

APPENDIX F: IMPACT ASSESSMENT TABLES
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Table 1: Impact Assessment during Construction Phase

CONSTRUCTION PHASE: SITE ACCESS AND SITE ESTABLISHMENT		
Potential impact and risk: Loss of topsoil, increased dust levels, and soil compaction	IMPACT 1: SOIL EROSION & SOIL COMPACTION:	
	The clearing of areas for mining logistics, the waste rock dump site and TSF at Rietberg and all other infrastructure not located on an existing historical mining footprint will result in the removal of existing vegetation and topsoil. This will disturb the soil increasing the potential for soil erosion by wind and loss of soil in the event of rainfall. Soil compaction will result from ongoing repeated use of access tracks.	
ALTERNATIVE	PREFERRED AND ONLY ALTERNATIVE	NO-GO ALTERNATIVE
Nature of impact:	Negative	N/A
Extent and duration of impact:	Site and Short term	N/A
Consequence of impact or risk:	Loss	N/A
Probability of occurrence:	Probable	N/A
Degree to which the impact may cause irreplaceable loss of resources:	Low	N/A
Degree to which the impact can be reversed:	Reversible	N/A
Indirect impacts:	<ul style="list-style-type: none"> • Dust impacting on adjacent vegetation and causing a nuisance to workers. • Compaction of topsoil where vehicles drive outside demarcated areas damages seed bank and habitat for invertebrates. 	N/A
Cumulative impact prior to mitigation:	Medium	N/A
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Medium	
Degree to which the impact can be avoided :	High	N/A
Degree to which the impact can be managed :	High	N/A
Degree to which the impact can be mitigated :	High	N/A
Proposed mitigation:	<ul style="list-style-type: none"> • After clearing, the affected area shall be stabilized to prevent any erosion or sediment runoff. Stabilized areas shall be demarcated accordingly. • Incremental clearing of ground cover should take place to avoid unnecessary exposed surfaces. • Reasonable measures must be undertaken to ensure that any exposed areas are adequately protected against the wind and potential stormwater run-off. • Topsoil shall be removed separately and stockpiled separately from other soil base layers. • The stockpile areas for soil base layers are temporary as they will be re-used on a cut and fill basis. • Stockpiles should ideally be located to create the least visual impact and must be maintained to avoid erosion of the material. • Topsoil storage areas must be convex and should not exceed 2m in height. • Topsoil must be treated with care, must not be buried or in any other way be rendered unsuitable for further use (e.g. by mixing with spoil) and precautions must be taken to prevent unnecessary handling and compaction. • In particular, topsoil must not be subject to compaction greater than 1 500 kg/m² and must not be pushed by a bulldozer for more than 50 metres. Trucks may not be driven over the stockpiles. • Reduce drop height of material to a minimum. • Temporarily halt material handling in windy conditions. • A speed limit of 30km/hour will be displayed and enforced through a fining system. All vehicle drivers using the access road and entering the site will be informed of the speed limit. 	N/A

	<ul style="list-style-type: none"> • Soil erosion and compaction on the section of public road (should this road not be surfaced) is required to be monitored and timeously repaired. • Soil erosion on private haul roads is to be regularly monitored and repaired. • Compacted areas that are not required for access shall be scarified after use during decommissioning and rehabilitation. 	
Residual impacts:	Potential loss of invertebrates that live in the top layers of the soil.	N/A
Cumulative impact post mitigation:	Low	N/A
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Low	N/A
Potential impact and risk: Potential Impacts on Water Resources	<p>IMPACT 2: SURFACE & GROUND WATER RESOURCES</p> <p>2.1 Surface water resources: Potential for watercourse pollution due to oil spills during routine maintenance of equipment, and potential for polluted run-off into nearby watercourses during construction. Ephemeral watercourses are located at the Rietberg Mine and the processing facility, TSF and logistics have been located to avoid these wherever possible. The water pipeline from the Henkries line will cross watercourses using existing historical plinths to reach the Rietberg Mine. Construction activities will need to be managed to avoid pollution of watercourses. An ephemeral watercourse is located to the north of the Jubilee Mine historically impacted on by mine waste rock dumps. Management of stormwater run-off will be required to keep clean water from entering polluted water systems. Any watercourse crossings for haul roads will be designed to minimise impact on the water resource.</p> <p>2.2 Groundwater quality: Limited use of groundwater during site establishment due to poor quality that will require treatment prior to use for construction purposes, such as mixing with cement. Potential for groundwater pollution due to oil spills during routine maintenance of equipment.</p> <p>2.3 Groundwater quantity: Limited use of groundwater during site establishment due to poor quality.</p>	
ALTERNATIVE	PREFERRED AND ONLY ALTERNATIVE	NO-GO ALTERNATIVE
Nature of impact:	Negative	N/A
Extent and duration of impact:	Site & Short term	N/A
Consequence of impact or risk:	Loss	N/A
Probability of occurrence:	Unlikely	N/A
Degree to which the impact may cause irreplaceable loss of resources:	Low	N/A
Degree to which the impact can be reversed:	Reversible	N/A
Indirect impacts:	Rainfall is very seldom and evaporation rate is very high. Indirect impacts on surface water are very unlikely.	N/A
Cumulative impact prior to mitigation:	Medium	N/A
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	High	
Degree to which the impact can be avoided :	High	N/A
Degree to which the impact can be managed :	High	N/A
Degree to which the impact can be mitigated :	High	N/A
Proposed mitigation:	<p>Surface water mitigation measures Generic mitigation measures for surface water resources</p> <ul style="list-style-type: none"> • Manage any road widening activities and construction of culverts and pipelines within watercourses and (National Water Act Regulated Area), to prevent an increase in suspended solids, turbidity and pollution from machinery entering the watercourse habitat. • Oils and lubricants must be stored within sealed containment structures. 	N/A

