

**SISHEN IRON ORE COMPANY (PTY) LTD**

**KOLOMELA MINE**

**HEUNINGKRA NZ PROJECT**

**(MINING AND PROCESSING AT HEUNINGKRA NZ)**

**POSTMASBURG, NORTHERN CAPE**

**ENVIRONMENTAL IMPACT ASSESSMENT**

**&**

**ENVIRONMENTAL MANAGEMENT PROGRAMME**

**PART B**

**FOR SUBMISSION TO DMR**

**DMR REFERENCE: NC30/5/1/2/3/2(069)MR**

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**ENVIRONMENTAL MANAGEMENT PROGRAMME**

**PART B**

**FOR SUBMISSION TO DMR**

**NAME OF APPLICANT:** Sishen Iron Ore Company (Pty) Ltd – Kolomela Mine

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**REF NUMBER:** NC 30/5/1/2/3/2/(069)MR

**TO BE SUBMITTED FOR AUTHORISATION IN TERMS OF:**

**SECTION 102 OF THE MINERALS AND PETROLEUM RESOURCES DEVELOPMENT ACT**

**LISTED ACTIVITIES UNDER THE NATIONAL ENVIRONMENTAL MANAGEMENT ACT AND NATIONAL ENVIRONMENTAL MANAGEMENT: WASTE ACT**



**AMENDMENT OF AN AUTHORISATION UNDER THE EIA REGULATIONS OF THE NATIONAL ENVIRONMENTAL MANAGEMENT ACT.**

**PREPARED BY:** EXM Advisory Services (Pty) Ltd

**DATE:** 23 April 2018

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Joshua O'Brien	Environmental Scientist		23 April 2018

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## ACRONYMS AND ABBREVIATIONS

	<b>Definition</b>
AEL	Atmospheric Emissions Licence
BID	Background Information Document
CBA	Critical Biodiversity Area
DMR	Department of Mineral Resources
DWS	Department of Water and Sanitation
EAP	Environmental Assessment Practitioner
EIA	Environmental Impact Assessment
EIS	Ecological Importance and Sensitivity
EMC	Ecological Management Class
EMPr	Environmental Management Programme
ESA	Ecological Support Area
GHG	Greenhouse Gases
GNR	Government Notice
IAP	Interested and Affected Party
LOM	Life of Mine
Mtpa	Million tons per annum
LSA	Late Stone Age
mamsl	Metres above mean sea level
Mbs	Metres below surface
MPRDA	Mineral and Petroleum Resources Development Act
MSA	Middle Stone Age
NAAQS	South African National Ambient Air Quality Standards
NDCR	National Dust Control Regulations
NEMA	National Environmental Management Act
NEM: AQA	National Environmental Management Air Quality Act
NEM: BA	National Environmental Management Biodiversity Act
NEM: WA	National Environmental Management Waste Act
NFEPA	National Freshwater Ecosystem Priority Areas
NHRA	National Heritage Resources Act
PES	Present Ecological Status
PM10	Particulate matter less than 10 microns
PM2.5	Particulate matter less than 2.5 microns
ROM	Run of Mine
RWD	Return Water Dam
SACNASP	South African Council for Natural & Scientific Professionals
SAHRA	South African Heritage Resource Agency
SAMRAD	South African Mineral Resources Administration (System)
SDF	Spatial Development Framework
SIOC	Sishen Iron Ore Company (Pty) Ltd
SLP	Social Labour Plan
TOPS	Threatened or Protected Species
UHDMS	Ultra-High Dense Media Separation
WML	Waste Management Licence

## 1. DETAILS OF THE EAP

### 1.1 Details of EAP who prepared the report

**Name of The Practitioner:** Kerry Fairley

**Affiliation:** Head Environmental Management Services and Director, EXM Advisory Services

**Tel No.:** 082 871 2959 or 010 0073617

**E-mail address:** kerry@exm.co.za

### 1.2 Expertise of the EAP

#### Qualifications

- BSc Botany Honours (University of the Witwatersrand)
- Registered as Professional Natural Scientist with the South African Council for Natural and Scientific Professionals (SACNASP) Registration Number: 400054/03


#### Expertise and Experience

Kerry Fairley has over 18 years of experience in environmental management in the mining industry as one of the most experienced environmental assessment practitioners in South Africa. Kerry is the author of numerous environmental impact assessment reports for both green fields mining projects as well as for expansions and amendment to existing mining operations in South Africa and as well as other African countries (Namibia, Malawi).

#### Declaration of Independence

The undersigned declare that this report represents an independent and objective assessment of the risks associated with the proposed development.

Curriculum vitae and proof of registration of the EAP is provided in Appendix A.

Name	Affiliation	Designation	Signature	Date
Kerry Fairley	EXM Advisory Services (Pty) Ltd	Pr.Sci.Nat. Director		

## **2. DESCRIPTION OF THE ASPECTS OF THE ACTIVITY**

**The requirement to describe the aspects of the activity that are covered by the draft environmental management programme are already included in PART A, Section 4, as required.**

The Sishen Iron Ore Company (Pty) Ltd (part of Kumba Iron Ore Limited, Kumba) is proposing to incorporate the Heuningkranz Section into the existing Kolomela Mine mining right. Heuningkranz includes the Farm 364 (Heuningkranz) and Farm 432 (Langverwacht), Portion 1, located approximately 18 km north west of Postmasburg and 18 km north north west of the main infrastructure area at Kolomela Mine.

Mining at the Heuningkranz Section will be from two (2) open pits, the Heuningkranz North and Heuningkranz South Pits. Overburden and waste rock originating from the Heuningkranz North and South Pits will be placed on surface to create waste rock dumps (WRDs), namely the North Eastern WRD, the South Eastern WRD and the South Western WRD. The pits will require dewatering and the water will be pumped to a new Heuningkranz Reservoir and then piped over a distance of approximately 15 km to Sedibeng Water via the existing Beeshoek Reservoir.

It is planned that 6 million tonnes per annum (Mtpa) of iron ore will be processed by using ultra high dense media separation (UHDMS) at a new processing plant to be developed at Heuningkranz. Mineral waste from processing by UHDMS will be managed into two mine residue facilities: a discard dump and slimes dam, that will be developed at Heuningkranz.

A further 4.2 Mtpa of high grade ore will be railed to Kolomela Mine, for processing at the existing Kolomela direct shipping ore (DSO) plant. Primary and secondary crushing of this ore will take place at Heuningkranz. A rail link will be developed at Heuningkranz both for the export of product directly from Heuningkranz as well as the transport of DSO material to Kolomela via the existing iron ore rail line for processing. The total maximum production from Heuningkranz will be 10.2 Mtpa.

Access to Heuningkranz will be via the R385 road linking Postmasburg and Olifantshoek and a new road from the R385 to the main infrastructure area at Heuningkranz will be constructed. The R385 will be upgraded to accommodate additional traffic volumes.

