed as part of the EIS.</p>	2	A	11 (M)	Traffic impact assessment will be undertaken as part of EIS.	Yes

Aspect	Potential Impact	Status and Proposed Control	Risk Assessment			Further Assessment Requirements	Further Assess. Required
			C	L	R		
Access to property	Potential impacts of project on access to property	<p>Realignment of Hebden Road will increase travel duration for residents in the Hebden area. Flood liability of road may also restrict access.</p> <p>Hebden Residences, Quarry Trucks, Mount Owen Complex Employees are key Hebden Road users which may be affected.</p> <p>The Traffic Impact assessment will assess the impacts of the proposed realignment of Hebden Road.</p>	1	C	4 (L)	Traffic impact assessment will be undertaken as part of EIS.	Yes
Access to utilities	Potential impacts of project on access to utilities	<p>Some realignment of local utilities will occur as part of the Project. Realignment and commissioning will occur prior to decommission of existing utilities.</p> <p>Hebden residences may also be affected.</p>	1	C	4 (L)		
Offsite Parking	Not holding sufficient parking for workforce during construction and operation	The Project will provide sufficient parking spaces for the operational and construction workforce during all stages of the Project and will be located off public roads.	1	A	1 (L)	Not considered a key issue for the Project	No
Public Safety	Potential impact on public safety through changes in road conditions associated with Hebden Road realignment and increased traffic movements during construction phases are	<p>The potential impacts can be managed to acceptable levels through standard and project specific management controls.</p> <p>Final landform will include pit lake and may include retained highwalls which present potential public safety risks.</p> <p>All impacts will be considered in specialist studies prepared for the EIS.</p>	2	D	5 (L)	Not considered a key issue for the Project to warrant standalone assessment. Public safety risks associated with final landform to be considered in Mine Closure and Rehabilitation Assessment.	Partial

Aspect	Potential Impact	Status and Proposed Control	Risk Assessment			Further Assessment Requirements	Further Assess. Required
			C	L	R		
Built features	Potential impact on built features and facilities (other than heritage items)	Roads impacted by project will be relocated. Some former farm buildings to be removed. Not currently occupied or required. Impacts of infrastructure items will be considered as part of the Social Impact Assessment.	1	C	4 (L)	Not considered a key issue for the Project	Partial
Land capability	Potential impact on land capability	Changes in terrain will affect Land Capability. Soils will be removed and reused. Final void will reduce agricultural capability but may have other (potentially higher) beneficial land uses.	2	A	16 (M)	Agriculture Impact and Mine Closure and Rehabilitation Assessments will be completed for the Project.	Yes
Land - Topography	Potential impact on topography	Mining will significantly affect the topography.	2	A	16 (M)	Agriculture Impact and Mine Closure and Rehabilitation Assessments will be completed for the Project.	
Biodiversity – Native Vegetation	Impact flora and vegetation communities including threatened species and Threatened Ecological Communities (TECs), Endangered Ecological Communities (EECs) and Endangered Populations	The Project will require areas of additional disturbance which has the potential for some areas of ecological value to be impacted, including an EEC/CEEC and listed threatened species and populations. An ecological survey is being completed within the Project area focussing on the Potential Additional Disturbance Area. The Project is designed to reduce/minimise the disturbance area and level of offset required. The mining area will be progressively rehabilitated throughout the duration of mining.	3	B	17 (H)	An assessment of the potential impacts of the Project on biodiversity values is required.	Yes