	<ul style="list-style-type: none"> • Any mechanical equipment maintenance must be undertaken on drip trays or UPVC sheets to prevent spills/ leaks onto the soil. • When not in use, a drip tray must be placed beneath mechanical equipment and vehicles. • Machinery must be kept in good working order and regularly inspected for leaks. • A spill kit will be available on each site where mining activities are in progress. • Any spillages will be cleaned up immediately and treated in the bio-cells (soil farms) which are located on the adjacent mine. • Waste materials generated on site must be stored in suitable lidded containers and removed off site to a suitable disposal facility. • Waste separation must be undertaken if practical for recycling • Provide all workers with environmental awareness training and comply with the requirements of the EMPr. • Provide a bin at the site and provide a mobile ablution facility. <p>Site Specific Mitigation measures</p> <ul style="list-style-type: none"> • Plan the location of the processing facility, TSF, waste rock dump and logistics at Rietberg to be outside the active river channel of the ephemeral watercourses wherever possible. • Make use of the existing historical plinths to raise the water pipeline from the Henkries line above the watercourses to reach the Rietberg Mine. • Avoid further impact on the Koeries River (ephemeral watercourse) located to the north of the Jubilee Mine historically impacted on by mine waste rock dumps. • Management of stormwater run-off will be required to keep clean water from entering polluted water systems. • Any watercourse crossings for haul roads will need to be designed to minimise impact on the water resource. <p>Stormwater management</p> <ul style="list-style-type: none"> • Ensure that soil erosion berms are placed in locations to prevent stormwater run-off eroding unconsolidated exposed soil. • Ensure that stormwater runoff is not contaminated and can enter watercourses. <p><u>Groundwater quality during construction (Appendix D)</u></p> <p>Essential groundwater mitigation measures during construction are as follows:</p> <ul style="list-style-type: none"> • Take care that onsite sanitation facilities are well maintained and serviced regularly. • Ensure that good housekeeping is implemented and followed. • Ensure that the design of the TSF and WRD complies with GN R632 published in terms of the NEM:WA: the Regulations Regarding the Planning and Management of Residue Stockpiles and Residue Deposits, unless motivation for an alternative design is accepted by the regulatory authorities. • Establish facilities posing a risk to groundwater contamination as far as possible away from known fault zones and perched intergranular aquifers associated with the dry drainage channels of the Koeries River. • Place oil traps under stationary machinery, only re-fuel machines at fueling station, construct structures to trap fuel spills at fueling station, immediately clean oil and fuel spills and dispose contaminated material (soil, etc.) at licensed sites only. • Draw-up and strictly enforce procedures for the storage, handling and transport of different hazardous materials. • Ensure vehicles and equipment are in good working order and drivers and operators are properly trained. <p>Best practice groundwater mitigation measures during construction are as follows:</p> <ul style="list-style-type: none"> • Implement a monitoring system to record the abstraction point's water level and volume abstracted on a regular basis, i.e. at least monthly, preferably weekly; • Monitor water levels at the proposed new monitoring boreholes (see section 9 on page 73 for details) and Rietberg Natural Spring on a regular basis, i.e. at least monthly, preferably weekly; 	
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	<ul style="list-style-type: none"> Collect water samples at the new monitoring boreholes and Rietberg Natural Spring every three months and submit to SANAS accredited laboratories for analysis of pH, EC, macro-chemistry (Na, Mg, K, Ca, NH₄, Cl, SO₄, Total Alkalinity, PO₄, F, NO₃), TPH, TOC and selected trace-metals (Fe, Al, Se, Cu, Pb, Zn, Cd, As, Sb and U) and microbiology. Minimise storage of hazardous substances onsite during construction; Service construction vehicles at a commercial service station if possible; Maintain vehicles to limit the potential for accidental hydrocarbon spillages; Encourage contractors to report, react and manage all spills and leaks so that any subsequent spills can be cleaned up immediately to prevent contamination of the groundwater; and Maintain and service onsite sanitation facilities regularly. <p><u>Groundwater quantity mitigation measures during Construction Phase (Appendix D)</u> Essential groundwater mitigation measures during construction are as follows:</p> <ul style="list-style-type: none"> If boreholes are used to augment construction water supplies, limit abstraction from these to 130 KL/d over an eight hour per day schedule, followed by 16 h recovery, before the next pumping schedule commences. Implement and follow water saving procedures and methodologies. 	
Residual impacts:	None	N/A
Cumulative impact post mitigation:	Low	N/A
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Low	N/A
Potential impact and risk: Potential Impacts on Biodiversity	IMPACT 3: BIODIVERSITY - LOSS OF NATURAL VEGETATION AND ECOLOGICAL FUNCTIONING IN A CBA1 AND CBA2 Rietberg TSF, WRD and processing plant has been moved out of a CBA1 and are now located in a CBA2. Jubilee mine is located on an existing mining footprint surrounded by a CBA1 associated with the Koeries River corridor. Homeep mine is located on an existing mining footprint surrounded by a CBA2. The expansion of the mine footprints into critical biodiversity areas is limited by using the existing historical mine footprints wherever possible.	
ALTERNATIVE	PREFERRED AND ONLY ALTERNATIVE	NO-GO ALTERNATIVE
Nature of impact:	Negative	N/A
Extent and duration of impact:	Site & Short term	N/A
Consequence of impact or risk:	Loss	N/A
Probability of occurrence:	Definite	N/A
Degree to which the impact may cause irreplaceable loss of resources:	Low	N/A
Degree to which the impact can be reversed:	Reversible	N/A
Indirect impacts:	<ul style="list-style-type: none"> Soil disturbance caused by vegetation clearing will provide suitable conditions for the establishment and spreading of alien invasive vegetation. Removal of alien invasive vegetation if required, is a positive impact, and will benefit local ecological functioning. 	N/A
Cumulative impact prior to mitigation:	Low	N/A
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Low	N/A
Degree to which the impact can be avoided :	Low	N/A
Degree to which the impact can be managed :	High	N/A
Degree to which the impact can be mitigated :	High	N/A
Proposed mitigation:	<ul style="list-style-type: none"> The mining area footprints must be demarcated and the footprint contained within the demarcated areas as shown on Diagrams 3b, 3c and 3d. 	N/A

	<ul style="list-style-type: none"> • Manage any road widening activities and construction of culverts and pipelines within the watercourse and (National Water Act Regulated Area), to prevent an increase in suspended solids, turbidity and pollution from machinery entering the watercourse habitat. • Remove alien invasive vegetation if required and ensure ongoing alien vegetation clearing in the area. • No indigenous plants outside of the demarcated work areas may be damaged. • The noise and vibration caused by the earthmoving equipment will disturb smaller animals. These will move away whilst operations are in progress. Should any animals be encountered these should be moved away by a suitably trained nature conservation officer, if necessary. • Topsoil is to be stockpiled and replaced during the Decommissioning and Closure Phase. 	
Residual impacts:	Removal of alien vegetation during clearing of footprint.	N/A
Cumulative impact post mitigation:	Medium-Low	N/A
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Medium-Low	N/A
Potential impact and risk: Contamination & Pollution	IMPACT 4: POTENTIAL FOR SOIL CONTAMINATION, AND WASTE GENERATION DURING CONSTRUCTION PHASE	
ALTERNATIVE	PREFERRED AND ONLY ALTERNATIVE	NO-GO ALTERNATIVE
Nature of impact:	Negative	N/A
Extent and duration of impact:	Site & Short term	N/A
Consequence of impact or risk:	Loss	N/A
Probability of occurrence:	Possible	N/A
Degree to which the impact may cause irreplaceable loss of resources:	Low	N/A
Degree to which the impact can be reversed:	Reversible	N/A
Indirect impacts:	<ul style="list-style-type: none"> • Windblown litter will cause visual blight. • Hydrocarbons are toxic and will cause vegetation die-back and soil poisoning. 	N/A
Cumulative impact prior to mitigation:	Medium	N/A
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Medium	N/A
Degree to which the impact can be avoided :	High	N/A
Degree to which the impact can be managed :	High	N/A
Degree to which the impact can be mitigated :	High	N/A
Proposed mitigation:	<ul style="list-style-type: none"> • Oils and lubricants must be stored within sealed containment structures. • Any mechanical equipment maintenance must be undertaken on drip trays or UPVC sheets to prevent spills/leaks onto the soil. • When not in use, a drip tray must be placed beneath mechanical equipment and vehicles. • Machinery must be kept in good working order and regularly inspected for leaks. • A spill kit will be available on each site where mining activities are in progress. • Any spillages will be cleaned up immediately. • Waste materials generated on site must be stored in suitable lidded containers and removed off site to a suitable disposal facility. • Waste separation must be undertaken. • Provide all workers with environmental awareness training. • Provide a bin at the site. • Regularly dispose of any solid waste at a municipal waste disposal site. • Ensure all workers comply with the requirements of the EMP. • Provide mobile ablution facilities. 	N/A
Residual impacts:	A lack of waste food management encourages vermin.	N/A

Cumulative impact post mitigation:	Low	N/A
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Low	N/A
Potential impact and risk: Potential Impacts on Visual Landscape	IMPACT 5: VISUAL INTRUSION Caused by machinery, topsoil stockpiles, cleared areas, and movement of trucks on site during preparation of site establishment. The 3 mining sites are located on existing mining footprints, and existing waste rock dumps will be utilised at Jubilee and Homeep. The TSF and waste rock dump at Rietberg will be located adjacent to the mountain slope (Diagram 3b in Draft EIA Report), where the visual intrusion is less compared to its original location on the flat plain located to the west of the mine.	
ALTERNATIVE	PREFERRED AND ONLY ALTERNATIVE	NO-GO ALTERNATIVE
Nature of impact:	Negative	N/A
Extent and duration of impact:	Site & Short term	N/A
Consequence of impact or risk:	Loss	N/A
Probability of occurrence:	Definite	N/A
Degree to which the impact may cause irreplaceable loss of resources:	Low	N/A
Degree to which the impact can be reversed:	Reversible	N/A
Indirect impacts:	The local area is characterised by mining infrastructure, and the project sites have existing historical mine shafts and waste rock dumps.	N/A
Cumulative impact prior to mitigation:	Low	N/A
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Low	N/A
Degree to which the impact can be avoided :	Medium	N/A
Degree to which the impact can be managed :	Medium	N/A
Degree to which the impact can be mitigated :	Medium	N/A
Proposed mitigation:	<ul style="list-style-type: none"> The construction areas shall be kept neat and tidy at all times. Equipment must be kept in designated areas and storing/stockpiling shall be kept orderly. Place shade cloth around the construction site camp to demarcate the area. 	N/A
Residual impacts:	Good housekeeping will ensure a neat and well-maintained construction area reducing visual impact, such as removal of the excessive litter at the Jubilee open pit site.	N/A
Cumulative impact post mitigation:	Medium-Low	N/A
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Medium-Low	N/A
Potential impact and risk: Potential Impacts on Social, and Biophysical Environments	IMPACT 6: EMISSIONS (DUST, VEHICLES, NOISE & LIGHT): Noise and dust will be created by site establishment equipment (e.g. front-end loaders), blasting (if required during construction), and vehicles (emitting Greenhouse Gases & other fugitive emissions). Light pollution will occur from safety lighting at the construction camp, etc.	
	PREFERRED AND ONLY ALTERNATIVE	NO-GO ALTERNATIVE
Nature of impact:	Negative	N/A
Extent and duration of impact:	Local & Short Term	N/A
Consequence of impact or risk:	Loss	N/A
Probability of occurrence:	Definite	N/A
Degree to which the impact may cause irreplaceable loss of resources:	Low	N/A
Degree to which the impact can be reversed:	Reversible	N/A
Indirect impacts:	<ul style="list-style-type: none"> Carbon emissions from vehicle exhausts have a negative impact on the ozone layer. 	N/A