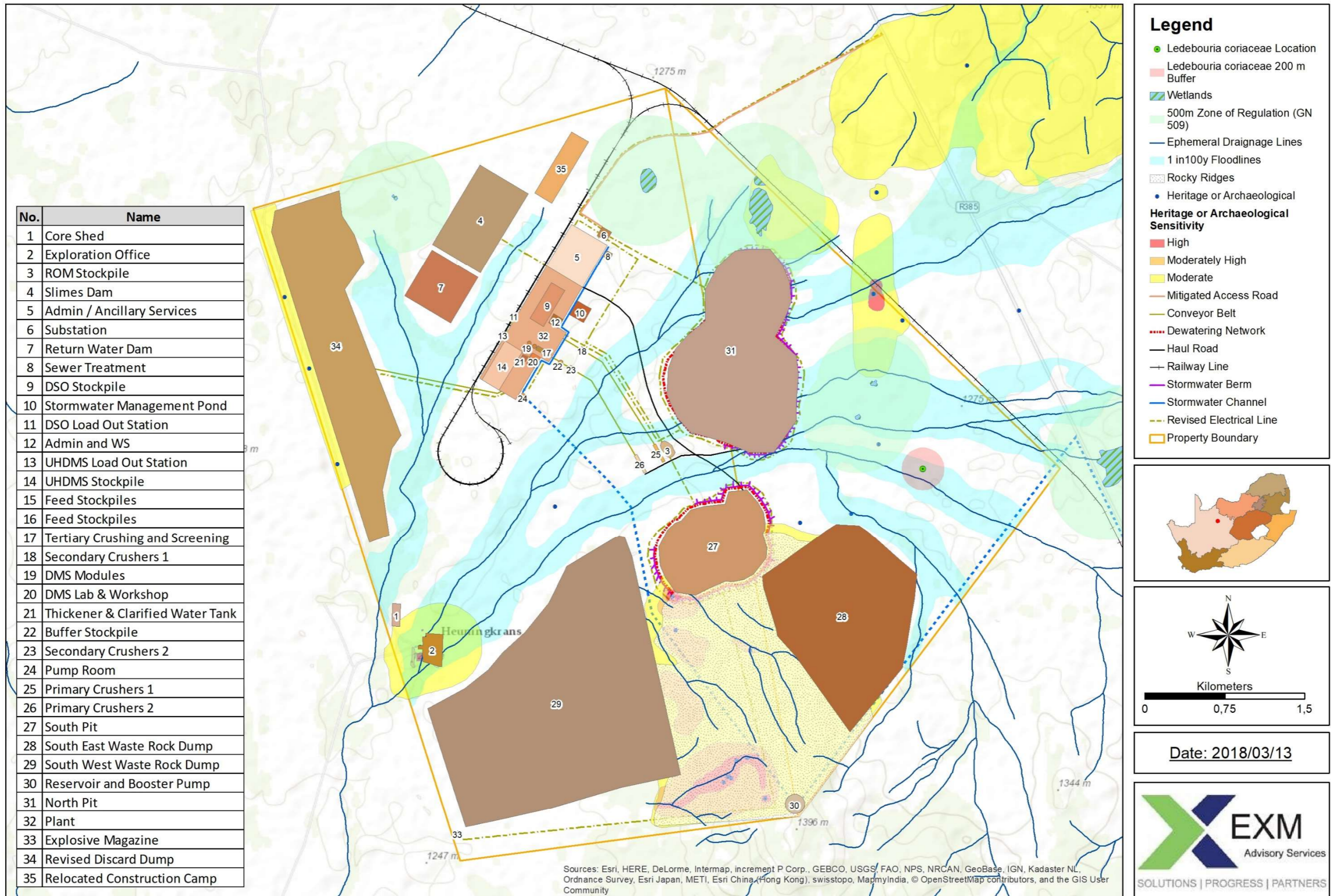
Supporting infrastructure to be developed at Heuningkranz includes: administration buildings, workshops, stores, fuel storage areas, an explosives magazine, sewage treatment works, pollution control dams, storm water management infrastructure, dewatering infrastructure; pipelines, evaporation dams, mine haul and internal roads and overland conveyors.



A construction village will be developed at Heuningkranz to house persons involved in developing the mine infrastructure, but no new housing will be necessary, as personnel will move from Kolomela to the Heuningkranz Section. The main administration services will remain at Kolomela.

### **3. COMPOSITE MAP**

**A map which superimposes the proposed activity, its associated structures, and infrastructure on the environmental sensitivities showing how areas are to be avoided is provided as Figure 3.1.**



**Heuningkranz Environmental Sensitivities**

**FIGURE 3-1: MITIGATED LAYOUT PLAN OF HEUNINGKRA NZ IN RELATION TO ENVIRONMENTAL SENSITIVITIES**

## **4. IMPACT MANAGEMENT OBJECTIVES**

### **4.1 Closure Objectives**

As per the requirements of the existing approved Environmental Management Programme for Kolomela Mine, the mine will plan for sustainable closure by ensuring that every reasonable effort has been made to achieve rehabilitation closure objectives that will give effect to the following principles:

- Safety and health of people and animals are safeguarded from hazards resulting from the suspended mining operations.
- Environmental damage or residual environmental impacts are 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 the land can be achieved.
- The physical and chemical stability of the remaining structures should be such that risk to the environment through naturally occurring forces is eliminated.
- 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 establishment of a socially stable community in line with the principles of sustainable development is facilitated.

### **4.2 Process for Managing Environmental Damage, Pollution, Pumping and Treatment of Extraneous Water and Ecological Degradation**

The current Kolomela Rehabilitation Strategy is provided in Part C – Appendix 15 (Golder, 2016). This will be updated on a regular basis and will also be applicable to Heuningkranz. This includes the detailed rehabilitation and management methodologies (see Section 8 of Kolomela Rehabilitation Strategy) for:

- Mining areas
  - Waste Rock Dumps
  - Tailings Impound Facility
  - Open Pits
  - Borrow Pits
  - Disturbed Land to be rehabilitated once infrastructure is removed
- Non-mining areas including
  - Bush encroachment and alien vegetation control
  - Sensitive and protected species
  - Pans and wetlands

- Site wide water management
  - Catchment yield and integrity
  - Pan and wetland catchment protection
  - Aquifer recharge beneficial ecological use

### 4.3 Potential Risk of Acid Mine Drainage

#### 4.3.1 Steps taken to investigate, assess and evaluate the impact of acid mine drainage

It was not considered necessary to undertake Acid-Base Accounting (ABA) for the Heuningkranz Project as ABA conducted for Kolomela and Sishen Mines has demonstrated iron ore (i.e. iron oxide) and waste rock/overburden material can be described as being **non-acid forming**. There is a negligible risk of acid mine drainage originating from waste streams. The various mineral waste streams to be produced at Heuningkranz were assessed in terms of the National Norms and Standards for the Assessment of Waste for Landfill Disposal (GNR. 635 of 23 August 2013). These regulations consider the leachable concentrations (LC) and total concentrations (TC) of potential contaminants compared to legislated limits. The wastes are then defined as types based on the risk to the environment. The containment barriers required to protect the environment from the different waste types are defined in the National Norms and Standards for Disposal of Waste to Landfill (GNR. 636 of 23 August 2013).

Since no waste streams have been produced at Heuningkranz, representative samples of DMS slimes and discard were obtained from Kolomela Mine. Geological core material was used to form composite samples of what would be considered to be representative of overburden material, waste rock and ore. The results of the waste assessment are presented in Table 4-1.

