8 FULL DESCRIPTION OF THE PROCESS UNDERTAKEN TO IDENTIFY, ASSESS AND RANK THE IMPACTS AND RISKS THE ACTIVITY WILL IMPOSE ON THE PREFERRED SITE THROUGH THE LIFE OF THE ACTIVITY

8.1 DESCRIPTION OF THE PROCESS UNDERTAKEN TO IDENTIFY IMPACTS

Environmental and socio-economic impacts associated with the proposed project were identified through site visits, undertaken by SLR and specialists (where relevant), the social scan, consideration of the project description, site layout and specialist studies.

Potential environmental and socio-economic impacts identified were outlined in the background information document that was distributed to IAPs and regulatory authorities (Section 7.2.2) for consideration. In addition to this, potential identified environmental and socio-economic impacts were discussed at the public and regulatory authorities meetings (Section 7.2.5). The feedback received from IAPs and regulatory authorities also provided input into the identification of environmental and socio-economic impacts.

8.2 DESCRIPTION OF THE PROCESS UNDERTAKEN TO ASSESS AND RANK THE IMPACTS AND RISKS

A description of the assessment methodology used to assess the severity of identified impacts including the nature of impacts and the degree to which impacts may cause irreplaceable loss of resources is provided in Section 7.6. In addition to this, the assessment methodology also assesses the extent of the impacts, the duration and reversibility of impacts, the probability of the impact occurring, and the degree to which the impacts can be mitigated.

8.3 A DESCRIPTION OF THE ENVIRONMENTAL IMPACTS AND RISKS IDENTIFIED DURING THE ENVIRONMENTAL ASSESSMENT PROCESS

This section below (Table 51) provides a description of the impacts on environmental and socio-economic aspects in respect of each of the main project actions / activities and processes that will be assessed in Appendix F and summarised in Section 9.

TABLE 51: LIST OF POTENTIAL IMPACTS AS THEY RELATE TO PROJECT ACTIONS / ACTIVITIES / PROCESSES

Main activity/process	Impacts (unmitigated)
Site preparation	Hazardous excavations and infrastructure Loss of soil resources and land capability through pollution Loss of soil resources and land capability through physical disturbance Physical destruction of biodiversity General disturbance of biodiversity Pollution from emissions to air

Main activity/process	Impacts (unmitigated)
	Noise pollution Negative visual impacts Loss of heritage/palaeontological resources Positive socio-economic impacts (Economic impact) Negative socio-economic impacts (Inward migration) Change in land use
Earthworks	Hazardous excavations and infrastructure Loss of soil resources and land capability through pollution Loss of soil resources and land capability through physical disturbance Physical destruction of biodiversity General disturbance of biodiversity Contamination of surface water resources Alteration of natural drainage patterns Contamination of groundwater Pollution from emissions to air Noise pollution Negative visual impacts Loss of heritage/palaeontological resources Positive socio-economic impacts (Economic impact) Negative socio-economic impacts (Inward migration) Change in land use
Civil works	Hazardous excavations and infrastructure Loss of soil resources and land capability through pollution Physical destruction of biodiversity General disturbance of biodiversity Contamination of surface water resources Alteration of natural drainage patterns Contamination of groundwater Pollution from emissions to air Noise pollution Negative visual impacts Positive socio-economic impacts (Economic impact) Negative socio-economic impacts (Inward migration) Change in land use
Open pit mining	Loss and sterilisation of mineral resources Hazardous excavations and infrastructure Loss of soil resources and land capability through pollution Loss of soil resources and land capability through physical disturbance Physical destruction of biodiversity General disturbance of biodiversity Contamination of surface water resources Alteration of natural drainage patterns Contamination of groundwater Pollution from emissions to air Noise pollution Negative visual impacts Loss of heritage/palaeontological resources Positive socio-economic impacts (Economic impact) Negative socio-economic impacts (Inward migration) Change in land use

Main activity/process	Impacts (unmitigated)
Processing plant	Hazardous excavations and infrastructure Loss of soil resources and land capability through pollution Loss of soil resources and land capability through physical disturbance Physical destruction of biodiversity General disturbance of biodiversity Contamination of surface water resources Alteration of natural drainage patterns Contamination of groundwater Pollution from emissions to air Noise pollution Negative visual impacts Loss of heritage/palaeontological resources Positive socio-economic impacts (Economic impact) Negative socio-economic impacts (Inward migration) Change in land use
Transport systems	Hazardous excavations and infrastructure Loss of soil resources and land capability through pollution Loss of soil resources and land capability through physical disturbance Physical destruction of biodiversity General disturbance of biodiversity Contamination of surface water resources Alteration of natural drainage patterns Contamination of groundwater Pollution from emissions to air Noise pollution Road disturbance and traffic safety Negative visual impacts Loss of heritage/palaeontological resources Positive socio-economic impacts (Economic impact) Negative socio-economic impacts (Inward migration) Change in land use
Power supply and use	Hazardous excavations and infrastructure Loss of soil resources and land capability through pollution Loss of soil resources and land capability through physical disturbance Physical destruction of biodiversity General disturbance of biodiversity Contamination of surface water resources Alteration of natural drainage patterns Contamination of groundwater Pollution from emissions to air Noise pollution Negative visual impacts Loss of heritage/palaeontological resources Positive socio-economic impacts (Economic impact) Negative socio-economic impacts (Inward migration) Change in land use
Water supply and use	Hazardous excavations and infrastructure Loss of soil resources and land capability through pollution Loss of soil resources and land capability through physical disturbance Physical destruction of biodiversity General disturbance of biodiversity Contamination of surface water resources Alteration of natural drainage patterns Contamination of groundwater Reduction of groundwater levels and availability Negative visual impacts Loss of heritage/palaeontological resources Positive socio-economic impacts (Economic impact) Negative socio-economic impacts (Inward migration) Change in land use

Main activity/process	Impacts (unmitigated)
Mineralised waste	Loss and sterilization of mineral resources Hazardous excavations and infrastructure Loss of soil resources and land capability through pollution Loss of soil resources and land capability through physical disturbance Physical destruction of biodiversity General disturbance of biodiversity Contamination of surface water resources Alteration of natural drainage patterns Contamination of groundwater Pollution from emissions to air Noise pollution Negative visual impacts Loss of heritage/palaeontological resources Positive socio-economic impacts (Economic impact) Negative socio-economic impacts (Inward migration) Change in land use
Non-mineralised waste management (general and hazardous)	Loss of soil resources and land capability through pollution Loss of soil resources and land capability through physical disturbance Physical destruction of biodiversity General disturbance of biodiversity Contamination of surface water resources Alteration of natural drainage patterns Contamination of groundwater Pollution from emissions to air Noise pollution Negative visual impacts Loss of heritage/palaeontological resources Positive socio-economic impacts (Economic impact) Negative socio-economic impacts (Inward migration) Change in land use
Support services	Hazardous excavations and infrastructure Loss of soil resources and land capability through pollution Loss of soil resources and land capability through physical disturbance Physical destruction of biodiversity General disturbance of biodiversity Contamination of surface water resources Alteration of natural drainage patterns Contamination of groundwater Pollution from emissions to air Noise pollution Negative visual impacts Loss of heritage/palaeontological resources Positive socio-economic impacts (Economic impact) Negative socio-economic impacts (Inward migration) Change in land use
General site management	Loss of soil resources and land capability through pollution Loss of soil resources and land capability through physical disturbance Physical destruction of biodiversity General disturbance of biodiversity Contamination of surface water resources Alteration of natural drainage patterns Contamination of groundwater Pollution from emissions to air Negative visual impacts Loss of heritage/palaeontological resources Positive socio-economic impacts (Economic impact) Negative socio-economic impacts (Inward migration) Change in land use
Demolition	Hazardous excavations and infrastructure Loss of soil resources and land capability through pollution

Main activity/process	Impacts (unmitigated)
	Loss of soil resources and land capability through physical disturbance Physical destruction of biodiversity General disturbance of biodiversity Contamination of surface water resources Alteration of natural drainage patterns Contamination of groundwater Pollution from emissions to air Noise pollution Negative visual impacts Loss of heritage/palaeontological resources Positive socio-economic impacts (Economic impact) Negative socio-economic impacts (Inward migration) Change in land use
Rehabilitation	Loss and sterilization of mineral resources Hazardous excavations, surface subsidence and infrastructure Loss of soil resources and land capability through pollution Loss of soil resources and land capability through physical disturbance Physical destruction of biodiversity General disturbance of biodiversity Contamination of surface water resources Alteration of natural drainage patterns Contamination of groundwater Pollution from emissions to air Noise pollution negative visual impacts Loss of heritage/palaeontological resources Positive socio-economic impacts (Economic impact) Negative socio-economic impacts (Inward migration) Change in land use
Maintenance and aftercare	Loss and sterilization of mineral resources Hazardous excavations and infrastructure Loss of soil resources and land capability through pollution Loss of soil resources and land capability through physical disturbance Physical destruction of biodiversity General disturbance of biodiversity Contamination of surface water resources Alteration of natural drainage patterns Contamination of groundwater Pollution from emissions to air Negative visual impacts Loss of heritage/palaeontological resources Positive socio-economic impacts (Economic impact) Negative socio-economic impacts (Inward migration) Change in land use

8.4 ASSESSMENT OF THE SIGNIFICANCE OF EACH IMPACT AND RISK AND AN INDICATION OF THE EXTENT OF TO WHICH THE ISSUE AND RISK CAN BE AVOIDED OR ADDRESSED BY THE ADOPTION OF MITIGATION MEASURES

The assessment of the significance of the impacts identified for the proposed project area are included in Appendix F and summarised in Section 9. The extent to which the identified impacts can be avoided or addressed by the adoption of mitigation measures is included in Section 9.

9 ASSESSMENT OF EACH IDENTIFIED POTENTIALLY SIGNIFICANT IMPACT AND RISK

As stipulated by the DMR template a summary of the assessment of the environmental and socio-economic impacts associated with the proposed project is provided in Table 52 below. A full description of the assessment is included in Appendix F. All identified impacts are considered in a cumulative manner such that the current baseline conditions on site and in the surrounding area are discussed and assessed together.

TABLE 52: ASSESSMENT OF SIGNIFICANT IMPACTS AND RISKS

Activity	Potential impact	Aspects affected	Phase	Significance (unmitigated)	Mitigation type	Significance (mitigated)	Extent to which the impact can be avoided or addressed through the implementation of management measures
Open pit mining Placement of infrastructure Mineralised waste Maintenance and aftercare	Loss and sterilisation of mineral resources	Geology	Construction Operation Decommissioning Closure	High	• Control through infrastructure design and placement to ore body	Low	Can be managed/mitigated to acceptable levels
Site preparation Earthworks Civil works Open pit mining Processing plant Transportation Power supply and use Water supply and use Mineralised waste Support services Demolition Rehabilitation Maintenance and aftercare	Hazardous excavations, infrastructure and surface subsidence that can be harmful to people and animals	Topography	Construction Operation Decommissioning Closure	High	• Control through access control • Control through management and monitoring • Control through rehabilitation • Remedy through emergency response procedure (Section 31.2.2)	Low	Can be managed/mitigated to acceptable levels
Site preparation Earthworks Civil works Open pit mining Processing plant Transportation Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services General site management Demolition Rehabilitation Maintenance and aftercare of rehabilitated areas	Loss of soil resources and land capability through contamination	Soil and land capability	Construction Operation Decommissioning Closure	Medium	• Manage through the implementation of soil conservation management plan and waste management plan • Control through rehabilitation • Remedy through emergency response procedure (Section 31.2.2)	Low	Can be managed/mitigated to acceptable levels
Site preparation Earthworks	Loss of soil resources and		Construction Operation	High	• Manage through the implementation of soil	Low	Can be managed/mitigated to

Activity	Potential impact	Aspects affected	Phase	Significance (unmitigated)	Mitigation type	Significance (mitigated)	Extent to which the impact can be avoided or addressed through the implementation of management measures
Open pit mining Processing plant Transportation Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services General site management Demolition Rehabilitation Maintenance and aftercare of rehabilitated areas	land capability through physical disturbance		Decommissioning Closure		conservation management plan and waste management plan • Control through rehabilitation • Control through limiting project footprint		acceptable levels
Site preparation Earthworks Civil works Open pit mining Processing plant Transportation Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services General site management Rehabilitation Maintenance and aftercare	Physical destruction of biodiversity	Biodiversity	Construction Operation Decommissioning Closure	High	• Control through limiting the project footprint • Control through alien invasive species programme • Remedy through biodiversity action plan • Remedy through biodiversity offset • Control through comprehensive monitoring of protected trees • Remedy through rehabilitation close to pre-mining conditions as practically possible.	Medium	Can be managed/mitigated to acceptable levels
Site preparation Earthworks Civil works Open pit mining Processing plant Transportation Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services	General disturbance of biodiversity		Construction Operation Decommissioning Closure	High	• Control through dust control • Control through training of employees • Control through waste management procedures.	Low	Can be managed/mitigated to acceptable levels

Activity	Potential impact	Aspects affected	Phase	Significance (unmitigated)	Mitigation type	Significance (mitigated)	Extent to which the impact can be avoided or addressed through the implementation of management measures
General site management Rehabilitation Maintenance and aftercare							
Earthworks Civil works Open pit mining Processing plant Transportation Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services General site management Demolition Rehabilitation Maintenance and aftercare	Contamination of surface water resources	Surface water	Construction Operation Decommissioning Closure	High	• Control through stormwater management and design • Remedy through emergency response procedure (Section 31.2.2)	Low	Can be managed/mitigated to acceptable levels
Earthworks Civil works Open pit mining Processing plant Transportation Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services General site management Demolition Rehabilitation Maintenance and aftercare	Alteration of natural drainage patters		Construction Operation Decommissioning Closure	High	• Control through appropriate design • Control through the separation of dirty and clean water	M (Low at closure) Low (realignment)	Can be managed/mitigated to acceptable levels
Earthworks Civil works Open pit mining Processing plant Transportation Power supply and use	Contamination of groundwater resources	Groundwater	Construction Operation Decommissioning Closure	Medium	• Control through monitoring • Remedy through emergency response procedure (Section 31.2.2)	Low	Can be managed/mitigated to acceptable levels

Activity	Potential impact	Aspects affected	Phase	Significance (unmitigated)	Mitigation type	Significance (mitigated)	Extent to which the impact can be avoided or addressed through the implementation of management measures
Water supply and use Mineralised waste Non-mineralised waste Support services General site management Demolition Rehabilitation Maintenance and aftercare							
Water supply and use Open pit mining	Reduction of groundwater levels and availability		Construction Operation Decommissioning	Low	• Control through monitoring	Low	Can be managed/mitigated to acceptable levels
Site preparation Earthworks Civil works Open pit mining Processing plant Transportation Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services Demolition General site management Rehabilitation Maintenance and aftercare	Air pollution	Air	Construction Operation Decommissioning Closure	High (Mn element – limited to the operational phase) Medium (High for $PM_{2.5}$ and PM_{10} in operational phase)	• Control through monitoring	Medium (Low for dust fallout)	
Site preparation Earthworks Civil works Open pit mining Processing plant Transportation Power supply and use Water supply and use Mineralised waste Non-mineralised waste	Noise pollution	Noise	Construction Operation Decommissioning	Medium	• Control through noise control measures and monitoring (if required)	Low	Can be managed/mitigated to acceptable levels

Activity	Potential impact	Aspects affected	Phase	Significance (unmitigated)	Mitigation type	Significance (mitigated)	Extent to which the impact can be avoided or addressed through the implementation of management measures
Support services Demolition General site management Rehabilitation Maintenance and aftercare							
Open pit mining	Blasting impacts (fly rock, air blasts and ground vibrations)	Blasting	Operation	High	• Control through access control • Manage through appropriate blast design • Remedy through emergency response procedure (Section 31.2.2)	Medium	Can be managed/mitigated to acceptable levels
Transport system	Road disturbance and traffic safety	Traffic	Construction Operation Decommissioning	High	• Control through appropriate design • Management through the implementation of traffic safety programme • Remedy through emergency response procedure (Section 31.2.2)	Medium	Can be managed/mitigated to acceptable levels
Site preparation Earthworks Civil works Open pit mining Processing plant Transportation Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services General site management Demolition Rehabilitation Maintenance and aftercare of rehabilitated areas	Negative visual views	Visual	Construction Operation Decommissioning Closure	Medium	• Control through visual controls and con-current rehabilitation	Medium (Low at closure)	Can be managed/mitigated to acceptable levels
Site preparation Earthworks	Loss of heritage,	Heritage/ cultural and	Construction Operation	Medium	• Control through avoidance of heritage resources	Low	Can be avoided

Activity	Potential impact	Aspects affected	Phase	Significance (unmitigated)	Mitigation type	Significance (mitigated)	Extent to which the impact can be avoided or addressed through the implementation of management measures
Civil works Open pit mining Processing plant Transportation Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services General site management Demolition Rehabilitation Maintenance and aftercare of rehabilitated areas	cultural and palaeontological resources	palaeontological resources	Decommissioning Closure		• Remedy through emergency response procedure (Section 31.2.2)		
Site preparation Earthworks Civil works Open pit mining Processing plant Transportation Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services General site management Demolition Rehabilitation Maintenance and aftercare of rehabilitated areas	Economic impact	Socio-economic	Construction Operation Decommissioning Closure	High positive	• Control through procurement programme and bursary and skills development programme	High positive	Can be managed/mitigated to acceptable levels
Site preparation Earthworks Civil works Open pit mining Processing plant Transportation Power supply and use Water supply and use	Inward migration		Construction Operation Decommissioning Closure	High	• Control through health policy, monitoring the development of informal settlements • Remedy through emergency response procedure (Section 31.2.2)	Medium	Can be managed/mitigated to acceptable levels

Activity	Potential impact	Aspects affected	Phase	Significance (unmitigated)	Mitigation type	Significance (mitigated)	Extent to which the impact can be avoided or addressed through the implementation of management measures
Mineralised waste Non-mineralised waste Support services General site management Demolition Rehabilitation Maintenance and aftercare of rehabilitated areas							
Site preparation Earthworks Civil works Open pit mining Processing plant Transportation Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services General site management Demolition Rehabilitation Maintenance and aftercare of rehabilitated areas	Land use impact	Land use	Construction Operation Decommissioning Closure	High	• Control through closure planning	Medium (Low at closure)	Can be managed/mitigated to acceptable levels

10 SUMMARY OF SPECIALIST REPORT FINDINGS

The relevant specialist studies that were undertaken as part of the proposed project including the recommendations made by the specialist are summarised in Table 51 below. The relevant specialist reports have been attached in the appendices to this EIA and EMP report.

TABLE 53: SUMMARY OF SPECIALIST REPORTS

Studies undertaken	Recommendations of specialists	Specialist recommendations that have been included in the EIA report (mark with an x)	Reference to applicable section in this report
Groundwater impact assessment	• Mokala should implement a groundwater monitoring programme with the following features: o The objective of the programme is to characterise groundwater quality and groundwater levels in and outside the mine lease area on a regular basis. o As preliminary guidance, SLR suggests that a network of six to eight boreholes be identified at various distances around the proposed pit. The borehole locations should be decided in consultation with an experienced groundwater professional. Mokala should choose monitoring locations according to the following guidelines: - At least two boreholes should be upstream of the proposed project to sample background groundwater quality - At least two boreholes should be within 500 m of the pit margins - At least three boreholes should be within the modelled zone of dewatering - At least three boreholes should be within the project site near potential sources of groundwater contamination, such as the overburden stockpile - At least two boreholes should be outside the modelled zone of dewatering - At least two boreholes should be downstream of the proposed project site and at least one of these should be in the modelled groundwater plume • These could be boreholes identified in the hydrocensus, existing boreholes on site, and/or new boreholes drilled by Mokala for monitoring purposes. • Mokala should conduct groundwater level monitoring by manual dipping or automated sensors. • Mokala should conduct groundwater quality monitoring using the procedure documented by Weaver et al (2007). This should include purging of the borehole prior to sampling, field measurement of selected water quality parameters, filtering of the sample through 0.45 µm polycarbonate filters, collection of the sample into laboratory-provided containers, preservation of samples, and analysis of samples by a SANAS-accredited laboratory • Groundwater levels should be measured every three months starting at least one year prior to mining, throughout mine operation, and for at least 10 years after closure. • Groundwater quality should be measured every six months starting at least one year prior to mining, throughout mine operation, and for at least 10 years after closure. • Mokala should appoint an experienced groundwater professional, registered with the SACNASP, to review the groundwater quality and level data every year. The	X	Section 28 and Section 30

Studies undertaken	Recommendations of specialists	Specialist recommendations that have been included in the EIA report (mark with an x)	Reference to applicable section in this report
	professional should provide Mokala with a technical report evaluating the groundwater level trends and making recommendations as required to maintain/extend the monitoring network and record data. This will require the development of a groundwater model for the operation. • Prevent spills or accidental releases of contaminants (such as oils, fuels, explosives, etc.) in all areas of the site • Maintain and inspect vehicles to reduce the occurrence of contaminant leaks. • If there is a reduction in quality or quantity of water in 3rd party boreholes then Mokala should provide an alternative water supply of equal or better quality and quantity. • Records should be kept of actual groundwater volumes abstracted and on-site daily rainfall data throughout the life of mine. • Updates of the groundwater model (transform from steady state into transient) as groundwater level and quality data become available. This will increase the confidence in simulated recharge rates but also in results of predictive simulations.		
Geochemistry impact assessment	• As a mitigation measure, runoff and seepage from the overburden stockpile is classified as “dirty water”. Mokala should take measures to intercept water from these areas thereby preventing the operation from increasing inorganic nitrogen concentrations in local surface water and groundwater resources. This should be considered in more detail during the design of storm water management for the overburden stockpiles. • The potential impact of overburden and pit backfill seepage on local groundwater quality should be assessed using a numerical groundwater model and the indicative concentrations and/or source terms presented in this report. • Mokala should institute a groundwater and surface water quality monitoring programme. The programme should allow for: o Regular collection of representative water samples. o Analysis of the samples by a SANS-accredited laboratory • The water quality results should be assessed by a suitably-qualified professional registered with the South African Council for Natural Scientific Professional (SACNASP). • It is recommended that the groundwater and surface water quality monitoring programme is included as a condition of the environmental authorisation.	X	Section 28
Soils and land capability impact assessment	• During the construction and operational phases the following needs to be implemented: o The existing pre-construction mine layout and designs aiming to minimise the area to be occupied by mine infrastructure (workshops, administration, processing plants, etc.) to as small as practically possible. All footprint areas should also be	X	Section 28

Studies undertaken	Recommendations of specialists	Specialist recommendations that have been included in the EIA report (mark with an x)	Reference to applicable section in this report
	clearly defined and demarcated and edge effects beyond these areas clearly defined. This measure will significantly reduce areas to be compacted by heavy construction vehicles and regular activities during the operational phase. o The activities of construction contractors or employees will be restricted to the planned areas. Instructions must be included in contracts that will restrict construction work and construction workers to the clearly defined limits of the construction site. In addition, compliance to these instructions must be monitored. o Locate all soil and overburden stockpiles in areas where they will not have to be relocated prior to replacement for final rehabilitation. Refrain from locating stockpiles as close as possible to the extraction point for cost saving only to have it relocated later during the life of mine. The ideal is to place all overburden materials removed at mine opening in their final closure location, or as close as practicable to it. o Wherever possible, stripping and replacing of soils should be done in a single action. This is both to reduce compaction and also to increase the viability of the seed bank contained in the stripped surface soil horizons. Stripping should be conducted a suitable distance ahead of mining at all times, to avoid loss and contamination. As a norm, soil stripping should be kept within 3-9 months of mining, or between 50-100 metres ahead of the active mining face. o To minimise compaction associated with stockpile creation, it is recommended that the height of topsoil stockpiles be restricted between of 4 – 5 metres maximum. For extra stability and erosion protection, the stockpiles may be benched although the clay content is sufficient for stockpiles to remain relatively stable without benching. o Ensure all topsoil stockpiles are clearly and permanently demarcated and located in defined no-go areas. As the mining will last over several years it is important to have well defined maps of stockpile locations that correlate with these demarcated areas as re-vegetated stockpiles may easily be mistaken for something else. These areas should be maintained for rehabilitation purposes and topsoil should never be used as a filling material for open pit. o Topsoil stockpiles can be contaminated by dumping waste materials next to or on the stockpiles, contamination by fly-rock from blasting and the pumping out of contaminated water from the pit are all hazards faced by stockpiles. This should be avoided at all cost and if it occurs, should be cleaned up immediately. o Management of the terrain for stability by using the following measures will reduce the risk of erosion significantly: - Using appropriate blasting methods that are in accordance with regulatory		

Studies undertaken	Recommendations of specialists	Specialist recommendations that have been included in the EIA report (mark with an x)	Reference to applicable section in this report
	requirements and industrial best practices procedures; - Reducing slope gradients as far as possible along road cuts and disturbed areas to gradients at or below the angle of repose of those disturbed surfaces; and - Using drainage control measures and culverts to manage the natural flow of surface runoff. o Existing established roads should be used wherever possible. Where possible, roads that will carry heavy-duty traffic should be designed in areas previously disturbed rather than clearing new areas, where possible. The moisture content of access road surface layers must be maintained through routine spraying or the use of an appropriate dust suppressant. o Access roads should be designed with a camber to avoid ponding and to encourage drainage to side drains; where necessary, culverts will be installed to permit free drainage of existing water courses. The side drains on of the roads can be protected with sediment traps and/or gabions to reduce the erosive velocity of water during storm events and where necessary geo-membrane lining can be used. o Soil pollution should be minimised as follows: - Losses of fuel and lubricants from the oil racks of vehicles and equipment should be contained using a drip tray with plastic sheeting filled and with sand - Using biodegradable drilling fluids, using lined sumps for collection of drilling fluids, recovering drilling muds and treating them off-site, and securely storing dried waste mud by burying it in a purpose-built containment area - Avoiding waste disposal at the site wherever possible, by segregating, trucking out, and recycling waste - Containing potentially contaminating fluids and other wastes - Cleaning up areas of spillage of potentially contaminating liquids and solids - Stockpiles are managed so they do not become contaminated and then need additional handling or disposal - A low process or storage inventory must be held to reduce the potential volume of material that could be accidentally released or spilled - Processing areas should be contained and systems designed to effectively manage and dispose of contained stormwater, effluent and solids - Storage tanks of fuels, oils or other chemicals stored are above ground, preferably with inspectable bottoms, or with bases designed to minimise		

Studies undertaken	Recommendations of specialists	Specialist recommendations that have been included in the EIA report (mark with an x)	Reference to applicable section in this report
	corrosion. Above-ground (rather than in-ground) piping systems should be provided. Containment bunds should be sealed to prevent spills contaminating the soil and groundwater - Equipment, and vehicle maintenance and washdown areas, are contained and appropriate means provided for treating and disposing of liquids and solids; - Air pollution control systems avoid release of fines to the ground (such as dust from dust collectors or slurry from scrubbing systems) - Solids and slurries are disposed of in a manner consistent with the nature of the material and recognises and avoids contamination - Effluent and processing drainage systems avoid leakage to ground. • During the operational phase the additional soil management measures are recommended: o The vegetative (grass) cover on the soil stockpiles (berms) must be continually monitored in order to maintain a high basal cover. Such maintenance will limit soil erosion by both the mediums of water (runoff) and wind (dust). o Drains and intercept drains must be maintained so that it continues to redirect clean water away from the operating plants, and to convey any potentially polluted water to a potential pollution control dams. o Routine monitoring will be required in and around the sites. • During the decommissioning phase the following soil management procedures need to be implemented: o The activities of decommissioning contractors or employees will be restricted to the planned areas. Instructions must be included in contracts that will restrict decommissioning workers to the areas demarcated for decommissioning. In addition, compliance to these instructions must be monitored o All buildings, structures and foundations not part of the post-closure land use plan must be demolished and removed from site o Once the site has been cleared of infrastructure and potential contamination, the slope must be re-graded (slope) in order to approximate the pre-mining aspect and contours. The previous infrastructure footprint area must be ripped a number of times in order to reduce soil compaction. The area must then be covered with topsoil material from the stockpiles. o Once the land has been prepared, seeding and re-vegetation will contribute to establishing a vegetative cover on disturbed soil as a means to control erosion and to restore disturbed areas to beneficial uses as quickly as possible. The vegetative		

Studies undertaken	Recommendations of specialists	Specialist recommendations that have been included in the EIA report (mark with an x)	Reference to applicable section in this report
	cover reduces erosion potential, slows down runoff velocities, physically binds soil with roots and reduces water infiltration through evapotranspiration. Indigenous species will be used for the re-vegetation, the exact species will be chosen based on research available and then experience as the further areas are re-vegetated. ○ During the decommissioning phase, chemical soil pollution should be minimised as follows: - Losses of fuel and lubricants from the oil racks of vehicles and equipment should be contained using a drip tray with plastic sheeting filled and with sand - Using biodegradable drilling fluids, using lined sumps for collection of drilling fluids, recovering drilling muds and treating them off-site, and securely storing dried waste mud by burying it in a purpose-built containment area - Avoiding waste disposal at the site wherever possible, by segregating, trucking out, and recycling waste - Containing potentially contaminating fluids and other wastes - Cleaning up areas of spillage of potentially contaminating liquids and solids. • During the closure phase activities include the maintenance and aftercare of final rehabilitated land. In this regard, frequent visual observations should be undertaken to confirm if vegetation has re-established and if any erosion gulley's have developed. In the event that vegetation has not re-established and erosion gulley's have developed, remedial action should be taken.		
Biodiversity impact assessment	• Preconstruction surveys of the development footprints for species suitable to search and rescue operations. • All cleared areas should be re-seeded once the topsoil has been replaced with a seed mixture reflecting the natural vegetation as is currently found (harvesting of seed from similar areas within the study area should be undertaken). This may be used in conjunction with a commercially available mix as this will ensure a good vegetation coverage and soil stability. Species such as *Stipagrostis* are good sand binders and aid in stabilising the substrate and are present within the study area. • Pods of *Vachellia erioloba*, and *Vachellia haematoxylon* should be collected from the area in order to aid in the re-establishment of these species. These seeds do however require artificial scarring/acid washing in order to aid in germination. The establishment of these trees will form a pivotal part in the rehabilitation of this area post mining as *V. erioloba* increases habitat heterogeneity. *V. erioloba* increases species richness by providing habitats and services for a variety of plants, reptiles, birds and mammals. Evidence also suggests that *V. erioloba* obtains nitrogen from deep ground water and then cycles nutrients from great depths, making them available above ground. High	X	Section 28 and Section 30