	<ul style="list-style-type: none"> Local residents along the access tracks and roads would be impacted on by noise, dust and vehicle emissions during the construction activities. Light pollution is visible in remote areas for long distances. 	
Cumulative impact prior to mitigation:	Low	N/A
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Low	N/A
Degree to which the impact can be avoided :	Medium	N/A
Degree to which the impact can be managed :	Medium	N/A
Degree to which the impact can be mitigated :	Medium	N/A
Proposed mitigation:	<ul style="list-style-type: none"> The Applicant shall adhere to the local by-laws and regulations regarding the noise and associated hours of operations. The Applicant shall limit noise levels (e.g. install and maintain silencers on machinery). The provisions of SANS 1200A Sub clause 4.1 regarding “built-up” area shall apply to all areas within audible distance of residents whether in urban, peri-urban or rural areas. Construction and demolition activities generating output of 85dB or more, shall be limited to normal working hours and not allowed during weekends to limit the impact of noise of neighbours. No amplified music shall be allowed on site. Hauling vehicles shall adhere to municipal and provincial traffic regulations including speed limits. Vehicles used on site for the construction related activities shall be maintained and in a good working condition so as to reduce emissions. Engines shall be turned off when the vehicle is temporarily parked or stationery for long periods. Stockpiles must be maintained (covered where necessary) to avoid wind erosion of the material. Reduce drop height of material to a minimum. Temporarily halt material handling in windy conditions. Wetting of road surfaces will reduce dust. Incremental clearing of ground cover should take place to avoid unnecessary exposed surfaces. Provide lighting to ensure safety standards are met, and direct light away from public areas (such as the public access road). Ensure workers are supplied with Health and Safety equipment for noise and dust where applicable. Apply safety standards for blasting. 	N/A
Residual impacts:	Carbon emissions have impact on climate change.	N/A
Cumulative impact post mitigation:	Very Low	N/A
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Very Low	N/A
Potential impact and risk: Potential Impacts on Heritage, Paleontological and Cultural landscape	IMPACT 7: POTENTIAL FOR HERITAGE, PALAEOLOGICAL AND CULTURAL IMPACTS: Refer to Appendix C . The heritage resources identified as no-go area have been demarcated at the Homeep mine where the mine footprint will not impact on it, and at the Jubilee mine the graveyard is outside the mine footprint. There are no expected impacts on palaeontological resources.	
ALTERNATIVE	PREFERRED AND ONLY ALTERNATIVE	NO-GO ALTERNATIVE
Nature of impact:	Negative for loss Positive for potential provincial heritage site related to the history of the area as recommended in the HIA.	N/A
Extent and duration of impact:	Local & Long term	N/A
Consequence of impact or risk:	Loss of some resources at the Jubilee mine located partially buried by the waste rock dump site. No loss expected for fossils.	N/A
Probability of occurrence:	Possible	N/A
Degree to which the impact may cause irreplaceable loss of resources:	No loss (according to Specialist Report).	N/A

Degree to which the impact can be reversed:	Irreversible for loss	N/A
Indirect impacts:	Blasting at Jubilee is likely to cause fly-rock (small rock pieces) to land on the graveyard located to the north-east of the open pit.	N/A
Cumulative impact prior to mitigation:	Low	N/A
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Medium	N/A
Degree to which the impact can be avoided :	Low	N/A
Degree to which the impact can be managed :	Medium	N/A
Degree to which the impact can be mitigated :	High	N/A
Proposed mitigation:	<ul style="list-style-type: none"> • All haul roads must make use of existing roads as far as possible (including where they cross or follow the historic copper mining railway). • All upgrades to haul roads must be centered on the existing roads as far as possible so as to minimize impacts to features located close to these roads. • Any alteration to the overall project footprint (i.e. mine fences and haul road locations) must be subjected to further assessment as may be required. • All surface activities must be contained within the three mine fences to avoid impacts to unsurveyed areas. • The final layout of each of the three mines must be considered by an archaeologist or heritage consultant to determine whether any specific mitigation measures or no-go areas not anticipated in the present assessment might be required prior to construction. • The graveyard in the Jubilee Mine (Waypoint 111) must be fenced with a 30 m buffer and declared a no-go area. A gate should be provided for potential visitors and to allow cleaning of any wind-blown litter. • The historical stone-built mining-related structures in the Jubilee Mine must be preserved. They can be reused if required but their modification must be approved by SAHRA to ensure that their heritage significance is not diminished (this may require the services of a heritage architect). • The stone house and threshing floor in the Homeep Mine (Waypoint 163) must be avoided and declared a no-go area. A 30 m buffer should be imposed if possible but this is not required. The structure should not be used for mining-related activities. (This has been demarcated on Figure 3d and is excluded from the mine site boundary.) • All ruins, livestock enclosures and structures related to local herder activity and hence living heritage) must be avoided as far as is possible. • If any herder enclosures or structures will need to be removed or will be covered by mine dumps then this must be done in consultation with their owners (if traceable) or other community members. • If any historical underground mine workings are opened then these must be inspected (insofar as it is safe to do so) for historical traces such as hand tools, mining equipment, graffiti or other features. A report including a photographic record must be submitted to SAHRA for approval prior to modification or destruction of the historical workings. • A chance finds procedure for recording and recovering isolated fossil finds must be incorporated into the environmental management program for the project. (Included as Table 21 in Part B: EMP of this report). • If any Stone Age, historical or industrial archaeological material (e.g. stone tools, historical rubbish dumps, historic mining equipment or tools) or human burials are uncovered during the course of development then work in the immediate area should be halted. The find would need to be reported to the heritage authorities and may require inspection by an archaeologist. Such heritage is the property of the state and may require excavation and curation in an approved institution 	N/A
Residual impacts:	None identified for insignificant findings	N/A
Cumulative impact post mitigation:	Medium-Low	N/A
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Medium-Low	N/A

Potential impact and risk: Potential Impacts on Socio-Economic Environment	IMPACT 8: CREATION OF EMPLOYMENT & JOB SECURITY DURING CONSTRUCTION PHASE WITH LOCAL AND REGIONAL ECONOMIC SPIN-OFFS	
ALTERNATIVE	PREFERRED AND ONLY ALTERNATIVE	NO-GO ALTERNATIVE
Nature of impact:	Positive	Negative
Extent and duration of impact:	Local, District and Short term	Local, District & Short Term
Consequence of impact or risk:	Gain	Loss
Probability of occurrence:	Definite	Definite
Degree to which the impact may cause irreplaceable loss of resources:	No Loss	Medium
Degree to which the impact can be reversed:	Irreversible (employment can be lost by an individual due to non-performance but the job provision is irreversible)	Reversible
Indirect impacts:	<ul style="list-style-type: none"> • Upskilling • Local economic spin-offs through increased income earned, and through purchasing of local materials • Income generation for landowners in a time of drought where livestock farming is not sustainable. 	<ul style="list-style-type: none"> • No upskilling • No local economic spin-offs from purchase of equipment and goods for construction phase. • Opportunity cost for landowner and applicant.
Cumulative impact prior to mitigation:	Medium (-)	Medium (-)
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Medium (-)	Medium (-)
Degree to which the impact can be avoided :	Very low	Medium
Degree to which the impact can be managed :	High	Medium
Degree to which the impact can be mitigated :	High	Medium
Proposed mitigation:	<ul style="list-style-type: none"> • Employment of local previously disadvantaged labour wherever possible, with provision of training (upskilling) • Employment of skilled labour. 	No mitigation possible with No-Go alternative.
Residual impacts:	<ul style="list-style-type: none"> • The upliftment of unemployed people, with positive impact on standard of living for their families. • Local and regional economic spin-offs from investment through Social Labour Plan. • Influx of workers looking for opportunities and employed workers will result in a change to the demographics of the local communities. 	No job creation or potential for upskilling of previously disadvantaged labour, and no supply of copper and tungsten.
Cumulative impact post mitigation:	Medium (+)	Medium (-)
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Medium (+)	Medium (-)