**TABLE 4-1: SUMMARY OF WASTE ASSESSMENT RESULTS**

Waste	Description	LC Results	TC Results	Overall Result
Kolomela Tailings	Iron exceed leachable limits* Barium, cadmium & fluoride exceed total limits. Near neutral	Type 3	Type 3	Type 3
Kolomela Discard	Iron exceed leachable limits* Barium, cadmium & fluoride exceed total limits. Alkaline	Type 3	Type 3	Type 3
Heuningkranz: South Pit Waste	No constituents exceed leachable limits Barium, cadmium, manganese & fluoride exceed total limits. Slightly alkaline	Type 4	Type 3	Type 3
Heuningkranz: Low Grade Ore	No constituents exceed leachable limits Barium, cadmium, & fluoride exceed total limits. Slightly alkaline	Type 4	Type 3	Type 3
Heuningkranz: Overburden	No constituents exceed leachable limits Barium, cadmium, manganese, nickel & fluoride exceed total limits.	Type 4	Type 3	Type 3

Waste	Description	LC Results	TC Results	Overall Result
	Highly alkaline			
Heuningkranz: North Pit Waste	Sulfate exceeds leachable limits Cadmium & fluoride exceed total limits. Slightly alkaline	Type 3	Type 3	Type 3
Heuningkranz: High Grade Ore	Sulfate exceeds leachable limits Cadmium & fluoride exceed total limits. Slightly alkaline	Type 3	Type 3	Type 3

Source: Jones & Wagener (October 2017)

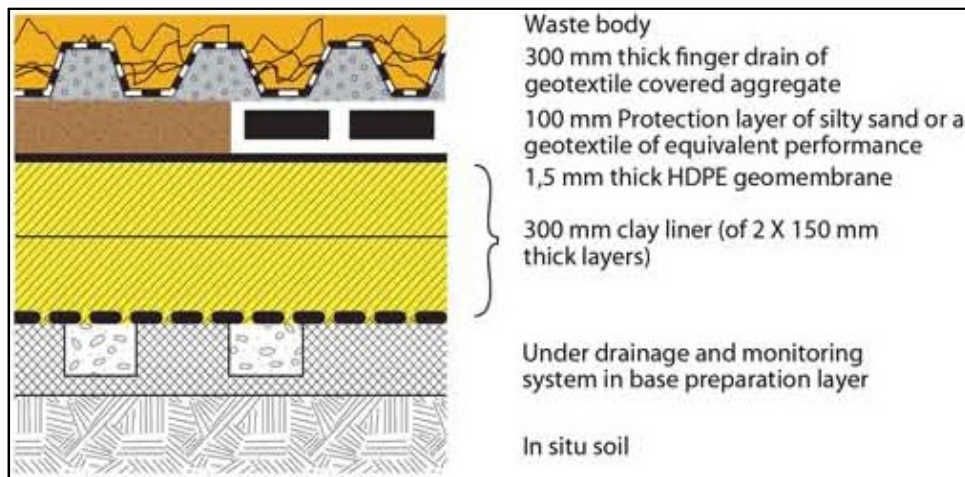
\* Although iron is not listed in the National Norms and Standards, it was compared to the SANS 241 2015 drinking water standard of 2.0 mg/ℓ, the chronic health limit, which is also the LCT0 value.

#### 4.3.2 Engineering/Mine design solution to be implemented to avoid or remedy acid mine drainage

The waste streams do not produce leachable concentrations of contaminants that are considered to pose a risk to the environment. Furthermore, mass transport modelling undertaken by Groundwater Complete (January, 2018) shows that the potential dispersion of contaminants will be limited to within the boundaries of the mine at closure. Even after 50 years, water levels would still not have fully recovered from the impacts of pit dewatering and therefore the pits continue to act as sinks for both groundwater and contamination; and contamination will have decreased to 10 km<sup>2</sup>, 50 years after closure. This is because the pit areas will continue to act as sinks if left open or only partially backfilled.

Given that the material is of an inert nature and the fact that contaminant concentrations will be low and unlikely to ever reach receptors it is motivated that barriers would not be required for the protection of the environment from overburden and waste rock material. The implementation of a Class C barrier systems at waste rock dumps is not practicable and is not considered to add any additional barrier in terms of the protection of the environment. This is further motivated by the fact that groundwater monitoring at both Kolomela Mine and Sishen Mine have not shown any potential risk of groundwater contamination due to the disposal of waste rock directly onto surface. .

Typical Class C barrier systems are shown in Figure 4-1.



**FIGURE 4-1: CLASS C BARRIER SYSTEM**

The DMS discard and slimes material sourced from Kolomela only show potential for the leaching of iron. Based on work undertaken of similar material at Sishen Mine it has been motivated that these wastes are unlikely to be subject to the chemical processes that mobilise metals and anions as the residues are generally resistant to chemical weathering and thus have slow reaction rates. It is therefore considered that the discard and the slimes will not have a significant impact on the water environment. The wastes at Sishen have been classified as Type 4 wastes. For the purposes of this assessment it has been assumed that the risks to groundwater at Heuningkranz will be the same and no liners have been provided for the discard and slimes dam.

The tailings water fractions at Sishen have however been found to have elevated nitrate concentrations and the groundwater in the vicinity of the tailings disposal facility appears to have been impacted by nitrate. It is expected that similar conditions will be applicable to Heuningkranz. It is thus recommended that the slimes return water dam be lined with a Class C barrier (see Figure 4-1) or equivalent in order to ensure protection of the groundwater environment. Furthermore, a barrier may be required for the slimes dam. This should be confirmed by source-pathway-receptor modelling of groundwater impacts.

Since the stormwater management pond will result in the containment of dirty water run-off, which includes workshops, hydrocarbon and refuelling areas, it is recommended that the dam also be lined. However, the need for lining this dam may be negated should internal lined pollution control dams be put in place that intercepts water from key pollution sources.

**4.3.3 Measures that will be put in place to remedy any residual or cumulative impact that may result from acid mine drainage**

Not applicable.

#### 4.4 Volumes and rate of water use required for mining

In order for the iron ore to be safely removed from the pits, the pits will need to be dewatered. Some of this water will be used by the mine for processing, dust suppression and domestic use. It is estimated that a maximum of 200 m<sup>3</sup>/hour is required for domestic use and processing at Heuningkranz. The remaining water will be pumped to an on-site reservoir and then to the Beeshoek Reservoir. As is currently the case at Kolomela, this water will enter the Sedibeng Water Supply Scheme.

Based on the simulated groundwater influx (Groundwater Complete, January 2018), the maximum amount of dewatering required will be 116 l/s or 416 m<sup>3</sup>/hr. The maximum amount of water to be exported will be ~ 216 m<sup>3</sup>/hr. However, the modelled results are preliminary and based on the best information currently available, the model will be updated regularly as more information becomes available and before the commencement of the activities at Heuningkranz.

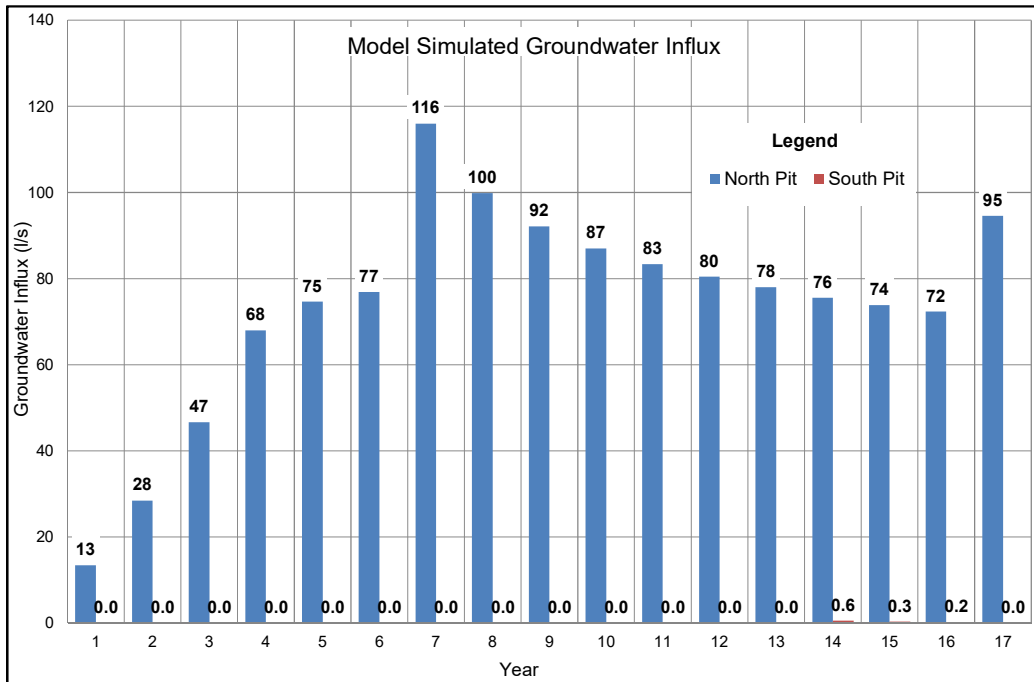


FIGURE 4-2: SIMULATED GROUNDWATER INFLUX INTO THE NORTH AND SOUTH PITS DURING THE LIFE OF THE HEUNINGKRA NZ PROJECT

#### 4.5 Water use licence application

Kolomela Mine currently operates under a valid Water Use Licence (Licence No. 10/D73A/ABCEGIJ/4125 of 13 March 2016). The licence is in the process of being amended to accommodate the expansion of activities at the existing Kolomela Section. The Kolomela Water Use Licence applicable at the time of the planned commencement of activities at the Heuningkranz Section will need to be updated to provide for new water uses at Heuningkranz. The water use licence will be updated prior to the commencement of activities at Heuningkranz