Studies undertaken	Recommendations of specialists	Specialist recommendations that have been included in the EIA report (mark with an x)	Reference to applicable section in this report
	nutrient levels and shade of the sub-canopy microhabitat increase survivorship of shade tolerant fleshy fruited plants. This microhabitat enables a suite of species, not adapted to conditions, to exist in this environment, thus enriching overall biodiversity. These plants provide a valuable food resource for a number of bird and mammal species. • Prior to the clearing of the protected floral species the relevant permits must be obtained from the relevant authorities. • A comprehensive monitoring programme of the protected trees within the area must be undertaken. This monitoring will need to be conducted on an individual tree basis as well as monitoring on a community level. • The possibility and practicality of removing dust from protected trees could be investigated as part of an experimentation process for the mine, in an attempt to determine if and how this could be achieved. Should the experimentation process prove successful the techniques developed could assist in minimizing the stresses of the trees, particularly within linking corridors inside the mining area. New innovative techniques to mitigate the effects of mining on biodiversity are continually being sort to lessen the destructive effects of these developments. • A comprehensive alien invasive eradication programme should be drawn up and implemented. • A biodiversity action plan for the mining area should be drawn up and implemented. • Prior to the establishment of the proposed mine, a biodiversity offset needs to be undertaken in support of the tree removal permit, given that more than 1000 protected tress will be removed.		
Surface water impact assessment	• Due to the uncertainties associated with the peak flood events, it is recommended that these uncertainties are managed by applying a 1 m freeboard to design levels for any infrastructure within close proximity to the Ga-Mogara drainage channel, including the proposed channel realignment and any flood protection berms. • On-going visual monitoring should be undertaken to record any flow events within the Ga-Mogara River. Where flow occurs, ideally measurement of flow should be undertaken using a portable flow meter, where this is not possible records should be taken (GPS reading, and supporting photographs) of the maximum extent of flows within the channel, or high water levels on any of the river crossings. This data can be cross referenced against rainfall records within the catchment and used to calibrate future flood modelling studies.	X	Section 28 and Section 30
Air quality impact assessment	• For the control of vehicle entrained dust it is recommended that water (at an application rate >2 litre/m2-hour), be applied in combination with dust palliative consisting of a cationic bitumen emulsion to stabilize the surface and prevent dust. Literature reports	X	Section 28 and Section 30

Studies undertaken	Recommendations of specialists	Specialist recommendations that have been included in the EIA report (mark with an x)	Reference to applicable section in this report
	an emissions reduction efficiency of up to 90%. • Crushers and screens should be fitted with dust suppression systems. • In minimizing windblown dust from stockpile areas (product stockpile), water sprays should be used to keep surface material moist and wind breaks installed to reduce wind speeds over the area. • In the transportation of ore and products, trucks, where possible should be well covered in order to avoid spillages. This will reduce the release of PM and consequently, elemental Mn emissions (Mn emission is taken as a fraction of PM10 emissions). • To ensure lower diesel exhaust emissions, equipment suppliers or contractors should be required to ensure compliance with appropriate emission standards for mining fleets. • It is recommended that continuous dustfall monitoring be conducted as part of the project's air quality management plan. This should be undertaken throughout the life of mine to provide air quality trends. • It is recommended that Mokala collaborate with other mines/industries and relevant authorities in the region to install a gravimetric PM10/PM2.5 monitor at Gloria Mine Village or Hotazel. This will provide adequate data on cumulative PM10 and PM2.5 concentrations from the Mokala Manganese Project and other mines/industries in the region. • It is recommended that the PM10/PM2.5 samples be analysed for manganese content in collaboration with other mines/industries and relevant authorities to indicate the manganese concentrations in the inhalable and respirable dust. This can be done by conducting an Inductively Coupled Plasma (ICP) analysis on the gravimetric PM10/PM2.5 filter sample to determine the trace concentration of elemental manganese in the ambient air. Should exceedances of the long-term assessment criteria occur (as was simulated), a health risk/toxicological assessment should then be conducted to determine the health impact due to manganese emissions at Gloria Mine village or Hotazel in collaboration with other mines/industries and relevant authorities. • Periodic inspections and external audits are essential for progress measurement, evaluation and reporting purposes. It is recommended that site inspections and progress reporting be undertaken at regular intervals (at least quarterly), with annual environmental audits being conducted. Annual environmental audits should be continued at least until closure. Results from site inspections and monitoring efforts should be combined to determine progress against source and receptor-based performance indicators. Progress should be reported to all interested and affected parties, including authorities and persons affected by pollution. The criteria to be taken into account in the inspections and audits must be made transparent by way of		

Studies undertaken	Recommendations of specialists	Specialist recommendations that have been included in the EIA report (mark with an x)	Reference to applicable section in this report
	minimum requirement checklists included in the management plan. Corrective action or the implementation of contingency measures must be proposed to the stakeholder forum in the event that progress towards targets is indicated by the quarterly/annual reviews to be unsatisfactory.		
Noise impact assessment	• For general activities the following good engineering practice should be applied: o All diesel powered equipment and plant vehicles should be kept at a high level of maintenance. This should particularly include the regular inspection and, if necessary, replacement of intake and exhaust silencers. Any change in the noise emission characteristics of equipment should serve as trigger for withdrawing it for maintenance. o To minimise noise generation, vendors should be required to guarantee optimised equipment design noise levels. o A mechanism to monitor noise levels, record and respond to complaints and mitigate impacts should be developed. o Blasting at the surface will be audible over long distances and may cause a startling reaction at receptors in close proximity. This can be mitigated by adhering to blast schedules that have been communicated to the affected parties. • In general, road traffic noise is the combination of noise from individual vehicles in a traffic stream and is considered as a line source if the density of the traffic is high enough to distinguish it from a point source. The following general factors are considered the most significant with respect to road traffic noise generation: o Traffic volumes i.e. average daily traffic. o Average speed of traffic. o Traffic composition i.e. percentage heavy vehicles. o Road gradient. o Road surface type and condition. o Individual vehicle noise including engine noise, transmission noise, contact noise (the interaction of tyres and the road surface, body, tray and load vibration and aerodynamic noise • In managing transport noise specifically related to trucks, efforts should be directed at: o Minimizing individual vehicle engine, transmission and body noise/vibration. This is achieved through the implementation of an equipment maintenance program. o Minimize slopes by managing and planning road gradients to avoid the need for excessive acceleration/deceleration. o Maintain road surface regularly to avoid corrugations, potholes etc.	X	Section 28 and Section 30

Studies undertaken	Recommendations of specialists	Specialist recommendations that have been included in the EIA report (mark with an x)	Reference to applicable section in this report
	○ Avoid unnecessary idling times. ○ Minimizing the need for trucks/equipment to reverse. This will reduce the frequency at which disturbing but necessary reverse warnings will occur. Alternatives to the traditional reverse 'beeper' alarm such as a 'self-adjusting' or 'smart' alarm could be considered. These alarms include a mechanism to detect the local noise level and automatically adjust the output of the alarm is so that it is 5 to 10 dB above the noise level in the vicinity of the moving equipment. The promotional material for some smart alarms does state that the ability to adjust the level of the alarm is of advantage to those sites 'with low ambient noise level. • In the event that Mokala receives noise related complaints during either construction or operation, then Mokala should consider conducting short term (24-hour) ambient noise measurements as part of investigating the complaints. The results of the measurements should be used to inform any follow up interventions. The following procedure should be adopted for all noise surveys: ○ Any surveys should be designed and conducted by a trained specialist. ○ Sampling should be carried out using a Type 1 sound level meter (SLM) that meets all appropriate International Electrotechnical Commission (IEC) standards and is subject to annual calibration by an accredited laboratory. ○ The acoustic sensitivity of the SLM should be tested with a portable acoustic calibrator before and after each sampling session. ○ Samples of at least 24 hours in duration and sufficient for statistical analysis should be taken with the use of portable SLM's capable of logging data continuously over the time period. Samples representative of the day- and night-time acoustic climate should be taken. ○ The following acoustic indices should be recorded and reported: - LAeq (T) - Statistical noise level LA90, - LAmin and LAmax - Octave band or 3rd octave band frequency spectra. ○ The SLM should be located approximately 1.5 m above the ground and no closer than 3 m to any reflecting surface. ○ Efforts should be made to ensure that measurements are not affected by the residual noise and extraneous influences, e.g. wind, electrical interference and any other non-acoustic interference, and that the instrument is operated under the conditions specified by the manufacturer. It is good practice to avoid conducting		

Studies undertaken	Recommendations of specialists	Specialist recommendations that have been included in the EIA report (mark with an x)	Reference to applicable section in this report
	measurements when the wind speed is more than 5 m/s, while it is raining or when the ground is wet. o A detailed log and record should be kept. Records should include site details, weather conditions during sampling and observations made regarding the acoustic climate of each site.		
Traffic impact assessment	• It is recommended that the following improvements should be made in terms of Road Safety: o In terms of the use of the R380 as illustrated in Figure 27, Mokala should investigate together with the roads department should collaborate in terms of the structural maintenance of the road infrastructure by providing the following: - Reflective Road Studs to ensure visibility at night time; - Road surface maintenance; - Road markings (Highway paint recommended); - Road traffic signs; - Fencing along public roads to control animal movement; and - Road safety training to workers and local communities. o The layout as indicated by Figure 4 should be provided at the intersection of Road R380, Gloria Mine Access Road and the Proposed Mining Development Access point to ensure that the relevant functions in a safe and acceptable manner o In terms of workers and visitors, a dedicated loading and off-loading area needs to be provided on the property of the Proposed Mining Development o Proper road markings, reflective road studs, road signs, overhead lighting and proper pedestrian crossings should be provided and maintained at the proposed mine access intersection to ensure visibility during night time, proper visibility of intersection lane geometry and sufficient information to road users. • The expected lifespan of the Proposed Mining Development will be at least until the year 2032. It is therefore required that the Proposed Mining Development should evaluate the relevant intersections and road sections on a regular basis as part of a risk and safety management process. • The traffic impact assessment does not comment on pavement layer attributes in terms of the relevant road section. The last mentioned need to be based on recommendations to be made by pavement design specialist. • The following recommendations are suggested in terms of the detailed design phase of roads for the proposed project: o Detailed investigations should be conducted in conjunction with the relevant Road	X	Section 28

Studies undertaken	Recommendations of specialists	Specialist recommendations that have been included in the EIA report (mark with an x)	Reference to applicable section in this report
	Authority in terms of the existing quality and potential life span of the existing road surface layers of the roads where processed product, consumables and workers will be transported (Road R380) ○ A road maintenance plan needs to be prepared in conjunction with the relevant road authority on public roads where trucks will operate (Road R380 (MR887-2)) in order to ensure that the processed product, consumables and workers can be transported at all times.		
Blasting assessment	• The modelling results indicate that the disturbance levels that could be experienced at the various locations around the planned mine should not cause damage to surface infrastructure. The potential ground vibration levels experienced in areas close to the open pit, are very high. In this regard clear and precise internal blast notifications must be given to all mine divisions (offices, workshops, plant and open pit) at least a day prior to the blast. A 500m safety radius needs to be determined for each block to be blasted and illustrated on a map. This will show what mine infrastructure if any falls within the safety radius. All personnel in these areas must be evacuated prior to the blast being set off. In the event that Mokala is unable to confirm if all personnel have been evacuated prior to the blast then the blast must be postponed. Notification boards could be placed at the entrance to the mine as well as alongside main roads. The date and time of the next blast should be shown. • External notifications should also be sent to the Kalagadi and Assmang Mines informing them of the date and time of any blasts. • Blasting operations must be conducted between the hours of sunrise and sunset. It may be prudent to apply for blasting permission on all weekdays as well as on Saturdays. No blasting should take place on Sundays. • The first blast should be audited. Aspects such as pattern layout, hole depths, method of charging holes, explosive column rise, stemming length and finally the timing and sequencing of the blast must be checked. • The charging operation must be accurately controlled. Overcharged holes can result in excessive airblast and flyrock and are therefore unacceptable. It is therefore essential that the correct control measures are put into place from day one to help control and minimise the disturbance levels. The bulk explosive supply company must be informed of this. • The blast should be monitored at a number of locations to allow the disturbance levels to be measured. Industry approved seismographs capable of recording ground vibration and airblast simultaneously should be used for this. The monitoring locations will need to be decided on. After the first blast the actual measurements made must be compared	X	Section 28 and Section 30

Studies undertaken	Recommendations of specialists	Specialist recommendations that have been included in the EIA report (mark with an x)	Reference to applicable section in this report
	to the predictions. The design can then be remodelled if required. • Exercise on-going care and control during all stages of the drilling and blasting operation. • Prior to charging up the blast, the holes drilled should be inspected and all 'problem' holes identified for corrective action. Examples of 'problem' holes could include holes that are under burdened, holes that are short drilled, holes surrounded by badly cracked ground and off pattern holes that could potentially lead to problems. • Production checks must be implemented as part of the Standard Operating Procedures. This is particularly important if Anfo or bulk explosives are being used. During charging up of the holes the bulk explosive product should be sampled on an on-going basis to ensure acceptable quality. • After charging up is complete and prior to stemming the holes closed, they should be taped to determine the explosive column rise to ensure that the required stemming length is obtained. Any errors must be corrected before the hole is stemmed closed. • The tie up should be carried out according to the blast plan to ensure that the timing and sequencing of the blast proceeds as planned. • Avoid prolonged sleeping of blasts particularly in wet ground conditions. It is preferable to charge and blast in the shortest possible time frame. • If fumes occur after a blast then the immediate vicinity of the blast area must be kept clear until these have dissipated. The wind direction and conditions must also be kept in mind to ensure that the fumes do not impact further afield. • It is advisable to schedule the blast for a time when majority of people are likely to be at home.		
Heritage/cultural and palaeontological impact assessment	• No mitigation measures are required for low heritage significant sites and as such can be disturbed/destroyed without any permits. • A qualified archaeologist must monitor the construction activity in the vicinity of HMK2 during the construction of the realignment and associated earth works.	X	Section 28
Economic and sustainability land use analysis	Not applicable	Not applicable	Section 28
Closure cost assessment	Not applicable	Not applicable	Section 28

11 ENVIRONMENTAL IMPACT STATEMENT

11.1.1 SUMMARY OF KEY FINDINGS OF THE EIA

This section provides a summary of the findings of identified and assessed potential impacts on the receiving environment in both the unmitigated and mitigated scenarios, including cumulative impacts. A summary of the potential impacts (as per Section 9), associated with the chosen alternatives (as per Section 7), in the unmitigated and mitigated scenarios for all project phases is included in Table 54 below.

TABLE 54: SUMMARY OF POTENTIAL IMPACTS

Section	Potential impact	Significance of the impact (the ratings are negative unless otherwise specified)	
		Unmitigated	Mitigated
Geology	Loss and sterilization of mineral resources	H	L
Topography	Hazardous excavations and infrastructure	H	L
Soils and land capability	Loss of soil resources and land capability through contamination	M	L
	Loss of soil resources and land capability through physical disturbance	H	L
Biodiversity	Physical destruction of biodiversity	H	M
	General disturbance of biodiversity	H	L
Surface water	Contamination of surface water resources	H	L
	Alteration of natural drainage patterns	H	M (L at closure) L (realignment)
Groundwater	Contamination of groundwater resources	M	L
	Reduction of groundwater levels and availability	L	L
Air quality	Air pollution	High (Mn element – limited to the operational phase) Medium (High for PM2.5 and PM10 in operational phase)	M (L for dust fallout)
Noise	Noise pollution	M	L
Blasting	Blasting impacts	H	M
Traffic	Road disturbance and traffic safety	H	M
Visual	Visual impacts	M	M (L at closure)
Heritage, palaeontological and cultural resources	Loss of heritage, palaeontological and cultural resources	M	L
Socio-economic	Economic impact	H^+	H^+
	Inward migration	H	M
Land use	Land use impact	H	M (L at closure)

The assessment of the proposed project presents the potential for significant negative impacts to occur (in the unmitigated scenario in particular) on the bio-physical, cultural and socio-economic environments both on the project sites and in the surrounding area. With mitigation these potential impacts can be prevented or reduced to acceptable levels.

It follows that provided the EMP is effectively implemented there is no environmental, social or economic reason why the project should not proceed.

11.1.2 FINAL SITE MAP

The final preferred site layout plan is included in Appendix G.

11.1.3 SUMMARY OF THE POSITIVE AND NEGATIVE IMPLICATIONS AND RISKS OF THE PROPOSED ACTIVITY AND IDENTIFIED ALTERNATIVES

A detailed discussion of the positive and negative implications and risks of the proposed activity and identified alternatives is provided in Section 7.7. The environmental implications and risks for soil, groundwater, visual, air, noise, land use, economic impact and inward migration are the same for both site layout options. Option 2 will require the disturbance of high biodiversity sensitive areas, the destruction of a low significance heritage resource and will be located outside the 1:100 year floodline and will be 100m from the Ga-Mogara drainage channel. Option 1 will result in the sterilisation of future mineable resources, existing surface infrastructure such as the R380 and the Telkom line will be damaged from blasting activities and the project will be unviable as option 1 will result in the loss of approximately 6 million tons of ore if the R380 is not diverted.

The negative implications of option 2 is that sensitive areas/resources will be disturbed/destroyed, however based on the outcome of the site selection process as outlined in Section 7.7, while option 1 has some positive implications as it remains away from sensitive areas/resources when compared to option 2 (both options will require the removal of protected tress), option 1 has negative implications to the proposed projects viability.

12 IMPACT MANAGEMENT OBJECTIVES AND OUTCOMES FOR INCLUSION IN THE EMPR

Based on the outcome of the impact assessment and where applicable the recommendations from specialists the proposed management objectives and outcomes for inclusion into the environmental management programme are detailed in this section.

12.1 PROPOSED MANAGEMENT OBJECTIVES AND OUTCOMES FOR ENVIRONMENTAL AND SOCIO-ECONOMIC IMPACTS

Specific environmental objectives to control, remedy or stop potential impacts emanating from the proposed project is provided in Table 55 below.

TABLE 55: ENVIRONMENTAL OBJECTIVES AND OUTCOMES

Aspect	Environmental objective	Outcome
Geology	To prevent unacceptable mineral sterilisation	Avoid mineral sterilisation
Topography	To prevent physical harm to third parties and animals from potentially hazardous excavations and infrastructure	To ensure the safety of people and animals
Soil and land capability	To prevent soil pollution and to minimise the loss of soil resources and related land capability through physical disturbance, erosion and compaction	To handle, manage and conserve soil resources to be used as part of rehabilitation and re-establishment of the pre-mining land capability
Biodiversity	To prevent the unacceptable disturbance and loss of biodiversity and related ecosystem functionality through physical destruction and disturbance	To limit the area of disturbance as far as practically possible
Surface water	To prevent pollution of surface water resources and related harm to surface water users (if any) and to prevent unacceptable alteration of drainage patterns and related reduction of downstream surface water flow	To ensure surface water quality remains within acceptable limits for both domestic and agricultural purposes. To ensure that the reduction of the volume of run-off into the downstream catchment is limited to what is necessary and that natural drainage patterns are re-established as part of rehabilitation.
Groundwater	To prevent pollution of groundwater resources and related harm to water users and to prevent losses to third party water users.	To ensure groundwater quality remains within acceptable limits for both domestic and agricultural purposes. To ensure that groundwater continues to be available to current users.
Air	To prevent air pollution health impacts	To ensure that any pollutants emitted as a result of the proposed project remains with acceptable limits
Noise	To prevent unacceptable noise impacts	To ensure that any noise generated as a result of the proposed project remain within acceptable limits
Visual	To limit negative visual impacts	To ensure visual views that complement

Aspect	Environmental objective	Outcome
		the surrounding environment
Traffic	To reduce the potential for safety and vehicle related impacts on road users	To ensure the mine's use of public roads is done in a responsible manner
Blasting	To minimise the potential for third party damage and/or loss	To protect third party property from proposed project-related activities, where possible Where damage is unavoidable, to work together with the third parties to achieve a favourable outcome To ensure public safety
Heritage and cultural	To prevent unacceptable loss of heritage resources and related information	To protect heritage resources where possible If disturbance is unavoidable, then mitigate impact in consultation with a specialist and the SAHRA and in line with regulatory requirements
Socio-economic	To enhance the positive economic impacts and limit the negative economic impacts	To work together with existing structures and organisations
Informal settlements	To limit the impacts associated with inward migration	To establish and maintain a good working relationship with surrounding communities, local authorities and land owners
Land uses	To prevent unacceptable impacts on surrounding land uses and their economic activity	To co-exist with existing land uses To negatively impact existing land uses as little as possible

12.1.1 IMPACTS THAT REQUIRE MONITORING PROGRAMMES

Outcomes of the environmental objectives are the implementation of monitoring programmes. Impacts that require monitoring include:

- Hazardous excavations and structures
- Physical destruction and general disturbance of biodiversity
- Pollution of surface water resources
- Contamination of groundwater
- Depletion of groundwater resources
- Increase in air pollution
- Increase in noise levels
- Blasting damage
- Traffic increase and road use

12.1.2 ACTIVITIES AND INFRASTRUCTURE

The source activities of potential impacts which require management are detailed in Section 4.1 and listed below.

- Site preparation
- Earthworks
- Civil works
- Open pit mining
- Processing plant
- Transportation
- Mineralised waste
- Non-mineralised waste
- Water supply, use and management
- Power supply and use
- Supporting services
- General site management
- Demolition
- Rehabilitation
- Maintenance and aftercare

12.1.3 MANAGEMENT ACTIONS

Management actions which will be conducted to control the project activities or processes which have the potential to pollute or result in environmental degradation are detailed in Section 28.

12.1.4 ROLES AND RESPONSIBILITIES

The key personnel to ensure compliance to this EMP report will be the operations executive, the environmental department manager and the stakeholder engagement manager. As a minimum, these roles as they relate to the implementation of monitoring programmes and management activities will include:

- Senior Operational Manager and Environmental Department Manager
  - Ensure that the monitoring programmes and audits are scoped and included in the annual mine budget
  - Identify and appoint appropriately qualified specialists/engineers to undertake the programmes
  - Appoint specialists in a timeously manner to ensure work can be carried out to acceptable standards
- Stakeholder engagement department:
  - Liaise with the relevant structures in terms of the commitments in the SLP
  - Ensure that commitments in the SLP are developed and implemented timeously
  - Establish and maintain good working relations with surrounding communities and landowners
  - Facilitate stakeholder communication, information sharing and grievance mechanism

13 FINAL PROPOSED ALTERNATIVES

The preferred alternatives for the proposed project include the following:

- Site layout option 2 which includes the realignment of the R380 and the establishment of infrastructure to the north and south of the existing R380
- The use of water from on-site boreholes and from the Vaal Ga-Mogara water supply scheme
- The transportation of ore via road to Durban and Port Elizabeth

For the details pertaining to how these alternatives were selected refer to sections 7.1 and 7.7. The environmental impact assessment provided in Section 9 is based on these alternatives. It follows that the impact management objectives and measures were identified to manage and mitigate impacts associated with the above listed alternatives.

14 ASPECTS FOR INCLUSION AS CONDITIONS OF THE AUTHORISATION

Management measures including monitoring requirements as outlined in Sections 28 and 30 need to form part of the conditions of the environmental authorisation. With reference to Section 26 of GN.982 of NEMA, additional conditions that need to form part of the environmental authorisation that are not specifically included in the EIA and EMP report include the following:

- Mokala must comply with all applicable environmental legislation whether specifically mentioned in this document or not and which may be amended from time to time.

15 ASSUMPTIONS, UNCERTAINTIES AND GAPS IN KNOWLEDGE

Assumptions, uncertainties and limitations associated with the proposed project are included below.

15.1 ENVIRONMENTAL ASSESSMENT LIMIT

The EIA and EMP focused on third parties only and did not assess health and safety impacts on workers because the assumption was made that these aspects are separately regulated by health and safety legislation, policies and standards, and that Mokala will adhere to these.

15.2 PREDICTIVE MODELS IN GENERAL

All predictive models are only as accurate as the input data provided to the modellers. If any of the input data is found to be inaccurate or is not applicable because of project design changes that occur over time, then the model predictions will be less accurate.

15.3 TOPOGRAPHY

None.

15.4 CLIMATE

None.

15.5 SOILS AND LAND CAPABILITY

The assumptions and limitations were made as part of the soils and land capability study include the following (Terra Africa, July 2015):

The following assumptions were made during the assessment and reporting phases:

- Soil profiles were observed using a 1.5 m hand-held soil auger or open profiles where it was possible in old prospecting areas. A description of the soil characteristics deeper than 1.5 m cannot be given.

15.6 BIODIVERSITY

The assumptions and limitation that were made as part of the biodiversity impact assessment include the following (EMS, August 2015):

- The major potential limitation associated with the sampling approach is the narrow temporal window of sampling. Ideally, a site should be visited several times during different seasons to ensure that the

full complement of plant and animal species present are captured. The information presented in this report represents the wet/summer season survey.

- A full plant species list was compiled for the site from the site visits, this was complemented by a list of any listed species which are known from other studies to occur in the broad vicinity of the site. The lists of amphibians, reptiles and mammals for the site are based on those observed at the site as well as those likely to occur in the area based on their distribution and habitat preferences. This represents a sufficiently conservative and cautious approach that takes account of the study limitations.
- At present there is no Systematic Biodiversity Conservation Plan for the Northern Cape other than the Namakwa District Biodiversity Sector Plan. Thus there is no fine scale biodiversity data available and consequently no CBA have been defined for this area. Thus although there are no CBAs defined it should not be assumed that they don't exist. No information is currently available on the fine scale distribution of ADEs, type of plant association, (singly, in stands or gallery forests), aquifer association, condition of vegetation and therefore a precautionary approach should be taken when developing in and around these systems until such time that the research data indicates whether or not they are in fact CBAs.
- There is no quantitative analysis of the resource base for the protected trees (*Vachellia erioloba* and *Vachellia haematoxylon*) and as such it is not known how many of the trees can be removed from an area without detrimentally affecting the overall population numbers.

15.7 SURFACE WATER

The limitation associated with the flow peak determination methods is that the recommended flows determined take into account a comprehensive review of available data. It should however be noted that there remains significant uncertainties associated with flood estimation within an ungauged catchment, even more so for a watercourse with a catchment area in excess of 8 000 km^2 which only flows during exceptional conditions. It is recommended that these uncertainties are managed by applying a 1 m freeboard to design levels for any infrastructure within close proximity to the Ga-Magara drainage channel including the proposed channel realignment channel and any flood protection berms (SLR, August 2015).

The water balance assumes the following (SLR, October 2015):

- All infrastructures is fully developed, no consideration is given to changes in flows resulting from progressive development of infrastructure, variations in climate, changes in production rate or storage (e.g. start-up water).
- Due to the inherent uncertainty in estimating pit ground water inflows a minimum and maximum estimate is given in the Groundwater Report, being 2.5 l/s and 5.1 l/s respectively. The lower

estimate is applied to the 'dry' water balance while the upper estimate is applied to the 'wet' water balance. An evaporation rate is applied to 50% of the pit area open at any one time to account for evaporation of ground water inflows at the seepage face.

- No rainfall is applied for the 'dry' water balance while the average monthly value of 63.5 mm (February) is used for the 'wet' water balance.
- An average of the evaporation rates for June, July and August is used in the 'dry' water balance, being 97 mm, while the monthly average evaporation rate for February is used for the 'wet' water balance, being 185 mm.
- The area taken for the open pit is that for two strips, being the average of the strip lengths shown on the layout plan and a fixed 50 m width. Due to the use of the strip mining method only two strips will be open at any one time.
- No consideration is given to storage in the water balance, i.e. flow in = flow out.
- Pump testing undertaken as part of the groundwater study gave the best available yield for borehole GL27 as approximately 36 000 l/d. However long term pumping will result in the depletion of the groundwater resource. The cone of drawdown from pit dewatering has been shown not to significantly impact on the tested borehole.
- Borehole water will have to be treated to potable standards with reverse osmosis (RO). The RO plant is taken to have a 75% recovery rate. Brine from the RO plant is to be directed to the RWP 4.
- Ground water inflows to the pit will not be suitable for RO treatment due to the high suspended solids content.
- External water requirements will be supplied from the Vaal Ga-Mogara Water Supply Scheme.

15.8 GROUNDWATER

The assumptions and limitation that were made as part of the groundwater assessment (SLR, October 2015) are discussed below.

Pit dewatering assumptions that were made as part of the groundwater assessment included the following:

- The maximum pit floor elevation used was 870 mamsl which equals to a maximum pit depth of approximately 170m below ground level.

Groundwater contamination assumptions that were made as part of the proposed project include:

- Potential plumes emanating from the most significant potential sources (overburden stockpile) were simulated non-reactive, transient solute transport model. No lining or base preparation of the stockpile footprint was assumed. No specific source concentration was simulated and the plumes are illustrated in percentages of the relative source concentration applied to the overburden stockpile.

Consequently the concentration of a distinct parameter at a given location can be determined as the simulated percentage of its initial source concentration. Impacts associated with ad hoc sources such as spillages were not modelled as it was assumed that these will be managed by Mokala using best practice management measures.

- The calibrated steady state flow field served as the base in the transient non-reactive solute transport model. According to the dewatering scenario, the entire proposed mining infrastructure will be located within the cone of the depression of the dewatered mine pit. Therefore, it is assumed that the mine pit will eventually capture potential leachates and consequently a partial recycling of the seepage water with subsequent potential salt build-up within the water system of the mine is a possibility to be considered by Mokala.
- Further, adsorption and potential degradation were not modelled and the solute was treated as a conservative tracer by simulating only advection, longitudinal and transversal dispersion. Hence, processes that could reduce transport of contaminants were not simulated. Since site-specific information on effective porosity, dispersity and seepage rates and on the potential source concentration were not available the following assumption were made:
  - No specific source concentration is simulated and the plumes are modelled in percentages of the relative source concentration applied to the overburden stockpile
  - The ratio between longitudinal, transversal and vertical dispersity (D_L, D_T, D_V) is 100:10:1 (Kinzelbach et al., 1995). A longitudinal dispersity of 20 m was simulated.
  - Simulated effective porosity for the Kalahari beds is 10% and 1% to 2.5 % for the underlying bedrock units (no site specific information available)
  - Two times calibrated and monthly rainfall averages natural recharge was simulated over the overburden stockpile footprint to account for potential increased infiltration rates in the mostly unconsolidated overburden material.
  - A constant seepage concentration is assumed. This is a worst case assumption as in reality seepage concentration will decline over time due to leaching processes in the stockpile. The stockpile will also only exist as a source during the life of mine.
  - No transport in the unsaturated Kalahari beds is simulated, i.e. the initial source concentration is applied to the groundwater table. In reality potential seepage will flow through approximately 45 m of unsaturated Kalahari beds to reach the groundwater table resulting in an additional time lag and attenuation of contaminants in the unsaturated zone not depicted by the model
- Effective porosity is the most significant uncertainty in the transport model. Reported effective porosity values for sediments of the Kalahari Formation applied in studies on neighbouring sites range between 15% and 30% (SLR, 2015b). These may be realistic for sand and fractured calcrete of Kalahari age. However, they are likely to be too high for clay, or clay-bearing sands and calcrete. Therefore, the Kalahari Formation was simulated with an effective porosity of 10%.