Table 2: Impact Assessment during Operational Phase

OPERATIONAL PHASE		
Potential impact and risk: Change in Topography	IMPACT 1: CHANGE IN TOPOGRAPHY ABOVE GROUND & GEOLOGY BELOW GROUND: Ore removed below ground at the mines will leave voids. Mined ore will be stored as Run of Mine rock stockpiles prior to processing; existing historical waste rock dumps will be utilised at Jubilee and Homeep. Existing historical mine footprints will be utilised. A self-raising Tailings Storage Facility (TSF) at Rietberg impacting on the site's topography. Change in topography and below ground geology is associated with mineral extraction.	
ALTERNATIVE	PREFERRED AND ONLY ALTERNATIVE	NO-GO ALTERNATIVE
Nature of impact:	Negative	N/A
Extent and duration of impact:	Site & Long term	N/A
Consequence of impact or risk:	Loss	N/A
Probability of occurrence:	Definite	N/A
Degree to which the impact may cause irreplaceable loss of resources:	High	N/A
Degree to which the impact can be reversed:	Irreversible	N/A
Indirect impacts:	Increase in habitat creation for fauna (rock hyrax and lizards) on waste rock dumps.	N/A
Cumulative impact prior to mitigation:	Medium	N/A
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Medium	N/A
Degree to which the impact can be avoided :	Medium	N/A
Degree to which the impact can be managed :	Medium	N/A
Degree to which the impact can be mitigated :	Medium	N/A
Proposed mitigation:	<p>The focus of topographic rehabilitation may not be obvious at the time of mine planning and must be addressed as the mine develops and the Closure Plan must be reviewed periodically for continued relevance in the light of changed mine path or long-term plans.</p> <ul style="list-style-type: none"> The waste rock dump must be designed to meet minimum slope stability and safety standards and vegetated to reduce erosion and runoff. The ongoing management of the self-raising TSF shall be in accordance with the relevant regulations and as per the Report attached at Appendix D. The basic rehabilitation methodology will strive to replicate the pre-mining topography, wherever possible, or at least not to increase overall slope gradients without emplacement of adequately designed erosion control or runoff diversion structures. 	N/A
Residual impacts:	<ul style="list-style-type: none"> Visual change in landscape and topography following rehabilitation improving sense of place. Creation of new habitats. Potential for instability below ground. 	N/A
Cumulative impact post mitigation:	Medium-Low	N/A
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Medium-Low	N/A
Potential impact and risk: Loss of soil, increased dust levels, and soil compaction	IMPACT 2: SOIL EROSION & SOIL COMPACTION The potential for soil erosion by wind and storm water run-off; soil compaction from repeated use of access tracks inside the mining area.	
ALTERNATIVE	PREFERRED AND ONLY ALTERNATIVE	NO-GO ALTERNATIVE
Nature of impact:	Negative	N/A
Extent and duration of impact:	Site & Long term	N/A
Consequence of impact or risk:	Loss	N/A
Probability of occurrence:	Definite	N/A

Degree to which the impact may cause irreplaceable loss of resources:	Medium	N/A
Degree to which the impact can be reversed:	Reversible	N/A
Indirect impacts:	<ul style="list-style-type: none"> Dust impacting on adjacent vegetation decreasing palatability for livestock and fauna and causing a nuisance to workers, considering that vegetation is very sparse and livestock farming is limited. Compaction of topsoil damages seed bank and habitat for invertebrates. 	N/A
Cumulative impact prior to mitigation:	Medium	N/A
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Medium	N/A
Degree to which the impact can be avoided :	Medium	N/A
Degree to which the impact can be managed :	Medium	N/A
Degree to which the impact can be mitigated :	Medium	N/A
Proposed mitigation:	<ul style="list-style-type: none"> After clearing, the affected area shall be stabilized to prevent any erosion or sediment runoff. Stabilised areas shall be demarcated accordingly. Incremental clearing of vegetation should take place to avoid unnecessary exposed surfaces. Reasonable measures must be undertaken to ensure that any exposed areas are adequately protected against the wind and storm water run-off. Stockpiles should ideally be located to create the least visual impact and must be maintained to avoid erosion of the material. Reduce drop height of material to a minimum. Temporarily halt material handling in windy conditions. A speed limit of 30km/hour will be displayed and enforced through a fining system. All vehicle drivers using the access road and entering the site will be informed of the speed limit. Compacted areas that are not required for access shall be scarified after use during decommissioning and rehabilitation. Provision must also be made for efficient storm water control to prevent erosion. Soil erosion and compaction on the section of public road, should it remain unsurfaced, used by the Applicant is required to be monitored and timeously repaired. Soil erosion on private haul roads is to be regularly monitored and repaired. 	N/A
Residual impacts:	<ul style="list-style-type: none"> Unmanaged soil erosion will result in loss of topsoil. Unmanaged dust from unsurfaced roads will cause a nuisance and impact on the health of the workers. Dust impacting on adjacent vegetation decreasing palatability for livestock and fauna. Climate change is predicted to result in less rainfall in the western areas of South Africa with increases in temperature and reduction in vegetation growth, increasing soil erosion. 	N/A
Cumulative impact post mitigation:	Low	N/A
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Low	N/A
Potential impact and risk: Potential Impacts on Surface water Resources	<p>IMPACT 3.1: SURFACE WATER RESOURCES</p> <p>Ephemeral watercourses are located at the Rietberg Mine and the processing facility, TSF and logistics have been located to avoid these wherever possible. The water pipeline from the Henkries line will cross watercourses to reach the Rietberg Mine. An ephemeral watercourse is located to the north of the Jubilee Mine historically impacted on by mine waste rock dumps. Management of stormwater run-off will be required to keep clean water from entering polluted water systems. Any watercourse crossings for haul roads will be designed to minimise impact on the water resource and maintained during operation.</p>	
ALTERNATIVE	PREFERRED AND ONLY ALTERNATIVE	NO-GO ALTERNATIVE
Nature of impact:	Negative	N/A
Extent and duration of impact:	Site & Long term	N/A

Consequence of impact or risk:	Loss	N/A
Probability of occurrence:	Unlikely	N/A
Degree to which the impact may cause irreplaceable loss of resources:	Low	N/A
Degree to which the impact can be reversed:	Reversible	N/A
Indirect impacts:	Indirect impacts on surface water could result during storm water events from unmanaged pollutants entering the river system.	N/A
Cumulative impact prior to mitigation:	High	N/A
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	High	N/A
Degree to which the impact can be avoided :	Medium	N/A
Degree to which the impact can be managed :	High	N/A
Degree to which the impact can be mitigated :	High	N/A
Proposed mitigation:	<ul style="list-style-type: none"> • Ensure that an effluent purification and recycling system is installed. • Implement an integrated waste management system on site. • Ensure all hazardous substances are stored correctly. • Ensure stormwater berms divert stormwater away from infrastructure in the mine area. • Adhere to the management of the TSF as per Appendix D to ensure that this waste disposal facility does not pollute surface water resources and ensure the ongoing maintenance of the stormwater diversion trenches associated with the TSF. • Ensure all pipelines and powerlines located within close proximity to the water course are maintained and erosion of support structures does not occur to compromise the integrity of the infrastructure, resulting in water pollution or riverbank erosion. 	N/A
Residual impacts:	Ongoing maintenance will be required to ensure the integrity of the infrastructure, to prevent contamination of surface water resources.	N/A
Cumulative impact post mitigation:	Low	N/A
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Low	N/A
Potential impact and risk: Potential Impacts on Groundwater Resources	IMPACT 3.2: GROUND WATER RESOURCES: QUALITY The TSF at Rietberg is to be lined with a class c containment system preventing pollution of groundwater. Generic mitigation measures to prevent pollution from mining activities will be implemented as listed below and included in the EMPr.	
ALTERNATIVE	PREFERRED AND ONLY ALTERNATIVE	NO-GO ALTERNATIVE
Nature of impact:	Negative	N/A
Extent and duration of impact:	Site & Long term	N/A
Consequence of impact or risk:	Loss	N/A
Probability of occurrence:	Definite	N/A
Degree to which the impact may cause irreplaceable loss of resources:	High	N/A
Degree to which the impact can be reversed:	Reversible	N/A
Indirect impacts:	Historical mining and the existing geology has had an impact on the groundwater quality of the Rietberg and Homeep shafts and Jubilee open pit, as described in the Hydrogeological Report (Appendix E).	N/A
Cumulative impact prior to mitigation:	High	N/A
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	High	N/A
Degree to which the impact can be avoided :	High	N/A