and will also provide for the downscaling of activities at Kolomela. The cumulative changes in the water uses will be accommodated in the amendment at that time. The following water uses are however applicable to the activities at Heuningkranz:

- Section 21 (a) – taking of water from a water resource.

Water will be taken for use at administration offices, workshops, ancillary services as well as processing activities.

- Section 21 (b) – storing of (clean) water

Raw and domestic supply water will be stored in reservoirs

- Section 21 (c&i) – impeding or diverting the flow of water in a water resource or altering the beds, banks or characteristics of a watercourse

The pits and waste rock dumps will intercept watercourses, requiring the diversion of clean water around such impedances and this will need to be licensed.

Pipelines, conveyors and roads will cross watercourses and will require licensing.

Any development within the catchment of a wetland pan will also require licensing.

- Section 21 (g) – disposing of waste in a manner which may detrimentally impact on a water resource.

Slimes Dam and Return Water Dam, Discard Dump, Stormwater Management Pond, Waste Rock Dumps and any additional Pollution Control Dams will require licensing.

Section 21 (j) – removing, discharging or disposing of water found underground if it is necessary for the efficient continuation of an activity or for the safety of people.

Dewatering is required to allow for the safe mining of open pits.



## 5. ENVIRONMENTAL MANAGEMENT PROGRAMME

### 5.1 Planning and Design/Pre-Construction

Action No.	IMPACT MANAGEMENT ACTION	APPLICABLE STANDARD	Scheduling	APPLICABLE ACTIVITIES											
				CONSTRUCTION VILLAGE, LAYDOWN AREAS, WORKSHOPS	ADMINISTRATION, ANCILLARY SERVICES, WORKSHOPS	ACCESS ROAD	RAIL LINK, BALLOON AND MAINTENANCE ROAD	PRIMARY AND SECONDARY CRUSHERS AND ROM	PROCESS PLANT & STOCKPILE AREAS	DISCARD DUMP AND DISCARD CONVEYOR	SLIMES DAM, RWD AND PIPELINES	DEWATERING INFRASTRUCTURE INCLUDING PIPELINES	NORTH AND SOUTH PITS	WASTE ROCK DUMPS	EXPLOSIVES MAGAZINE
<b>5.1.1</b>	<b>PROTECTION OF SOILS</b>														
5.1.1.1	The location of soil stockpiles is to be included in planning, and suitable areas are to be identified giving cognisance to: access, erosion control and location of future ore reserves.	-	Layout Planning	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
5.1.1.2	Provide sufficient storage areas with bunding and containment to prevent contamination of soils by pollutants/waste	-	Conceptual Design	Y	Y	-	-	Y	Y	-	-	-	-	-	Y
5.1.1.3	Disturbance areas are to be planned to minimise that required for safe construction and operation.	-	Layout Planning	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
5.1.1.4	Plan for the early implementation of a sewage treatment works for the management of sewage during construction.	-	Project Scheduling	Y	-	-	-	-	-	-	-	-	-	-	-
5.1.1.5	Provide sufficient storage of hazardous and general waste and a Bioremediation Facility for the treatment of soils contaminated with hydrocarbons.	GN. 96 of 2013-	Layout Planning * Conceptual Design												
5.1.1.6	Identify borrow areas for construction aimed at minimisation of additional disturbance footprint areas.	-	Layout Planning	Y	Y	Y	Y	Y	Y	Y	Y	Y	-	-	Y
<b>5.1.2</b>	<b>MINIMISE LANDFORM CHANGE (TOPOGRAPHY)</b>														
5.1.2.1	Prioritise in-pit dumping of waste rock into open pits.	-	Mine Planning	-	-	-	-	-	-	-	-	-	Y	Y	-
<b>5.1.3</b>	<b>PROTECTION OF GROUNDWATER RESOURCES</b>														
5.1.3.1	Update the groundwater model as more information on mine planning and aquifer characteristics become available, and plan dewatering requirements accordingly.	-	Ongoing	-	-	-	-	-	-	-	-	Y	Y	-	-
5.1.3.2	Undertake a cumulative impact assessment that takes into consideration the combined impact of dewatering at Kolomela Mine, Beeshoek Mine and the Heuningkranz Project.		Prior to WULA												
5.1.3.3	Groundwater level (continuous data loggers) are to be put in place		Prior to construction	SITE AND SURROUNDS											
5.1.3.4	PCDs and RWDs, which contain water that pose a risk of groundwater pollution, are to be lined with a minimum of a Class C barrier.	GN. 636 of 2013	Conceptual Design	-	Y	-	-	-	-	-	-	Y	-	-	-
5.1.3.5	Slimes dam is to be planned with a Class C barrier, unless source-pathway receptor modelling can demonstrate that a less stringent barrier system is required.	GN. 636 of 2013	Conceptual Design	-	-	-	-	-	-	-	-	Y	-	-	-
5.1.3.6	Investigate the opportunity for aquifer recharge of water sourced from dewatering activities.	-	Prior to commencement of dewatering	-	-	-	-	-	-	-	-	Y	Y	-	-
5.1.3.7	Groundwater monitoring of on-site boreholes and boreholes within 2 km of site boundary.	-	Annually	SITE AND SURROUNDS											