- To investigate the potential impacts on groundwater quality due to a backfilled mine pit with fully recovered pit water levels, the steady state flow field of the backfill scenario was used as the base of a transient, non-reactive STM simulating the spreading of potential plumes emanating from the backfilled mine pit.

The hydrocensus identified surrounding boreholes and the assessment of impacts relates to these identified boreholes. If other boreholes exist or are developed in future, these can be incorporated into the monitoring and management programme.

15.9 GEOCHEMISTRY

The following assumptions were made as part of the geochemistry assessment (SLR, August 2015) undertaken for the proposed project:

- The leach tests for the twenty (20) geochemistry samples at a solution-solid ratio of 3:1 were used as a starting point for estimating drainage quality. The PHREEQC equilibrium geochemical modelling code was used to simulate the solution composition at the water-rock ratio indicated by the conceptual model.
- It is generally impossible to determine precisely the physical and geochemical characteristics of a mine facilities that do not yet exist. Therefore, assumptions are required to predict water qualities by means of geochemical modelling. General assumptions include:
    - Input water qualities are obtained from the results of the geochemical characterisation programme. The water compositions used in the modelling do not represent actual water samples but “theoretical” compositions from sample analysis results.
    - Leaching of salts and metals at the field scale is variable through time and controlled by factors not fully applied at the lab scale. These factors include temperature, nature of the leaching solution, the solution to solid ratio, solution-solid contact time, particle size of the solid, and so on.
    - Modelled waters are in full thermodynamic equilibrium. Equilibrium is the computational basis of PHREEQC. Equilibrium is unlikely to be the case for all chemical components throughout all mine waters. However, research has shown that assuming equilibrium conditions may usefully describe the composition of natural and mine water.
    - The PHREEQC model appropriately simulates chemical reactions and contains the appropriate thermodynamic constants.
- Due to the assumptions and inherent limitations of predictive modelling, the model results presented in the geochemistry report are order of magnitude estimates. Therefore, results do not indicate modelled concentrations less than 0.1 mg/L.

- It was confirmed by Mokala that the Lower Manganese Ore body would not be fully excavated and the Lower BIF would not be exposed, therefore samples of the Lower BIF have not been collected and test as part of the geochemical assessment.

15.10 AIR QUALITY

The assumptions and limitations that were made as part of the air quality impact assessment include the following (Airshed, September 2015):

- The quantification and simulation of sources of emission was restricted to the proposed project area. No background pollutant concentrations were available for the region and the potential for cumulative impacts were assessed qualitatively.
- Project information required to calculate emissions for proposed operations were provided by SLR. Where necessary, assumptions were made based on the specialist's experience.
- Routine emissions were estimated and simulated.
- In the absence of on-site surface meteorological data, use was made of modelled MM5 data for an on-site location.
- A minimum of 1 year on-site, or at least 3 years of appropriate off-site meteorological data, not older than 5 years, are required for use in atmospheric dispersion modelling for air quality impact assessment purposes. Three years of simulated meteorological data (2011 to 2013) was utilized as part of the air quality impact assessment.
- The impact assessment was limited to airborne particulates (including TSP, PM_{10} and $PM_{2.5}$), elemental Mn and gaseous pollutants from diesel engines, including CO, NO_x VOCs and SO_2 as relevant to the various project phases.
- Nitrogen monoxide (NO) emissions are rapidly converted in the atmosphere into nitrogen dioxide (NO_2). NO_2 impacts where calculated by AERMOD using the ozone limiting method assuming constant monthly average background ozone concentrations of 30 ppb and a NO_2/NO_x emission ratio of 0.2.
- Decommissioning phase impacts (similar to construction) and post closure impacts were not quantified. Impacts associated with these phases are generally less significant than operational phase impacts since most of the air pollutions sources and activities have ceased. Mitigation and management measures recommended for the operational and construction phases are however also applicable in the decommissioning phase and to a lesser extent in the post closure phase.
- VOC emissions from diesel storage were not included. It is known to contribute minimally to total VOC emissions from mining operations.

15.11 NOISE

The assumptions and limitations that were made as part of the noise impact assessment include the following (Airshed, September 2015):

- The study excluded the assessment of the impact of blasting. Blast noise cannot be modelled due to its sporadic nature. Air blasts are the main concern which is dealt with by the blasting specialists.
- All mining activities were assumed to be at the surface of pit areas. The mitigating effect of pit walls and waste rock dumps were therefore not accounted for. This means that the study outcomes for mining activities are conservative.

15.12 VISUAL ASPECTS

None.

15.13 BLASTING

The assumptions that were made as part of the blasting assessment include the following (Cambrian, August 2015):

- The prediction of the possible disturbance levels at various distances is based on reasonable assumptions regarding the blast patterns to be drilled and blasted. Generally accepted equations and modelling methods were used to perform the calculations on which the predictions are based, however prior to the start of the drill and blast operation these figures must be reviewed to correct for any variances between ‘actual’ versus ‘modelled’.
- It is possible that the surrounding infrastructure that was identified as part of the blasting assessment may change or be altered by the time mining activities commence. It follows that as part of the final design the identification of surrounding infrastructure needs to be confirmed.

15.14 HERITAGE/ CULTURAL AND PALAEONTOLOGICAL RESOURCES

Not detracting in any way from the comprehensiveness of the fieldwork undertaken, it is necessary to realise that the heritage resources located during the fieldwork do not necessarily represent all the possible heritage resources present within the area. Various factors account for this, including the subterranean nature of some archaeological sites and the current dense vegetation cover. As such, should any heritage features and/or objects not included in the present inventory be located or observed, the chance find procedure applies.

15.15 ECONOMIC LAND USE AND SUSTAINABILITY

The following assumptions and limitations apply to the economic impact and sustainability analysis assessment:

- the information supplied in relation to employment opportunities, income generation, life of mine, etc. by the client is an accurate reflection of the activities during construction, operational and closure phases of the proposed project
- A discount factor supplied by the client was used to calculate the net present value calculations;
- Information which were used in some of the agricultural calculations were sourced from third parties. Errors with this information could possible effect the results of the calculations and therefore the assessment
- A buffer zone of 500m surrounding the impacted area was applied as a precautionary measure to ensure that the potential impacts associated with the planned project are not understated. All relevant calculations were based on this adjusted footprint, which included the buffer zone
- The macro-economic data for this analysis was obtained from Quantec, Global Insights, Stats SA and local government websites (Integrated Development Plans and Spatial Development Framework reports). Errors with this information could possible effect the results of the calculations and therefore the assessment
- land values are based on average land values in the region, however the true value of the land is determined by a range of factors and will therefore most likely be higher or lower than the value used in this report.

15.16 TRAFFIC IMPACT ASSESSMENT

Assumptions relevant to the traffic impact assessment include (Siyazi, March 2015):

- The anticipated average rate of growth of 4% per annum has been included as background traffic for the respective road sections.
- The absorption rate by all other types of completed developments will maintain the same status for the next ten years.

15.17 CLOSURE COST ESTIMATE

The closure cost estimate for the proposed project was based on the following assumptions (SLR, September 2015):

- No allowance for salvage and recycled/scrap material has been considered.
- All infrastructure will be demolished and no handover of any facilities (for post closure use) has been allowed for.

16 REASONED OPINION AS TO WHETHER THE PROPOSED ACTIVITY SHOULD OR SHOULD NOT BE AUTHORISED

16.1.1 REASONS WHY THE ACTIVITY SHOULD BE AUTHORIZED OR NOT

The assessment of the proposed project presents the potential for significant negative impacts to occur (in the unmitigated scenario in particular) on the bio-physical, cultural and socio-economic environments both on the project sites and in the surrounding area. With mitigation these potential impacts can be prevented or reduced to acceptable levels. It follows that provided the EMP is effectively implemented there is no environmental, social or economic reason why the project should not proceed.

16.1.2 CONDITIONS THAT MUST BE INCLUDED IN THE AUTHORISATION

16.1.2.1 Specific conditions for inclusion in the EMPR

Refer to Section 14.

16.1.2.2 Rehabilitation Requirements

Refer to Section 29.1.1.

17 PERIOD FOR WHICH AUTHORISATION IS REQUIRED

The life of mine is expected to be approximately 15 years.

18 UNDERTAKING

I, Natasha Daly, the Environmental Assessment Practitioner responsible for compiling this report, undertake that:

- the information provided herein is correct;
- the comments and inputs from stakeholders and I&APs has been included;
- inputs and recommendations from the specialist reports have been included where relevant.
- Any information provided by the EAP to interested and affected parties and any responses by the EAP to comments or inputs made by interested or affected parties

Signature of EAP

09/11/2015
Date

Signature of commissioner of oath

09/11/2015
Date

BRANDON IAN STOBART
EX OFFICIO
COMMISSIONER OF OATHS
NON-PRACTISING ATTORNEY
REPUBLIC OF SOUTH AFRICA
UNIT 7, FOURWAYS MANOR OFFICE PARK
FOURWAYS

19 FINANCIAL PROVISION

Estimated costs for implementing the technical and management actions identified in Section 28 are included in the table below (Table 56). The costs are either once off costs or an annual cost and have been determined at 2011 rates. Please note that the costs included in the table are based on conceptual estimates only (using experience in similar projects).

19.1.1 METHOD TO DERIVE THE AMOUNT TO MANAGE AND REHABILITATE THE ENVIRONMENT

TABLE 56: ESTIMATED COSTS FOR IMPLEMENTING TECHNICAL AND MANAGEMENT OPTIONS

Potential impact	Technical and management options	Estimated costs
Resources	• All options need to be implemented with input from a dedicated environmental management resource at the mine.	• R700 000.00
Auditing and annual review	• Biannual EMP performance assessment (external) • Annual review of closure cost estimate	• R60 000.00 (EMP performance assessment) • R92 000.00 (Closure cost update)
Hazardous structures	• Establish and maintain site security measures • Control site and facility access • Appropriate design of stockpiles with the potential to fail (and by qualified person) • Establish and maintain infrastructure security measures • Undertake third party awareness training	• Approximately 2 million to cover all aspects
Loss of soil resources	• Implement a site-specific soil management plan • Implement a non-mineralised waste management procedure (provide skips for waste sorting and waste removal contractor) • Rehabilitation of contaminated soils (as soon as possible)	• Approximately 1 million to cover all aspects
Biodiversity	• Apply for permit to disturb protected trees • Compile a biodiversity offset plan and implementation thereof • Implement a monitoring programme to remove alien and invasive species	• R30 000.00 (Tree removal permit m- as and when required) • R100 000 to 150 000 (Offset – once off) • R30 000 (Alien invasive species programme)
Alternation of drainage patterns	• Construction of stormwater controls (and by qualified person) • Construction of Ga-Mogara drainage channel realignment	• R2 700 000.00 (stormwater controls – once off) • R6 500 000.00 (Channel realignment - once off)
Surface water pollution	• Maintain stormwater controls and inspections • Update water balance on an annual basis	• R30 000.00 (water balance) • R60 000.00 (maintain stormwater controls and inspections)

Potential impact	Technical and management options	Estimated costs
Groundwater quality and quantity	• Implement a monitoring programme (quality and quantity). Where surface water resources are present, include these in the programme. • Installation of liners in recycled water dams	• R400 000.00 (monitoring) • R 2 500 000.00 (liners – once off)
Air pollution	• Install dust monitoring buckets and implement monitoring programme • Implement a PM10/PM2.5 sampler and monitoring	• R150 000 (Dust bucket installation and monitoring) • Mokala's portion of R160 000 (PM10 and PM2.5 sampler and monitoring). This cost be shared with surrounding operations.
Disturbing noise	• Short term noise monitoring if required • Maintenance of equipment	• R80 000.00 (Noise sampling) • R280 000.00 (maintenance)
Landscape and visual	• Retain natural vegetation as screens • Paint buildings and structures in colours that reflect landscape • Careful use of night lights • Prevent litter	• Approximately R500 000.00
Blast hazards	• Design and implement blast to meet threshold criteria • Monitor blasts and installation of seismographs	• R200 000.00 (blast design and monitoring)
Traffic	• On-going training of staff • Maintenance of vehicles and of roads	• R150 000.00 (training) • R280 000 (maintenance)
Heritage	• Not applicable unless there are chance finds.	Not applicable
Socio-economic	• Quarterly meetings	• R20 000.00

The estimated total amount to manage and rehabilitate the environment amount to approximately R18 072 000.00. It is however important to note that some of these costs are once-off and will only be required during the construction phase as part of implementing facilities.

19.1.2 CONFIRM THAT THE AMOUNT CAN BE PROVIDED FOR FROM OPERATING EXPENDITURE

The amount required in order to manage and rehabilitate the environmental is provided for in the operating costs.

20 DEVIATIONS FROM SCOPING REPORT AND APPROVED PLAN OF STUDY

20.1.1 DEVIATION FROM THE METHODOLOGY USED IN DETERMINING THE SIGNIFICANCE OF POTENTIAL ENVIRONMENTAL IMPACTS AND RISKS

No deviations in terms of the methodology used to determine the significance of potential environmental impacts and risks were made as per the approved plan of study in the scoping report.

20.1.2 MOTIVATIONS FOR DEVIATION

Not applicable.

21 SPECIFIC INFORMATION REQUIRED BY THE COMPETENT AUTHORITY

21.1.1 IMPACT ON THE SOCIO-ECONOMIC CONDITIONS OF ANY DIRECTLY AFFECTED PERSON

The impacts associated with socio-economic conditions are discussed in Appendix F. Management and mitigation measures identified to address any socio-economic impacts are included in Section 28. It is however important to note that no person will be directly affected by the proposed project given that no IAPs currently reside within the proposed project footprint area.

21.1.2 IMPACT ON ANY NATIONAL ESTATE REFERRED TO IN SECTION 3(2) OF THE NATIONAL HERITAGE RESOURCES ACT

Not applicable as no national estate will be affected as part of the proposed project.

22 OTHER MATTERS REQUIRED IN TERMS OF SECTIONS 24(4)(A) AND (B) OF THE ACT

No other matters are required in terms of Section 24(4)(A) and (B) of the act.

PART B – ENVIRONMENTAL MANAGEMENT PROGRAMME REPORT

23 DETAILS OF THE EAP

It is hereby confirmed that the details of the EAP who undertook the EIA and prepared this EMP are provided in Part A, Section 1 of the EIA report.

24 DESCRIPTION OF THE ASPECTS OF THE ACTIVITY

It is hereby confirmed that the activities covered by this EMP are fully described in Part A, Section 4 of the EIA report.

25 COMPOSITE MAP

A map indicated all surface infrastructure superimposed on the environmental sensitive areas of the preferred site is included in Appendix G.

26 DESCRIPTION OF THE IMPACT MANAGEMENT OBJECTIVES INCLUDING MANAGEMENT STATEMENTS

26.1 DETERMINATION OF CLOSURE OBJECTIVES

The closure objectives for the proposed project were determined taking into account the exiting type of environment as described in Section 7.4.1, in order to ensure that the closure objectives strive to achieve a condition approximating its natural state as far as possible. Further information pertaining to the closure objectives identified for the proposed project, refer to Section 29.1.1.

26.2 THE PROCESS FOR MANAGING ENVIRONMENTAL DAMAGE AS A RESULT OF UNDERTAKING THE ACTIVITY

The management measures outlined in Section 28 have been identified in order to manage and reduce impacts associated with the proposed project in order to prevent unnecessary damage to the environment as a result of the proposed project. In the event that incidents occur that may result in environmental damages the emergency response procedure as outlined in Section 31.2 will be implemented to avoid pollution or degradation.

26.3 POTENTIAL RISK OF ACID MINE DRAINAGE

As part of the proposed project a geochemistry analysis was undertaken. The results of the analysis indicate that there is no risk of acid mine drainage. Further information is provided in Section 7.4.1.1.

26.4 STEPS TAKEN TO INVESTIGATE, ASSESS AND EVALUATE THE IMPACT OF ACID MINE DRAINAGE

This section is not applicable as acid mine drainage is not associated with the proposed project.

26.5 ENGINEERING OR MINE DESIGN SOLUTIONS TO AVOID OR REMEDY ACID MINE DRAINAGE

This section is not applicable as acid mine drainage is not associated with the proposed project.

26.6 MEASURES IN PLACE TO REMEDY RESIDUAL OR CUMULATIVE IMPACT FROM ACID MINE DRAINAGE

This section is not applicable as acid mine drainage is not associated with the proposed project.

26.7 VOLUMES AND RATE OF WATER USE FOR MINING

The volumes of water required as part of the proposed project include the following:

- Potable water (62 350 l/day or 1 856 m^3/month)
- Process water (40 000 l/day or 1 216 m^3/month)
- Plant dust suppression (49 396 l/day or 1 502 m^3/month)
- Plant washdown water (961 l/day or 29 m^3/month)
- Dust suppression along roads and at overburden stockpiles (minimum of 94 750 l/day or 2882 m^3/month).

26.8 HAS A WATER USE LICENCE BEEN APPLIED FOR

A water use license application is required for the proposed project. The water use license application will be submitted to the DWS in early 2016. The DWS has been notified that a water use license application will be submitted as part of the proposed project. In this regard a copy of the notice of intent letter submitted to the DWS in included in Appendix E.

26.9 IMPACTS TO BE MITIGATED IN THEIR RESPECTIVE PHASES

The section below focuses on mitigation measures that are specific to listed activities based on actions outlined in section 28.

TABLE 57: MEASURES TO REHABILITATE THE ENVIRONMENT AFFECTED BY THE LISTED ACTIVITIES

Activities (Listed)		Phase	Size and scale of disturbance	Mitigation measures	Compliance with standards	Time period for implementation
Number	Description					
GNR. 983 - 13	The development of facilities or infrastructure for the off-stream storage of water, including dams and reservoirs, with a combined capacity of 50 000 cubic metres or more, unless such storage falls within the ambit of activity 16 in Listing Notice 2 of 2014.	Construction Operation Decommissioning Closure	11.32 ha (All stormwater facilities combined)	• In all phases mine infrastructure will be constructed, operated and maintained so as to comply with the provisions of the National Water Act (36 of 1998) and Regulation 704 (4 June 1999) of any future amendments thereto. These include: ○ Clean water systems are separated from dirty water systems ○ The size of dirty water areas are minimized and clean run-off and rainfall water is diverted around dirty areas and back into the normal flow in the environment ○ The site wide water balance is refined on an on-going basis with the input of actual flow volumes and used as a decision making tool for water management and impact mitigation (Section 30). ○ The location of all activities and infrastructure should be outside of the specified zones and/or flood lines of watercourses. If this is unavoidable the necessary exemptions/approvals will be obtained. ○ Due to the uncertainties associated with the peak flood events, it is recommended that these uncertainties are managed by applying a 1 m freeboard to design levels for any infrastructure within close proximity to the Ga-Mogara drainage channel.	National Water Act (36 of 1998) and Regulation 704 (4 June 1999)	On-going
GNR. 983 - 12	The development of- (xii) infrastructure or structures with a physical footprint of 100 square metres or more; where such development occurs- (a) within a watercourse; (b) in front of a development setback; or (c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse; - excluding- (aa) the development of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour; (bb) where such development activities are related to the development of a port or harbour, in which case activity 26 in Listing Notice 2 of 2014 applies; (cc) activities listed in activity 14 in Listing Notice 2 of 2014 or activity 14 in Listing Notice 3 of 2014, in which case that activity applies; (dd) where such development occurs within an urban area; or (ee) where such development occurs within existing roads or road reserves.	Construction Operation Decommissioning Closure	16.6 ha (Ga-Mogara realignment and haul road, and topsoil berm)			
GNR. 983	The development of facilities or infrastructure,	Construction	200m^3	• All hazardous chemicals (diesel) must be	Not applicable	On-going

Activities (Listed)		Phase	Size and scale of disturbance	Mitigation measures	Compliance with standards	Time period for implementation
Number	Description					
14	for the storage, or for the storage and handling, of a dangerous good, where such storage occurs in containers with a combined capacity of 80 cubic metres or more but not exceeding 500 cubic metres.	Operation Decommissioning Closure	(combined diesel capacity)	handled in a manner that surface water is not polluted. This will be implemented by means of the following: o Pollution prevention through basic infrastructure design o Pollution prevention through maintenance of equipment o Pollution prevention through education and training of workers (permanent and temporary) o Pollution prevention through appropriate management of hazardous, materials and o The required steps to enable containment and remediation of pollution incidents o Specifications for post rehabilitation audit criteria to ascertain whether the remediation has been successful and if not, to recommend and implement further measures.		
GNR. 983 19	The infilling or depositing of any material of more than 5 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 5 cubic metres from- (i) a watercourse; (ii) the seashore; or (iii) the littoral active zone, an estuary or a distance of 100 metres inland of the high-water mark of the sea or an estuary, whichever distance is the greater but excluding where such infilling, depositing, dredging, excavation, removal or moving- (a) will occur behind a development setback; (b) is for maintenance purposes undertaken in accordance with a maintenance management plan; or (c) falls within the ambit of activity 21 in this Notice, in which case that activity applies.	Construction Operation Decommissioning Closure	2.47ha (Ga-Mogara realignment)	• In terms of the proposed realignment of the Ga-Mogara drainage channel, the following applies: o An engineered channel realignment will be designed and constructed for used within the first 3 years, when space constraints are at a peak, after which the channel will be permanently realigned and will focus on replicating aspects of the existing Ga-Mogara drainage channel. In this regard, the permanent realignment will aim to look as natural as possible and will therefore include natural curves, , will allow for the continuation of flow (when this occurs)make use of natural soils and revegetation using indigenous species.	Not applicable	As required
GNR. 983 27	The clearance of an area of 1 hectares or more, but less than 20 hectares of indigenous	Construction Operation	154 ha	• As part of construction and operation the following should be undertaken:	The mitigation action to obtain	On-going

Activities (Listed)		Phase	Size and scale of disturbance	Mitigation measures	Compliance with standards	Time period for implementation
Number	**Description**					
	vegetation, except where such clearance of indigenous vegetation is required for- (i) the undertaking of a linear activity; or (ii) maintenance purposes undertaken in accordance with a maintenance management plan.	Decommissioning Closure		○ Limit the clearing of vegetation and limiting infrastructure, activities and related disturbance to those specifically identified and described in this report ○ Preconstruction surveys of the development footprints for species suitable for search and rescue operations. ○ Prevent the disturbance of sensitive areas so that the species composition and ecosystem functionality remain intact as far as practically possible ○ Collection of pods of *Vachellia erioloba* (Camel Thorn) and *Vachellia haematoxylon* (Grey Camel Thorn) should be collected in order to aid in the re-establishment of these species ○ Obtain a tree removal permit prior to removal of protected tree species from DAFF. ○ A comprehensive monitoring programme of the protected trees within the area must be undertaken. This monitoring should be conducted on an individual tree basis as well as monitoring on a community level. ○ Implementation of an alien invasive species programme ○ Implementation of a biodiversity action plan to ensure that the undeveloped/mined areas within the property are properly conserved and maintained ○ Implementation of a biodiversity offset for approval by DAFF prior to the removal of any protected trees. ○ All employees (permanent and temporary) should be aware of which areas are identified for infrastructure/activities. In this regard, no activities or infrastructure should be placed on the western section of the proposed project area. ○ Where soils have to be disturbed the soils	a tree removal permit from DAFF is in accordance with the National Forests Act (No. 84 of 1998) that stipulates that no person may cut, disturb, damage or destroy any protected tree or possess, collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree or any forest product derived from a protected tree, except under a license.	
GNR. 983 - 28	Residential, mixed, retail, commercial, industrial or institutional developments where such land was used for agriculture or afforestation on or after 01 April 1998 and where such development: (i) will occur inside an urban area, where the total land to be developed is bigger than 5 hectares; or (ii) will occur outside an urban area, where the total land to be developed is bigger than 1 hectare; excluding where such land has already been developed for residential, mixed, retail, commercial, industrial or institutional purposes.	Construction Operation Decommissioning Closure				
GNR. 984 15	The clearance of an area of 20 hectares or more of indigenous vegetation, excluding where such clearance of indigenous vegetation is required for- (i) the undertaking of a linear activity; or (ii) maintenance purposes undertaken in accordance with a maintenance management plan.	Construction Operation Decommissioning Closure				
GNR. 985 - 12	The clearance of an area of 300 square metres or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a maintenance management plan. i. Within any critically endangered or endangered ecosystem listed in terms of section 52 of the NEMBA 'or prior to the publication of such a list, within an area that has been identified as critically endangered in the National Spatial	Construction Operation Decommissioning Closure				

Activities (Listed)		Phase	Size and scale of disturbance	Mitigation measures	Compliance with standards	Time period for implementation
Number	Description					
	Biodiversity Assessment 2004; ii. Within critical biodiversity areas identified in bioregional plans; iii. Within the littoral active zone or 100 metres inland from high water mark of the sea or an estuary, whichever distance is the greater, excluding where such removal will occur behind the development setback line on even in urban areas; or iv. On land, where, at the time of the coming into effect of this Notice or thereafter such land was zoned open space, conservation or had an equivalent zoning.			will be stripping, storage and maintenance and replaced in accordance with the specifications of the soil management principles included in Table 61 and the detailed Mokala soils management procedure. o Mokala will ensure that a 50m buffer zone around heritage site HMK2 is maintained. o If there are any chance finds of heritage and/or cultural sites, Mokala will follow the emergency response procedure (Section 31.2.2). • As part of con-current rehabilitation during the operational and decommissioning phases, all cleared areas should be re-seeded once the topsoil has been replaced with a seed mixture reflecting the current natural vegetation. • Closure objective should aim to ensure effective rehabilitation to as close to pre-mining conditions as practically possible. In addition to this closure planning needs to take into consideration the requirements for the establishment of long term species diversity, ecosystem functionality, aftercare and confirmatory monitoring • During closure final rehabilitated areas will be managed through a care and maintenance programme to limit and/or enhance the long term post closure visual impacts	Compliance with the National Heritage Resource Act No. 25 of 1999 in the event of any chance finds of heritage resources.	On-going As required
GNR.984 -17	Any activity including the operation of that activity which requires a mining right as contemplated in section 22 of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002), including associated infrastructure, structures and earthworks, directly related to the extraction of a mineral resource, including activities for which an exemption has been issued in terms of section 106 of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002).	Construction Operation Decommissioning Closure				As required
GNR. 984 - 21	Any activity including the operation of that activity associated with the primary processing of a mineral resource including winning, reduction, extraction, classifying, concentrating, crushing, screening and washing but excluding the smelting, beneficiation, refining, calcining or gasification of the mineral resource in which case activity 6 in this Notice applies.	Construction Operation Decommissioning Closure	1ha (processing plant)			
GNR. 983 - 10	The development and related operation of infrastructure exceeding 1000 metres in length for the bulk transportation of sewage, effluent, process water, waste water, return water, industrial discharge or slimes (i) with an internal diameter of 0,36 metres or more; or	Construction Operation Decommissioning Closure	-			

Activities (Listed)		Phase	Size and scale of disturbance	Mitigation measures	Compliance with standards	Time period for implementation
Number	**Description**					
	(ii) with a peak throughput of 120 litres per second or more; excluding where- (a) such infrastructure is for bulk transportation of sewage, effluent, process water, waste water, return water, industrial discharge or slimes inside a road reserve; or (b) where such development will occur within an urban area.					
GNR. 983 - 11	The development of facilities or infrastructure for the transmission and distribution of electricity- (i) outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kilovolts; or (ii) inside urban areas or industrial complexes with a capacity of 275 kilovolts or more.	Construction Operation Decommissioning Closure	0.02 ha (generators and mini sub-station combined)			
GNR. 983 24	The development of - (v) a road for which an environmental authorisation was obtained for the route determination in terms of activity 5 in Government Notice 387 of 2006 or activity 18 in Government Notice 545 of 2010; (vi) a road with a reserve wider than 13.5 metres, or where no reserve exists where the road is wider than 8 metres but excluding – (b) roads which are identified and included in activity 27 of Listing Notice 27 in Notice 2 of 2014; or roads where the entire road falls within an urban area	Construction Operation Decommissioning Closure	11.2ha (All road infrastructure combined)	• Mokala will implement a transport safety programme to achieve the mitigation objectives during the construction, operational and decommissioning phases. Key components of the programme include: o Education and awareness training o Maintenance of the transport system o Use of dedicated loading and off-loading areas on site • In terms of the use of the R380, Mokala should investigate, together with the roads department and neighbouring mines, the possibility of maintaining the road infrastructure by providing the following during the construction, operational and decommissioning phases: o Reflective road studs to ensure visibility at night time o Road surface maintenance o Road markings (Highway paint recommended) o Road traffic signs o Fencing along public roads to control animal movement o Road safety training to workers and local	Not applicable	On-going As required
GNR. 983 56	The widening of a road by more than 6 metres, or the lengthening of a road by more than 1 km – (vii) where the existing reserve is wider than 13.5 metres; or (viii) where no reserve exists, where the existing road is wider than 8 metres; excluding where widening or lengthening occur inside urban areas.	Construction Operation Decommissioning Closure				

Activities (Listed)		Phase	Size and scale of disturbance	Mitigation measures	Compliance with standards	Time period for implementation
Number	Description					
GNR. 984 - 27	The development of - (i) a national road as defined in section 40 of the South African National Roads Agency Limited and National Roads Act, 1998 (Act No. 7 of 1998); (ii) a road administered by a provincial authority; (iii) a road with a reserve wider than 30 metres; or (iv) a road catering for more than one lane of traffic in both directions; but excluding the development and related operation of a road for which an environmental authorisation was obtained for the route determination in terms of activity 5 in Government Notice 387 of 2006 or activity 18 in Government Notice 545 of 2010, in which case activity 24 in Listing Notice 1 of 2014 applies.	Construction Operation Decommissioning Closure		communities. ○ Regular inspections of these intersections should take place as part of a risk and safety management process • The design of the R380 realignment and proposed upgrade of the intersection to the proposed mine needs to be approved by the roads department prior to establishment to ensure that the necessary function of safety is acceptable. Investigations around road surface layers need to form part of the design of the R380 realignment. • Mokala needs to ensure that proper road markings, reflective road studs, road signs, overhead lighting and proper pedestrian crossings should be provided and maintained at the entrance to the mine • A road maintenance plan needs to be developed for the proposed project • Mokala should investigate the possibility of transporting ore to loadout stations at nearby mines. • In case of a person or animal being injured by transport activities the emergency response procedure in Section 31.2.2 will be followed.		As required On-going On-going On-going As required
GNR. 984 - 6	The development of facilities or infrastructure for any process or activity which requires a permit or licence in terms of national or provincial legislation governing the generation or release of emissions, pollution or effluent, excluding i) activities which are identified and included in Listing Notice 1 of 2014; (ii) activities which are included in the list of waste management activities published in terms of section 19 of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) in which case the National Environmental Management: Waste Act, 2008 applies; or	Construction Operation Decommissioning Closure	18.3ha (overburden stockpiles and berms combined) 4ha (product stockpiles combined) 1.13ha (stormwater facilities combined)	• Mokala will comply with both the National Water Act (36 of 1998) and Regulation 704 (4 June 1999) • All hazardous chemicals (new and used), mineralised wastes and non-mineralised waste are handled in a manner that they do not pollute groundwater. This will be implemented by covering the following: ○ Pollution prevention through basic infrastructure design ○ Pollution prevention through maintenance of equipment ○ pollution prevention through education and training of workers (permanent and temporary);	Water use licence in terms of Section 21g of the NWA. Regulations regarding the planning and management of residue stockpiles and deposits from a prospecting, mining, exploration or	On-going On-going

Activities (Listed)		Phase	Size and scale of disturbance	Mitigation measures	Compliance with standards	Time period for implementation
Number	Description					
	(iii) the development of facilities or infrastructure for the treatment of effluent, wastewater or sewage where such facilities have a daily throughput capacity of 2000 cubic metres or less.			○ Pollution prevention through appropriate management of hazardous chemicals, materials and non-mineralised waste ○ Required steps to enable containment and remediation of pollution incidents ○ Specification for post rehabilitation audit criteria to ascertain whether the remediation has been successful and if not, to recommend and implement further measures	production operation in terms of NEM:WA, Regulation 632.	
GNR. 921- Category B 4(7)	The disposal of any quantities of hazardous waste to land	Construction Operation Decommissioning Closure	18.3ha (overburden stockpiles and berms combined) Backfilling pit with overburden (93ha)	• Infrastructure that has the potential to pollute groundwater resources will be designed and implemented in a manner that pollution is addressed in all mine phases. In this regard design of overburden stockpiles need to comply with Section 7 of GN. 632 of NEM:WA where relevant.		On-going
GNR. 921- Category B 4(8)	The disposal of general waste to land covering an area in excess of 200m^2 and with a total capacity exceeding 25 000 tons.					
GNR. 921- Category B 4(10)	The construction of a facility for a waste management activity listed in Category B of this schedule			• Planned infrastructure that has the potential to pollute groundwater (overburden stockpiles) will be identified and included into the groundwater pollution management plan which will be implemented and needs to comply with Section 7 of GN. 632. The plan includes: ○ Identify potential pollution sources ○ Determine the extent of the pollution plume ○ Design and implement intervention measures to prevent, eliminate and/or control the pollution plume. ○ Limit unauthorized access to overburden stockpile ○ Monitoring all potential impact zones to track pollution and mitigation impacts ○ Where monitoring results indicates that third party water supply has been polluted by Mokala, Mokala will ensure that an alternative equivalent water supply will be provided. ○ At closure no overburden will remain on surface as all overburden will be backfilled into the open pit as part of rehabilitation		On-going

Activities (Listed)		Phase	Size and scale of disturbance	Mitigation measures	Compliance with standards	Time period for implementation
Number	Description					
				• Mokala will implement the groundwater monitoring programme as outlined in Section 30. • In case of a major discharge incident that may result in the pollution of groundwater resources the emergency response procedure in Section 31.2.2 will be followed.		On-going As required

27 IMPACT MANAGEMENT OUTCOMES

The section below provides a description of the outcomes and objective of mitigation actions in order to manage, remedy, control or modify potential impacts. The mitigation actions identified to achieve these outcomes and objectives are described in Section 28.