Degree to which the impact can be managed :	High	N/A
Degree to which the impact can be mitigated :	High	N/A
Proposed mitigation:	<p>The Tailings Storage Facility (TSF) will be lined with a Class C containment system as detailed in Appendix D, thus preventing groundwater contamination.</p> <p>Mitigation Measures during Operational Phase (Appendix D):</p> <p>Essential groundwater mitigation measures during operations are as follows:</p> <ul style="list-style-type: none"> • Take care that onsite sanitation facilities are well maintained and serviced regularly. • Ensure that the design of the TSF and WRD complies with GN R632 published in terms of the NEM:WA: the Regulations Regarding the Planning and Management of Residue Stockpiles and Residue Deposits, unless motivation for an alternative design is accepted by the regulatory authorities. • Design and construct the RWD and SWD with adequate liners. • Slope the WRD and RoM Stockpiles to prevent rainwater ponding and maximise storm water runoff. • Channel stormwater runoff to the SWD. • Draw-up and strictly enforce procedures for the storage, handling and transport of different waste materials. • Place oil traps under stationary machinery, only re-fuel machines at fueling station, construct structures to trap fuel spills at fueling station, immediately clean oil and fuel spills and dispose contaminated material (soil, etc.) at licensed sites only. • Draw-up and strictly enforce procedures to handle accidental spillage and leaks on process water pipelines and incorporate adequate leakage detection and spill control measures in the facility's design and construction. • Ensure vehicles and equipment are in good working order and drivers and operators are properly trained. • Ensure that good housekeeping rules are applied, and emergency spill clean-up procedures and equipment are in place. <p>Best practise groundwater mitigation measures during operation:</p> <ul style="list-style-type: none"> • Reduce salinity of groundwater derived process water from mine dewatering and possibly the O'Kiep mine, by blending with better quality water, e.g. less saline treated wastewater from the O'Kiep and/or Concordia Municipal WWTW, or Sedibeng Water's pipeline; • Install a groundwater monitoring system with monitoring boreholes drilled upstream and downstream of facilities where potential groundwater risk is highest, i.e. TSF, RWD, SWD and Treatment Plant. Suggested number of monitoring boreholes are as follows: <ul style="list-style-type: none"> ○ TSF and RWD – one upstream and two downstream; and ○ SWD – one upstream and one downstream. • Install a monitoring borehole upstream and downstream of each mine site to monitor groundwater levels and chemistry in the fractured-rock aquifers; • Monitor groundwater dewatering discharge and water quality at the three SHIP mines, i.e. Rietberg, Jubilee and Homeep; • The groundwater monitoring should include the following: <ul style="list-style-type: none"> ○ The water levels at all monitoring boreholes and the three mines must be recorded on at least a monthly basis – best results are obtained if automatic water level recorders set to take hourly readings are installed; ○ Volumes abstracted must be measured and recorded on at least a monthly basis; ○ Water samples must be collected at all monitoring boreholes and the three SHIP mines on a three-monthly basis and submitted to a SANAS accredited laboratory for analysis of pH, EC, macro-chemistry (Na, Mg, K, Ca, NH₄, Cl, SO₄, Total Alkalinity, PO₄, F, NO₃), COD, TPH and selected trace-metals (Fe, Mn, Al, Se, Cu, Pb, Zn, Cd, As, Sb and U); and ○ A SACNASP registered hydrogeologist should evaluate the monitoring data on an annual basis and compile a monitoring report. • Minimise storage of hazardous substances onsite during operation. 	N/A
Residual impacts:	The lined TSF will ensure that the groundwater quality is not impacted on by the mining activities.	N/A

Cumulative impact post mitigation:	Low	N/A
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Low	N/A
Potential impact and risk: Potential Impacts on Groundwater Resources	IMPACT 3.3: GROUND WATER RESOURCES: QUANTITY Process water is to be obtained from dewatering the mine shafts, and potentially off-site from the O’Kiep open pit which will need to be treated and trucked in. Water is to be recycled from the mining operations. Dewatering of the Rietberg mine will not impact on the local spring in the valley. Dewatering of Jubilee and Homeep mine will have drawdown that will impact on the Apollis Guest house, and potable water of a better quality than the borehole water on the property (which has high salinity), will be supplied to compensate.	
ALTERNATIVE	PREFERRED AND ONLY ALTERNATIVE	NO-GO ALTERNATIVE
Nature of impact:	Negative	N/A
Extent and duration of impact:	Site & Long term	N/A
Consequence of impact or risk:	Loss	N/A
Probability of occurrence:	Definite	N/A
Degree to which the impact may cause irreplaceable loss of resources:	High	N/A
Degree to which the impact can be reversed:	Irreversible	N/A
Indirect impacts:	Good rainfall will increase the groundwater levels offsetting the drawdown as described in Appendix E .	N/A
Cumulative impact prior to mitigation:	High	N/A
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	High	N/A
Degree to which the impact can be avoided :	Low	N/A
Degree to which the impact can be managed :	Low	N/A
Degree to which the impact can be mitigated :	Medium-High	N/A
Proposed mitigation:	Mitigation Measures during Operational Phase (Appendix E): Essential groundwater mitigation measures during operations are as follows: <ul style="list-style-type: none"> Implement and follow water saving procedures and methodologies and use alternative water supply sources. Replace water supply at the impacted private borehole with an alternative water supply, e.g. municipal 	N/A
Residual impacts:	There will be localised negative impacts on the sustainable livelihoods of livestock farmers that rely on groundwater for watering their stock near the Jubilee and Homeep mines. Climate change is predicted to result in less rainfall in the western areas of South Africa with increases in temperature and reduction in vegetation growth, impacting on livestock farming due to a lack of fodder. The spring at Rietberg will not be affected with no negative impact on the livestock farmers that utilise this water source. Potable water will be provided to the Apollis Cottage near the Homeep mine.	N/A
Cumulative impact post mitigation:	Medium-Low	N/A
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Medium-Low	N/A
Potential impact and risk: Potential Impacts on Biodiversity	IMPACT 4: LOSS OF NATURAL VEGETATION AND ECOLOGICAL FUNCTIONING IN A CBA1 AND CBA2 Rietberg TSF, WRD and processing plant has been moved out of a CBA1 and are located in a CBA2. Jubilee mine is located on an existing mining footprint surrounded by a CBA1 associated with the Koeries River corridor. Homeep mine is located on an existing mining footprint surrounded by a CBA2. All mine infrastructure will be operated in accordance with the EMPr to avoid impacting on the surrounding areas during the operational phase.	
ALTERNATIVE	PREFERRED AND ONLY ALTERNATIVE	NO-GO ALTERNATIVE
Nature of impact:	Negative	N/A
Extent and duration of impact:	Site & Long term	N/A
Consequence of impact or risk:	Loss	N/A