Action No.	IMPACT MANAGEMENT ACTION	APPLICABLE STANDARD	Scheduling	APPLICABLE ACTIVITIES											
				CONSTRUCTION VILLAGE, LAYDOWN AREAS, WORKSHOPS	ADMINISTRATION, ANCILLARY SERVICES, WORKSHOPS	ACCESS ROAD	RAIL LINK, BALLOON AND MAINTENANCE ROAD	PRIMARY AND SECONDARY CRUSHERS AND ROM	PROCESS PLANT & STOCKPILE AREAS	DISCARD DUMP AND DISCARD CONVEYOR	SLIMES DAM, RWD AND PIPELINES	DEWATERING INFRASTRUCTURE INCLUDING PIPELINES	NORTH AND SOUTH PITS	WASTE ROCK DUMPS	EXPLOSIVES MAGAZINE
			Quarterly 1 year prior to commencement of dewatering												
5.1.3.8	Collate information on all water abstraction points used by farmers in the predicted area of impacts including infrastructure, water levels, water requirements, proposed future plans for additional water abstraction.		Prior to construction	SITE AND SURROUNDS											
<b>5.1.4</b>	<b>PROTECTION OF WATERCOURSES</b>														
5.1.4.1	Minimise disturbance of watercourses as per Mitigated Layout	GNR. 704 of 1999	Layout Planning	-	-	-	-	-	-	-	-	-	Y	Y	-
5.1.4.2	Any area with the potential to contaminate surface water run-off is to be identified and delineated as a dirty water management area.	GNR. 704 of 1999	Layout Planning	Y	Y	-	-	Y	Y	Y	Y	-	Y	Y	Y
5.1.4.3	Clean stormwater is to be diverted around all dirty water management areas by means of berms and channels.	GNR. 704 of 1999	Layout Planning	Y	Y	-	-	Y	Y	Y	Y	-	Y	Y	Y
5.1.4.4	Clean water diversions able to manage the 1 in 100-year storm event are to be provided with measures to attenuate flow and/or prevent erosion where the flow and gradient necessitates this.	GNR. 704 of 1999	Conceptual Design	Y	Y	-	-	Y	Y	Y	Y	-	Y	Y	Y
5.1.4.5	Provide for culverts where roads, haul and rail infrastructure intercepts drainage. Such culverts should be designed so as not to cause erosion downstream of the crossing.	-	Conceptual Design	-	-	Y	Y	Y	-	-	-	-	-	Y	-
5.1.4.6	Conveyor and pipeline crossings are to be lifted above the 1 in 100-year flood level at the points where these cross watercourses.	-	Conceptual Design	-	-	-	-	Y	-	Y	Y	Y	-	-	-
5.1.4.7	Conveyors and slimes and return water are to be provided with measures at crossing points to contain spillages and prevent these from entering any watercourse.	-	Conceptual Design	-	-	-	-	Y	-	Y	Y	Y	-	-	-
5.1.4.8	All areas where chemicals, hydrocarbons or other potential pollutants are stored or handled are to be provided with measures to contain spillages of such substances.	SANS 01131	Conceptual Design	Y	Y	-	-	Y	Y	-	-	-	-	-	Y
5.1.4.9	Run-off from dirty water areas is to be contained and prevented from entering any water resource.	-	Layout Planning	Y	Y	-	-	Y	Y	Y	Y	-	-	Y	Y
5.1.4.10	Pollution control dams (PCDs) and RWDs are to be able to contain a 1 in 50-year storm and be provided with a minimum free board of 800 mm.	GNR. 704 of 1999	Conceptual Design	Y	Y	-	-	Y	Y	Y	Y	-	Y	-	Y
5.1.4.11	Investigate the need for evaporation ponds to handle stormwater pumped from pit areas and include in layout if necessary.	GNR. 704 of 1999	Conceptual Design	-	-	-	-	-	-	-	-	-	Y	-	-
5.1.4.12	Sediment and/or oil interceptors are to be provided where dirty water is channelled from contaminant areas towards pollution control dams.	-	Conceptual Design	Y	Y	-	-	Y	Y	-	-	-	-	-	Y
5.1.4.13	Develop a water balance that maximises the recycling and reuse of dirty water and minimise the need for raw water make-up.	-	Conceptual Design	-	Y	-	-	Y	Y	Y	Y	-	-	-	Y
5.1.4.14	Apply for the amendment of the Kolomela WUL.	-	2 years prior to implementation	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

Action No.	IMPACT MANAGEMENT ACTION	APPLICABLE STANDARD	Scheduling	APPLICABLE ACTIVITIES											
				CONSTRUCTION VILLAGE, LAYDOWN AREAS, WORKSHOPS	ADMINISTRATION, ANCILLARY SERVICES, WORKSHOPS	ACCESS ROAD	RAIL LINK, BALLOON AND MAINTENANCE ROAD	PRIMARY AND SECONDARY CRUSHERS AND ROM	PROCESS PLANT & STOCKPILE AREAS	DISCARD DUMP AND DISCARD CONVEYOR	SLIMES DAM, RWD AND PIPELINES	DEWATERING INFRASTRUCTURE INCLUDING PIPELINES	NORTH AND SOUTH PITS	WASTE ROCK DUMPS	EXPLOSIVES MAGAZINE
5.1.4. 15	Method statement to be developed for construction activities within watercourses aimed at protecting watercourses from unnecessary disturbance.	-	In Support of WULA	-	-	Y	-	Y	-	Y	Y	Y	Y	Y	-
5.1.4. 16	Remediate the existing impedance of flow from the north west due to boundary road and rail to reinstate catchment of the tributary of the Soutloop River (liaise with Transnet for rail portion)	-	ASAP	TRIBUTARY OF THE SOUTLOOP RIVER											
<b>5.1.5</b>	<b>PROTECTION OF WETLANDS</b>														
5.1.5.1	Delineate the catchments of wetland pans.	-	Layout Planning	Y	-	Y	Y	-	-	Y	-	-	Y	-	-
5.1.5.2	Minimise disturbance to wetlands/wetland catchment areas in accordance with final mitigated layout plan.	-	Layout Planning	-	-	Y	Y	Y	-	Y	-	-	Y	-	-
5.1.5.3	Provide for culverts where linear infrastructure intercepts catchments of wetland pans.	-	Conceptual Design	-	-	Y	Y	Y	-	-	-	-	-	-	-
<b>5.1.6</b>	<b>BIODIVERSITY PROTECTION</b>														
5.1.6.1	Investigate the occurrence of <i>Ledebouria coriacea</i> including confirmation of ID, magnitude and extent of population.	-	ASAP	-	-	-	-	-	-	-	-	-	Y	Y	
5.1.6.2	Obtain necessary permits for the destruction/relocation of species of conservation importance.	-	Pre-Construction	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
5.1.6.3	Undertake site walkover of footprint areas of disturbance to mark protected plant species.	-	Layout Planning	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
5.1.6.4	Revise layout of infrastructure to minimise disturbance to protected plant species.	-	Layout Planning	Y	-	-	-	-	-	-	-	Y	-	-	Y
5.1.6.5	Internal fencing to be planned to allow for movement of fauna.	-	Conceptual Design	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
5.1.6.6	Provide for overpasses and underpasses for faunal movement past linear infrastructure.	-	Conceptual Design	-	-	-	-	Y	-	-	Y	Y	-	-	-
5.1.6.7	Expansion of Kolomela current biomonitoring programme to include Heuningkranz and downstream environment.	-	Every 2 years during wet season	SITE WIDE AND DOWNSTREAM											
5.1.6.7	Update Kolomela's Alien Invasive Species Management Plan to include Heuningkranz.	-	Prior to Implementation												
<b>5.1.7</b>	<b>MINIMISE ATMOSPHERIC EMISSIONS</b>														
5.1.7.1	Provide for dust management measures in infrastructure planning.	-	Conceptual Design	-	-	-	-	Y	Y	Y	-	-	-	-	-
5.1.7.2	Plan for the upgrading and maintenance of public roads to be used during construction and operations, including the surfacing of the R385.	-	Conceptual Design	-	-	Y	-	-	-	-	-	-	-	-	-
5.1.7.3	Atmospheric Emissions Licence including a Leak Detection and Repair Management Programme for bulk fuel storage facilities.	-	Prior to Implementation	-	Y	-	-	-	-	-	-	-	-	-	-
5.1.7.4	On site monitoring of PM <sub>2.5</sub> and PM <sub>10</sub> and dustfall on site and surrounding receptor points.	-	Continuous PM <sub>2.5</sub> & PM <sub>10</sub> Monthly Fallout	SITE AND SURROUNDS											
<b>5.1.8</b>	<b>NOISE IMPACTS</b>														