TABLE 58: DESCRIPTION OF IMPACT MANAGEMENT OUTCOMES

Activity	Potential impact	Affected aspect	Phase	Mitigation type	Standard to be achieved (Impact management outcome/objectives)
Open pit mining Placement of infrastructure Mineralised waste Maintenance and aftercare	Loss and sterilisation of mineral resources	Geology	Construction Operation Decommissioning Closure	• Control through infrastructure design and placement to ore body	Avoid sterilisation of mineral resources to prevent unacceptable mineral sterilisation.
Site preparation Earthworks Civil works Open pit mining Processing plant Transportation Power supply and use Water supply and use Mineralised waste Support services Demolition Rehabilitation Maintenance and aftercare	Hazardous excavations infrastructure and surface subsidence	Topography	Construction Operation Decommissioning Closure	• Control through access control • Control through management and monitoring • Control through rehabilitation • Remedy through emergency response procedure (Section 31.2.2)	To ensure the safety of people and animals in order to prevent physical harm from potentially hazardous excavations and infrastructure
Site preparation Earthworks Civil works Open pit mining Processing plant Transportation Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services General site management Demolition	Loss of soil resources and land capability through contamination	Soils and land capability	Construction Operation Decommissioning Closure	• Manage through the implementation of soil conservation management plan and waste management plan • Control through rehabilitation • Remedy through emergency response procedure (Section 31.2.2)	To ensure that soil resources are handled and managed properly in order to conserve these resources for use as part of rehabilitation which will assist with the restoration of pre-mining land capability as far as possible.

Activity	Potential impact	Affected aspect	Phase	Mitigation type	Standard to be achieved (Impact management outcome/objectives)
Rehabilitation Maintenance and aftercare of rehabilitated areas					
Site preparation Earthworks Open pit mining Processing plant Transportation Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services General site management Demolition Rehabilitation Maintenance and aftercare of rehabilitated areas	Loss of soil resources and land capability through physical disturbance		Construction Operation Decommissioning Closure	• Manage through the implementation of soil conservation management plan and waste management plan • Control through rehabilitation • Control through limiting project footprint	To ensure that soil resources are handled and managed properly in order to conserve these resources for use as part of rehabilitation which will assist with the restoration of pre-mining land capability as far as possible.
Site preparation Earthworks Civil works Open pit mining Processing plant Transportation Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services General site management Rehabilitation Maintenance and aftercare	Physical destruction of biodiversity	Biodiversity	Construction Operation Decommissioning Closure	• Control through limiting the project footprint • Control through alien invasive species programme • Remedy through biodiversity action plan • Remedy through biodiversity offset • Control through comprehensive monitoring of protected trees • Remedy through rehabilitation close to pre-mining conditions as practically possible.	To prevent the unacceptable disturbance and loss of biodiversity and related ecosystem functionality through physical destruction and to limit the area of disturbance as far as possible.
Site preparation Earthworks Civil works Open pit mining Processing plant Transportation Power supply and use Water supply and use Mineralised waste	General disturbance of biodiversity	Biodiversity	Construction Operation Decommissioning Closure	• Control through dust control • Control through training of employees • Control through waste management procedures.	To prevent the unacceptable disturbance and loss of biodiversity and related ecosystem functionality through physical disturbance.

Activity	Potential impact	Affected aspect	Phase	Mitigation type	Standard to be achieved (Impact management outcome/objectives)
Non-mineralised waste Support services General site management Rehabilitation Maintenance and aftercare					
Earthworks Civil works Open pit mining Processing plant Transportation Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services General site management Demolition Rehabilitation Maintenance and aftercare	Contamination of surface water resources	Surface water	Construction Operation Decommissioning Closure	• Control through stormwater management and design • Remedy through emergency response procedure (Section 31.2.2)	To ensure surface water quality remains within acceptable limits for both domestic and agricultural purposes to prevent pollution of surface water resources and related harm to surface water users.
Earthworks Civil works Open pit mining Processing plant Transportation Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services General site management Demolition Rehabilitation Maintenance and aftercare	Alteration of natural drainage patterns		Construction Operation Decommissioning Closure	• Control through appropriate design • Control through the separation of dirty and clean water	To ensure that the reduction of the volume of run-off into the downstream catchment is limited to what is necessary and that natural drainage patterns are re-established as part of rehabilitation in order to prevent unacceptable alteration of drainage patterns and related reduction of downstream surface water flow.
Earthworks Civil works Open pit mining Processing plant Transportation Power supply and use Water supply and use Mineralised waste	Contamination of groundwater resources	Groundwater	Construction Operation Decommissioning Closure	• Control through monitoring • Remedy through emergency response procedure (Section 31.2.2)	To ensure groundwater quality remains within acceptable limits for both domestic and agricultural purposes to prevent harm to water users.

Activity	Potential impact	Affected aspect	Phase	Mitigation type	Standard to be achieved (Impact management outcome/objectives)
Non-mineralised waste Support services General site management Demolition Rehabilitation Maintenance and aftercare					
Water supply and use Open pit mining	Reduction of groundwater levels and availability		Construction Operation Decommissioning	• Control through monitoring	To avoid loss of groundwater for third party use.
Site preparation Earthworks Civil works Open pit mining Processing plant Transportation Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services Demolition General site management Rehabilitation Maintenance and aftercare	Air pollution	Air	Construction Operation Decommissioning Closure	• Control through monitoring	To ensure that any pollutants emitted as a result of the proposed project remain with acceptable limits so as to prevent health related impacts.
Site preparation Earthworks Civil works Open pit mining Processing plant Transportation Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services Demolition General site management Rehabilitation Maintenance and aftercare	Noise pollution	Noise	Construction Operation Decommissioning	• Control through noise control measures and monitoring (if required)	To ensure that any noise generated as a result of the proposed project remains within acceptable limits to avoid the disturbance of third parties.
Open pit mining	Blasting impacts (fly rock, air blasts and	Blasting	Operation	• Control through access control	To protect third party property from

Activity	Potential impact	Affected aspect	Phase	Mitigation type	Standard to be achieved (Impact management outcome/objectives)
	ground vibrations)			• Manage through appropriate blast design • Remedy through emergency response procedure (Section 31.2.2)	proposed project-related activities, where possible. Where damage is unavoidable, to work together with the third parties to achieve a favourable outcome and to ensure public safety
Transport system	Road disturbance and traffic safety	Traffic	Construction Operation Decommissioning	• Control through appropriate design • Management through the implementation of traffic safety programme • Remedy through emergency response procedure (Section 31.2.2)	To ensure the mine's use of public roads is done in a responsible manner to reduce the potential for safety and vehicle related impacts on road users.
Site preparation Earthworks Civil works Open pit mining Processing plant Transportation Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services General site management Demolition Rehabilitation Maintenance and aftercare of rehabilitated areas	Negative visual views	Visual	Construction Operation Decommissioning Closure	• Control through visual controls and con-current rehabilitation	To ensure visual views that complement the surrounding environment to limit negative visual views.
Site preparation Earthworks Civil works Open pit mining Processing plant Transportation Power supply and use Water supply and use Mineralised waste Non-mineralised waste	Loss of heritage, cultural and palaeontological resources	Heritage/ cultural and palaeontological resources	Construction Operation Decommissioning Closure	• Control through avoidance of heritage resources • Remedy through emergency response procedure (Section 31.2.2)	To avoid the disturbance of significant heritage resources

Activity	Potential impact	Affected aspect	Phase	Mitigation type	Standard to be achieved (Impact management outcome/objectives)
Support services General site management Demolition Rehabilitation Maintenance and aftercare of rehabilitated areas					
Site preparation Earthworks Civil works Open pit mining Processing plant Transportation Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services General site management Demolition Rehabilitation Maintenance and aftercare of rehabilitated areas	Economic impact	Socio-economic	Construction Operation Decommissioning Closure	• Control through procurement programme and bursary and skills development programme	To enhance the positive economic impacts by working together with existing structures and organisations.
Site preparation Earthworks Civil works Open pit mining Processing plant Transportation Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services General site management Demolition Rehabilitation Maintenance and aftercare of rehabilitated areas	Inward migration		Construction Operation Decommissioning Closure	• Control through health policy, monitoring the development of informal settlements • Remedy through emergency response procedure (Section 31.2.2)	To establish and maintain a good working relationship with surrounding communities, local authorities and land owners in order to limit the impacts associated with inward migration.
Site preparation Earthworks Civil works	Land use impact	Land use	Construction Operation Decommissioning	• Control through closure planning	To co-exist with existing land uses and to negatively impact on land uses as little as possible in order to prevent

Activity	Potential impact	Affected aspect	Phase	Mitigation type	Standard to be achieved (Impact management outcome/objectives)
Open pit mining Processing plant Transportation Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services General site management Demolition Rehabilitation Maintenance and aftercare of rehabilitated areas			Closure		unacceptable impacts on surrounding land uses and their economic activity.

28 IMPACT MANAGEMENT ACTIONS

The mitigation actions for all phases (construction, operation, decommissioning and closure) to achieve the objectives and outcomes set out in Section 27 are listed in tabular format below. The action plans include the timeframes for implementing the mitigation actions together with a description of how mitigation actions comply with relevant standards. Mitigation actions and recommendations identified by specialists have been summarised and are included into Table 59 below.

TABLE 59: DESCRIPTION OF IMPACT MANAGEMENT ACTIONS

Activity	Potential impact	Mitigation type	Time period for implementation	Compliance with standards
Open pit mining Mineralised waste Placement of infrastructure Maintenance and aftercare	Loss and sterilisation of mineral resources	• During all mine phases Mokala will ensure the following: o Incorporation of cross discipline planning structures for all mining and infrastructure to avoid mineral sterilization. A key component of the cross cutting function is the Mine resource manager o Mine workings will be developed and designed so as not to limit the potential to exploit deeper minerals	Design phase On-going	Not applicable
Site preparation Earthworks Civil works Open pit mining Processing plant Transportation Power supply and use Water supply and use Mineralised waste Support services Demolition Rehabilitation Maintenance and aftercare	Hazardous excavations, infrastructure and surface subsidence	• All mineralised waste facilities and water dams will be designed, constructed, operated and closed in a manner to ensure stability and related safety risks to third parties and animals are addressed. It will furthermore be monitored according to a schedule that is deemed relevant to the type of facility by a professional engineer. As part of closure, Mokala should ensure that provision is made to address long term and safety risks in the decommissioning and rehabilitation planning. • Mokala will survey its mining area and update its mine plan map on a routine basis to ensure that the position and extent of all potential hazardous excavations, hazardous infrastructure and subsidence is known as part of construction, operation and decommissioning. It will further more ensure that appropriate management measures are taken to address the related safety risks to third parties and animals • As part of construction and operation, the safety risks associated with identified hazardous excavations, subsidence and infrastructure will be addressed through one or more of the following: o Fencing, berms, barriers and/or security personnel to prevent unauthorized access o Warning signs in the appropriate languages (s) Warning	On-going On-going On-going	Not applicable

Activity	Potential impact	Mitigation type	Time period for implementation	Compliance with standards
		pictures can be used as an alternative • During decommissioning planning of any part of the mine, provision will be made to address long term safety risks in the decommissioning and rehabilitation phases. • At closure of any part of the mine, the hazardous infrastructure will either have been removed or decommissioned and rehabilitated in a manner that it does not present a long term safety and/or stability risk. • At closure the hazardous excavations and subsidence will have been dealt with as follows: o All pits will have been backfilled and rehabilitated o The potential for surface subsidence will have been addressed by providing a bulking factor for the backfilled pit o Monitoring and maintenance will take place to observe whether the relevant long term safety objective have been achieved and to identify the need for additional intervention where the objectives have not been met. • In case of injury or death due to hazardous excavations, the emergency response procedure in Section 31.2.2 will be followed.	As required As required As required As required	
Site preparation Earthworks Civil works Open pit mining Processing plant Transportation Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services General site management Demolition Rehabilitation Maintenance and aftercare of rehabilitated areas	Loss of soil resources and land capability through contamination	• During the construction, operational and decommissioning phases, Mokala will ensure that all hazardous chemicals (new and used), dirty water, mineralized wastes and non-mineralised wastes are transported, handled and stored in a manner that they do not pollute soils. This will be implemented through a procedure(s) covering the following: Pollution prevention through basic infrastructure design o Pollution prevention through maintenance of equipment o Maintenance of equipment should be done either on impermeable surfaces or drip trays should be used. o Pollution prevention through education and training of workers (temporary and permanent) o Pollution prevention through appropriate management of hazardous materials and waste as outlined in Table 60. o The required steps to enable fast reaction to contain and remediate pollution incidents. In this regard the remediation options include containment and in situ treatment or disposal of contaminated soils as hazardous waste. In situ treatment is generally considered to be the preferred option because with successful in situ remediation the soil resourced will be retained in the correct place. The in situ options include bioremediation at the point of pollution, or removal of soils for washing and/or	On-going	Not applicable

Activity	Potential impact	Mitigation type	Time period for implementation	Compliance with standards
		bio remediation at a designated area after which the soils are returned o Specifications for post rehabilitation audit to ascertain whether the remediation of any polluted soils and re-establishment of soil functionality has been successful and if not, to recommend and implement further measures • In case of major spillage incidents the emergency response procedure in Section 31.2.2 will be followed.	If required	
Site preparation Earthworks Open pit mining Processing plant Transportation Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services General site management Demolition Rehabilitation Maintenance and aftercare of rehabilitated areas	Loss of soil resources and land capability through physical disturbance	• Limit the disturbance of soils to what is absolutely necessary for earthworks on-going activities, infrastructure footprints and use of vehicles during all phases. • All employees (permanent and temporary) should be aware of which areas are identified for infrastructure/activities. In this regard, no activities or infrastructure should be placed on the western section of the proposed project area. • Where soils have to be disturbed the soils will be stripped, storage and maintenance and replaced in accordance with the specifications of the soil management principles included in Table 61 and the detailed Mokala soils management procedure.	On-going On-going On-going	Not applicable
Site preparation Earthworks Civil works Open pit mining Processing plant Transportation Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services General site management Rehabilitation Maintenance and aftercare	Physical destruction of biodiversity	• As part of construction and operation the following should be undertaken: o Limiting infrastructure, activities and related disturbance to those specifically identified and described in this report o Preconstruction surveys of the development footprints for species suitable for search and rescue operations. o Prevent the disturbance of sensitive areas so that the species composition and ecosystem functionality remain intact as far as practically possible o Collection of pods of *Vachellia erioloba* (Camel Thorn) and *Vachellia haematoxylon* (Grey Camel Thorn) should be collected in order to aid in the re-establishment of these species o Obtain a tree removal permit prior to removal of protected tree species from DAFF. o A comprehensive monitoring programme of the protected trees within the area must be undertaken. This monitoring should be conducted on an individual tree basis as well as monitoring on a community level.	On-going	The mitigation action to obtain a tree removal permit from DAFF is in accordance with the National Forests Act (No. 84 of 1998) that stipulates that no person may cut, disturb, damage or destroy any protected tree or possess, collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree or any forest product derived from a protected tree, except under a license.

Activity	Potential impact	Mitigation type	Time period for implementation	Compliance with standards
		○ As part of the construction and operational phases, Mokala should strive to investigate alternative means of removing dust from protected trees where practical ○ Implementation of an alien invasive species programme ○ Implementation of a biodiversity action plan to ensure that the undeveloped/mined areas within the property are properly conserved and maintained ○ Implementation of a biodiversity offset for approval by DAFF prior to the removal of any protected trees. • As part of con-current rehabilitation during the operational and decommissioning phases, all cleared areas should be re-seeded once the topsoil has been replaced with a seed mixture reflecting the current natural vegetation. This may be used in conjunction with commercially available mix as this will ensure good vegetation coverage and soil stability. • Closure objective should aim to ensure effective rehabilitation to as close to pre-mining conditions as practically possible. In addition to this closure planning needs to take into consideration the requirements for the establishment of long term species diversity, ecosystem functionality, aftercare and confirmatory monitoring	On-going As required	
Site preparation Earthworks Civil works Open pit mining Processing plant Transportation Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services General site management Rehabilitation Maintenance and aftercare	General disturbance of biodiversity	• During construction, operation, decommissioning and closure the following needs to be adhered to: ○ The use of light is kept to a minimum, and where it is required, yellow lighting is used where possible ○ Vertebrates should be kept away from the proposed project area with appropriate fencing ○ There is training for workers on the value of biodiversity and the need to conserve the species and systems that occur within the surface use area ○ There is zero tolerance of the killing or collecting of any biodiversity by anybody working for or on behalf of Mokala ○ Strict speed control measures are used for any vehicles driving within the surface use area ○ Noisy and/or vibrating equipment will be well maintained to control noise and vibration emission levels ○ Dust control measures will be implemented ○ Pollution and litter prevention measures will be implemented ○ Prevention and combatting veld fires though establishment and maintaining of fire breaks and through the education of employees ○ Mokala will form part of existing forums within the area and	On-going	The mitigation actions regarding veld fires are in accordance with the National Veld and Forest Fire Act No. 101 of 1998. The purpose of this Act is to prevent and combat veld, fires and places the responsibility on landowners to develop and maintain firebreaks as well as be sufficiently prepared to combat veld fires in terms of equipment as well as suitably trained personnel.

Activity	Potential impact	Mitigation type	Time period for implementation	Compliance with standards
		work together with local farmers to combat, manage and control veld fires • As part of closure planning, the designs of any permanent and potentially polluting structures (mineralised waste facilities) will take consideration of the requirements for long term pollution prevention and confirmatory monitoring. • In case of a major incident the emergency response procedure in Section 31.2.2 will be followed.	As required As required	
Earthworks Civil works Open pit mining Processing plant Transportation Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services General site management Demolition Rehabilitation Maintenance and aftercare	Contamination of surface water resources	• Mine infrastructure, will be constructed and operated so as to comply with the National Water Act (36 of 1998) and Regulation 704 (4 June 1999): o Clean water systems are separated from dirty water systems o Clean run-off and rainfall water is diverted around dirty areas and back into its normal flow in the environment o The size of dirty water areas are minimized and dirty water is contained in systems that allow the reuse and/or recycling of this dirty water o Discharges of dirty water may only occur in accordance with authorisations that are issued in terms of the relevant legislation specifications and they must not result in negative health impacts for downstream surface water users. The relevant legislation specifications comprise any applicable authorisation/exemption, the National Water Act (36 of 1998) and Regulation 704. • All hazardous chemicals (new and used), mineralized waste and non-mineralised waste must be handled in a manner that they do not pollute surface water. This will be implemented by means of the following: o Pollution prevention through basic infrastructure design o Pollution prevention through maintenance of equipment o Pollution prevention through education and training of workers (permanent and temporary) o Pollution prevention through appropriate management of hazardous, materials and o The required steps to enable containment and remediation of pollution incidents o Specifications for post rehabilitation audit criteria to ascertain whether the remediation has been successful and if not, to recommend and implement further measures. • The designs of potentially polluting structures will take account of the requirements for long term surface water pollution prevention.	On-going On-going On-going	As outlined in mitigation type.

Activity	Potential impact	Mitigation type	Time period for implementation	Compliance with standards
		• Mokala will monitor the water quality of the Ga-Mogara when in flow as per the monitoring programme outlined in Section 30. • In case of a discharge incident that may result in the pollution of surface water resources, the emergency response procedure in Section 31.2.2 will be followed.	On-going As required	
Earthworks Civil works Open pit mining Processing plant Transportation Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services General site management Demolition Rehabilitation Maintenance and aftercare	Alteration of natural drainage patterns	• In all phases mine infrastructure will be constructed, operated and maintained so as to comply with the provisions of the National Water Act (36 of 1998) and Regulation 704 (4 June 1999) of any future amendments thereto. These include: o Clean water systems are separated from dirty water systems o The size of dirty water areas are minimized and clean run-off and rainfall water is diverted around dirty areas and back into the normal flow in the environment o The site wide water balance is refined on an on-going basis with the input of actual flow volumes and used as a decision making tool for water management and impact mitigation (Section 30). o The location of all activities and infrastructure should be outside of the specified zones and/or flood lines of watercourses. If this is unavoidable the necessary exemptions/approvals will be obtained. o Due to the uncertainties associated with the peak flood events, it is recommended that these uncertainties are managed by applying a 1 m freeboard to design levels for any infrastructure within close proximity to the Ga-Mogara drainage channel, including the proposed channel realignment and any flood protection berms. • In terms of the proposed realignment of the Ga-Mogara drainage channel, the following applies: o An engineered temporary channel realignment will be designed and constructed for used within the first 3 years when space constraints are at a peak, after which the channel will be permanently realigned and will focus on replicating aspects of the existing Ga-Mogara drainage channel. In this regard, the permanent realignment will aim to look as natural as possible and will therefore include natural curves, will allow for the continuation of flow (when this occurs), make use of natural soils and revegetation using indigenous species.	On-going As required As required	As outlined in mitigation type.
Earthworks Civil works Open pit mining	Contamination of groundwater resources	• Mokala will comply with both the National Water Act (36 of 1998) and Regulation 704 (4 June 1999) • All hazardous chemicals (new and used), mineralized wastes and	On-going On-going	As outlined in mitigation type.

Activity	Potential impact	Mitigation type	Time period for implementation	Compliance with standards
Processing plant Transportation Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services General site management Demolition Rehabilitation Maintenance and aftercare		non-mineralised waste are handled in a manner that they do not pollute groundwater. This will be implemented by covering the following: o Pollution prevention through basic infrastructure design o Pollution prevention through maintenance of equipment o Pollution prevention through education and training of workers (permanent and temporary) o Pollution prevention through appropriate management of hazardous chemicals, materials and non-mineralised waste o Required steps to enable containment and remediation of pollution incidents o Specification for post rehabilitation audit criteria to ascertain whether the remediation has been successful and if not, to recommend and implement further measures		
		• Infrastructure that has the potential to pollute groundwater resources will be designed and implemented in a manner that pollution is addressed in all mine phases. In this regard design of overburden stockpiles need to comply with Section 7 of GN. 632 of NEM:WA where relevant.	On-going	
		• Planned infrastructure that has the potential to pollute groundwater (overburden stockpiles) will be identified and included into the groundwater pollution management plan which will be implemented and needs to comply with Section 7 of GN. 632. The plan includes: o Identify potential pollution sources o Determine the extent of the pollution plume o Design and implement intervention measures to prevent, eliminate and/or control the pollution plume. o Limit unauthorized access to overburden stockpile o Monitoring all potential impact zones to track pollution and mitigation impacts o Where monitoring results indicates that third party water supply has been polluted by Mokala, Mokala will ensure that an alternative equivalent water supply will be provided. o At closure no overburden will remain on surface as all overburden will be backfilled into the open pit as part of rehabilitation	On-going	
		• Mokala will implement the groundwater monitoring programme as outlined in Section 30.	On-going	
		• In case of a major discharge incident that may result in the pollution of groundwater resources the emergency response procedure in Section 31.2.2 will be followed.	As required	

Activity	Potential impact	Mitigation type	Time period for implementation	Compliance with standards
Water supply and use Open pit mining	Reduction of groundwater levels and availability	• During the construction and operational and decommissioning phases, Mokala will implement the following: o All potentially affected third party boreholes will be included in the Mokala groundwater monitoring program to ensure that changes in water depths can be identified, where possible. o Where Mokala's dewatering causes a loss of water supply to third parties an alternative equivalent water supply will be provided by Mokala until such time as the dewatering impacts cease. o Mokala will monitor groundwater quantity as per the monitoring programme included in Section 30.	On-going	Not applicable
Site preparation Earthworks Civil works Open pit mining Processing plant Transportation Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services Demolition General site management Rehabilitation Maintenance and aftercare	Air pollution	• During the construction, operation and decommissioning phases, Mokala will implement a dynamic air quality management plan that covers: o The identification of sources and emissions inventory o The implementation of source based controls o The use of source and receptor based performance indicators and monitoring strategies o The use of source and receptor based mitigation measures o The use of internal and external auditing o Review and plan adjustment as required. • During the construction, operation and decommissioning phases, the following specific mitigation measures will be implemented for the main emission sources: roads, crushing and screening, materials handling (tipping points), vehicles and wind erosion. The recommended methods include: o Limit the disturbance of land to what is absolutely necessary and in accordance with the mine infrastructure layout o For the control of vehicle entrained dust it is recommended that water (at an application rate >2 litre/m2-hour), be applied in combination with dust palliative consisting of a cationic bitumen emulsion to stabilize the surface and prevent dust. Literature reports an emissions reduction efficiency of up to 90%. o Dust controls at the crushing and screening operation by water sprays o In minimizing windblown dust from stockpile areas (product stockpile), water sprays should be used to keep surface material moist and wind breaks installed to reduce wind speeds over the area. o In the transportation of ore and products, trucks should be well covered in order to avoid spillages. This will reduce the release	On-going On-going	National Atmospheric Emission Reporting Regulations in terms of the National Environmental Management: Air Quality Act 39 of 2004 requires that holders of mining rights register on the National Atmospheric Emissions Inventory System (NAEIS) and to ensure that annual monitoring reports are uploaded onto the NAEIS.