Probability of occurrence:	Definite	N/A
Degree to which the impact may cause irreplaceable loss of resources:	Low	N/A
Degree to which the impact can be reversed:	Irreversible	N/A
Indirect impacts:	<ul style="list-style-type: none"> Soil disturbance caused by vegetation clearing will provide suitable conditions for the establishment and spreading of alien invasive vegetation. Removal of alien invasive vegetation is a positive impact and will benefit the ecological functioning. Fencing the mine site will assist in the re-establishment of small fauna hunted by local communities. 	N/A
Cumulative impact prior to mitigation:	Medium	N/A
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Medium	N/A
Degree to which the impact can be avoided :	Medium-High (new mining is to take place mostly on historical mining footprints)	N/A
Degree to which the impact can be managed :	High	N/A
Degree to which the impact can be mitigated :	High	N/A
Proposed mitigation:	<ul style="list-style-type: none"> The mining area footprints must be demarcated and the footprint contained within the demarcated areas as shown on Diagrams 3b, 3c and 3d. Clearing of vegetation for new access roads should be undertaken incrementally to avoid exposed soil for long periods of time. The annual rehabilitation plan must be implemented. Rehabilitation of the TSF as per Appendix D will improve the local biodiversity of this site. Remove alien invasive vegetation and ensure ongoing alien vegetation clearing should this be required. No indigenous plants outside of the demarcated work areas may be damaged. The noise and vibration caused by the earthmoving equipment will disturb smaller animals. These will move away whilst operations are in progress. Should any animals be encountered these should be moved away by a suitably trained nature conservation officer, if necessary. 	N/A
Residual impacts:	Increase in habitat creation for fauna (rock hyrax and lizards) on waste rock dump.	N/A
Cumulative impact post mitigation:	Low	N/A
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Low	N/A
Potential impact and risk: Contamination & Pollution	<p>IMPACT 5: POTENTIAL FOR SOIL CONTAMINATION, AND WASTE GENERATION DURING OPERATIONAL PHASE</p> <p>Waste rock dump; overburden; industrial waste (hazardous wastes, oil & greases); domestic waste; wastewater, including effluent & sewage sludge and the TSF.</p> <p>All mine infrastructure will be operated in accordance with the EMPr to avoid impacting on the surrounding areas during the operational phase.</p>	
ALTERNATIVE	PREFERRED AND ONLY ALTERNATIVE	NO-GO ALTERNATIVE
Nature of impact:	Negative	N/A
Extent and duration of impact:	Site & Short term	N/A
Consequence of impact or risk:	Loss	N/A
Probability of occurrence:	Possible	N/A
Degree to which the impact may cause irreplaceable loss of resources:	Medium	N/A
Degree to which the impact can be reversed:	Reversible	N/A
Indirect impacts:	<ul style="list-style-type: none"> Windblown litter will cause visual blight. Hydrocarbons are toxic and will cause vegetation die-back and soil poisoning. A lack of waste food management encourages vermin. 	N/A
Cumulative impact prior to mitigation:	High	N/A

Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	High	N/A
Degree to which the impact can be avoided :	Medium-High	N/A
Degree to which the impact can be managed :	High	N/A
Degree to which the impact can be mitigated :	High	N/A
Proposed mitigation:	<p>Waste rock from the mining process is to be disposed of in the waste rock dumps.</p> <p>Industrial waste (i.e. including hazardous wastes and oils and greases)</p> <ul style="list-style-type: none"> Separation of wastes into classes will ensure that waste is disposed of safely and according to the correct procedure. In order to ensure that waste classes are kept in separate streams, training will be undertaken. Petrochemical spillages to be collected in a drip tray and drum to store; excavate spill affected soil for disposal at a registered hazardous waste facility. Hazardous waste is to be disposed of at Vissershoeck Landfill. <p>Domestic waste (i.e. waste that is generated from the offices)</p> <ul style="list-style-type: none"> Domestic waste - separated at source into recyclable products. These must then be removed and recycled by recognised contractors. (Note that the mine is responsible for the waste from cradle to grave). Disposal at a registered and officially permitted commercial or municipal landfill site is the most cost-effective option for materials that cannot be recycled. Domestic waste generated by workers needs to be sorted and all biodegradable waste must be stored in separate drums provided for. <p>Mine residue Disposal Storage Facility (MRDSF)</p> <ul style="list-style-type: none"> The TSF will be lined preventing groundwater contamination (Appendix D). Manage according to the Report (Appendix D) to ensure that the waste disposal facility complies with relevant legislation. <p>Wastewater</p> <ul style="list-style-type: none"> Equipment used in the mining process will be adequately maintained so that during operations it does not spill oil, diesel, fuel, or hydraulic fluid. By keeping contaminated and clean water separate and establishing controlled runoff washing bays, the flow and end destination of decontamination washing water will be controlled. Slow storm water runoff with contoured, low-gradient drains and channels, as well as retention ponds. A series of ponds may also be used to remove sediment and other contaminants from water before reuse or reintroduction into the mining process. Ensure that a purification and recycling sewage and effluent management system is installed, such as a biozone purification system. 	N/A
Residual impacts:	Recycling of waste material creates employment.	N/A
Cumulative impact post mitigation:	Medium-Low	N/A
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Low	N/A
Potential impact and risk: Potential Impacts on Visual Landscape	<p>IMPACT 6: VISUAL INTRUSION</p> <p>Mining activities during the operational phase will have a visual impact associated with mining machinery, topsoil and run of mine stockpiles, waste rock dumps, TSF, logistics and movement of trucks on site and on access and haul roads. Mining activities are located in areas historically mined.</p>	
ALTERNATIVE	PREFERRED AND ONLY ALTERNATIVE	NO-GO ALTERNATIVE
Nature of impact:	Negative	
Extent and duration of impact:	Site & Long term	
Consequence of impact or risk:	Loss	
Probability of occurrence:	Definite	
Degree to which the impact may cause irreplaceable loss of resources:	Low	
Degree to which the impact can be reversed:	Reversible	

Indirect impacts:	The local topography and landscape is already altered due the historical mining onsite and existing mines in the local area.	
Cumulative impact prior to mitigation:	Medium	
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Medium	
Degree to which the impact can be avoided :	Medium	
Degree to which the impact can be managed :	Medium	
Degree to which the impact can be mitigated :	Medium	
Proposed mitigation:	<ul style="list-style-type: none"> The site shall be kept neat and tidy at all times. Equipment must be kept in designated areas and storing/stockpiling shall be kept orderly. Mitigation of the visual impact of “heaped fill dumps” and “sidehill dumps” will include limited topsoil application to the slope and revegetation on the top of the dump. The visual impact of the TSF will be mitigated during rehabilitation when re-vegetation is facilitated. 	
Residual impacts:	Good housekeeping will ensure a neat and well-maintained operational area reducing visual impact.	
Cumulative impact post mitigation:	Low	
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Low	
Potential impact and risk: Potential Impacts on Social, and Biophysical Environments	IMPACT 7: EMISSIONS (DUST, VEHICLES, NOISE & LIGHT) Blasting will generate noise, vibration and dust. Hauling vehicles emit Greenhouse Gases and other fugitive emissions. Dust will be generated on access roads, and in rock dumping. Lighting impacts on surrounding communities and fauna.	
ALTERNATIVE	PREFERRED AND ONLY ALTERNATIVE	NO-GO ALTERNATIVE
Nature of impact:	Negative	N/A
Extent and duration of impact:	Site and Long Term	N/A
Consequence of impact or risk:	Loss	N/A
Probability of occurrence:	Definite	N/A
Degree to which the impact may cause irreplaceable loss of resources:	Low	N/A
Degree to which the impact can be reversed:	Low	N/A
Indirect impacts:	<ul style="list-style-type: none"> Carbon emissions from vehicle exhausts have a negative impact on the ozone layer. Residents outside the project site that reside along the access road would be impacted on by noise, dust (if road is not surfaced) and vehicle emissions. Lighting attracts insects, and a localized food chain is likely to develop. 	N/A
Cumulative impact prior to mitigation:	Medium	N/A
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Medium	N/A
Degree to which the impact can be avoided :	Medium	N/A
Degree to which the impact can be managed :	Medium	N/A
Degree to which the impact can be mitigated :	Medium	N/A
Proposed mitigation:	<ul style="list-style-type: none"> Health and safety equipment is required for workers. Wetting helps reduce dust generation. No amplified music should be allowed on site. Existing tracks will be used as haul roads and will only be upgraded to facilitate haul trucks by applying dust suppression and/or hardening compound such as Macadamite. On public roads the vehicles shall adhere to municipal and provincial traffic regulations including speed limits. Vehicles used on site for the construction related activities shall be maintained and in a good working condition so as to reduce emissions. 	N/A