Action No.	IMPACT MANAGEMENT ACTION	APPLICABLE STANDARD	Scheduling	APPLICABLE ACTIVITIES											
				CONSTRUCTION VILLAGE, LAYDOWN AREAS, WORKSHOPS	ADMINISTRATION, ANCILLARY SERVICES, WORKSHOPS	ACCESS ROAD	RAIL LINK, BALLOON AND MAINTENANCE ROAD	PRIMARY AND SECONDARY CRUSHERS AND ROM	PROCESS PLANT & STOCKPILE AREAS	DISCARD DUMP AND DISCARD CONVEYOR	SLIMES DAM, RWD AND PIPELINES	DEWATERING INFRASTRUCTURE INCLUDING PIPELINES	NORTH AND SOUTH PITS	WASTE ROCK DUMPS	EXPLOSIVES MAGAZINE
5.1.8.1	Monitor noise impacts at key receptor points.		Annually	SURROUNDING RECEPTORS											
5.1.8.2	Noise pollution must be considered during design and procurement phases of all equipment		Ongoing	Y	Y	-	Y	Y	Y	Y	Y	Y	-	-	Y
<b>5.1.9</b>	<b>REDUCE VISUAL IMPACTS</b>														
5.1.9.1	Consolidation of WRDs as per the mitigated layout.		Layout Planning	-	-	-	-	-	-	-	-	-	-	Y	-
5.1.9.2	Lighting to aim at reducing glare, light trespass and night glow.	-	Conceptual Design	Y	Y	Y	Y	Y		Y	Y	Y	Y	Y	Y
5.1.9.3	Investigate opportunities for visual screening of discard dump, slimes dam administration, ancillary services, workshop and plant areas from neighbouring receptors.	-	Layout Planning	-	Y	-	-	-		Y	Y	-	-	-	-
<b>5.1.10</b>	<b>PROTECTION OF HERITAGE RESOURCES</b>														
5.1.10.1	Consolidation of WRDs as per the mitigated layout.		Layout Planning	-	-	-	-	-	-	-	-	-	-	Y-	-
5.1.10.2	Phase 2 heritage assessment on heritage resources at sites HKZ2, HKZ13-15 and HKZ 9.	Heritage Permit	ASAP	-	-	-	-	-	-	Y-	-	-	Y	Y	-
5.1.10.3	Obtain destruction permits for the destruction of heritage resources LVW4.	Heritage Permit	Prior to destruction	-	-	-	-	-	-	-	-	-	Y	-	-
5.1.10.4	ECO is to be informed of the rich palaeontological heritage of the quaternary aged sediments on site and the potential for the unearthing of fossils.			-	-	-	-	-	-	-	-	-	Y	-	-
<b>5.1.11</b>	<b>PROTECTION OF LAND USE POTENTIAL AND LAND CAPABILITY</b>														
5.1.11.1	Financial provision for rehabilitation in mine and new infrastructure planning.	GNR. 1147 of 2015, as amended	Annual Update	Y	Y	Y	Y	Y		Y	Y	Y	Y	Y	Y
5.1.11.2	Relocate private access road to allow for continued access to the north.	-	Layout Planning	-	-	-	-	-	-	Y	-	-	-	-	-
<b>5.1.12</b>	<b>PUBLIC AND LABOUR RELATIONS</b>														
5.1.12.1	Stakeholder management plan to ensure that key stakeholders are kept informed of planning regarding Heuningkrantz.	SMP	Ongoing	GENERAL											
5.1.12.2	Capacity building and skills development programmes to consider the future needs for the implementation and operation of Heuningkrantz.	KOLOMELA SLP	Immediately	GENERAL											

## 5.2 Construction of Infrastructure

Action No.	IMPACT MANAGEMENT ACTION	APPLICABLE STANDARD	Scheduling	APPLICABLE ACTIVITIES											
				CONSTRUCTION VILLAGE, LAYDOWN AREAS, WORKSHOPS AND	ADMINISTRATION, ANCILLARY SERVICES, WORKSHOPS	ACCESS ROAD	RAIL LINK, BALLOON AND MAINTENANCE ROAD	PRIMARY AND SECONDARY CRUSHERS AND ROM STOCKPILE	PROCESS PLANT & STOCKPILE AREAS	DISCARD DUMP AND DISCARD CONVEYOR	SLIMES DAM, RWD AND PIPELINES	DEWATERING INFRASTRUCTURE INCLUDING PIPELINES	NORTH AND SOUTH PITS	WASTE ROCK DUMPS	EXPLOSIVES MAGAZINE
<b>5.2.1</b>	<b>PROTECTION OF SOILS</b>														
5.2.1.1	Strip available topsoil from disturbance footprint areas.	-	Construction Schedule	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
5.2.1.2	Topsoil stockpiles are to be protected from erosion and must not pose a risk of pollution of any water resource.	-	Ongoing	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
5.2.1.3	Implement measures for spill prevention, response and clean-up in accordance with Kolomela Mine Spill Management Procedure.	-	On Implementation Ongoing	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
5.2.1.4	Chemical, hydrocarbon and fuel stores to be contained in bunded areas and spills contained.	-	On Implementation Ongoing	Y	-	-	-	-	-	-	-	-	-	-	-
5.2.1.5	No wastes are to be disposed on site. Wastes are to be temporarily stored within containers and/or within bunded areas and in accordance with regulatory requirements.	GN. 96 of 2013	On Implementation Ongoing	Y	-	-	-	-	-	-	-	-	-	-	-
5.2.1.6	Temporary toilets and ablution facilities to be provided for areas not serviced by sewage treatment works and these are to be regularly maintained and sewage removed for treatment at an authorised facility.	-	On Implementation Ongoing	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
5.2.1.7	Soils contaminated with hydrocarbons are to be bioremediated either in-situ or at the Bioremediation Facility which should be constructed earlier in implementation. In the interim soils to be taken to Kolomela for treatment	-	As required	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
<b>5.2.2</b>	<b>MINIMISE LANDFORM CHANGE (TOPOGRAPHY)</b>														
5.2.2.1	Minimise disturbance due to borrow pit areas. Borrow pits to be limited to the planned footprints of pit areas and waste rock dumps.	-	Ongoing	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
5.2.2.2	Rehabilitate borrow pits to resemble natural landform.	-	On Completion of Construction Activities	Y	Y	Y	Y	Y	Y	Y	Y	Y	-	-	Y
<b>5.2.3</b>	<b>PROTECTION OF GROUNDWATER RESOURCES</b>														
5.2.3.1	Implement measures 5.2.1.3-5.2.1.6.	-	On Implementation Ongoing	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
5.2.3.2	Groundwater monitoring on site and in area of predicted groundwater dewatering impact.	-	Quarterly	SITE AND SURROUNDS											
5.2.3.3	Quarterly groundwater quality monitoring in areas designated for development of areas that may have a contaminant risk i.e. workshops, bulk fuel storage, refuelling areas, stockpile areas, slimes dam and RWD, discard dump, and WRDs.	-	Quarterly	-	Y	-	-	Y	Y	Y	Y	-	Y	Y	Y
<b>5.2.4</b>	<b>PROTECTION OF WATERCOURSES</b>														
5.2.4.1	Implement measures 5.2.1.3-5.2.1.6.	-	On Implementation	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