Activity	Potential impact	Mitigation type	Time period for implementation	Compliance with standards
		of PM and consequently, elemental Mn emissions (Mn emission is taken as a fraction of PM10 emissions). o To ensure lower diesel exhaust emissions, equipment suppliers or contractors should be required to ensure compliance with appropriate emission standards for mining fleets. o Rehabilitation and re-vegetation of all decommissioned areas o Maintenance of all vehicles to achieve optimal exhaust emissions. • Mokala will implement a dust fallout monitoring programme as included in Section 30. • Mokala needs to register as a data provider on the National Atmospheric Emissions Inventory System. • It is recommended that Mokala collaborate with other mines/industries and relevant authorities in the region to install a gravimetric PM10/PM2.5 monitor at Gloria Mine Village or Hotazel. This will provide adequate data on cumulative PM10 and PM2.5 concentrations from the Mokala Manganese Project and other mines/industries in the region. It is recommended that the PM10 and PM2.5 samples are analysed for manganese content in collaboration with other mines/industries and relevant authorities. Should exceedances of the long-term assessment criteria occur (as was simulated), a health risk/toxicological assessment should then be conducted to determine the health impact due to manganese emissions at the potentially affected receptors such as Gloria Mine village and Hotazel in collaboration with other mines/industries and relevant authorities. • Implementation of an air complaints procedure during all phases. • Undertake a carbon footprint assessment when during the operational phase of the project.	On-going On-going As required On-going As required	
Site preparation Earthworks Civil works Open pit mining Processing plant Transportation Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services Demolition	Noise pollution	• During the construction, operation and decommissioning phases the following good engineering practice should be applied: o All diesel powered equipment and plant vehicles should be kept at a high level of maintenance. This should particularly include the regular inspection and, if necessary, replacement of intake and exhaust silencers. o Optimised equipment design noise levels. o A noise complaints register should be kept on site • During the construction, operation and decommissioning phases measures to manage transport related noise, specifically from trucks, include o Minimizing individual vehicle engine, transmission and body	On-going On-going	Not applicable

Activity	Potential impact	Mitigation type	Time period for implementation	Compliance with standards
General site management Rehabilitation Maintenance and aftercare		noise/vibration. This is achieved through the implementation of an equipment maintenance program. o Minimize slopes by managing and planning road gradients to avoid the need for excessive acceleration/deceleration. o Maintain road surface regularly to avoid corrugations, potholes etc. o Avoid unnecessary idling times. o Minimizing the need for trucks/equipment to reverse. This will reduce the frequency at which disturbing but necessary reverse warnings will occur. Alternatives to the traditional reverse 'beeper' alarm such as a 'self-adjusting' or 'smart' alarm could be considered. These alarms include a mechanism to detect the local noise level and automatically adjust the output of the alarm is so that it is 5 to 10 dB above the noise level in the vicinity of the moving equipment. The promotional material for some smart alarms does state that the ability to adjust the level of the alarm is of advantage to those sites 'with low ambient noise level. • In the event that Mokala receives noise related complaints during either construction or operation, monitoring measures outlined in Section 30 should be implemented.	As required	
Open pit mining	Blasting impacts (fly rock, air blasts and ground vibrations)	• Implementation of a blast management programme during the operational phase which has the following principles: o Pre mining structure and crack survey of structures within the potential impact zone o Design of blasts to prevent injury to people and livestock and to prevent damage to structures. As a minimum the blast design will achieve: o A fly rock zone limit of less than 500 m o A peak velocity limit of less than 12 mm/s at third party structures that are built according to building industry standards and that is further reduced at third party structures that are not built according to building industry standards o An air blast limit of less than 130 dB at third party structures o Communication of the planned blast programme to interested and affected parties including mine personnel o Pre-blast warning and evacuation to clear people, traffic, moveable property and livestock from the potential impact zone o Blast monitoring to verify the effectiveness of the blast design and blast execution o Audit and review to adjust the blast design where necessary to	On-going	Not applicable

Activity	Potential impact	Mitigation type	Time period for implementation	Compliance with standards
		achieve the stated objectives o Formal documented investigation and response for all third party blast related complaints o Remediation of all impacts caused by blasting • No blasting will take place within 500 m of any third party structures. Where Mokala would like to blast in areas within this 500 m distance, a project specific risk assessment will be completed and project specific mitigation measures will be implemented, subject to approval by the relevant authority(ies) • Blasting activities is limited to day time hours • In case of a person or animal being injured by blasting activities the emergency response procedure in Section 31.2.2 will be followed.	On-going On-going As required	
Transport system	Road disturbance and traffic safety	• Mokala will implement a transport safety programme to achieve the mitigation objectives during the construction, operational and decommissioning phases. Key components of the programme include: o Education and awareness training o Maintenance of the transport system o Use of dedicated loading and off-loading areas on site • In terms of the use of the R380 as illustrated in Figure 27, Mokala should investigate, together with the roads department and neighbouring mines, the possibility of maintaining the road infrastructure by providing the following during the construction, operational and decommissioning phases: o Reflective road studs to ensure visibility at night time o Road surface maintenance o Road markings (Highway paint recommended) o Road traffic signs o Fencing along public roads to control animal movement o Road safety training to workers and local communities. o Regular inspections of these intersections should take place as part of a risk and safety management process • The design of the R380 realignment and proposed upgrade of the intersection to the proposed mine needs to be approved by the roads department prior to establishment to ensure that the necessary function of safety is acceptable. Investigations around road surface layers need to form part of the design of the R380 realignment. • Mokala needs to ensure that proper road markings, reflective road studs, road signs, overhead lighting and proper pedestrian crossings should be provided and maintained at the entrance to the mine	On-going On-going As required On-going	Not applicable

Activity	Potential impact	Mitigation type	Time period for implementation	Compliance with standards
		• A road maintenance plan needs to be developed for the proposed project • Mokala should investigate the possibility of transporting ore to loadout stations at nearby mines. • In case of a person or animal being injured by transport activities the emergency response procedure in Section 31.2.2 will be followed.	On-going As required As required	
Site preparation Earthworks Civil works Open pit mining Processing plant Transportation Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services General site management Demolition Rehabilitation Maintenance and aftercare of rehabilitated areas	Negative visual impact	• During construction and operation phases, Mokala will ensure the following: o Limit the clearing of vegetation o Limit the emission of visual air emission plumes (dust emissions) o Use of lighting will be limited to project requirements and measures will be implemented to limit light pollution impacts on surrounding areas o On-going vegetation establishment on rehabilitated areas o Painting infrastructure with colours that blend in with the surrounding environment where possible • During the decommissioning phase, Mokala will implement a closure plan which involves the removal of infrastructure, and the rehabilitation and re-vegetation of disturbed areas. The pit will be backfilled and all stockpiles will have been removed. • During closure final rehabilitated areas will be managed through a care and maintenance programme to limit and/or enhance the long term post closure visual impacts	On-going As required As required	Not applicable
Site preparation Earthworks Civil works Open pit mining Processing plant Transportation Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services General site management Demolition Rehabilitation Maintenance and aftercare of rehabilitated areas	Loss of heritage, cultural and palaeontological resources	• Mokala will ensure that a 50m buffer zone around heritage site HMK2 is maintained. • If there are any chance finds of heritage and/or cultural sites, Mokala will follow the emergency response procedure (Section 31.2.2).	On-going As required	Compliance with the National Heritage Resource Act No. 25 of 1999 in the event of any chance finds.
Site preparation	Economic impact	• During all mine phases, Mokala will ensure the following:	On-going	Not applicable

Activity	Potential impact	Mitigation type	Time period for implementation	Compliance with standards
Earthworks Civil works Open pit mining Processing plant Transportation Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services General site management Demolition Rehabilitation Maintenance and aftercare of rehabilitated areas		○ Mokala (and its contractors) will hire local people from the closest communities where possible ○ Mokala will extend its formal bursary and skills development programmes to the closest communities to increase the number of local skilled people and thereby increase the potential local employee base ○ Mokala will ensure it procures local goods and services from the closest communities where possible ○ Mokala will implement a procurement mentorship programme which provides support to local businesses from the enquiry to project delivery stages ○ Mokala will ensure that it incorporates economic considerations into its closure planning from the outset ○ Closure planning considerations cover the skilling of employees for the downscaling, early closure and long term closure scenarios ○ Mokala will identify and develop sustainable business opportunities and skills, independent from mining for members of the local communities to ensure continued economic prosperity beyond the life of mine.		
Site preparation Earthworks Civil works Open pit mining Processing plant Transportation Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services General site management Demolition Rehabilitation Maintenance and aftercare of rehabilitated areas	Inward migration	• In terms of recruitment, procurement and training during all mine phases Mokala will ensure the following: ○ Good communication with all job and procurement opportunity seekers will be maintained throughout the recruitment process. The process must be seen and understood to be fair and impartial by all involved. The personnel in charge of resolving recruitment and procurement concerns must be clearly identified and accessible to potential applicants ○ The precise number of new job opportunities (permanent and temporary) and procurement opportunities will be made public together with the required skills and qualifications. The duration of temporary work will be clearly indicated and the relevant employees/contractors provided with regular reminders and revisions throughout the temporary period ○ Recruitment and procurement, by Mokala and its contractors, will be preferentially provided to people in the communities where possible, that are closest to Mokala. In order to be in a position to achieve this a skills register of people within the closest communities will be maintained. Mokala will also preferentially provide bursaries and training to people that reside in these closest communities	On-going	Not applicable

Activity	Potential impact	Mitigation type	Time period for implementation	Compliance with standards
		○ There will be no recruitment or procurement at the gates of the mine. All recruitment will take place off at designated locations. All procurement will be through existing, established procurement and tendering processes that will include mechanisms for empowering service providers from the closest communities • During all mine phases, Mokala will ensure the following: ○ No mine employees will be housed on-site ○ Mokala will work with neighbouring mines, local authorities and law enforcement officials to monitor and prevent the development of informal settlements near the mine and to assist where possible with crime prevention within the proposed project area ○ Mokala will implement a health policy on HIV/AIDS and tuberculosis. This policy will promote education, awareness and disease management both in the workplace and in the home so that the initiatives of the workplace have a positive impact on the communities from which employees are recruited. Partnerships will be formed with local and provincial authorities to maximize the off-site benefits of the policy. ○ Mokala will work closely with the local and regional authorities and other mine/industries in the areas to be part of the problem solving process that needs to address social service constraints. ○ Mokala will implement a stakeholder communication, information sharing and grievance mechanism to enable all stakeholders to engage with Mokala on both socio-economic and environmental issues	On-going	
Site preparation Earthworks Civil works Open pit mining Processing plant Transportation Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services General site management Demolition	Land use impact	• Prior to construction, Mokala will apply to the local municipality to change the land zoning from agriculture to mining. • Prior to the realignment of the existing Telkom line that runs parallel to the R380, the necessary approvals will be obtained • During construction, operation and decommissioning Mokala will implement the EMP commitments with a view not only to prevent and/or mitigate the various environmental and social impacts, but also to prevent negative impacts on surrounding land uses. • During closure planning Mokala will incorporate measures to achieve the future land use plans for the land within the proposed project area • Quarterly meetings will be held with surrounding landowners for the purpose of information sharing and problem solving.	As required As required As required As required On-going	Re-zoning applications need to be submitted in terms of the Northern Cape Planning and Development Act No. 7 of 1998 or the Spatial Planning and Land Use Management Act No. 16 of 2013, whichever is applicable at the time of the submission of the re-zoning application.

Activity	Potential impact	Mitigation type	Time period for implementation	Compliance with standards
Rehabilitation Maintenance and aftercare of rehabilitated areas		• Mokala will ensure that it forms part of existing forums and initiatives within the area in order to aid in the management of environmental matters.	On-going	

The waste management and soil conservation procedures applicable to the proposed project are included in Table 60 and Table 61 below.

TABLE 60: WASTE MANAGEMENT PROCEDURES FOR GENERAL AND HAZARDOUS WASTE

Items to be considered		Intentions
General	**Specific**	
Classification and record keeping	General	The waste management procedure for the mine will cover the storage, handling and transportation of waste to and from the mine. The mine will ensure that the contractor's responsible are made aware of these procedures.
	Waste opportunity analysis	In line with DWEA's strategy to eliminate waste streams in the longer term, Mokala will assess each waste type to see whether there are alternative uses for the material. This will be done as a priority before the disposal option.
	Classification	Wastes (except those listed in Annexure 1 of the new Waste Regulations) will be classified in accordance with SANS 10234 within one hundred and eighty (180) days of generation. Waste will be re-classified every five (5) years, or within 30 days of modification to the process or activity that generated the waste, changes in raw materials or other inputs, or any other variation of relevant factors.
	Safety data sheets	The mine will maintain, where required in terms of the Regulations, the safety data sheets for hazardous waste (prepared in accordance with SANS 10234).
	Inventory of wastes produced	The mine will keep an accurate and up to date record of the management of the waste they generate, which records must reflect: • The classification of the wastes • The quantity of each waste generated, expressed in tons or cubic metres per month • The quantities of each waste that has either been re-used, recycled, recovered, treated or disposed of • By whom the waste was managed.
	Labelling and inventory of waste produced	Any container or storage impoundment holding waste must be labelled, or where labelling is not possible, records must be kept, reflecting: • The date on which waste was first placed in the container • The date on which waste was placed in the container for the last time when the container was filled, closed, sealed or covered • The dates when, and quantities of, waste added and waste removed from containers or storage impoundments, if relevant • The specific category or categories of waste in the container or storage impoundment as identified in terms of the National Waste Information Regulations, 2012 • The classification of the waste in terms of Regulation 4 once it has been completed (if required).
	Disposal record	Written evidence of safe disposal of waste will be kept.
	Record keeping	Records will be retained for a period of at least 5 years and will be made available to the Department on request.
Waste management	Collection points	Designated waste collection points will be established on site. Care will be taken to ensure that there will be sufficient collection points with adequate capacity and that these are serviced frequently.
	Laydown/ salvage areas	During decommissioning and closure, lay down areas for re-usable non-hazardous materials will be established.
	General waste	Will be stored in designated skips and removed by an approved contractor for disposal at a licensed facility.
	Scrap metal and building rubble	Care will be taken to ensure that scrap metal and building rubble does not become polluted or mixed with any other waste. The scrap metal will be collected in a designated area for scrap metal. It will be sold to scrap dealers.

Items to be considered		Intentions
General	**Specific**	
	Hazardous wastes	Medical waste will be temporarily stored in sealed containers in a bunded store before removal by an approved waste contractor and disposal in a licenced facility.
	Oil and grease	Oil and grease will be collected in suitable containers at designated collection points. The collection points will be bunded and underlain by impervious materials to ensure that any spills are contained. Notices will be erected at each waste oil point giving instructions on the procedure for waste oil discharge and collection. An approved subcontractor will remove oil from site.
	Diesel tanks	Bunds should be established around the diesel tanks
	Any soil polluted by a spill	If remediation of the soil *in situ* is not possible, the soils will be classified as a waste in terms of the Waste Regulations and will be disposed of at an appropriate permitted waste facility.
	Mixing of wastes	Waste will not be mixed or treated where this would reduce the potential for re-use, recycling or recovery; or result in treatment that is not controlled and not permanent.
Disposal	Off site waste disposal facilities	Waste will be disposed of at appropriate permitted waste disposal facilities.
		Unless collected by the municipality, the mine must ensure that their waste is assessed in accordance with the Norms and Standards for Assessment of Waste for Landfill Disposal set in terms of section 7(1) of the Waste Act prior to the disposal of the waste to landfill.
		Unless collected by the municipality, the mine must ensure that the disposal of their waste to landfill is done in accordance with the Norms and Standards for Disposal of Waste to Landfill set in terms of section 7(1) of the Waste Act.
Waste transport	Contractor	A qualified waste management subcontractor will undertake the waste transport. The contractor will provide an inventory of each load collected and of proof of disposal at a licensed facility.
Banned practices	Long-term stockpiling of waste	Stockpiling of waste is a temporary measure. Waste stockpiling sites must have an impervious floor, be bunded and have a drainage system for collection and containment of water on the site.
	Burying of waste	No wastes will be buried on site.
	Burning of waste	Waste may only be burned in legally approved incinerators.

TABLE 61: SOIL MANAGEMENT PRINCIPLES

Steps	Factors to consider	Detail
Delineation of areas to be stripped		Stripping will only occur where soils are to be disturbed by activities and infrastructure that are described in the EIA and EMP report, and where a clearly defined end rehabilitation use for the stripped soil has been identified. Soil stripping should be conducted a suitable period ahead of mining.
Stripping	Topsoil	A minimum of 400 mm topsoil will be stripped unless a soils expert advises otherwise.
Delineation of stockpiling areas	Location	Stockpiling areas will be identified in close proximity to the source of the soil to limit handling and to promote reuse of soils in the correct areas.
	Designation of the areas	Soil stockpiles will be clearly identifiable in terms of soil type and the intended areas of rehabilitation. All topsoil will be stockpiled in areas clearly demarcated on the infrastructure layout and should be defined as no-go areas.
Stockpile management	Vegetation establishment and erosion control	Rapid growth of vegetation on the topsoil stockpiles will be promoted (e.g. by means of watering or fertilisation). The purpose of this exercise will be to encourage vegetation growth on soil stockpiles and to combat erosion by water and wind.
	Storm water controls	Stockpiles will be established with storm water diversion berms to prevent run off erosion.

Steps	Factors to consider	Detail
	Height and slope	Soil stockpile height will be controlled to avoid compaction and damage to the underlying soils. In this regard, topsoil stockpiles should be limited to a maximum height of 5m. The stockpile side slopes should be flat enough to promote vegetation growth and reduce run-off related erosion. In addition to this, the topsoil stockpiles need to be established on a gradual slope if possible.
	Waste	No waste material will be placed on the soil stockpiles.
	Vehicles	Equipment movement on top of the soil stockpiles will be limited to avoid topsoil compaction and subsequent damage to the soils and seedbank.
Rehabilitation of disturbed land: restoration of land capability	Placement of soil	Once the site has been cleared on infrastructure, the area to be rehabilitated should be ripped in order to reduce soil compaction. A minimum layer of 400 mm of topsoil will be replaced unless a soils expert advises otherwise. Once the land has been prepared, seeding and re-vegetation will contribute to establishing a vegetative cover on disturbed soil as a means to restore disturbed areas to beneficial uses as quickly as possible.
	Fertilisation	Samples of stripped soils will be analysed to determine the nutrient status of the soil before rehabilitation commences. As a minimum, the following elements will be tested for cation exchange capacity, pH and phosphate. These elements provide the basis for determining the fertility of soil. Based on the analysis, fertilisers will be applied if necessary.
	Erosion control	Erosion control measures will be implemented to ensure that the topsoil is not washed away and that erosion gulley's do not develop prior to vegetation establishment. If erosion is evident on the topsoil stockpiles, the side slopes can be stabilised through re-vegetation with indigenous species.
	Restore land function and capability	Apply landscape function analysis and restoration interventions to areas where soil has been replaced as part of rehabilitation, but the land function and capability has not been effectively restored.

29 FINANCIAL PROVISION

29.1 DETERMINATION OF THE AMOUNT OF THE FINANCIAL PROVISION

29.1.1 DESCRIPTION OF THE CLOSURE OBJECTIVES AND THE ALIGNMENT WITH THE BASELINE ENVIRONMENT

The closure objective for the proposed project including how with objective will align with the current baseline environment includes the following:

- To maintain a relatively flat topography or a topography that emulates the existing ground lines.
- To maintain a functioning ecosystem
- Moderate groundwater quality
- Stable water table providing groundwater as a water supply source for domestic livestock watering
- Quite rural/urban environment
- Environmental damage is minimised to the extent that they are acceptable to all parties involved
- The land is rehabilitated to achieve a condition approximating its natural state, or so that the envisaged end use of wilderness and grazing is achieved
- Backfilling of the open pit will take place on a concurrent basis.
- All surface infrastructure, excluding the realignment of the R380 will be removed from site after rehabilitation and the open pit will be completely backfilled.
- Once the Ga-Mogara drainage channel has been permanently realigned, the design and establishment of the Ga-Mogara drainage channel permanent realignment will focus on replicating aspects of existing Ga-Mogara drainage channel. This will include the following closure objectives:
    - Natural flow will be allowed to continue when this occurs
    - The design of the realignment will incorporate curves
    - Vegetation within the realigned drainage channel will consist of plant and animal species endemic to the proposed project area.
    - The design will incorporate natural soils
- Mine closure is achieved efficiently, cost effectively and in compliance with the law.
- The social impacts resulting from mine closure are managed in such a way that negative socio-economic impacts are minimised.

29.1.2 CONFIRMATION THAT THE CLOSURE OBJECTIVES HAVE BEEN CONSULTED WITH LANDOWNERS AND IAPS

The closure objectives were outlined in the scoping report which was made available to IAPs, including landowners for review and comment (Section 7.2.7). Further to this, IAPs including landowners will be given a further opportunity to review the closure objectives associated with the proposed project as part of the review of the EIA and EMP report (Section 7.2.8).

To date no comments regarding the closure objectives associated with the proposed project have been received from IAPs including landowners.

29.1.3 REHABILITATION PLAN

The plan showing the location and aerial extent of the entire operation at the time of closure is illustrated in Figure 3.

29.1.4 COMPATIBILITY OF THE REHABILITATION PLAN WITH THE CLOSURE OBJECTIVES

It can be confirmed that the rehabilitation plan is compatible with the closure objectives given that the closure objectives were taken into account during the determination of the financial provision.

29.1.5 CALCULATE AND STATE THE QUANTUM OF THE FINANCIAL PROVISION

The information in this section was sourced from the closure cost calculation study completed by SLR (SLR, September 2015) and is included in Appendix S. The closure cost assessment was undertaken in accordance to the DMR Guideline Document for the Evaluation of the Quantum of Closure-Related Financial Provision Provided by a Mine.

The financial closure liability associated with the proposed Mokala Manganese Mine (as at life of mine, life of mine is R. 19 286 474.00 (including VAT). The annual forecasted financial provision for the first 10 years of the proposed project is provided in Table 62 below. Further details regarding the closure cost calculation is included in the closure cost assessment (SLR, September 2015) and is included in Appendix S.

TABLE 62: FINANCIAL PROVISION (SLR, SEPTEMBER 2015)

Year	Financial provision (R, including vat)
1	15 341 645.00
2	16 739 217.00
3	18 118 871.00
4	18 265 763.00
5	18 410 772.00
6	18 557 664.00
7	18 702 673.00
8	18 849 565.00

Year	Financial provision (R, including vat)
9	18 994 573.00
10	19 141 465.00
Life of mine	**19 286 474.00**

29.1.6 CONFIRMATION THAT THE FINANCIAL PROVISION WILL BE PROVIDED

The financial provision will be provided in the form of a bank guarantee.

30 MECHANISMS FOR MONITORING COMPLIANCE AND PERFORMANCE AGAINST THE EMP

Environmental impacts requiring monitoring are listed in Table 63 below.

TABLE 63: MONITORING OF COMPLIANCE AND PERFORMANCE IN TERMS OF EMPR

Activity	Impacts requiring monitoring	Functional requirements for monitoring	Roles and responsibilities	Monitoring and reporting frequency and time period for management actions
Site preparation Earthworks Civil works Open pit mining Processing plant Transportation Power supply and use Water supply and use Mineralised waste Support services Demolition Rehabilitation Maintenance and aftercare	Hazardous infrastructure	All mineralised waste facilities and water dams will be monitored to ensure stability, safety and prevention of environmental impacts. The findings will be documented for record-keeping and auditing purposes and addressed where relevant to achieve the stated objectives.	Qualified engineer	The frequency of the monitoring and the qualification of the monitoring personnel will be determined on an infrastructure specific basis. Monitoring will be undertaken for the duration of the mine.
Earthworks Civil works Open pit mining Processing plant Transportation Power supply and use Mineralised waste Non-mineralised waste Support services Rehabilitation Demolition Maintenance and aftercare	Alteration of natural drainage patterns	An operational water balance for the mine needs to be developed from recorded flow measurements and production figures. This is done by an appropriately qualified person. The water balance is used to check on an on-going basis that the capacity of the dirty water holding facilities is adequate.	Environmental Department	Updated on a monthly basis for the duration of the mine.
Earthworks Civil works Open pit mining Processing plant	Contamination of surface water resources	Monitoring of surface water quality should be undertaken in the event that surface water flow is present in the Ga-Mogara drainage channel. Water quality analyses results should be classified in terms of the DWAF Guidelines Domestic Water Supply (1999), the DWAF guidelines for livestock watering,	Environmental Department	Monitoring reports need to be submitted to the DWS as per the conditions of the WULA.

<table>
<tr><th>Activity</th><th>Impacts requiring monitoring</th><th>Functional requirements for monitoring</th><th>Roles and responsibilities</th><th>Monitoring and reporting frequency and time period for management actions</th></tr>
<tr><td>Transportation
Power supply and use
Mineralised waste
Non-mineralised waste
Support services
Rehabilitation
Demolition
Maintenance and aftercare</td><td></td><td>IFC mining Effluent Limits, WHO guidelines and SANS guideline limits. The parameters that need to be tested as part of the monitoring programme are those outlined in the groundwater monitoring programme. The monitoring results should be assessed by a suitably-qualified professional registered with the South African Council for Natural Scientific Professional (SACNASP). All of the above may be amended to comply with the WUL conditions.</td><td></td><td>Monitoring will be undertaken when the Ga-Mogara drainage channel is in flow.</td></tr>
<tr><td>Earthworks
Civil works
Open pit mining
Processing plant
Transportation
Power supply and use
Mineralised waste
Non-mineralised waste
Support services
Rehabilitation
Demolition
Maintenance and aftercare</td><td>Contamination of groundwater resources</td><td>As part of the proposed project, Mokala will implement a groundwater monitoring programme. The proposed location of the groundwater monitoring boreholes are illustrated in Figure 32. The exact location and number of monitoring boreholes should be refined with consultation with a qualified specialists. Water quality analyses results should be classified in terms of the DWAF Guidelines Domestic Water Supply (1999), the DWAF guidelines for livestock watering, IFC mining Effluent Limits, WHO guidelines and SANS guideline limits. The parameters that should be monitored are tabulated below.

<table><tr><td>pH</td><td>Potassium</td></tr><tr><td>Electrical conductivity</td><td>Magnesium</td></tr><tr><td>Temperature</td><td>Manganese</td></tr><tr><td>Fluoride as F</td><td>Sodium</td></tr><tr><td>Total alkalinity as $CaCO_3$</td><td>Selenium</td></tr><tr><td>Chloride as Cl</td><td>Zinc</td></tr><tr><td>Sulphate as SO_4</td><td>Total dissolved solids</td></tr><tr><td>Nitrate as N</td><td>Iron</td></tr><tr><td>Aluminium</td><td>Calcium</td></tr><tr><td>Boron</td><td>-</td></tr></table>
The monitoring results should be assessed by a suitably-qualified professional registered with the South African Council for Natural Scientific Professional (SACNASP). All of the above may be amended to comply with the WUL conditions.</td><td>Environmental Department</td><td>Groundwater quality should be monitored bi-annually for the duration of the mine and for at least ten years after closure.

Groundwater quantity should be monitored on a quarterly basis for the duration of the mine and for at least ten years after closure.

The monitoring programme should be implemented at least one year prior to mining.

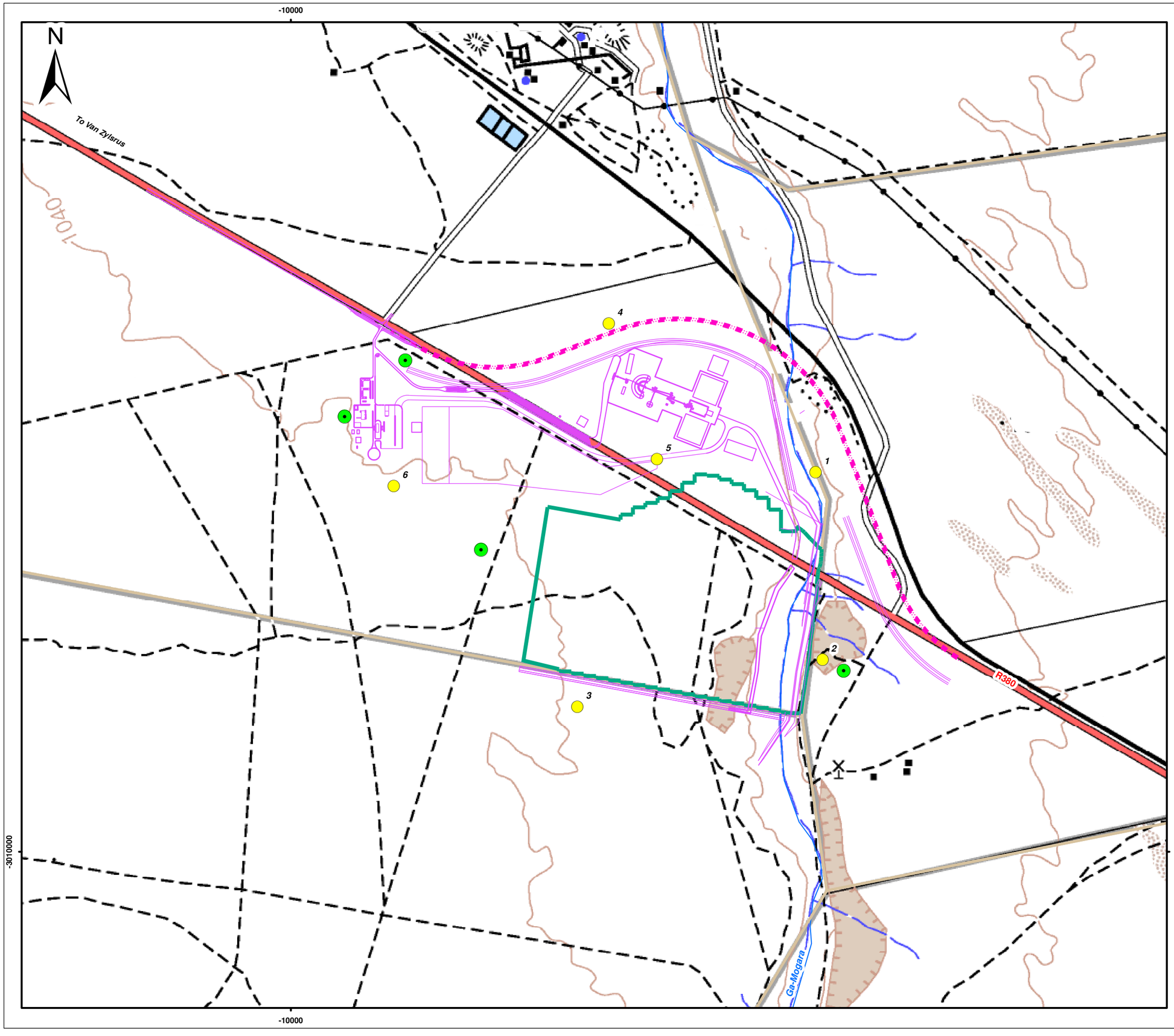
Groundwater monitoring reports need to be submitted to the DWS as per the conditions of the WUL.</td></tr>
<tr><td>Site preparation
Earthworks
Civil works</td><td>Air pollution</td><td>Mokala will ensure the implementation of a dust fallout monitoring programme for the proposed project. The location of the dust fallout monitoring points are illustrated in Figure 32. It is also recommended that Mokala collaborate with</td><td>Environmental Department</td><td>Dust fallout monitoring must be undertaken on a monthly basis. Monitoring will be</td></tr>
</table>

Activity	Impacts requiring monitoring	Functional requirements for monitoring	Roles and responsibilities	Monitoring and reporting frequency and time period for management actions
Open pit mining Processing plant Transportation Power supply and use Mineralised waste Non-mineralised waste Support services Rehabilitation Demolition Maintenance and aftercare		other mines/industries in the region to install a gravimetric PM10/PM2.5 monitor at Gloria Mine Village or Hotazel. This will provide adequate data on cumulative PM10 and PM2.5 concentrations from the Mokala Manganese Project and other mines/industries in the region. Once the PM10 and PM2.5 sampler has been installed, this data should be used to determine the trace concentration of the Mn element. Should exceedances of the long-term assessment criteria occur (as was simulated), a health risk/toxicological assessment should then be conducted to determine the health impact due to manganese emissions at the potentially affected receptors such as Gloria Mine village and Hotazel.		undertaken for the duration of the mine. PM10, PM2.5 and Mn element monitoring should take place on a monthly basis. Monitoring reports need to be uploaded onto the National Emissions Inventory System on annual basis.
Site preparation Earthworks Civil works Open pit mining Processing plant Transportation Power supply and use Mineralised waste Non-mineralised waste Support services Rehabilitation Demolition	Noise pollution	In the event that Mokala receives noise related complaints during either construction or operation, Mokala should consider conducting short term (24-hour) ambient noise measurements as part of investigating the complaints. The results of the measurements should be used to inform any follow up interventions. The following procedure should be adopted for all noise surveys if required: • Any surveys should be designed and conducted by a trained specialist. • Sampling should be carried out using a Type 1 sound level meter (SLM) that meets all appropriate International Electrotechnical Commission (IEC) standards and is subject to annual calibration by an accredited laboratory. • The acoustic sensitivity of the SLM should be tested with a portable acoustic calibrator before and after each sampling session. • Samples of at least 24 hours in duration and sufficient for statistical analysis should be taken with the use of portable SLM's capable of logging data continuously over the time period. Samples representative of the day- and night-time acoustic climate should be taken. • The following acoustic indices should be recoded and reported: o LAeq (T) o Statistical noise level LA90 o LAmin and LAmax o Octave band or 3rd octave band frequency spectra. • The SLM should be located approximately 1.5 m above the ground and no closer than 3 m to any reflecting surface. • Efforts should be made to ensure that measurements are not affected by the residual noise and extraneous influences, e.g. wind, electrical interference and any other non-acoustic interference, and that the instrument is operated under the conditions specified by the	Environmental Department	Noise monitoring should be done for a month in the event of a noise related complaint.