	<ul style="list-style-type: none"> Engines shall be turned off when the vehicle is temporarily parked or stationary for long periods. Reduce drop height of material to a minimum. Temporarily halt material handling in windy conditions. Provide lighting to ensure safety standards are met, and direct light away from public areas (such as the public access road). Use energy efficient bulbs that do not attract insects. Ensure workers are supplied with Health and Safety equipment for noise and dust where applicable. Apply safety standards for blasting. Ensure dust suppression on MRDSF if required. 	
Residual impacts:	Dust settling on adjacent vegetation can impact negatively on vegetative growth.	N/A
Cumulative impact post mitigation:	Low	N/A
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Low	
Potential impact and risk: Potential Impacts on Heritage, Paleontological and Cultural landscape	IMPACT 8: POTENTIAL FOR HERITAGE, PALAEOLOGICAL AND CULTURAL IMPACTS: Refer to Appendix C . The heritage resources identified as no-go area have been demarcated at the Homeep mine where the mine footprint will not impact on it, and at the Jubilee mine the graveyard is outside the mine footprint. There are no expected impacts on palaeontological resources.	
ALTERNATIVE	PREFERRED AND ONLY ALTERNATIVE	NO-GO ALTERNATIVE
Nature of impact:	Negative for loss Positive for potential provincial heritage site related to the history of the area as recommended in the HIA.	N/A
Extent and duration of impact:	Local & Long term	N/A
Consequence of impact or risk:	Loss of some resources at the Jubilee mine located partially buried by the waste rock dump site. No loss expected for fossils.	N/A
Probability of occurrence:	Possible	N/A
Degree to which the impact may cause irreplaceable loss of resources:	No loss (according to Specialist Report).	N/A
Degree to which the impact can be reversed:	Irreversible for loss	N/A
Indirect impacts:	Blasting at Jubilee is likely to cause fly-rock (small rock pieces) to land on the graveyard located to the north-east of the open pit.	N/A
Cumulative impact prior to mitigation:	Low	N/A
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Medium	N/A
Degree to which the impact can be avoided :	Low	N/A
Degree to which the impact can be managed :	Medium	N/A
Degree to which the impact can be mitigated :	High	N/A
Proposed mitigation:	<ul style="list-style-type: none"> All haul roads must make use of existing roads as far as possible (including where they cross or follow the historic copper mining railway). All upgrades to haul roads must be centered on the existing roads as far as possible so as to minimize impacts to features located close to these roads. Any alteration to the overall project footprint (i.e. mine fences and haul road locations) must be subjected to further assessment as may be required. All surface activities must be contained within the three mine fences to avoid impacts to unsurveyed areas. The final layout of each of the three mines must be considered by an archaeologist or heritage consultant to determine whether any specific mitigation measures or no-go areas not anticipated in the present assessment might be required prior to construction. 	N/A

	<ul style="list-style-type: none"> The graveyard in the Jubilee Mine (Waypoint 111) must be fenced with a 30 m buffer and declared a no-go area. A gate should be provided for potential visitors and to allow cleaning of any wind-blown litter. The historical stone-built mining-related structures in the Jubilee Mine must be preserved. They can be reused if required but their modification must be approved by SAHRA to ensure that their heritage significance is not diminished (this may require the services of a heritage architect). The stone house and threshing floor in the Homeep Mine (Waypoint 163) must be avoided and declared a no-go area. A 30 m buffer should be imposed if possible but this is not required. The structure should not be used for mining-related activities. (This has been demarcated on Figure 3d and is excluded from the mine site boundary.) All ruins, livestock enclosures and structures related to local herder activity and hence living heritage) must be avoided as far as is possible. If any herder enclosures or structures will need to be removed or will be covered by mine dumps then this must be done in consultation with their owners (if traceable) or other community members. If any historical underground mine workings are opened then these must be inspected (insofar as it is safe to do so) for historical traces such as hand tools, mining equipment, graffiti or other features. A report including a photographic record must be submitted to SAHRA for approval prior to modification or destruction of the historical workings. A chance finds procedure for recording and recovering isolated fossil finds must be incorporated into the environmental management program for the project. (Included as Table 21 in Part B: EMPr of this report). If any Stone Age, historical or industrial archaeological material (e.g. stone tools, historical rubbish dumps, historic mining equipment or tools) or human burials are uncovered during the course of development then work in the immediate area should be halted. The find would need to be reported to the heritage authorities and may require inspection by an archaeologist. Such heritage is the property of the state and may require excavation and curation in an approved institution 	
Residual impacts:	None identified for insignificant findings	N/A
Cumulative impact post mitigation:	Medium-Low	N/A
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Medium-Low	N/A
Potential impact and risk: Potential Impacts on Socio-Economic Environment	IMPACT 9: CREATION OF EMPLOYMENT & JOB SECURITY DURING OPERATIONAL PHASE WITH LOCAL AND REGIONAL ECONOMIC SPIN-OFFS Including Improvement in road infrastructure, and safety of community from haul trucks due to by-pass routes.	
ALTERNATIVE	PREFERRED AND ONLY ALTERNATIVE	NO-GO ALTERNATIVE
Nature of impact:	Positive	Negative
Extent and duration of impact:	Local, district and Long term	Local, District & Long Term
Consequence of impact or risk:	Gain	Loss
Probability of occurrence:	Definite	Definite
Degree to which the impact may cause irreplaceable loss of resources:	No loss	Medium
Degree to which the impact can be reversed:	Irreversible (employment can be lost by an individual due to non-performance but the job provision is irreversible)	Reversible
Indirect impacts:	<ul style="list-style-type: none"> Sections of roads to be upgraded for mine access. Upskilling. Local economic spin-offs through increased income earned, and through purchasing of local materials required for the operational activities. 	<ul style="list-style-type: none"> No upskilling. No local economic spin-offs due to lack of income earned. No ongoing supply of copper to local and international markets.
Cumulative impact prior to mitigation:	Medium (-)	Medium (-)

Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Medium (-)	Medium (-)
Degree to which the impact can be avoided :	Very low	Medium
Degree to which the impact can be managed :	High	Medium
Degree to which the impact can be mitigated :	High	Medium
Proposed mitigation:	<ul style="list-style-type: none"> • Employment of local previously disadvantaged labour wherever possible, with provision of training (upskilling) 	No mitigation possible with No-Go alternative.
Residual impacts:	<ul style="list-style-type: none"> • The upliftment of unemployed people, with positive impact on standard of living for their families. • Local and regional economic spin-offs from investment through Social Labour Plan. • Influx of workers looking for opportunities and employed workers will result in a change to the demographics of the local communities. 	No job creation or potential for upskilling of previously disadvantaged labour.
Cumulative impact post mitigation:	Medium (+)	Medium (-)
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Medium (+)	Medium (-)