Action No.	IMPACT MANAGEMENT ACTION	APPLICABLE STANDARD	Scheduling	APPLICABLE ACTIVITIES												
				CONSTRUCTION VILLAGE, LAYDOWN AREAS, WORKSHOPS AND	ADMINISTRATION, ANCILLARY SERVICES, WORKSHOPS	ACCESS ROAD	RAIL LINK, BALLOON AND MAINTENANCE ROAD	PRIMARY AND SECONDARY CRUSHERS AND ROM STOCKPILE	PROCESS PLANT & STOCKPILE AREAS	DISCARD DUMP AND DISCARD CONVEYOR	SLIMES DAM, RWD AND PIPELINES	DEWATERING INFRASTRUCTURE INCLUDING PIPELINES	NORTH AND SOUTH PITS	WASTE ROCK DUMPS	EXPLOSIVES MAGAZINE	
			Ongoing													
5.2.4.2	Divert clean water from any disturbed area by diversion berms and channels.	-	On Implementation Ongoing	Y	Y	-	-	Y	Y	Y	Y	Y	Y	Y	Y	Y
5.2.4.3	Contain run-off from any disturbed area and prevent run-off from entering any watercourse or wetland pan.	-	On Implementation Ongoing	Y	Y	-	-	Y	Y	Y	Y	Y	Y	Y	Y	Y
5.2.4.4	Implement method statements for construction within watercourses to minimise disturbance.	-	Construction within Watercourses	-	-	Y	-	Y	-	Y	Y	Y	Y	Y	Y	-
<b>5.2.5</b>	<b>PROTECTION OF WETLANDS</b>															
5.2.5.1	Wetland pans and catchments to be designated as sensitive sites.	-	On Implementation Ongoing	SITE WIDE												
5.2.5.2	No unnecessary disturbance of wetland areas.	-	On Implementation Ongoing	SITE WIDE												
<b>5.2.6</b>	<b>BIODIVERSITY PROTECTION</b>															
5.2.6.1	Relocate protected plant species where possible.	-	Ahead of Site Clearance	-	-	-	-	-	-	-	-	-	-	Y	Y	
5.2.6.2	Rehabilitation of construction areas and biodiversity not to be used in the future to obtain pre-construction land capability and use.	-	Layout Planning	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
5.2.6.3	Implement fencing designs aimed at promoting internal movement of fauna.	-	On Implementation Ongoing	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
5.2.6.4	Implement underpasses and overpasses to promote movement of fauna.	-	On Implementation Ongoing	-	-	-	-	Y	-	-	Y	Y	-	-	-	
5.2.6.5	Implementation of alien invasive monitoring and management plan.	-	On Implementation Ongoing	SITE WIDE												
5.2.6.6	Continue implementing biomonitoring programme.	-	Every 2 years	SITE WIDE AND DOWNSTREAM												
<b>5.2.7</b>	<b>MINIMISE ATMOSPHERIC EMISSIONS</b>															
5.2.7.1	Wet suppression on construction roads and within areas of work.	-	On Implementation Ongoing	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
5.2.7.2	Upgrade and maintain access roads used for construction. Implement surface wetting until roads are surfaced.	-	On Implementation Ongoing	-	-	Y	-	-	-	-	-	-	-	-	--	-
5.2.7.3	Speed limit of 40 km/hr on site and 60 km/hr on unsurfaced public roads for all vehicles involved in construction.	-	On Implementation Ongoing	-	-	Y	-	-	-	-	-	-	-	-	--	-
5.2.7.4	Surface the R385 up until site access.	-	ASAP	-	-	Y	-	-	-	-	-	-	-	-	-	-
5.2.7.5	On site monitoring of PM <sub>2.5</sub> and PM <sub>10</sub> and dustfall on site and surrounding receptor points.	-	Continuous PM <sub>2.5</sub> & PM <sub>10</sub> Monthly Fallout	SITE AND SURROUNDS												

Action No.	IMPACT MANAGEMENT ACTION	APPLICABLE STANDARD	Scheduling	APPLICABLE ACTIVITIES												
				CONSTRUCTION VILLAGE, LAYDOWN AREAS, WORKSHOPS AND	ADMINISTRATION, ANCILLARY SERVICES, WORKSHOPS	ACCESS ROAD	RAIL LINK, BALLOON AND MAINTENANCE ROAD	PRIMARY AND SECONDARY CRUSHERS AND ROM STOCKPILE	PROCESS PLANT & STOCKPILE AREAS	DISCARD DUMP AND DISCARD CONVEYOR	SLIMES DAM, RWD AND PIPELINES	DEWATERING INFRASTRUCTURE INCLUDING PIPELINES	NORTH AND SOUTH PITS	WASTE ROCK DUMPS	EXPLOSIVES MAGAZINE	
<b>5.2.8</b>	<b>NOISE IMPACTS</b>															
5.2.8.1	All vehicles and machinery must be kept in a high level of maintenance.	-	Ongoing	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
5.2.8.2	Upgrade and maintain access roads.	-	On Implementation and Ongoing													
5.2.8.3	Monitor noise impacts at key receptor points.	-	Annually or in response to complaints	SURROUNDING RECEPTORS												
<b>5.2.9</b>	<b>REDUCE VISUAL IMPACTS</b>															
5.2.9.1	Remove construction infrastructure as soon as not required.	-	On Completion of Construction	Y	-	-	-	-	-	-	-	-	-	-	-	-
5.2.9.2	Construction lighting should not cause light trespass, glare or contribute to night glow. This should be done by shielding and use of yellow rather than blue light.	-	On Implementation Ongoing	Y	Y	Y	Y	Y		Y	Y	Y	Y	Y	Y	Y
5.2.9.3	Visual screening of construction activities.	-	On Implementation Ongoing	Y	Y	-	-	-	-	Y	Y	-	-	-	-	-
<b>5.2.10</b>	<b>PROTECTION OF HERITAGE RESOURCES</b>															
5.2.10.1	LSA Shelters (HKZ 6-11) and LVW1 to be designated as no-go areas. Disturbance of these sites is to be prohibited.	-	On Implementation Ongoing	SITE WIDE												
5.2.10.2	Chance Find Protocol for unearthened fossils.	Heritage Permit	On Implementation Ongoing	-	Y	-	-	Y	Y	-	Y	-	Y	-	-	-
<b>5.2.11</b>	<b>PROTECTION OF LAND USE POTENTIAL AND LAND CAPABILITY</b>															
5.2.11.1	Implement measure 5.2.6.		On Implementation Ongoing	Y	Y	Y	Y	Y		Y	Y	Y	Y	Y	Y	Y
<b>5.2.12</b>	<b>PUBLIC AND LABOUR RELATIONS</b>															
5.2.12.1	Preferential procurement of local service providers.	Kolomela SLP	On Implementation Ongoing	SITE WIDE												
5.2.12.2	Preferential employment of local persons.	Kolomela SLP	On Implementation Ongoing	SITE WIDE												
5.2.12.3	Local employment commitments for contractors in line with Kolomela/Kumba's targets.	Kolomela SLP	On Implementation Ongoing	SITE WIDE												
5.2.12.4	Continue to engage with public through existing structures and forums.	-	On Implementation Ongoing	SITE WIDE												

Action No.	IMPACT MANAGEMENT ACTION	APPLICABLE STANDARD	Scheduling	APPLICABLE ACTIVITIES										
				CONSTRUCTION VILLAGE, LAYDOWN AREAS, WORKSHOPS AND	ADMINISTRATION, ANCILLARY SERVICES, WORKSHOPS	ACCESS ROAD	RAIL LINK, BALLOON AND MAINTENANCE ROAD	PRIMARY AND SECONDARY CRUSHERS AND ROM STOCKPILE	PROCESS PLANT & STOCKPILE AREAS	DISCARD DUMP AND DISCARD CONVEYOR	SLIMES DAM, RWD AND PIPELINES	DEWATERING INFRASTRUCTURE INCLUDING PIPELINES	NORTH AND SOUTH PITS	WASTE ROCK DUMPS
5.2.12.5	Public Complaints to be addressed through the Kolomela Public Complaints Procedure.	Kolomela's Complaints Procedure	On Implementation Ongoing	SITE WIDE										