Activity	Impacts requiring monitoring	Functional requirements for monitoring	Roles and responsibilities	Monitoring and reporting frequency and time period for management actions
		manufacturer. It is good practice to avoid conducting measurements when the wind speed is more than 5 m/s, while it is raining or when the ground is wet. • A detailed log and record should be kept. Records should include site details, weather conditions during sampling and observations made regarding the acoustic climate of each site.		
Site preparation Earthworks Civil works Open pit mining Processing plant Transportation Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services General site management Rehabilitation Demolition Maintenance and aftercare	Physical destruction and general disturbance of biodiversity	Mokala will implement an alien/invasive /weed management programme to control the spread of these plants onto and form disturbed areas. This will be achieved by active eradication and the establishment of natural species and through on-going monitoring and assessment. The use of herbicides will be limited and focussed and will only be used under strict controls. Herbicides will be selected to ensure least residual harm. Herbicides will be administered by suitably qualified people. Continued monitoring will be undertaken to ensure that the alien invasive species have been eradicated and are controlled for both controlled sites as well as rehabilitated areas. For each area requiring rehabilitation specific landscape functionality objectives will be set with expert input and the associated targets and monitoring program will follow accordingly.	Environmental Department	The alien/invasive/weed management programme should be undertaken on an annual basis for the duration of the mine. After closure, repeat surveys should be carried out annually for at least the first three years post-rehabilitation.
Open pit mining	Blasting impacts (fly rock, air blasts and ground vibrations)	Monitoring of each blast will be taken as part of the proposed project. Points for off-site vibration and airblast monitoring will be identified in consultation with surrounding landowners and a blast monitoring specialist. The monitoring results will be documented and maintained for record-keeping and auditing purposes.	Qualified blasting specialist	Blast monitoring will take place for the duration of blasting activities.

30.1 FREQUENCY OF PERFORMANCE ASSESSMENT REPORT

The environmental department manager will conduct internal management audits against the commitments in the EMP. These audits will be conducted on an on-going basis until final closure. The audit findings will be documented for both record keeping purposes and for informing continual improvement. In addition, and in accordance with mining regulation R527, an independent professional will conduct an EMP performance assessment every 2 years. The site's compliance with the provisions of the EMP and the adequacy of the EMP report relative to the on-site activities will be assessed in the performance assessment.



Legend

- Proposed Infrastructure
- Proposed Road Re-Alignment of R380
- Proposed Open Pit Area
- Farm Boundaries
- Rivers

Monitoring Plan

- Groundwater
- Dust

0 300 600 Meters

Scale: 1:70 500 @ A3

Projection:Transverse Mercator
Datum: Hartebeeshoek, Lo 23

MOKALA MANGANESE (PTY) LTD

Figure 32

Monitoring Plan

SLR Consulting (Africa) (Pty) Ltd
P O Box 1596, Cramerview, 2060, South Africa
Tel: +27 (11) 467-0945 Fax: +27 (11) 467-0978

710.0912.00001 | October 2015

31 ENVIRONMENTAL AWARENESS PLAN

31.1 MANNER IN WHICH APPLICANT INTENDS TO INFORM EMPLOYEES OF THE ENVIRONMENTAL RISKS

This section includes an environmental awareness plan for the proposed mine. The plan describes how employees will be informed of environmental risks which may result from their work, the manner in which the risk must be dealt with in order to avoid pollution or degradation of the environment and the training required for general environmental awareness and the dealing of emergency situations and remediation measures for such emergencies.

All contractors that conduct work on behalf of Mokala are bound by the content of the EMPr and a contractual condition to this effect will be included in all such contracts entered into by the mine. If contractors are used, the responsibility for ensuring compliance with the EMPr will remain with Mokala.

The purpose of the environmental awareness plan is to ensure that all personnel and management understand the general environmental requirements of the site. In addition, greater environmental awareness must be communicated to personnel involved in specific activities which can have a significant impact on the environment and ensure that they are competent to carry out their tasks on the basis of appropriate education, training and/or experience. The environmental awareness plan should enable Mokala to achieve the objectives of the environmental policy.

31.1.1 ENVIRONMENTAL POLICY

Mokala will display the environmental policy. To achieve world class environmental performance in a sustainable manner Mokala is currently committed to:

- Integrating environmental management into all aspects of our business, including the entire product life cycle;
- Complying with all applicable legislation and other requirement to which Mokala subscribes;
- Practising responsible stewardship by adopting world class standards;
- Proactively identifying and managing significant environmental aspects in order to:
    - Minimise emissions to atmosphere
    - Minimise the release of effluent
    - Optimise resource consumption
    - Mitigate our impacts on climate change
    - Minimise waste
    - Rehabilitate disturbed land and protect environmental biodiversity

- Protect cultural heritage resources.

- Ensuring environmental awareness and appropriate competency among employees and promoting environmental awareness in the community
- Engaging with all IAPs towards the shared goal of improving the environment;
- Setting objectives and, where possible, quantitative targets, to determine continual improvement in environmental performance and the prevention of pollution

31.1.2 STEPS TO ACHIEVE THE ENVIRONMENTAL POLICY OBJECTIVES

Mokala's environmental policy will be realised by setting specific and measurable objectives. It is proposed that new objectives are set throughout the life of mine, but initial objectives are as follows:

- Management of environmental responsibilities:
  - Mokala will establish and appoint Managers at senior mine management level at each site, who will be provided with all necessary resources to carry out the management of all environmental aspects of the site irrespective of other responsibilities, for example:
    - Compliance with environmental legislation and EMP commitments
    - Implementing and maintaining an environmental management system with the assistance of the appointed EMS Area Coordinator and the Area Waste Coordinator
    - Developing environmental emergency response procedures and coordinating personnel during incidents
    - Manage routine environmental monitoring and data interpretation
    - Environmental trouble shooting and implementation of remediation strategies
    - Closure planning.
- Communication of environmental issues and information:
  - Meetings, consultations and progress reviews will be carried out, and specifically Mokala will:
    - Set the discussion of environmental issues and feedback on environmental projects as an agenda item at all company board meetings
    - Provide progress reports on the achievement of policy objectives and level of compliance with the approved EMP to the Department of Minerals Resources
    - Ensure environmental issues are raised at monthly mine management executive committee meetings and all relevant mine wide meetings at all levels
    - Ensure environmental issues are discussed at all general liaison meetings with local communities and other interested and affected parties.
- Environmental awareness training:
  - Mokala will provide environmental awareness training to individuals at a level of detail specific to the requirements of their job, but will generally comprise:

  - Basic awareness training for all prior to granting access to site (e.g. short video presentation requiring registration once completed). Employees and contractors who have not attended the training will not be allowed on site.
  - General environmental awareness training will be given to all employees and contractors as part of the Safety, Health and Environment induction programme. All non-Mokala personnel who will be on site for more than three days must undergo the SHE induction training.
  - Specific environmental awareness training will be provided to personnel whose work activities can have a significant impact on the environment (e.g. workshops, waste handling and disposal, sanitation, etc.).
- Review and update the environmental topics already identified in the EMPr which currently includes the following purpose
  - Topography (hazardous excavations)
  - Soil and land capability management (loss of soil resource)
  - Management of biodiversity
  - Surface water management (alteration of surface drainage and pollution of surface water)
  - Groundwater management (reduction in groundwater levels/availability and groundwater contamination)
  - Management of air quality (dust generation)
  - Noise (specifically management of disturbing noise)
  - Visual aspects (reduction of negative visual impacts)
  - Surrounding land use (traffic management, blast management, land use loss)
  - Heritage resources (management of sites)
  - Socio-economic impacts (management of positive and negative impacts)
- The mine will be designed to minimise impact on the environment and to accomplish closure/rehabilitation objectives.
- Mokala will maintain records of all environmental training, monitoring, incidents, corrective actions and reports.

31.1.3 TRAINING OBJECTIVES OF THE ENVIRONMENTAL AWARENESS PLAN

The environmental awareness plan ensures that training needs are identified and that appropriate training is provided. The environmental awareness plan should communicate:

- The importance of conformance with the environmental policy, procedures and other requirements of good environmental management
- The significant environmental impacts and risks of individuals work activities and explain the environmental benefits of improved performance
- Individuals roles and responsibilities in achieving the aims and objectives of the environmental policy

- The potential consequences of not complying with environmental procedures.

31.1.3.1 General Contents of the Environmental Awareness Plan

To achieve the objectives of the environmental awareness plan the general contents of the training plans are as follows:

- Module 1 – Basic training plan applicable to all personnel entering the site:
  - Short (15 min) presentation to indicate the site layout and activities at specific business units together with their environmental aspects and potential impacts.
  - Individuals to sign off with site security on completion in order to gain access to the site.
- Module 2 – General training plan applicable to all personnel at the site for longer than 3 days:
  - General understanding of the environmental setting of the mine (e.g. local communities and industries and proximity to natural resources such as rivers);
  - Understanding the environmental impact of individuals activities on site (e.g. excessive production of waste, poor housekeeping, energy consumption, water use, noise, etc.);
  - Indicate potential site specific environmental aspects and their impacts;
  - Mokala's environmental management strategy;
  - Identifying poor environmental management and stopping work which presents significant risks;
  - Reporting incidents;
  - Examples of poor environmental management and environmental incidents; and
  - Procedures for emergency response and cleaning up minor leaks and spills.
- Module 3 – Specific training plan:
  - Environmental setting of the workplace (e.g. proximity of watercourses, vulnerability of groundwater, proximity of local communities and industries, etc.);
  - Specific environmental aspects such as:
    - Spillage of hydrocarbons at workshops
    - Spillage of explosive liquids in the open pits
    - Poor waste management such as mixing hazardous and general wastes, inappropriate storage and stockpiling large amounts of waste
    - Poor housekeeping practices
    - Poor working practices (e.g. not carrying out oil changes in designated bunded areas)
    - Excessive noise generation and unnecessary use of hooters
    - Protection of heritage resources (including palaeontological resources).
  - Impact of environmental aspects, for example:
    - Hydrocarbon contamination resulting in loss of resource (soil, water) to downstream users;
    - Groundwater contamination also resulting in loss of resource due to potential adverse aesthetic, taste and health effects; and
    - Dust impacts on local communities (nuisance and health implications).

- Mokala's duty of care (specifically with respect to waste management); and
- Purpose and function of Mokala's environmental management system.

Individuals required to complete Module 3 (Specific training module) will need to complete Modules 1 and 2 first. On completion of the Module 3, individuals will be subject to a short test (written or verbal) to ensure the level of competence has been achieved. Individuals who fail the test will be allowed to re-sit the test after further training by the training department.

The actual contents of the training modules will be developed based on a training needs analysis.

Key personnel will be required to undergo formal, external environmental management training (e.g. how to operate the environmental management system, waste management and legal compliance).
In addition to the above Mokala will:

- Conduct refresher training/presentations on environmental issues for mine employees (permanent and contractors) at regular intervals.
- Promote environmental awareness using relevant environmental topic posters displayed at strategic locations on the mine. These topics will be changed monthly, and will be reviewed annually by the Environmental Department Manager to ensure relevance.
- Participate and organise events which promote environmental awareness, some of which will be tied to national initiatives e.g. National Arbour Week, World Environment Day and National Water Week.

31.2 MANNER IN WHICH RISKS WILL BE DEALT WITH TO AVOID POLLUTION OR DEGRADATION

31.2.1 ON-GOING MONITORING AND MANAGEMENT MEASURES

The monitoring programme as described in Section 30 will be undertaken to provide early warning systems necessary to avoid environmental emergencies.

31.2.2 PROCEDURES IN CASE OF ENVIRONMENTAL EMERGENCIES

Emergency procedures apply to incidents that are unexpected and that may be sudden, and which lead to serious danger to the public and/or potentially serious pollution of, or detriment to the environment (immediate and delayed). Procedures to be followed in case of environmental emergencies are described in the table below (Table 64).

31.2.2.1 General emergency procedure

The general procedure that should be followed in the event of all emergency situations is as follows.

- Applicable incident controller defined in emergency plans must be notified of an incident upon discovery
- Area to be cordoned off to prevent unauthorised access and tampering with evidence
- Undertake actions defined in emergency plant to limit/contain the impact of the emergency
- If residue facilities/dams, stormwater diversions, etc., are partially or totally failing and this cannot be prevented, the emergency siren is to be sounded (nearest one available). After hours the Operations Engineer on shift must be notified
- Take photographs and samples as necessary to assist in investigation
- Report the incident immediately to the environmental department for emergencies involving environmental impacts or to the safely department in the case of injury
- The Environment department must comply with Section 30 of the National Environmental Management Act (107 of 1998) such that:
    - The Environment department must immediately notify the Director-General (DWS and DMR and Inspectorate of Mines as appropriate), the South African Police Services, the relevant fire prevention service, the provincial head of DMR, the head of the local municipality, the head of the regional DWS office and any persons whose health may be affected of:
        - The nature of the incident
        - Any risks posed to public health, safety and property
        - The toxicity of the substances or by-products released by the incident
        - Any steps taken to avoid or minimise the effects of the incident on public health and the environment.
- The Environment department must as soon as is practical after the incident:
        - Take all reasonable measures to contain and minimise the effects of the incident including its effects on the environment and any risks posed by the incident to the health, safety and property of persons;
        - Undertake clean up procedures;
        - Remedy the effects of the incident; and
        - Assess the immediate and long term effects of the incident (environment and public health);
    - Within 14 days the Environment department must report to the Director-General DWS and DEA, the provincial head of DMR, the regional manager of the DMR, the head of the local and district municipality, the head of the regional DWS office such information as is available to enable an initial evaluation of the incident, including:
        - The nature of the incident
        - The substances involved and an estimation of the quantity released
        - The possible acute effects of the substances on the persons and the environment (including the data needed to assess these effects)
        - Initial measures taken to minimise the impacts

- Causes of the incident, whether direct or indirect, including equipment, technology, system or management failure
- Measures taken to avoid a recurrence of the incident.

31.2.2.2 Identification of Emergency Situations

The site wide emergency situations that have been identified together with specific emergency response procedures are outlined in Table 64.

31.2.3 TECHNICAL, MANAGEMENT AND FINANCIAL OPTIONS

Technical, management and financial options that will be put into place to deal with the remediation of impacts in cases of environmental emergencies are described below.

- The applicant will appoint a competent management team with the appropriate skills to develop and manage a mine of this scale and nature.
- To prevent the occurrence of emergency situations, the mine will implement as a minimum the mine plan and mitigation measures as included in this EMPr report.
- The mine has an environmental management system in place where all operation identify, report, investigate, address and close out environmental incidents.
- As part of its annual budget, the mine will allow a contingency for handling of any risks identified and/or emergency situations.
- Where required, the mine will seek input from appropriately qualified people.

TABLE 64: EMERGENCY RESPONSE PROCEDURES

Item	Emergency situation	Response in addition to general procedures
1	Spillage of chemicals, engineering substances and waste	Where there is a risk that contamination will contaminate the land (leading to a loss of resource), surface water and/or groundwater, Mokala will: • Notify residents/users downstream of the pollution incident. • Identify and provide alternative resources should contamination impact adversely on the existing environment. • Cut off the source if the spill is originating from a pump, pipeline or valve (e.g. refuelling bays) and the infrastructure 'made safe'. • Contain the spill (e.g. construct temporary earth bund around source such as road tanker). • Pump excess hazardous liquids on the surface to temporary containers (e.g. 210 litre drums, mobile tanker, etc.) for appropriate disposal. • Remove hazardous substances from damaged infrastructure to an appropriate storage area before it is removed/repaired.
2	Discharge of dirty water to the environment	Apply the principals listed for Item 1 above. To stop spillage from the dirty water system the mine will: • Redirect excess water to other dirty water facilities where possible • Pump dirty water to available containment in the clean water system, where there is no capacity in the dirty water system • Carry out an emergency discharge of clean water and redirect the spillage to the emptied facility. • Apply for emergency discharge as a last resort.
3	Pollution of surface water (where relevant)	Personnel discovering the incident must inform the Environment department of the location and contaminant source. Apply the principals listed for Item 1 above. Absorbent booms will be used to absorb surface plumes of hydrocarbon contaminants. Contamination entering the surface water drainage system should be redirected into the dirty water system. The Environment department will collect in-stream water samples downstream of the incident to assess the immediate risk posed by contamination.
4	Groundwater contamination	Use the groundwater monitoring boreholes as scavenger wells to pump out the polluted groundwater for re-use in the process water circuit (hence containing the contamination and preventing further migration). Investigate the source of contamination and implement control/mitigation measures.
5	Burst water pipes (loss of resource and erosion)	Notify authority responsible for the pipeline (if not mine responsibility). Shut off the water flowing through the damaged area and repair the damage. Apply the principals listed for Item 1 above if spill is from the dirty/process water circuit.
6	Flooding from failure of surface water control	Evacuate the area downstream of the failure. Using the emergency response team, rescue/recover and medically treat any injured personnel.

Item	Emergency situation	Response in addition to general procedures
	infrastructure	Temporarily reinstate/repair stormwater diversions during the storm event (e.g. emergency supply of sandbags). Close the roads affected by localised flooding or where a stormwater surge has destroyed crossings/bridges.
7	Risk of drowning from falling into water dams	Attempt rescue of individuals from land by throwing lifeline/lifesaving ring. Get assistance of emergency response team whilst attempting rescue or to carry out rescue of animals and or people as relevant. Ensure medical assistance is available to recovered individual.
8	Veld fire	Evacuate mine employees from areas at risk. Notify downwind residents and industries of the danger. Assist those in imminent danger/less able individuals to evacuate until danger has passed. Provide emergency fire fighting assistance with available trained mine personnel and equipment.
9	Falling into hazardous excavations	Personnel discovering the fallen individual or animal must mobilise the emergency response team to the location of the incident and provide a general appraisal of the situation (e.g. human or animal, conscious or unconscious, etc.). The injured party should be recovered by trained professionals such as the mine emergency response team. A doctor (or appropriate medical practitioner)/ambulance should be present at the scene to provide first aid and transport individual to hospital.
10	Road traffic accidents (on site)	The individual discovering the accident (be it bystander or able casualty) must raise the alarm giving the location of the incident. Able personnel at the scene should shut down vehicles where it is safe to do so. Access to the area should be restricted and access roads cleared for the emergency response team. Vehicles must be made safe first by trained professionals (e.g. crushed or overturned vehicles). Casualties will be moved to safety by trained professionals and provided with medical assistance. Medical centres in the vicinity with appropriate medical capabilities will be notified if multiple seriously injured casualties are expected. A nearby vet should be consulted in the case of animal injury
11	Development of informal settlements	The mine will inform the local authorities (municipality and police) that people are illegally occupying the land and ensure that action is taken within 24hrs.
12	Injury from fly rock	The person discovering the incident will contact the mine emergency response personnel to recover the injured person or animal and provide medical assistance. Whilst awaiting arrival of the emergency response personnel, first aid should be administered to the injured person by a qualified first aider if it is safe to do so.
13	Uncovering of graves and sites	Personnel discovering the grave or site must inform the Environment department immediately. Prior to damaging or destroying any of the identified graves, permission for the exhumation and relocation of graves must be obtained from the relevant descendants (if known), the National Department of Health, the Provincial Department of Health, the

Item	Emergency situation	Response in addition to general procedures
		Premier of the Province and the local Police. The exhumation process must comply with the requirements of the relevant Ordinance on Exhumations, and the Human Tissues Act, 65 of 1983.
14	Uncovering of fossils	Personnel discovering the fossil or potential site must inform the Environment department immediately. Should any fossils be uncovered during the development of the site, a palaeontologist will be consulted to identify the possibility for research.

32 SPECIFIC INFORMATION REQUIRED BY THE COMPETENT AUTHORITY

The following documents will be submitted to the DMR from the start of construction until mine closure:

- In accordance to Section 34 of GNR. 982 of NEMA, the holder of a mining right needs to submit an environmental audit report, prepared by an independent person, to the DMR at intervals indicated in the environmental authorisation. The purpose of the environmental audit report is to ensure compliance with the conditions of the environmental authorisation and the EMP.
- The financial provision will be updated on an annual basis and submitted to the DMR

33 UNDERTAKING

I, Natasha Daly, the Environmental Assessment Practitioner responsible for compiling this EMPR hereby confirm:

- The correctness of the information provided in the report;
- The inclusion of comments and inputs form stakeholders and IAPs;
- The inclusion of inputs and recommendations from the specialist reports where relevant; and
- The acceptability of the project in relation to the finding of the assessment and the level of mitigation proposed.

Signature of the EAP

Date: 09/11/2015

34 REFERENCES

Aecom, Mokala Manganese Mine, surface water management report, October 2015.

Airshed Planning Professionals (Pty) Ltd, Air Quality Specialist Report for the Proposed Mokala Manganese Project in the Northern Cape Province, September 2015.

Airshed Planning Professionals (Pty) Ltd, Noise Impact Assessment for the Proposed Mokala Manganese Project near Hotazel in the Northern Cape Province, September 2015.

Cambrian CC, Preliminary Blast Evaluation of the Drill and Blast Operation for the Proposed Mokala Manganese Project, August 2015.

Ecological Management Services, Biodiversity Survey Report for the proposed Mokala manganese mine layout, August 2015.

Gideon Groenewald, Palaeontological desktop assessment of the farm Gloria, 266, near Hotzel town in the John Toalo Gaetsewe District Municipality in the Northern Cape Province, April 2013.

Joe Morolong Spatial Development Framework, September 2012.

Management Transformation Solutions (Pty) Ltd, Social and Labour Plan for the Mokala Manganese Mine, January 2015.

PGS, Heritage Impact Assessment, Prospecting activities on the farm Gloria 266, near Hotazel in the Northern Cape Province, May 2013.

PGS, Heritage Impact Assessment, RE-alignment of the R380 and a portion of the Ga-Mogara River on a portion of the farm Kipling 271, near Hotazel in the Northern Cape Province, October 2015.

SLR Consulting (Africa) (Pty) Ltd, Mokala surface water study, February 2015.

SLR Consulting (Africa) (Pty) Ltd, Geochemical Assessment in support of the Environmental Impact Assessment, August 2015.

SLR Consulting (Africa) (Pty) Ltd, Groundwater Assessment for the Proposed Mokala Manganese Project, August 2015.

SLR Consulting (Africa) (Pty) Ltd, Calculation of the Current and Future Financial Closure Liabilities for the Proposed Mokala Manganese Project as at August 2015, September 2015.

Siyazi, Traffic Impact Assessment for the Proposed Mokala Manganese Mine to be located near Hotazel (Road R380) in the Northern Cape, March 2015.

Terra Africa Environmental Consultants, Mokala Manganese Project Soil, Land Use and Land Capability Report, July 2015.

APPENDIX A: PROOF OF EAP QUALIFICATIONS

APPENDIX B: CURRICULUM VITAE OF EAP

APPENDIX C: LOCAL AND REGIONAL SETTING

APPENDIX D: SITE LAYOUT

APPENDIX E: STAKEHOLDER ENGAGEMENT DOCUMENTS

- NEMA/NEMWA application form
- Database
- Notice of intent letter submitted to the DWS
- DMR acceptance letter of relevant applications
- Background information document in English and Afrikaans
- Site notices in English and Afrikaans and photos of the site notices
- Advertisements placed in the Kalahari Bulletin and Kathu Gazette
- Formal invitations sent to IAPs to notify them of the public meeting
- Formal invitations sent to Regulatory authorities to notify them of the authorities meeting
- Minutes of the public meeting including the attendance register
- Minutes of the regulatory authorities meeting including the attendance register
- Correspondence from the land claims commissioner
- Summary document of the scoping report submitted to IAPs and regulatory authorities in English and Afrikaans
- Proof of distribution of the scoping report and summaries to IAPs and regulatory authorities for review and comment
- Comments received during the review of the scoping report by IAPs and regulatory authorities

APPENDIX F: IMPACT RATING FOR EACH POTENTIAL IMPACT

Potential environmental and socio-economic impacts were identified by SLR and other stakeholders. The impacts are discussed under issue headings in this section. All identified impacts are considered in a cumulative manner such that the current baseline conditions on site and in the surrounding area are discussed and assessed together. The criteria used to rate each impact is outlined in Section 7.6. The potential impacts are rated with the assumption that no mitigation measures are applied and then again with mitigation. An indication of the phases in which the impact will occur including the activity associated with each impact is provided below. A summary of the impact assessment is summarised in Section 9 of the main report.

Environmental impacts that will be assessed in this section include the following:

- Loss and sterilisation of a mineral resource
- Hazardous excavations, infrastructure and surface subsidence
- Loss of soil resources and land capability through contamination
- Loss of soil resources and land capability through physical disturbance
- Physical destruction of biodiversity
- General disturbance of biodiversity
- Contamination of surface water resources
- Alteration of natural drainage patterns
- Contamination of groundwater resources
- Reduction of groundwater levels and availability
- Air pollution
- Noise pollution
- Blasting impacts
- Road disturbance and traffic safety
- Visual impacts
- Loss of heritage, cultural and palaeontological resources
- Economic impact
- Inward migration impact
- Land use impact

GEOLOGY

ISSUE: LOSS AND STERILIZATION OF MINERAL RESOURCE

Information in this section was sourced from the project team.

Introduction

Mineral resources can be sterilised and/or lost through the placement of infrastructure and activities in close proximity to mineral resources, by preventing access to potential mining areas, and through the disposal of mineral resources onto mineralised waste facilities (overburden stockpiles) or as backfill in the open pit.

Project phase and link to activities/infrastructure

Construction	Operational	Decommissioning	Closure
Open pit mining Mineralised waste Placement of infrastructure	Open pit mining Mineralised waste Placement of infrastructure	Open pit mining Mineralised waste	Maintenance and aftercare of rehabilitated areas

Rating of impact

Severity / nature

The severity of sterilising mineral resources is considered to be high because of the associated potential economic value that is lost when sterilisation occurs. In the unmitigated scenario, this may occur in the event that Mokala develops or decommissions infrastructure in a manner that it prohibits the mining of feasible resources, or where it disposes of feasible mineral resources onto the overburden stockpile which will be backfilled into the open pit in a manner that makes it difficult or impossible to access the resources.

In the mitigated scenario, planning and co-ordination between the project team can help to prevent the unacceptable sterilisation of resources, without compromising safety requirements. The mitigated severity reduces to low.

Duration

If sterilisation of resources occurs it is likely that the related impact will extend beyond the life of mine. This is a long term duration.

Spatial scale / extent

The spatial extent of the physical impact is linked to the spatial extent of the proposed project area. This is a localised spatial extent. If one however considers the economic nature of the impact, it will extend beyond the site into the broader economy.

Consequence

The unmitigated consequence is high. The mitigated consequence is medium.

Probability

Without mitigation the probability is high. With the implementation of mitigation measures, planning structures will be in place to avoid infrastructure and development related sterilisation which reduces the probability to low.

Significance

The unmitigated significance is high. In the mitigated scenario the significance is low.

Unmitigated – summary of the rated loss and sterilisation of mineral resources impact per phase of the project

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
Operation, decommissioning and closure						
Unmitigated	H	H	M	H	H	H

Mitigated – summary of the rated loss and sterilisation of mineral resources impact per phase of the project

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
Operation, decommissioning and closure						
Mitigated	L	H	M	M	L	L

TOPOGRAPHY

ISSUE: HAZARDOUS EXCAVATIONS AND INFRASTRUCTURE

Information in this section was sourced from the project team.

Introduction

Hazardous excavations and infrastructure include all structures into or off which third parties and animals can fall and be harmed. Included in this category is surface subsidence associated with mining areas. Hazardous excavations and infrastructure occur in all mine phases from construction through operation to decommissioning and closure. In the construction and decommissioning phases these hazardous

excavations and infrastructure are usually temporary in nature, usually existing for a few weeks to a few months. The operational phase will present more long term hazardous excavations and infrastructure and the closure phase will present final land forms that are considered hazardous.

Project phase and link to activities/infrastructure

Construction	Operational	Decommissioning	Closure
Site preparation Earthworks Civil works	Open pit mining Processing plant Transportation Power supply and use Water supply and use Mineralised waste Support services Rehabilitation	Open pit mining Processing plant Transportation Power supply and use Water supply and use Mineralised waste Support services Demolition Rehabilitation	Maintenance and aftercare of rehabilitated areas

Rating of impact

Severity/ nature

In the unmitigated scenario, in all project phases, most of the identified hazardous excavations and infrastructure present a potential risk of injury and/or death to both people and animals for all the proposed project. This is a potential high severity.

In the mitigated scenario the severity reduces to low with the implementation of management measures focused on access control and the design of the open pit con-current rehabilitation components to prevent and/or mitigate impacts.

Duration

Death or permanent injury is considered a long term, permanent impact in both the mitigated and unmitigated scenarios.

Spatial scale/ extent

Direct impacts associated with hazardous infrastructure and excavations will be located within the site boundary in all project phases, with or without mitigation. The potential indirect impacts will however extend beyond the site boundary to the communities to which the injured people and/or animals belong.

Consequence

The consequence is high in both the unmitigated and mitigated scenarios.

Probability

In the unmitigated scenario, without design and management interventions the impact probably is expected to be medium. The mitigation measures will focus on infrastructure safety design and implementation as well as on limiting access to third parties and animals which reduces the probability of the impact occurring.

Significance

In the unmitigated scenario, the significance of this potential impact is high. In the mitigated scenario, the significance of this potential impact is low because there will be a reduction in probability that the impact occurs.

Unmitigated – summary of the rated hazardous excavations and infrastructure impact per phase of the project

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
All phases						
Unmitigated	H	H	M	H	M	H

Mitigated – summary of the rated hazardous excavations and infrastructure impact per phase of the project

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
All phases						
Mitigated	L	H	M	M	L	L

SOIL AND LAND CAPABILITY

ISSUE: LOSS OF SOIL RESOURCES AND LAND CAPABILITY THROUGH CONTAMINATION

Information in this section was sourced from the soils, land use and land capability study for the proposed project (Terra Africa, July 2015) included in Appendix J.

Introduction

Soil is a valuable resource that supports a variety of ecological functions. The proposed project has the potential to damage soil resources through physical disturbance and/or contamination. Contamination of soils also has the potential to impact both surface and groundwater resources. Surface and groundwater contamination impacts are discussed under their respective headings in this appendix. The loss of soil resources has a direct impact on the potential loss of the natural capability of the land. This section therefore focuses directly on the potential for disturbance and contamination of the soil resources and the effect this has on land capability.