Aspect	Potential Impact	Status and Proposed Control	Risk Assessment			Further Assessment Requirements	Further Assess. Required
			C	L	R		
Biodiversity – Native Fauna	Potential impact on native fauna including threatened species	<p>Surface disturbing activities will remove habitat for some fauna. Threatened species known to and have potential to occur in Potential Additional Disturbance Area will be affected.</p> <p>An ecological survey is being completed within the Project area focussing on the Potential Additional Disturbance Area. The Project is designed to reduce/minimise the disturbance area and level of offset required. The mining area will be progressively rehabilitated throughout the duration of mining.</p>	3	B	17 (H)	An assessment of the potential impacts of the Project on biodiversity values is required.	Yes
Biodiversity – Ground Water Dependent Ecosystems	Potential impact on stygofauna, hyporheic fauna and riparian vegetation dependant on colluvial flows	<p>Depressurisation impacts on groundwater systems may impact on Stygofauna.</p> <p>Drawdown impacts and reduced baseflows on creeks may impact upon riparian vegetation and hyporheic fauna.</p> <p>Stygofauna surveys to be undertaken to understand potential impacts.</p>	2	C	8 (M)	Stygofauna assessment to be undertaken with potential impacts considered in the groundwater Impact Assessment and the Biodiversity Assessment.	Yes
Bushfire	Potential increase in risk of bushfires as a result of the Project	<p>The Project will not increase bushfire risk.</p> <p>Revegetation of disturbed areas may increase the amount of vegetation potential prone to bushfire.</p> <p>Management of bushfire risks will be similar to existing operations.</p>	1	C	4 (L)	A bushfire assessment is not required for the Project.	No

Aspect	Potential Impact	Status and Proposed Control	Risk Assessment			Further Assessment Requirements	Further Assess. Required
			C	L	R		
Housing	Lack of availability of accommodation in the local area	Operational workforce will remain largely unchanged throughout the life of the Project; however a moderate increase in workforce will occur associated with construction activities. The Social Impact Assessment will consider the availability of accommodation in the local area and potential impacts on accommodation supply.	2	C	8 (M)	Considered as part of the Social Impact Assessment	Yes
Undermining	The Project will result in subsidence	The Project does not involve underground workings. The Project is not subject to undermining from approved operations. Mine design has had regard to existing and proposed mining operations at Integra Underground and Liddell Coal.	1	C	4 (L)	Not considered as a risk of the Project.	No
Coastal Hazards	Impact of coastal hazards on Project	The Project Area is not subject to coastal hazards.	1	A	1 (L)	Not required	No
Socio-economic	The Project has the potential to result in a range of social and economic impacts, both positive and negative including sterilisation of coal resources if Project does not proceed Loss of Agricultural land if Project does proceed	The Project does not result in a significant increase to operational staff; however it will provide ongoing employment opportunities and provide significant employment during the construction phase. An extensive stakeholder engagement program will be developed and consultation undertaken as part of the EIS. Socio economic impacts will be identified and management measures will be proposed to manage any impacts as appropriate.	3-4	A	20-23 (H)	A detailed Social Impact Assessment and an Economic Assessment will be completed for the Project.	Yes

Aspect	Potential Impact	Status and Proposed Control	Risk Assessment			Further Assessment Requirements	Further Assess. Required
			C	L	R		
Community - Health	Particulate matter is known to be associated with various public health impacts. Project's social impacts may have positive and negative impacts on public health outcomes	Refer to Air Quality Issues and Socio-economic issues.	2	C	8 (M)	A detailed Social Impact Assessment and an Economic Assessment will be completed for the Project. A detailed Air Quality Impact Assessment will be undertaken which assesses the project relative to accepted public health standards	Yes – covered by other studies
Community - Safety	Safety risks associated with the Project are largely related to Traffic related impacts	Refer to Traffic Impacts.	1	E	1 (L)	No required – covered by other studies	No
Final landform – overburden emplacement area design	Impact on the landscape and future land use from the final landform.	Proposed final landform will be designed to provide an integrated final landform design across both the existing approved and proposed mining areas as there will be no additional void. The mine closure and rehabilitation assessment will include the use of natural landform design methodologies to inform conceptual final landform principles based on stable natural slopes.	3	A	20 (H)	Mine closure and Rehabilitation assessment will be undertaken for the Project.	Yes
Final landform – Steep slopes	Impact on steep slopes	The Project will not impact on steep slopes. Final Landform for Project may include retained highwalls and slopes up to 18 degrees. Slopes must be designed to be long term stable.	2	C	8 (M)	Mine closure and Rehabilitation assessment will be undertaken for the Project.	Yes
Final Void	Impact on final landform from the final void.	No additional final void is created as part of the proposed Project. The Mine closure and Rehabilitation will include consideration of opportunities presented by the final void and management requirements in the final landform.	C	A	20 (H)	Mine closure and Rehabilitation assessment will be undertaken for the Project.	Yes