Table 3: Impact Assessment during Decommissioning and Closure Phase

DECOMMISSIONING & CLOSURE PHASE		
Potential impact and risk: Potential Impacts on Biophysical Environment	IMPACT 1: REHABILITATION OF MINED AND CLEARED AREAS As per Rehabilitation, Decommissioning and Mine Closure Plan (Appendix G)	
ALTERNATIVE	ALTERNATIVE 1 (PREFERRED)	NO-GO ALTERNATIVE
Nature of impact:	Positive	N/A
Extent and duration of impact:	Local and Long term	N/A
Consequence of impact or risk:	Gain	N/A
Probability of occurrence:	Definitely	N/A
Degree to which the impact may cause irreplaceable loss of resources:	No loss	N/A
Degree to which the impact can be reversed:	Reversible	N/A
Indirect impacts:	Improved visual impact for tourism.	N/A
Cumulative impact prior to mitigation:	Medium	N/A
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Medium	N/A
Degree to which the impact can be avoided :	Very low (rehabilitation is mandatory)	N/A
Degree to which the impact can be managed :	High	N/A
Degree to which the impact can be mitigated :	High	N/A
Proposed mitigation:	<ul style="list-style-type: none"> • Implementation of Final Rehabilitation, Decommissioning and Mine Closure Plan (Appendix G). • The focus of topographic rehabilitation may not be obvious at the time of mine planning and must be addressed as the mine develops and the Closure Plan must be reviewed periodically for continued relevance in the light of changed mine path or long-term plans. • Compacted areas shall be scarified after use during decommissioning and rehabilitation. • Any stored topsoil shall be spread over the scarified surfaces. • Rehabilitation of the TSF as per Appendix D. • Other mitigating with regard to residual environmental impact - Implementing screening as part of the cleaning activities before materials is moved from the mine. - The infrastructure area will be screened for petrochemical spills and cleaned and waste from the temporary storage facility will be removed and the area cleaned. - Unwanted steel, sheet metal and equipment needs to be sold or disposed of as scrap metal. Recycling and reusing materials may reduce garbage haul fees or generate income through the sale of scrap metal and old equipment. - All steel structures and reinforcing will be discarded or sold as scrap. - All equipment and other items used during the mining operation needs to be removed from the site. - Used oils / hydrocarbons fuels / liquids are to be collected in sealed containers (stored on concrete slabs) and removed from site for recycling by a reputable company. - All waste in the temporary storage area for used lubrication products and other hazardous chemicals will be disposed of at a collection point from where it will be collected by a waste recycling company. - All temporary waste storage areas need to be cleaned out and waste removed. - Tyres to be return to supplier or a company that uses old tyres for making door mats, shoes, swings, etc. - Batteries to be return to supplier or disposed at a permitted hazardous waste facility. - Fluorescent tubes to be collected in sealed containers (stored on concrete slabs) and removed from site for disposal at a permitted hazardous waste facility. - Chemical containers to be returned to supplier or disposed of at a legal, permitted facility that is capable of disposing of the waste. (DO NOT sell chemical containers to workers or communities). 	N/A

	<ul style="list-style-type: none"> - Laboratory waste (chemicals) - Returned to supplier or disposed of at a permitted facility that is capable of disposing of the waste. - Industrial chemicals (laboratory waste) - Returned to supplier or disposed of at a permitted facility that is capable of disposing of the waste. These liquid wastes cannot be disposed of on the waste dumps. - Redundant structures, buildings and civil foundations (down to one meter below surface for subsurface infrastructure) will be removed for use elsewhere or demolished and discarded. - All redundant infrastructure and services needs to be demolished including ruins, buildings, foundations and footings. - Building rubble will be used as backfill in excavations or removed from site in the absence of excavations. - Remove all power and water supply installations not to be retained by landowner in terms of section 44 of the MPRDA. - Removing underground infrastructure to one meter below surface. - Excavations created by removing subsurface infrastructure needs to be filled, levelled and compacted. - Final walk through of complete mining lease area to ensure no mining related waste and of re-usable infrastructure remain on site. - As part of this phase training of personnel in the implementation of the Closure Plan will be done and the implementation of the environmental awareness plan will be an ongoing process. 	
Residual impacts:	Increase in natural habitat following rehabilitation processes.	N/A
Cumulative impact post mitigation:	Low	N/A
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Low	N/A
Potential impact and risk: Potential Impacts on Biophysical Environment	IMPACT 2: GROUNDWATER RESOURCES As per Appendix E and Rehabilitation, Decommissioning and Mine Closure Plan (Appendix G)	
ALTERNATIVE	ALTERNATIVE 1 (PREFERRED)	NO-GO ALTERNATIVE
Nature of impact:	Neutral	N/A
Extent and duration of impact:	Local and Long term	N/A
Consequence of impact or risk:	Gain	N/A
Probability of occurrence:	Definitely	N/A
Degree to which the impact may cause irreplaceable loss of resources:	No loss	N/A
Degree to which the impact can be reversed:	Reversible	N/A
Indirect impacts:	Increased knowledge of groundwater resource in area.	N/A
Cumulative impact prior to mitigation:	High	N/A
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	High	N/A
Degree to which the impact can be avoided :	Very low (rehabilitation is mandatory)	N/A
Degree to which the impact can be managed :	High	N/A
Degree to which the impact can be mitigated :	High	N/A
Proposed mitigation:	<u>Mitigation measures during Decommissioning Phase (Appendix D)</u> Essential groundwater mitigation measures during decommissioning are as follows: <ul style="list-style-type: none"> • Take care that onsite sanitation facilities are well maintained and serviced regularly. • Ensure that good housekeeping rules are applied. • Place oil traps under stationary machinery, only re-fuel machines at fueling station, construct structures to trap fuel spills at fueling station, immediately clean oil and fuel spills and dispose contaminated material (soil, etc.) at licensed sites only. • Draw-up and strictly enforce procedures for the storage, handling and transport of different hazardous materials. 	N/A

	<ul style="list-style-type: none"> • Ensure vehicles and equipment are in good working order and drivers and operators are properly trained. • Ensure that good housekeeping rules are applied. • Limit rainwater infiltration by topsoiling and vegetating the TSF. • Continue to collect and return leachate from the under drainage and seepage collection facilities to the RWD until dry. • Maintain RWD until leachate from the under drainage and seepage collection facilities of the TSF are dry before decommissioning the RWD. • Continue with groundwater monitoring. <p>Best practice groundwater mitigation measures during decommissioning are as follows:</p> <ul style="list-style-type: none"> • Maintain the groundwater monitoring system and procedures described in Appendix E. • The groundwater monitoring should include the following: <ul style="list-style-type: none"> ○ The water levels at all monitoring boreholes, wells, spring and the three mines, if possible, must be recorded on at least a three-monthly basis. Best results are obtained if automatic water level recorders set to take hourly readings are installed; ○ Water samples must be collected at all monitoring boreholes and the three SHIP mines, if possible, on a three-monthly basis and submitted to a SANAS accredited laboratory for analysis of pH, EC, macro-chemistry (Na, Mg, K, Ca, NH₄, Cl, SO₄, Total Alkalinity, PO₄, F, NO₃), COD, TPH and selected trace-metals (Fe, Mn, Al, Se, Cu, Pb, Zn, Cd, As, Sb and U); and • A SACNASP registered hydrogeologist should evaluate the monitoring data on an annual basis and compile a monitoring report. 	
Residual impacts:	Groundwater quantity slow to recover from drawdown at Homeep mine due to the depth of the mine.	N/A
Cumulative impact post mitigation:	Medium-Low	N/A
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Medium-Low	N/A
Potential impact and risk: Potential Impacts on Socio-Economic Environment	IMPACT 3: CREATION OF EMPLOYMENT, JOB SECURITY WITH LOCAL AND REGIONAL ECONOMIC SPIN-OFFS DURING DECOMMISSIONING & CLOSURE PHASE Including improved road infrastructure.	
ALTERNATIVE	PREFERRED AND ONLY ALTERNATIVE	NO-GO ALTERNATIVE
Nature of impact:	Positive	Negative
Extent and duration of impact:	Local, district and Short term	Local, District & Short Term
Consequence of impact or risk:	Gain	Loss
Probability of occurrence:	Definite	Definite
Degree to which the impact may cause irreplaceable loss of resources:	No loss	Medium
Degree to which the impact can be reversed:	Irreversible (employment can be lost by an individual due to non-performance but the job provision is irreversible)	Reversible
Indirect impacts:	<ul style="list-style-type: none"> • Upskilling. • Local economic spin-offs through increased income earned. 	<ul style="list-style-type: none"> • No upskilling • No local economic spin-offs due to lack of income earned. • Opportunity cost for landowner and applicant.
Cumulative impact prior to mitigation:	Medium (-)	Medium (-)

Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Low	Medium (-)
Degree to which the impact can be avoided :	Very low	Medium
Degree to which the impact can be managed :	High	Medium
Degree to which the impact can be mitigated :	High	Medium
Proposed mitigation:	<ul style="list-style-type: none"> Ongoing employment of local previously disadvantaged labour wherever possible, with provision of training (upskilling) 	No mitigation possible with No-Go alternative.
Residual impacts:	<ul style="list-style-type: none"> The upliftment of unemployed people, with positive impact on standard of living for their families. Local and regional economic spin-offs from investment through Social Labour Plan. Change to the demographics of the local communities if people move on to the next available place of work. 	No job creation or potential for upskilling of previously disadvantaged labour.
Cumulative impact post mitigation:	Medium (+)	Medium (-)
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	Medium (+)	Medium (-)