There are a number of sources in all phases that have the potential to pollute soil resources. Limited sources occur during the closure phase. In the decommissioning phase these pollution sources are usually temporary in nature, usually existing for a few weeks to a few months. The operational phase will present more long term pollution sources. Although the sources are temporary in nature, the potential related pollution can have long term effects.

Project phase and link to activities/infrastructure

Construction	Operational	Decommissioning	Closure
Site preparation Earthworks Civil works	Open pit mining Processing plant Transportation Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services General site management Rehabilitation	Open pit mining Processing plant Transportation Power supply and use Water supply and use Mineralised waste Support services General site management Demolition Rehabilitation	Maintenance and aftercare of rehabilitated areas

Rating of impacts

Severity/nature

In the unmitigated scenario, pollution of soils from numerous incidents can result in a loss of land capability as an ecological driver because it can create a toxic environment for vegetation and ecosystems that rely on the soil. It could also negatively impact on the chemistry of the soils such that current growth conditions are impaired. This is a medium severity in the unmitigated scenario.

In the mitigated scenario the number of pollution events should be significantly less which reduces the potential severity to low.

Duration

In the unmitigated scenario, most pollution impacts and associated loss in land capability will remain long after closure. In the mitigated scenario most of these potential impacts should either be avoided or be remedied within the life of the project, which reduces the duration to low. This will be achieved by the effective reaction time of the clean-up team and the chosen remediation methods.

Spatial scale/extent

In both the unmitigated and mitigated scenarios for all phases, the potential loss of soil resources and associated land capability will be restricted to within the site boundary.

Consequence

In the unmitigated scenario the consequence is medium. In the mitigated scenario the consequence is reduced to low as the severity and duration of the impact is reduced.

Probability

Without any mitigation the probability of impacting on soils and land capability through pollution events is high. With mitigation, the probability will be significantly reduced to low because emphasis will be placed on preventing pollution events and on quick and effective remediation if pollution events do occur.

Significance

In the unmitigated scenario, the significance of this potential impact is medium. In the mitigated scenario, the significance reduces to low because with mitigation the severity, duration and probability associated with the potential the impact all reduce.

Unmitigated – summary of the rated loss of soil resources and land capability through contamination impact per phase of the project

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
All phases						
Unmitigated	M	H	L	M	H	M

Mitigated – summary of the rated loss of soil resources and land capability through soil contamination impact per phase of the project

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
All phases						
Mitigated	L	L	L	L	L	L

ISSUE: LOSS OF SOIL RESOURCES AND LAND CAPABILITY THROUGH PHYSICAL DISTURBANCE

Information in this section was sourced from the soils, land use and land capability study for the proposed project (Terra Africa, July 2015) included in Appendix J.

Introduction

Soil is the key to re-establishing post closure land capability. There are a number of activities/infrastructure in all phases that have the potential to disturb soils and related land capability through removal, compaction and/or erosion. Decommissioning related activities are temporary in nature, usually existing for a few weeks to a few months. The operational phase will present more long term activities. During the closure phase, even though activities that cause physical disturbance of soil

and associated land capability will not occur during the closure phase, final rehabilitated areas may be susceptible to erosion.

Project phase and link to activities/infrastructure

Construction	Operational	Decommissioning	Closure
Site preparation Earthworks	Open pit mining Processing plant Transportation Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services General site management Rehabilitation	Open pit mining Processing plant Transportation Power supply and use Water supply and use Mineralised waste Support services General site management Demolition Rehabilitation	Maintenance and aftercare of rehabilitated areas

Rating of impact

Severity/nature

In the unmitigated scenario, physical soil disturbance can result in a loss of soil functionality as an ecological driver. In the case of erosion, the soils will be lost to the area of disturbance, and in the case of compaction the soils functionality will firstly be compromised through a lack of rooting ability and aeration, and secondly the compacted soils are likely to erode because with less inherent functionality there will be little chance for the establishment of vegetation and other matter that naturally protects the soils from erosion. This amounts to a high severity.

In the mitigated scenario, the soils can be conserved and reused which reduces the high unmitigated severity to medium.

Duration

In the unmitigated scenario the loss of soil and related functionality is long term and will continue after the life of the mine. In the mitigated scenario, the soil is conserved, replaced and the functionality restored which reduces the duration of the impact to medium.

Spatial scale/extent

In both the unmitigated and mitigated scenarios for all phases of the project, the potential loss of soil and land capability through physical disturbance will be restricted to within the site boundary.

Consequence

In the unmitigated scenario the consequence is high. In the mitigated scenario the consequence is medium as the severity and duration of the impact is reduced.

Probability

Without any mitigation the probability of losing soil and related land capability is definite. With mitigation, the probability will be reduced because emphasis will be placed on soil conservation and re-establishment.

Significance

In the unmitigated scenario the impact is high. In the mitigated scenario the significance of this impact is reduced to low as the severity, duration and probability are reduced.

Unmitigated – summary of the rated loss of soil resources and land capability through physical disturbance impact per phase of the project

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
All phases						
Unmitigated	H	H	L	H	H	H

Mitigated – summary of the rated loss of soil resources and land capability through physical disturbance impact per phase of the project

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
All phases						
Mitigated	M	M	L	M	L	L

BIODIVERSITY

ISSUE: PHYSICAL DESTRUCTION OF BIODIVERSITY

Information in this section was sourced from the biodiversity study undertaken by Environmental Management Services (EMS, August 2015) included in Appendix K.

Introduction

There are a number of activities/infrastructure in all phases that have the potential to destroy biodiversity in the broadest sense. In this regard, the discussion relates to the physical destruction of specific biodiversity areas, of linkages between biodiversity areas and related species which are considered to be significant because of their status, and/or the role that they play in the ecosystem.

Project phase and link to activities/infrastructure

Construction	Operational	Decommissioning	Closure
Site preparation Earthworks Civil works	Open pit mining Processing plant Transportation Power supply and use	Open pit mining Processing plant Transportation Power supply and use	Maintenance and aftercare of rehabilitated areas

Construction	Operational	Decommissioning	Closure
	Water supply and use Mineralised waste Non-mineralised waste Support services General site management Rehabilitation	Water supply and use Mineralised waste Non-mineralised waste Support services Demolition Rehabilitation	

Rating of impact

Severity/nature

Areas of high ecological sensitivity are functioning biodiversity areas with species diversity and associated intrinsic value. In addition, some of these areas host protected species. The linking areas have value because of the role they play in allowing the migration or movement of flora and fauna between the areas which is a key function for the broader ecosystem. The transformation of land for any purpose, including mining and associated activities, increases the destruction of the site specific biodiversity, the fragmentation of habitats, reduces its intrinsic functionality and reduces the linkage role that undeveloped land fulfils between different areas of biodiversity importance.

When considering the surface infrastructure/activities proposed as part of the project, it should be noted that some infrastructure will be placed within areas of high sensitivity (see Figure 21). The proposed project will also require the removal of protected species (*Vachellia erioloba* (Camel Thorn), *Vachellia haematoxylon* (Grey Camel Thorn)). In addition to this, and with reference to section 7.4.1.6, aquifer dependant ecosystems (ADE's) are located within the proposed project area. It is possible that species associated with deep root systems such as the *Vachellia haematoxylon* (Grey Camel Thorn), *Vachellia karroo* (Camel Thorn), *Rhus Lancea, Tamarix usneoides* and *Euclea pseudebenus* source water from groundwater aquifers. A mine related drop in groundwater levels can effectively place these trees in a situation where they are unable to reach water, particularly with larger trees as they are less adaptable to a change in groundwater levels than smaller trees. Although very limited information is known regarding how ADE plants access water and at what depths, lowering of groundwater levels associated with the proposed project may indirectly result in a loss of trees and as such is assessed as a precautionary approach.

The potential risk of losing ecosystem functionality amounts to a high severity in the unmitigated scenario when taking the above into consideration. With the correct mitigation measures being put in place, the physical disturbance to biodiversity can be limited somewhat; however by the very nature of opencast mining, the proposed activities will still be invasive. If the correct mitigation measures are put in place, some of the destruction could be avoided entirely and where such destruction has occurred, rehabilitation could establish a functional ecosystem. This amounts to a mitigated severity of medium for the proposed project.

Duration

In the unmitigated scenario the loss of biodiversity and related functionality is long term and will continue after the life of the mine. With mitigation, biodiversity and related functionality may be partially restored during the operational, decommissioning and closure phases. The duration is therefore high in the unmitigated scenario, reducing to medium in the mitigated scenario.

Spatial scale / extent

Given that biodiversity processes are not confined to the proposed project area, the spatial scale of impacts will extend beyond this boundary in both the mitigated and unmitigated scenarios. Key related issues are the migration of species and the flow of nutrients. The spatial scale is therefore medium in both the unmitigated and mitigated scenarios.

Consequence

In the unmitigated the consequence is high and reduces to medium with mitigation.

Probability

Without mitigation the probability is definite. With mitigation, the probability may be reduced to medium with correct management measures and concurrent rehabilitation.

Significance

The significance of this impact is high without mitigation, reducing to medium with the correct mitigation measures.

Unmitigated – summary of the cumulatively rated loss of biodiversity through physical destruction impact per phase of the project

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
All phases						
Unmitigated	H	H	M	H	H	H

Mitigated – summary of the cumulatively rated loss of biodiversity through physical destruction impact per phase of the project

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
All phases						
Mitigated	M	M	M	M	M	M

ISSUE: GENERAL DISTURBANCE OF BIODIVERSITY

Information in this section was sourced from the biodiversity study undertaken by Environmental Management Services (EMS, August 2015) included in Appendix K.

Introduction

There are a number of activities/infrastructure that have the potential to directly disturb vegetation, vertebrates and invertebrates in all project phases, particularly in the unmitigated scenario. In the construction and decommissioning phases these activities are temporary in nature, usually existing for a few weeks to a few months. The operational phase will present more long term occurrences that may have pollution potential through long term seepage and/or run-off.

Project phase and link to activities/infrastructure

Construction	Operational	Decommissioning	Closure
Site preparation Earthworks Civil works	Open pit mining Processing plant Transportation Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services General site management Rehabilitation	Open pit mining Processing plant Transportation Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services Demolition Rehabilitation	Maintenance and aftercare of rehabilitated areas

Rating of impact

Severity / nature

In the unmitigated scenario, biodiversity may be disturbed in the following ways:

- Lighting can attract large numbers of invertebrates which become easy prey for predators. This can upset the invertebrate population balances;
- People may kill various types of species for food, for sport, for fire wood etc.
- People may illegally collect and remove vegetation, vertebrate and invertebrate species
- Excessive dust fallout from various dust sources (the stockpiles (product and overburden) and processing plant) may have adverse effects on the growth of some vegetation, and it may cause varying stress on the teeth of vertebrates that have to graze soiled vegetation
- Noise and vibration pollution (from the open pit activities, vehicle movement, materials handling etc.) may scare off vertebrates and invertebrates. In some instances the animals may be deterred from passing close to noisy activities which can effectively block some of their migration paths. In other instances, vertebrates and invertebrates that rely on vibration and noise senses to locate for, and hunt, prey may be forced to leave the vicinity of noisy, vibrating activities
- The increased presence of vehicles in the area can cause road kills especially if drivers speed
- The presence of mine water impoundments may lead to drowning of fauna
- An increase in pollution emissions and general litter may directly impact on the survival of individual plants, vertebrates and invertebrates.

Taken together, the disturbances will have a high severity in the unmitigated scenario. In the mitigated scenario, many of these disturbances can be prevented or mitigated to acceptable levels, which reduces the severity to low.

Duration

In the unmitigated scenario, the impact is long term because where biodiversity is compromised, killed or removed from the area this impact is likely to exist beyond the life of the project. With mitigation this reduces to medium.

Spatial scale / extent

Given that biodiversity processes are not confined to the proposed project area, the spatial scale of general disturbances will extend beyond the site boundary in the unmitigated and mitigated scenarios. Key related issues are the migration of species and linkages between biodiversity areas. This is a medium spatial scale.

Consequence

In the unmitigated scenario, the consequence of this potential impact is high. With mitigation, this reduces to low because the severity and duration reduce.

Probability

Without any mitigation, the probability of negatively impacting on biodiversity through multiple disturbance events is high. With mitigation, the probability can be reduced to low because most of the disturbances can be controlled through implementation and enforcement of practices, policies and procedures.

Significance

In the unmitigated scenario, the significance of this potential impact is high reducing to low with mitigation.

Unmitigated – summary of the cumulatively rated general disturbance of biodiversity impact per phase of the project

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
All phases						
Unmitigated	H	H	M	H	H	H

Mitigated – summary of the cumulatively rated general disturbance of biodiversity impact per phase of the project

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
All phases						
Mitigated	L	M	M	L	L	L

SURFACE WATER

ISSUES: ALTERATION OF NATURAL DRAINAGE PATTERNS

Information in this section was sourced from the surface water study (SLR, October 2015) included in Appendix L.

Introduction

Pre-mining natural drainage across the proposed project area is via sheet flow and/or preferential flow paths (drainage line). Rainfall and surface water run-off will be collected in all areas that have been designed with water containment infrastructure as required by legislation. The collected run-off will therefore be lost to the catchment and can result in the alteration of drainage patterns. During the construction, operational and decommissioning phase, these activities will continue until such time as project infrastructure can be removed and/or the project areas are rehabilitated. During the closure phase rehabilitation will allow for the restoration of drainage patterns. In addition to this, the proposed open pit will be located within the 1:100 year floodline and within 100m from the Ga-Mogara drainage channel. therefore the project will require the realignment of the Ga-Mogara drainage channel. An engineered temporary channel realignment will be designed and constructed for used within the first 3 years during the construction phase when space constraints are at a peak, after which the channel will be permanently realigned and will focus on replicating aspects of the existing Ga-Mogara drainage channel. In this regard, the permanent realignment will aim to look as natural as possible and will therefore include natural curves, make use of natural soils and be vegetated using indigenous species.

Project phase and link to activities/infrastructure

Construction	Operational	Decommissioning	Closure
Earthworks Civil works	Open pit mining Processing plant Transportation Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services General site management Rehabilitation	Open pit mining Processing plant Transportation Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services Demolition Rehabilitation	Maintenance and aftercare of rehabilitated areas

Rating of impacts

Severity/nature

During the construction, operation, decommissioning, and to a lesser extent, the closure phases, rainfall and surface water run-off will be collected in all areas that have been designed with water containment infrastructure. The collected run-off will therefore be lost to the catchment and can result in the alteration of drainage patterns. The total MAR for the proposed project area is 1.92 million m^3. If one assumes that all run-off water that is generated in the infrastructure areas is contained then the estimated loss of run-off to the proposed project area is approximately 3.48m^3/year and this equates to only 0.02% of the total MAR. In the context of the affected quaternary catchments this is considered to be a medium severity because the reduction is measurable but will not result in a substantial deterioration in the water reserve and downstream water uses. The overall medium severity rating applies in both the unmitigated (all phases) and mitigated scenarios (prior to closure). After closure, in the mitigated scenario, the proposed project area will be rehabilitated to re-establish landscape functionality and surface water runoff will no longer be contained. The associated severity reduces to low.

The realignment of the Ga-Mogara drainage channel has a high severity in the unmitigated scenario. This can be reduced to low with mitigation measures focussed on ensuring that the design of the river realignment does not restrict natural flow.

Duration

In the unmitigated scenario, the alteration of drainage patterns will extend beyond closure. In the mitigated scenario, the duration of the alterations will mostly be restricted to the phases before closure.

Spatial scale / extent

In the mitigated and unmitigated scenario the physical alteration of drainage patterns will extend beyond the site boundary as flow reduction impacts could extend further downstream.

Consequence

In the unmitigated scenario the consequence is high. In the mitigated scenario the consequence is medium prior to closure and low thereafter because of reductions in duration and severity for containment facilities. The mitigated consequence for the realignment is low during all phases.

Probability

The probability of the alteration of drainage patterns is definite, but the magnitude of the reduced flows is unlikely to result in substantial deterioration and related flow impacts downstream therefore probability is medium until closure when it is expected to reduce to low. In terms of the realignment of the Ga-Mogara

drainage channel the probability is definite in the unmitigated scenario. The probability can be reduced to low during all phases with mitigation measures focussed on design that will ensure continuous flow.

Significance

The significance is high in all phases without mitigation. With mitigation this reduces to medium prior to closure and to low thereafter. In terms of the realignment of the Ga-Mogara drainage channel the mitigated significance is low in all phases.

Unmitigated – summary of the rated alteration of natural drainage patterns impact per phase of the project

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
All phases						
Unmitigated	M	H	M	H	M	H

Mitigated – summary of the rated alteration of natural drainage patterns impact per phase of the project

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
For construction, operation and decommissioning						
Mitigated	M (L for realignment)	M	M	M (L for realignment)	M (L for realignment)	M (L for realignment)
Closure						
Mitigated	L	L	M	L	L	L

ISSUE: CONTAMINATION OF SURFACE WATER RESOURCES

Information in this section was sourced from the surface water study (SLR, October 2015) included in Appendix L.

Introduction

There are a number of pollution sources in all project phases that have the potential to pollute surface water, particularly in the unmitigated scenario. In the construction, decommissioning and closure phases these potential pollution sources are temporary and diffuse in nature. Although these sources may be temporary, the potential pollution may be long term. The operational phase will present more long term potential sources.

Project phase and link to activities/infrastructure

Construction	Operational	Decommissioning	Closure
Earthworks Civil works	Open pit mining Processing plant Transportation Power supply and use Water supply and use	Open pit mining Processing plant Transportation Power supply and use Water supply and use	Maintenance and aftercare of rehabilitated areas

Construction	Operational	Decommissioning	Closure
	Mineralised waste Non-mineralised waste Support services General site management Rehabilitation	Mineralised waste Non-mineralised waste Support services Demolition Rehabilitation	

Rating of impacts

Severity/nature

In the unmitigated scenario, surface water may collect contaminants (hydrocarbons, salts, and metals) from numerous sources. Potential construction and decommissioning phase pollution sources include:

- Sedimentation from erosion
- Spillage from portable toilets, spillage of construction fuel, lubricants, cement or leaks from vehicles and equipment.

Potential operational phase pollution sources include:

- Spills from sewage treatment plant, spillage of operational fuel, lubricants, cement or leaks from vehicles and equipment.
- Contaminated discharges from the dirty water systems including: recycled water ponds, dirty water pipelines, water treatment plant
- Contaminated runoff and seepage from the temporary overburden stockpiles
- Sedimentation from erosion.

At elevated concentrations these contaminants can exceed the relevant surface water quality limits imposed by DWS and can be harmful to humans and livestock if ingested directly and possibly even indirectly through contaminated vegetation, vertebrates and invertebrates (Refer to the biodiversity section in this appendix for the potential biodiversity impacts. This impact will not be re-assessed in this section). The related unmitigated severity is high.

In the mitigated scenario, clean water will be diverted away from the project areas and contaminated run-off and process water will be contained and re-used in the normal course. The severity can therefore be reduced to medium.

Duration

In the unmitigated scenario, the contamination of surface water resources will occur for periods longer than the life of proposed project. With mitigation, pollution can be prevented and/or managed and as such the impacts can be reversed or mitigated within the life of proposed project.

Spatial scale / extent

In the mitigated and unmitigated scenarios the spatial scale is likely to extend beyond the proposed project area because contamination is mobile once it reaches flowing water courses. This will be more of an issue in the rainy season because most of the watercourses are non-perennial.

Consequence

In the unmitigated scenario the consequence is high and in the mitigated scenario it is medium.

Probability

The probability of the impact occurring relies on a causal chain that comprises three main elements:

- Does contamination reach surface water resources?
- Will people and livestock utilise this contaminated water?
- Is the contamination level harmful?

The first element is that contamination reaches the surface water resources within the proposed project area. Due to the proximity of the proposed open pit, overburden stockpiles, recycled water ponds, haul roads and processing plant to the Ga-Mogara drainage channel, contaminants could reach surface water resources. It should however be noted that the Ga-Mogara drainage channel is non-perennial with long periods of no flow.

The second element is that third parties and/or livestock use this contaminated water for drinking purposes. There is a limited possibility that this will occur given that there is no reliance on surface water resources in the area, for domestic use or livestock watering.

The third element is that it is likely that only some contaminants will be at a level which is harmful to humans and livestock. This is influenced both by the quality of any discharged water and by the diluting effect of any rainwater particularly in the rainy season.

As a combination, when considering the nature and location of the proposed infrastructure in proximity to the Ga-Mogara drainage channel, the unmitigated probability is medium, reducing to low with mitigation.

Significance

In the unmitigated scenario, the significance of this potential impact is high. In the mitigated scenario, the significance is reduced to low because of the reduction in severity, duration and probability.

Unmitigated – summary of the rated pollution of water resources impact per phase of the project

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
All phases						
Unmitigated	H	H	M	H	M	H

Mitigated – summary of the rated pollution of water resources impact per phase of the project

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
All phases						
Mitigated	M	M	M	M	L	L

GROUNDWATER

ISSUE: REDUCTION OF GROUNDWATER LEVELS AND AVAILABILITY

Information in this section was sourced from the groundwater study (SLR, October 2015) included in Appendix H.

Introduction

The pumping of seepage water from the open pit (either through abstraction directly from the pit or dewatering boreholes around the perimeter of the open pit) associated with the proposed open cast activities has the potential to cause dewatering in the operational phase, while the abstraction of water from boreholes for the use as potable and process water has the potential to cause a lowering of groundwater levels in the construction, operation and decommissioning phases. Lowering of groundwater levels through dewatering and abstraction may cause a loss in water supply to surrounding borehole users if they are in the impact zone.

It is important to note that as part of the groundwater study (SLR, October 2015) an aquifer associated with the Ga-Mogara drainage channel was not identified. It follows that groundwater drawdown associated with the proposed open pit is not expected to change base flow of the Ga-Mogara drainage channel and is therefore not assessed in the section below.

Activities and infrastructure - link to mine phases

Construction	Operation	Decommissioning	Closure
			N/A
Water supply and use	Open pit mining Water supply and use	Water supply and use	

Rating of impact

Severity / nature

Based on the results of the groundwater study, the cone of depression extends approximately 5km to the north and south of the proposed open pit area and approximately 1 to 1.5km to the east and west of the proposed open pit area. Closer to the open pit, the drop in water level is predicted to be 38m reducing with distance away from the open pit. The severity in the unmitigated and mitigated scenarios is low given that no users of groundwater for domestic or livestock use are likely to be affected.

Duration

The duration of the impacts is linked to the duration of the dewatering/abstraction and the recharge time thereafter. It is expected that the duration of dewatering/abstraction activities will not extend beyond closure, however water levels will not recover until well after closure in both the mitigated and unmitigated scenarios. This is a high duration.

Spatial scale / extent

The spatial scale of the known dewatering cone will extend beyond the site boundary which is a medium spatial scale in both the unmitigated and mitigated scenarios.

Consequence

In the unmitigated and mitigated scenarios is medium.

Probability

The hydrocensus identified six boreholes along the Ga-Mogara drainage channel that are located within the zone of influence. With reference to Figure 25, these include boreholes MH3, MH10, MH5, MH 14, MHsw2 and Mhsw1. All of these boreholes are used by neighbouring manganese mines for groundwater monitoring but none of them are used for abstraction. Modelling results indicate that the probability of impacting third party water supply is low in both the unmitigated and mitigated scenarios.

Significance

In the unmitigated and mitigated significance is low.

Unmitigated – summary of the rated dewatering impact per phase of the project

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
Operation						
Unmitigated	L	H	M	M	L	L

Mitigated – summary of the rated dewatering impact per phase of the project

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
Operation						
Mitigated	L	H	M	M	L	L

ISSUE: CONTAMINATION OF GROUNDWATER RESOURCES

Information in this section was sourced from the groundwater study (SLR, October 2015) included in Appendix H and the geochemistry study (SLR, August 2015) included in Appendix I.

Introduction

There are a number of sources in all mine phases that have the potential to pollute groundwater and impact surrounding groundwater users. In the construction, decommissioning and closure phases some of these potential pollution sources are temporary and diffuse in nature. Even though the sources are temporary in nature, related potential pollution can be long term. The operational phase will present more long term potential sources.

Project phase and link to activities/infrastructure

Construction	Operational	Decommissioning	Closure
Earthworks Civil works	Open pit mining Processing plant Transportation Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services General site management Rehabilitation	Open pit mining Processing plant Transportation Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services Demolition Rehabilitation	Maintenance and aftercare of rehabilitated areas

Rating of impacts

Severity / nature

Possible sources of groundwater contamination include seepage from accidental spills and leaks, and seepage from stockpiles. During operation, decommissioning and closure there is also a potential for groundwater resources to be contaminated from backfilling the open pit with overburden rock.

With reference to Section 7.4.1.1, the overburden material associated with the proposed project is non-acid generating, however a number of elements are leachable including aluminium, conductivity, manganese, nitrate and total dissolved solids. In addition, it is possible that blast residue related nitrates can be associated with some overburden. If this material is stockpiled, used for construction (roads and

platforms) or used for backfill, it presents a potential pollution risk for groundwater in both the short and long term.

The groundwater model (assuming no lining or base preparation of either the stockpile or the backfilled open pit) predicts that a contamination plume could migrate 200m from the overburden stockpile within the shallow aquifer over a period of 100 years, while the contamination plume for the deep aquifer could migrate 500m over a period of 100 years in a north westerly direction. The modelled results indicate that the contamination plume associated with the backfilled open pit is likely to extent 320m from the open pit in a westerly direction.

Close to the pollution sources the plume is associated with elevated concentrations for nitrate and manganese in particular. In the context of existing background concentrations the related impacts are limited. At the outer extremities of the plumes the deterioration is reduced to existing groundwater quality background values. It follows that without mitigation, the potential groundwater pollution amounts to a medium severity in both the mitigated and unmitigated scenarios.

Duration

Groundwater contamination is long term in nature, occurring for periods longer than the life of proposed project.

Spatial scale / extent

The pollution plume will extend beyond the site boundary in unmitigated scenario. With mitigation measures focussed on containing the pollution plume within the site boundary this can be reduced to low.

Consequence

The consequence is high in the unmitigated and mitigated scenarios.

Probability

The probability of the impact occurring relies on a causal chain that comprises three main elements:

- Does contamination reach groundwater resources?
- Will people and animals utilise this contaminated water?
- Is the contamination level harmful?

The first element is that contamination reaches the groundwater resources underneath or adjacent to the proposed project area. Due to the proximity of the sources to groundwater in the shallow aquifer, contaminants could reach groundwater resources.

The second element is that third parties and/or livestock use this contaminated water for drinking purposes. No third party boreholes are located within the contamination plume zone.

The third element is whether contamination is at concentrations which are harmful to users. Given that the existing groundwater quality is already poor (existing elevated nitrates and manganese) it is a certainty that mine related contamination will not significantly worsen the existing poor water quality, particularly in the mitigated scenario.

As a combination, the unmitigated and mitigated probability is low in both scenario.

Significance

The unmitigated significance is medium and the mitigated significance is low.

Unmitigated – summary of the rated contamination of groundwater impact per phase of the project

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
All phases						
Unmitigated	M	H	M	H	L	M

Mitigated – summary of the rated contamination of groundwater impact per phase of the project

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
All phases						
Mitigated	M	H	L	M	L	L

AIR QUALITY

ISSUES: AIR POLLUTION

Information in this section was sourced from the air quality assessment report (Airshed, September 2015) and included in Appendix M.

Introduction

There are a number of activities/infrastructure in the operation and decommissioning phases that have the potential to pollute the air. In the decommissioning phase these activities are temporary in nature. The operational phase will present more long term activities. The closure phase will present final rehabilitated areas that may have the potential to pollute the air through long term wind erosion.

Air pollution related impacts on biodiversity are discussed in the biodiversity section of this appendix and therefore this section focuses on the potential for human health impacts.

Project phase and link to activities/infrastructure

Construction	Operational	Decommissioning	Closure
Site preparation Earthworks Civil works	Open pit mining Processing plant Transportation Power supply and use Mineralised waste Non-mineralised waste Support services General site management Rehabilitation	Open pit mining Processing plant Transportation Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services Demolition Rehabilitation	Maintenance and aftercare of rehabilitated areas

Rating of impact

Severity / nature

The main contaminants associated with the proposed activities include: inhalable particulate matter less than 2.5 and 10 microns in size ($PM_{2.5}$ and PM_{10}), including a manganese fraction, larger total suspended particulates (TSP) that relate to dust fallout, and gas emissions mainly from vehicles and generators. Emissions from vehicles and generators are not considered significant and therefore the assessment below focusses on particulate matter and dust fallout.

The current approved mine presents a number of sources of $PM_{2.5}$, PM_{10} and dust fallout emissions in all mine phases. The proposed additional project components have the potential to contribute to these sources. The main sources of emissions include:

- Land clearing and topsoil removal activities
- Materials loading and hauling of ore and overburden
- Grading and bulldozing
- Blasting and drilling
- Crushing and screening
- Wind erosion of mineralised stockpiles such as the overburden stockpiles
- Wind erosion of disturbed areas, not yet rehabilitated
- Vehicle movement along unpaved roads.

The manganese content of the ore is reported to be approximately 37. It is important to note that the impact associated with manganese fraction is limited to the operational phase. Manganese emissions have therefore been estimated from the following sources:

- Blasting
- Crushing and screening
- Material handling
- Wind erosion from mineralised stockpiles such as overburden stockpiles

In order to determine the potential for health impacts, reference is made to South African (SA) National Ambient Air Quality Standards (NAAQS) for pollutants as outlined in Table 65 below. The dust fallout limits in terms of the National Dust Control Regulations (NDCR) is included in Table 66 below. The annual threshold value for manganese is 0.15 µg/m^3 in line with the WHO requirements. In the absence of manganese threshold values in SA, the WHO threshold value was used.

TABLE 65: AIR POLLUTION EVALUATION CRITERIA FOR PM10 AND PM2.5

Pollutant	Averaging	Limit value (µg/m³)	Frequency of exceedance	Compliance date
PM_{10}	24 hour	75	4 days per year	1 Jan 2015
	1	40	0	1 Jan 2015
$PM_{2.5}$	24 hour	40	4 days per year	1 Jan 2016 to 31 December 2029
	1	20	0	1 Jan 2016 to 31 December 2029

TABLE 66: DUST FALL OUT LIMITS

Pollutant	Application	Limit value (microgram m^2/day)	Compliance date
TSP	Industrial	1200	Current
	Residential	600	Current

Construction and decommissioning phases

Based on modelled results, the $PM_{2.5,}$ PM_{10} and dust fallout concentration in the construction and decommissioning phases are low and remain within their respective standards due to the temporary nature of the activities during these phases. It follows that without mitigation the severity is low as no standards are expected to be exceeded. With the application of mitigation measures it is predicted that contributions of $PM_{2.5,}$ PM_{10} and dust fallout concentration can be further below the relevant standards.

Operational phase: $PM_{2.5}$ and PM_{10}

Simulated annual average off-site $PM_{2.5}$ concentrations are expected to exceed the 4-day per year frequency of exceedance of the SA NAAQS for about 200 m to the north and southwest of the proposed project boundary. The 4-day per year frequency of exceedance of the SA NAAQS was exceeded for about 1 km to the north and about 2 km to the south of the proposed project boundary for simulated annual average PM_{10} concentrations. At nearby receptors the SA NAAQ daily limit of 40 µg/m³ for $PM_{2.5}$ and 75 µg/m³ for PM_{10} were not exceeded.

Operational phase: Dust fallout

The simulated maximum daily dust fallout deposition rate due to the operational phase does not exceed the NDCR standards outside the boundaries of the proposed project.

Operational phase: Mn element

Based on simulated results the annual average Mn concentrations exceed the WHO standards off-site by a distance ranging from 2 km to 5 km. The exceedance is expected to impact receptors at the Gloria Mine village and the outlying areas of the town Hotazel. Simulated results indicated that with the implementation of mitigation measures the areas of exceedance of the WHO standards can be reduced to 1 km to 4 km from the proposed project site. It follows that exceedances will not be expected at the town Hotazel.

It must be noted that although there are plans to possibly expand Hotazel town, the related potential impacts have not been directly addressed and are rather addressed by implication in the abovementioned discussion and associated specialist study. The reason for this approach is that the possibly expansion is not currently in place and it will need to take cognisance of the surrounding land uses and related issues in its detailed planning an execution phase. In this regard the closest potential mining operations would be the proposed Kudumane operations.

As a whole the severity of the impact in the unmitigated scenario is high, reducing to medium with mitigation for $PM_{2.5}$, PM_{10} and the Mn element. In the mitigated scenario the severity is low for dust fallout.

Closure: Dust fallout

At closure, rehabilitated landforms might be subject to on-going wind erosion. It follows that in the unmitigated scenario, the severity is medium, reducing to low with mitigation.

Duration

Without mitigation, the duration of health related impacts could extend beyond closure. With mitigation, the duration of impacts will be limited to the life of the project.

Spatial scale / extent

The spatial scale of the potential impact could be beyond the site boundary in both the mitigated and unmitigated scenarios.

Consequence

Without mitigation the consequence for the Mn element is high and can be reduced to medium with mitigation. Without mitigation the consequence for $PM_{2.5}$, PM_{10} and dust fallout is high in the operational phase and medium in the construction, decommissioning and closure phases. With mitigation the consequence is medium in all phases for $PM_{2.5}$, PM_{10} and low for dust fallout.

Probability

The health impact probability is linked to the probability of ambient concentrations exceeding the evaluation criteria in relation to sensitive receptors. Given that there is potential for exceedances of the criteria for $PM_{2.5}$, PM_{10} and Mn the probability is medium in the unmitigated scenario. The probability remains medium for $PM_{2.5}$, PM_{10} and Mn with mitigation given that even with mitigation exceedances can be expected at the Gloria Mine village. In terms of dust fallout the unmitigated scenario is medium and can be reduced to low with mitigation given that the probability of exceedance at sensitive receptors reduces.

Significance

The significance of this impact is high in the unmitigated scenario for the Mn element and can be reduced to medium with mitigation.

The significance for dust fallout in the unmitigated scenario during the operational phase is high and medium during the construction, decommissioning and closure phases. With mitigation the significance reduces to low.

The significance for $PM^{2.5}$ and PM^{10} in the unmitigated scenario during the operational phase is high and medium during the construction, decommissioning and closure phases. With mitigation the significance reduces to medium.

Unmitigated – summary of the cumulatively rated air pollution impact for PM 2.5, PM 10 and dust fallout per phase of the project

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
Construction, decommissioning and closure						
Unmitigated	L	H	M	M	M	M
Operational						
Unmitigated	H (M for dust fallout)	H	M	H	M	H

Mitigated – summary of the cumulatively rated air pollution impact for PM 2.5, PM 10 and dust fallout per phase of the project

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
All phases						
Mitigated	M (L for dust fallout)	M	M	M (L for dust fallout)	M (L for dust fallout)	M (L for dust fallout)

Unmitigated – summary of the cumulatively rated air pollution impact for Mn element per phase of the project

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
Operational phase						
Unmitigated	H	H	M	H	M	H

Mitigated – summary of the cumulatively rated air pollution impact for Mn element per phase of the project

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
Operational phase						
Mitigated	M	M	M	M	M	M

NOISE

ISSUES: NOISE POLLUTION

Information in this section was sourced from the noise specialist study undertaken by Airshed Planning Professionals (Airshed, September 2015) for the proposed project and included in Appendix N.

Introduction

Two types of noise are distinguished: noise disturbance and noise nuisance. The former is noise that can be registered as a discernible reading on a sound level meter and the latter, although it may not register as a discernible reading on a sound level meter, may cause nuisance because of its tonal character (e.g. distant humming noises).

Proposed activities/infrastructure present the possibility of generating both noise disturbances and noise nuisance in the project phases prior to closure. Refer to the biodiversity section in this appendix for the potential noise impacts on biodiversity. This section will only focus on the potential human related noise impacts.

Project phase and link to activities/infrastructure

Construction	Operational	Decommissioning	Closure
			N/A
Site preparation Earthworks Civil works	Open pit mining Processing plant Transportation Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services General site management Rehabilitation	Open pit mining Processing plant Transportation Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services Demolition Rehabilitation	

Rating of impact

Severity / nature

The impact of an intruding mining noise on the environment rarely extends over more than 5 km from the source. Based on modelled results, noise impacts are unlikely to extend to the town Hotazel even though the town falls within the 5km radius and as such for the purpose of this assessment the nearest sensitive noise receptors include the Kalagadi Mine (approximately 700m from the project site) and the Gloria Mine Village (approximately 1.3km from the project site).

It must be noted that although there are plans to possibly expand Hotazel town, the related potential impacts have not been directly addressed and are rather addressed by implication in this discussion and the associated specialist study. The reason for this approach is that the possibly expansion is not currently in place and it will need to take cognisance of the surrounding land uses and related issues in its detailed planning an execution phase. In this regard the closest potential mining operations would be the proposed Kudumane operations.

The IFC guidelines for residential and institutional receptors (55 dBA during the day and 45 dBA during the night) are the evaluation criteria used in this assessment given as these criteria are in line with the SANS 10103 guidelines for urban districts and IFC 3 dBA increase criteria is used to determine the potential noise impact.

During the day, noise levels will not exceed the IFC guideline limits given that an increase of less than 1 dBA is predicted at the nearest sensitive receptor which is within the relevant guideline limits. During the night, noise levels are predicted to increase between 2 dBA and 3 dBA over the baseline at the nearest noise sensitive receptor. The IFC guidelines will therefore not be exceeded at the nearest noise sensitive receptor at night.

Taking the above into consideration, it is predicted there will be noise increases and these will be medium significance without mitigation reducing to low with mitigation.

Duration

In both the unmitigated and mitigated scenarios the noise pollution impacts will generally occur until the closure phase of the mine when the noise generating activities are stopped. This is a medium duration.

Spatial scale / extent

In both the unmitigated and mitigated scenarios the noise impacts will extend beyond the site boundary. This is a medium spatial scale.

Consequence

The unmitigated consequence is medium and the mitigated consequence is low.

Probability

The unmitigated probability of the predicted noise increases causing a noise related disturbance at the nearest sensitive receptors is considered to be medium without mitigation. With mitigation the probability reduces to low.

Significance

The unmitigated significance is medium and can be reduced to low with mitigation given that the severity and probability of the impact are reduced.

Unmitigated – summary of the rated noise pollution impact per phase of the project

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
Construction, operation and decommissioning						
Unmitigated	M	M	M	M	M	M

Mitigated – summary of the rated noise pollution impact per phase of the project

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
Construction, operation and decommissioning						
Mitigated	L	M	M	L	L	L

BLASTING

ISSUE: BLASTING IMPACTS

Information in this section was sourced from the blasting study undertaken by Cambrian CC (Cambrian CC, August 2015) included in Appendix P.

Introduction

Blasting activities have the potential to impact on people, animals and structures located in the vicinity of the proposed project area. Air quality impacts and biodiversity impacts are discussed under their respective headings in this appendix and as such will not be re-assessed in this section.

Project phase and link to activities/infrastructure

Construction	Operational	Decommissioning	Closure
			N/A
-	Open pit mining	-	-

Rating of impact

Severity / nature

Blasting hazards include ground vibration, air blast and fly rock which can cause damage to buildings and/or harm people and animals.

Ground vibrations travel directly through the ground and have the potential to cause damage to buildings and can be disturbing to people. The intensity of ground vibrations is influenced by the charge mass (number of holes fired together). In this regard, the ground vibration levels increase with an increase in charge mass. The US Bureau of Mines (USBM) indicates that the threshold limit for ground vibrations for private property is 12.7mm/s. It is important to note that the R380 is able to withstand ground vibration levels up to 150mm/s if individual holes are fired within 200m from the R380. Based on predicted results, in the unmitigated scenario, third party infrastructure could be impacted. In the mitigated scenario, third party buildings should not be damaged if ground vibration levels remain below the 12.7mm/s threshold and individual holes are fired within 200m from the R380. As a result, the blast design must be specific to manage impacts on surrounding structures.

Airblast is an air pressure pulse that has both a high frequency audible sound and a low frequency inaudible concussion. If the pressure is great enough damage can be caused to structures. If the airblast is contained to 130 dB or less, then damage should not be caused to surrounding structures. In the unmitigated scenario, a limited number of third party structures could be at risk outside where airblast greater than 130 dB is generated by blasting. In the mitigated scenario, assuming that the blast design will consistently result in airblast of 130 dB or below, third party structures should not be damaged. As a result, the blast design must be specific to manage impacts on surrounding structures.

Fly rock generation is related to the energy or mass of explosives and the containment of the energy on all sides of the blast area. In general, larger blast holes tend both to throw larger rocks over greater distances. Containment of fly rock is important because it has the potential to cause injury and death to people and animals. It can also damage structures. In unmitigated scenario fly rock can extend more than 500m (safe distance) from the blast site. This could harm or kill people, animals and/or structures. In the mitigated scenario, this can be kept within a range of less than 500m.

In the unmitigated scenario, blasting impacts could damage third party infrastructure and cause injury to third parties and livestock. This is a high severity in the unmitigated scenario. In the mitigated scenario, the severity can be reduced to medium, because although measures can be taken to control blasts and associated impacts it may not always be possible to avoid blasting activities taking place at the same time as neighbouring mines which could exacerbate blasting impacts.

Duration

While damage to infrastructure can be repaired in the short term, injury or death is considered to be long term in nature. Therefore the unmitigated and mitigated impact duration is high.

Spatial scale / extent

Table 67 below outlines the structures and residential areas within close proximity to the proposed project area. In both the unmitigated and mitigated scenario the impacts will extend beyond the site boundary. This is a medium spatial scale.

TABLE 67: INFRASTRUCTURE AND RESIDENTIAL AREAS WITHIN CLOSE PROXIMITY TO THE PROPOSED PROJECT AREA

Infrastructure	Distance
Kalagadi Shaft	Approximately 735m from the proposed project area
Assmang (Gloria mine village)	Approximately 680m from the proposed project area
Hotazel	The closest residential house it approximately 2.6 Km from the proposed project area. If the possible expansion takes place this distance may reduce
R380	Traverses the proposed project site

Consequence

The consequence is high in both the unmitigated and mitigated scenarios.

Probability

Due to the fact that blasting on surface will only take place when required, the likelihood of this impact occurring is seldom and as such the probability is medium in the unmitigated scenario, reducing to low with mitigation.

Significance

The significance has been rated as high in the unmitigated scenario. This can be mitigated to medium.

Unmitigated – summary of the rated blasting impact per phase of the project

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
Operational						
Unmitigated	H	H	M	H	M	H

Mitigated – summary of the rated blasting impact per phase of the project

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
Operational						
Mitigated	M	H	M	H	L	M

TRAFFIC

ISSUE: ROAD DISTURBANCE AND TRAFFIC SAFETY

Information was sourced from the traffic specialist study (Siyazi, March 2015) included in Appendix O.

Introduction

Traffic impacts are expected from construction through to the end of the decommissioning phases when trucks, buses, and private vehicles make use of the private and public transport network in and adjacent to the proposed project area. The key potential traffic related impacts are on road capacity and public safety.

Project phase and link to activities/infrastructure

Construction	Operational	Decommissioning	Closure
			N/A
Transport system	Transport system	Transport system	

Rating of impact

Severity / nature

Existing traffic volumes comprising public traffic and traffic from nearby mines that utilise the R380 are associated with an acceptable level of service in the context of the existing public and private road infrastructure. The proposed project will generate higher volumes of traffic along the R380 and the R31 as a result of the transportation of ore, people and materials. The following safety risks apply when additional traffic associated with the proposed project is added to the transport network (R380):

- Pedestrian accidents
- Vehicle accidents.

The proposed project will also require the realignment of the R380 including the upgrade of the road access intersection as part of the proposed project. In the unmitigated scenario this can result in safety issues particularly if the design and implementation of the realignment and upgrade are not undertaken with appropriate safety protection measures.

In the unmitigated scenario the severity is high. In the mitigated scenario the severity reduces to medium because the frequency of potential accidents is expected to reduce.

Duration

Any serious injury or death is a long term impact in both the unmitigated and mitigated scenarios.

Spatial scale / extent

Possible accident sites could be located within or outside the proposed project given that both private and public roads are and will continue to be used for the transport of ore, materials and personnel. Any indirect impacts associated with any injuries or fatalities will extend to the communities to which the injured people/animals belong. This is a medium spatial scale both with and without mitigation.

Consequence

The consequence is high in both the unmitigated and mitigated scenario.

Probability

In the unmitigated scenario, the probability of accidents occurring as a result of the proposed project is medium because although there is a possibility that traffic accidents could occur these are not expected to occur on a continuous basis. With mitigation this reduces to low.

Significance

Without mitigation, the significance is high. With mitigation, this reduces to medium.

Unmitigated – summary of the cumulatively rated road disturbance and traffic safety impact per phase of the project

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
Construction, operation and decommissioning						
Unmitigated	H	H	M	H	M	H

Mitigated – summary of the cumulatively rated road disturbance and traffic safety impact per phase of the project

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
Construction, operation and decommissioning						
Mitigated	M	H	M	H	L	M

VISUAL

ISSUE: NEGATIVE VISUAL IMPACTS

Information in this section was sourced from on-site observations and through the review of maps and satellite imagery.

Introduction

Visual impacts on this receiving environment may be caused by activities and infrastructure in all mine phases. The more significant visual impacts relate to the larger infrastructure components (such as the

open pit mining, processing facilities and stockpiles). After closure the infrastructure should be removed and the site rehabilitated.

Project phase and link to activities/infrastructure

Construction	Operational	Decommissioning	Closure
Site preparation Earthworks Civil works	Open pit mining Processing plant Transportation Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services General site management Rehabilitation	Open pit mining Processing plant Transportation Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services General site management Demolition Rehabilitation	Maintenance and aftercare of rehabilitated areas

RATING OF IMPACTS

Severity / nature

The severity of visual impacts is determined by assessing the change to the visual landscape as a result of mine related infrastructure and activities.

As discussed in Section 7.4.1.11 of the EIA and EMP report, the visual landscape is determined by considering: landscape character, sense of place, scenic quality, sensitivity of the visual resource and sensitive views. In this regard, the proposed project area lies in a flat, open area characterised by semi-arid vegetation and ephemeral drainage lines. Livestock and game farms and associated isolated farmsteads are typical of the region. To the south, north and south east of the proposed project site the landscape is characterised by scattered operational and closed mining operations and supportive infrastructure such as rail and road networks, powerlines, and the residential and business centre of Hotazel (Figure 30).

When considering the potential change to the visual landscape the key issues are: visual exposure, visual intrusion, and sensitivity of receptors.

The severity in the unmitigated scenario is moderate when considered in the context of existing mining operations located to the north, south east and south of the proposed project area. The severity is unlikely to reduce with mitigation until the closure phase when the site has been rehabilitated (in the mitigated scenario).

Duration

In the unmitigated scenario the duration is high because the impacts will continue post closure. In the mitigated scenario the impacts are unlikely to extend post closure because all of the sites will have been rehabilitated.

Spatial scale / extent

In all phases visual impacts are likely to extend beyond the proposed project area. This is a medium spatial scale.

Consequence

The unmitigated consequence is high. With mitigation, prior to closure, this reduces to medium. After closure the consequence reduces to low.

Probability

In the unmitigated scenario and mitigated scenario the probability of visual impacts occurring as a result of the proposed project is medium because of the nature of the existing landscape. At closure when the site has been rehabilitated, the probability will be reduced to low.

Significance

The unmitigated and mitigated significance is medium. The mitigated significance reduces to low at closure.

Unmitigated – summary of the rated visual impact per phase of the project

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
All phases						
Unmitigated	M	H	M	H	M	M

Mitigated – summary of the rated visual impact per phase of the project

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
Construction, operation and decommissioning						
Mitigated	M	M	M	M	M	M
Closure						
Mitigated	L	L	M	L	L	L

HERITAGE/CULTURAL AND PALAEONTOLOGICAL RESOURCES

ISSUE: LOSS OF HERITAGE/CULTURAL AND PALAEONTOLOGICAL RESOURCES

Information was sourced from the heritage/cultural (PGS, May 2013) and desktop palaeontological (Gideon Groenewald, April 2013) studies undertaken for the farm Gloria 266, the heritage/cultural study (PGS, July 2014) undertaken for a neighbouring mine on the farm Kipling 271, and the heritage/cultural study undertaken on the farm Kipling 271 and Umtu 281 (PGS, October 2015) as part of the proposed project and included in Appendix Q.

Introduction

There are a number of activities/infrastructure in all phases prior to closure that have the potential to damage heritage and cultural resources, either directly or indirectly, and result in the loss of the resource for future generations. Heritage and cultural resources include sites of archaeological, cultural or historical importance.

No palaeontological resources were found on site, however there is a low possibility that the Hotazel Formation manganese ore body could contain stromatolites and this should be taken into account during the planning and development phases of the proposed project. The potential impact on palaeontological resources is therefore not assessed further however the mitigation measures cover the steps to be taken should there be any chance finds.

Project phase and link to activities/infrastructure

Construction	Operational	Decommissioning	Closure
Site preparation Earthworks Civil works	Open pit mining Processing plant Transportation Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services General site management Rehabilitation	Open pit mining Processing plant Transportation Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services General site management Demolition Rehabilitation	Maintenance and aftercare of rehabilitated areas

Rating of impact

Severity / nature

As part of the proposed project a total of four heritage sites were identified within the proposed project area as illustrated in Figure 28. The proposed project will require the destruction of the heritage site HMK1 in order for the R380 to be realigned. It is however important to note that HMK1 is considered to

be of low significance from a heritage perspective and can therefore be destroyed. It is planned that the remainder of the heritage sites will remain undisturbed by the proposed projects infrastructure and activities. In the unmitigated scenario where activities are uncontrolled, damage to heritage sites could occur. It follows that in the unmitigated scenario, the severity could be medium. With mitigation, the site would be protected and will remain undisturbed which reduces the severity to low.

Duration

If the heritage resources are removed, damaged or destroyed the impact duration is long term. In the mitigated scenario the duration reduces to less than the project life.

Spatial scale / extent

The spatial scale is low both with or without mitigation.

Consequence

The unmitigated scenario the consequence is medium. In the mitigated scenario the consequence reduces to low as the spatial scale, duration and severity is reduced.

Probability

The unmitigated probability is medium, reducing to low with mitigation.

Significance

The unmitigated significance is medium and the mitigated significance is low.

Unmitigated – summary of the cumulatively rated heritage resources impact per phase of the project

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
All phases prior to closure						
Unmitigated	M	H	L	M	M	M

Mitigated – summary of the cumulatively rated heritage resources impact per phase of the project

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
All phases prior to closure						
Mitigated	M	L	L	L	L	L

SOCIO-ECONOMIC

ISSUE: INWARD MIGRATION IMPACT

Introduction

Mining projects tend to bring with them an expectation of employment in all project phases prior to closure. This expectation can lead to the influx of job seekers to an area which in turn increases pressure on existing communities, housing, basic service delivery and raises concerns around safety and security. This section focuses on the potential for the inward migration and associated social issues.

Project phase and link to activities/infrastructure

Construction	Operational	Decommissioning	Closure
Site preparation Earthworks Civil works	Open pit mining Processing plant Transportation Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services General site management Rehabilitation	Open pit mining Processing plant Transportation Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services General site management Demolition Rehabilitation	Maintenance and aftercare of rehabilitated areas

Rating of impact

Severity / nature

The effects of inward migration can be significant. These effects could include, but not be limited to:

- Potential establishment or expansion of informal settlements
- Increased pressure on housing, water supply infrastructure, sanitation and waste management systems and infrastructure, health care and community services and infrastructure
- Potential for increased pressure on natural resources such as water, fauna, flora and soils
- Increase in crime
- Spread of disease, most notably HIV/Aids and tuberculosis.

It is not possible to predict how significant the inward migration may be, however this impact severity has been rated as high in line with the precautionary approach. It may be possible to mitigate this impact by managing expectations with regard to employment.

Duration

In the normal course, social impacts associated with each phase of the project will occur for the life of the project, but negative social issues associated with inward migration can continue beyond the closure of the mine, particularly in the unmitigated scenario.

Spatial scale / extent

In both the unmitigated and mitigated scenarios, the impacts of inward migration could extend beyond the proposed project area and into surrounding communities.

Consequence

In the unmitigated scenario the consequence associated with inward migration is high. In the mitigated scenario, the consequence is reduced to medium.

Probability

In the unmitigated scenario the impact is considered to be possible because although this type of pressure has been experienced in the communities around other mining operations, no informal settlements have been observed in the immediate vicinity of mines neighbouring the proposed project site. With mitigation, probability reduces to low.

Significance

In the unmitigated scenario, the significance of this potential impact is high. With mitigation this may reduce to medium.

Unmitigated – summary of the rated inward migration impact per phase of the project

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
Construction, operation, decommissioning						
Unmitigated	H	H	M	H	M	H

Mitigated – summary of the rated inward migration impact per phase of the project

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
Construction, operation and decommissioning						
Mitigated	M	H	M	H	L	M

ISSUE: ECONOMIC IMPACT

Information in this section was sourced from the economic study undertaken by Mercury (Mercury, October 2015) and included in Appendix R.

Introduction

In the broadest sense, all activities associated with the mine contribute towards a positive and negative economic impact in operation, decommissioning and closure phase.

Project phase and link to activities/infrastructure

Construction	Operational	Decommissioning	Closure
Site preparation Earthworks Civil works	Open pit mining Processing plant Transportation Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services General site management Rehabilitation	Open pit mining Processing plant Transportation Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services General site management Demolition Rehabilitation	Maintenance and aftercare of rehabilitated areas

Rating of impact

Severity / nature

The mine has a positive economic impact on the national, local and regional economy. Direct benefits are derived from wages, taxes and profits. Indirect benefits are derived through the procurement of goods and services, and the increased spending power of employees. The following positive and negative aspects apply (Mercury, October 2015):

- The proposed project will result in the loss of grazing land which is estimated to be valued at R3 500.00 per hectare. Considering that the proposed project will disturb approximately 154 ha, this equates to a loss of grazing land to a value of R539 000.00
- The anticipated contribution to the local gross domestic profit as a result of the proposed project is anticipated to be R847 168 000.00
- Mokala will contribute R1.35 billion in revenue earned per annum which equates to a total of R11 493 761 000 (R11.5 billion) over the life of the mine.

It follows that without mitigation the economic contribution from the proposed project is high and the potential loss to agriculture is relatively low so the net impact severity is high positive. With mitigation, Mokala could identify alternative projects that would increase the net positive severity further to benfiting the region.

Duration

In the normal course, the direct positive and negative economic impacts associated with the proposed mine will occur for the life of mine. Post closure, in the unmitigated scenario, the scale of the impacts will

be reduced. Furthermore, the proposed mine would have contributed to income creation, and a better skilled workforce is expected to continue beyond the life of mine. Quantitatively assessing the post closure impacts is not possible because there are a number of important unknown factors such as the general state of the future economy (local, national and world wide) and the future state of the mining sector in particular. There may also still be some negative impacts due to an un-rehabilitated site.

Spatial scale / extent

In both the mitigated and unmitigated scenarios, the spatial scale of the impact is high because it will extend far beyond the proposed project area on a regional and national scale.

Consequence

In both the unmitigated and mitigated scenarios the consequence is high and positive.

Probability

In the normal course of economic activity the net positive impacts will definitely occur.

Significance

In the unmitigated scenario, the significance of this potential impact is high positive. In the mitigated scenario, the significance is further increased.

Unmitigated – summary of the rated economic impact per phase of the project

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
All phases						
Unmitigated	H+	H	H	H+	H	H+

Mitigated – summary of the rated economic impact per phase of the project

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
All phases						
Mitigated	H+	H	H	H+	H	H+

LAND USE

ISSUE: LAND USE IMPACT

Information in this section was sourced from on-site observations and the project team.

Introduction

There are project related activities and infrastructure that may have an impact on other land uses in the proposed project areas in all mine phases.

Project phase and link to activities/infrastructure

Construction	Operational	Decommissioning	Closure
Site preparation Earthworks Civil works	Open pit mining Processing plant Transportation Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services General site management Rehabilitation	Open pit mining Processing plant Transportation Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services General site management Demolition Rehabilitation	Maintenance and aftercare of rehabilitated areas

Rating of impact

Severity / nature

Mokala currently undertakes prospecting related activities on the remaining extent of the farm Gloria 266 and there are no other activities on the site. It follows that although no on-site third party land use will be physically impacted, albeit that the current agricultural zoning requires temporary amendment. Other land uses within the proposed project area (remaining extent and portion 1 of Gloria 266, Umtu, 281 and Kipling 271) include: mining, agriculture (Ad-hoc livestock grazing and game) and infrastructure (existing road networks and Telkom lines). In addition to this, a land claim has been lodged on the farm Kipling 271.

Land uses surrounding the proposed project area include: residential, mining, powerlines, rail and agriculture (Ad-hoc livestock grazing and game). In addition to this, there is a possibility that the Hotazel residential area may be expanded in future.

These land uses within and surrounding the proposed project area may be affected by one or more of the following environmental and social impacts:

- Hazardous infrastructure and excavations
- Land clearing (vegetation and soil) for infrastructure and activities
- Surface and groundwater quality and quantity
- Dust generation
- Noise pollution
- Air pollution

- Traffic related safety impacts
- Visual
- Inward migration.

In the unmitigated scenario the cumulative severity could be high. This can be reduced to medium/low with mitigation that is focussed on prevention and/or controls for each environmental and social impact type.

Duration

In the unmitigated scenario the impact on land use will extend beyond mine closure. With mitigation the majority of the land use impacts are expected to be limited to the phases prior to mine closure.

Spatial scale / extent

The spatial scale extends beyond the proposed project area in both the mitigated and unmitigated scenario.

Consequence

The unmitigated consequence is high in all project phases. The mitigated consequence is low.

Probability

In the unmitigated scenario, where environmental and social impacts are uncontrolled, the probability that land uses will be impacted by mining is definite. With mitigation, the probability reduces to medium prior to closure and low post closure.

Significance

The unmitigated significance is high in all project phases. With mitigation this reduces to medium prior to closure and to low post closure.

Unmitigated – summary of the rated land use impact per phase of the project

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
All phases						
Unmitigated	H	H	M	H	H	H

Mitigated – summary of the rated land use impact per phase of the project

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
Construction, operation and decommissioning						
Mitigated	M-L	M	M	L	M	M

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
Closure						
Mitigated	M-L	L	M	L	L	L

APPENDIX G: COMPOSITE MAP

APPENDIX H: GROUNDWATER IMPACT ASSESSMENT REPORT

APPENDIX I: GEOCHEMISTRY IMPACT ASSESSMENT REPORT

APPENDIX J: SOILS AND LAND CAPABILITY IMPACT ASSESSMENT REPORT

APPENDIX K: BIODIVERSITY IMPACT ASSESSMENT REPORT

APPENDIX L: SURFACE WATER IMPACT ASSESSMENT REPORT

APPENDIX M: AIR QUALITY IMPACT ASSESSMENT REPORT

APPENDIX N: NOISE IMPACT ASSESSMENT REPORT

APPENDIX O: TRAFFIC IMPACT ASSESSMENT REPORT

APPENDIX P: BLASTING ASSESSMENT

APPENDIX Q: HERITAGE/CULTURAL AND PALEONTOLOGICAL IMPACT ASSESSMENT REPORT

APPENDIX R: ECONOMIC AND SUSTAINABILITY LAND USE ANALYSIS

APPENDIX S: CLOSURE COST ASSESSMENT

RECORD OF REPORT DISTRIBUTION

Project Number:	720.09012.00001
Title:	ENVIRONMENTAL IMPACT ASSESSMENT AND ENVIRONMENTAL MANAGEMENT PROGRAMME REPORT FOR THE DEVELOPMENT OF THE PROPOSED MOKALA MANGANESE MINE
Report Number:	1
Proponent:	SLR Consulting (South Africa) (Pty) Ltd

Name	Entity	Copy No.	Date issued	Issuer
Vincent Muila	Department of Mineral Resources	1	November 2015	N Daly
Moses Ramakulukusha	Department of Environment and Nature Conservation	2	November 2015	N Daly
Esther Makungo	Department of Water and Sanitation	3	November 2015	N Daly
Philip Hine	South African Heritage Resource Agency	Electronic	November 2015	N Daly
Viljoen Mothibi	Department of Agriculture and Land Affairs	4	November 2015	N Daly
Jacoline Mans	Department of Agriculture, Forestry and Fisheries	5	November 2015	N Daly
Ryan Oliver	The Northern Cape Department of Rural Development and Land Reform	6	November 2015	N Daly
Jaco Roelofse	Department of Public Works, Roads and Transport	7	November 2015	N Daly
Klaas Teise	John Taolo Gaetsene District Municipality	8	November 2015	N Daly
Seneo Seleka	Joe Morolong Local Municipality	9	November 2015	N Daly
Librarian	Kathu Library	10	November 2015	N Daly
Librarian	Hotazel Library	11	November 2015	N Daly
Librarian	Black Rock Library	12	November 2015	N Daly
Librarian	Kuruman Library	13	November 2015	N Daly
Librarian	Kathu Library	14	November 2015	N Daly
Richard Curtis	Mokala Manganese (Pty) Ltd	15	November 2015	N Daly
Carol Kenyon	SLR Consulting (South Africa) (Pty) Ltd	16	November 2015	N Daly