### 5.3 Mine Operations

Action No.	IMPACT MANAGEMENT ACTION	APPLICABLE STANDARD	Scheduling	APPLICABLE ACTIVITIES											
				CONSTRUCTION VILLAGE, LAYDOWN AREAS, WORKSHOPS AND	ADMINISTRATION, ANCILLARY SERVICES, WORKSHOPS	ACCESS ROAD	RAIL LINK, BALLOON AND MAINTENANCE ROAD	PRIMARY AND SECONDARY CRUSHERS AND ROM STOCKPILE	PROCESS PLANT & STOCKPILE AREAS	DISCARD DUMP AND DISCARD CONVEYOR	SLIMES DAM, RWD AND PIPELINES	DEWATERING INFRASTRUCTURE INCLUDING PIPELINES	NORTH AND SOUTH PITS	WASTE ROCK DUMPS	EXPLOSIVES MAGAZINE
<b>5.3.1</b>	<b>PROTECTION OF SOILS</b>														
5.3.1.1	Strip available topsoil ahead of expansion of pits and WRDs.	-	As mining proceeds	-	-	-	-	-	-	-	-	-	Y	Y	-
5.3.1.2	Topsoil stockpiles are to be protected from erosion and must not pose a risk of pollution of any water resource.	-	Throughout Operations	-	-	-	-	-	-	-	-	-	Y	Y	-
5.3.1.3	Implement measure for spill prevention, response and clean-up in accordance with Kolomela Mine Spill Management Procedure.	-	Throughout Operations	-	Y	-	-	Y	Y	Y	Y	-	Y	Y	Y
5.3.1.4	Hazardous chemical, hydrocarbon and fuel stores to be contained in bunded areas and spills contained.	-	Ongoing	-	Y	-	-	Y	Y	Y	Y	-	Y	Y	Y
5.3.1.5	No wastes are to be disposed on site. Wastes are to be stored on site in accordance with regulatory requirements.	GN. 96 of 2013	Throughout Operations	-	Y	-	-	-	-	-	-	-	-	-	-
5.3.1.6	Soils contaminated with hydrocarbons are to be bioremediated either in-situ or at the Bioremediation Facility.	-	As required	-	Y	-	-	Y	Y	Y	Y	-	Y	Y	Y
<b>5.3.2</b>	<b>MINIMISE LANDFORM CHANGE (TOPOGRAPHY)</b>														
5.3.2.1	Maximise opportunities for the in-pit dumping of waste rock.	-	Ongoing	-	-	-	-	-	-	-	-	-	Y	-	-
5.3.2.2	Ongoing rehabilitation to be undertaken on slopes of WRDs in accordance with Kolomela Rehabilitation Strategy.	-	Ongoing	-	-	-	-	-	-	-	-	-	-	Y	-
<b>5.3.3</b>	<b>PROTECTION OF GROUNDWATER RESOURCES</b>														
5.3.3.1	Implement measures 5.3.1.3-5.3.1.5.	-	Throughout Operations	-	Y	-	-	Y	Y	Y	Y	-	Y	Y	Y
5.3.3.2	Annual update of groundwater model to predict groundwater impacts.	-	Annually	-	-	-	-	-	-	-	-	-	Y	-	-



Action No.	IMPACT MANAGEMENT ACTION	APPLICABLE STANDARD	Scheduling	APPLICABLE ACTIVITIES											
				CONSTRUCTION VILLAGE, LAYDOWN AREAS, WORKSHOPS AND	ADMINISTRATION, ANCILLARY SERVICES, WORKSHOPS	ACCESS ROAD	RAIL LINK, BALLOON AND MAINTENANCE ROAD	PRIMARY AND SECONDARY CRUSHERS AND ROM STOCKPILE	PROCESS PLANT & STOCKPILE AREAS	DISCARD DUMP AND DISCARD CONVEYOR	SLIMES DAM, RWD AND PIPELINES	DEWATERING INFRASTRUCTURE INCLUDING PIPELINES	NORTH AND SOUTH PITS	WASTE ROCK DUMPS	EXPLOSIVES MAGAZINE
5.3.3.3	Quarterly monitoring of on-site boreholes and boreholes in potential dewatering impact zone.	-	Quarterly	-	-	-	-	-	-	-	-	-	Y	-	-
5.3.3.4	Compensation if surrounding landowners are affected by dewatering in accordance with Kolomela's Memorandum of Understanding.	-	As required	-	-	-	-	-	-	-	-	-	Y	-	-
5.3.3.5	Quarterly groundwater quality monitoring in areas designated for development specific to those areas that may have a contaminant risk i.e. workshops, bulk fuel storage, refuelling areas, slimes dam and RWD, discard dump, WRDs.	-	Quarterly	-	Y	-	-	Y	Y	Y	Y	-	Y	Y	Y
<b>5.3.4</b>	<b>PROTECTION OF WATERCOURSES</b>														
5.3.4.1	Implement measures 5.3.1.3-5.3.1.5.	-	On Implementation	-	Y	Y	Y	Y	Y	Y	Y	-	Y	Y	Y
5.3.4.2	Divert clean water from any dirty water area by diversion berms and channels.	-	On Implementation	-	Y	-	-	Y	Y	Y	Y	-	Y	Y	Y
5.3.4.3	Contain run-off from dirty water area and prevent run-off from entering any watercourse or wetland pan.	-	On Implementation	-	Y	-	-	Y	Y	Y	Y	-	Y	Y	Y
5.3.4.4	Maintain a free board of 800 mm on any PCD or RWD to prevent overflow in the case of a major storm event.	-	Ongoing	-	Y	-	-	Y	Y	Y	-	-	-	Y	Y
5.3.4.5	All water management channels are to be kept free of sediment and vegetation to ensure that the design capacity is maintained.	-	Ongoing	-	Y	-	-	Y	Y	Y	Y	-	Y	Y	Y
5.3.4.6	Clean water management berms and channels are to be monitored for erosion and remediated as required.	-		-	Y	-	-	Y	Y	Y	Y	-	Y	Y	Y
<b>5.3.5</b>	<b>PROTECTION OF WETLANDS</b>														
5.3.5.1	Wetland pans and catchments to be designated as sensitive sites	-	Ongoing	GENERAL											
5.3.5.2	No unnecessary disturbance of wetland areas.	-	Ongoing	GENERAL											
<b>5.3.6</b>	<b>BIODIVERSITY PROTECTION</b>														
5.3.6.1	Update permits for the destruction and/or relocation of protected species.	-	Annually	-	-	-	-	-	-	-	-	-	Y	Y	-
5.3.6.2	Relocate protected plant species where possible.	-	Ahead of disturbance	-	-	-	-	-	-	-	-	-	Y	Y	-
5.3.6.3	Implement 5.3.2.2.	-	Ongoing	-	-	-	-	-	-	-	-	-	-	Y	-
5.2.6.4	Maintain fencing designs aimed at promoting internal movement of fauna.	-	Ongoing	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
5.2.6.5	Maintain underpasses and overpasses to promote movement of fauna.	-	Ongoing	Y	-	-	-	Y	-	-	Y	Y	-	-	-
5.2.6.6	Ongoing rehabilitation of WRDs in accordance with Kolomela Rehabilitation Strategy aimed at achieving final land capability and land use objectives.	-													
5.3.6.7	Implementation of alien invasive monitoring and management plan.	-	Ongoing	SITE WIDE											
5.3.6.8	Continue implementing biomonitoring programme.	-	Every 2 years	SITE WIDE AND DOWNSTREAM											

Action No.	IMPACT MANAGEMENT ACTION	APPLICABLE STANDARD	Scheduling	APPLICABLE ACTIVITIES												
				CONSTRUCTION VILLAGE, LAYDOWN AREAS, WORKSHOPS AND	ADMINISTRATION, ANCILLARY SERVICES, WORKSHOPS	ACCESS ROAD	RAIL LINK, BALLOON AND MAINTENANCE ROAD	PRIMARY AND SECONDARY CRUSHERS AND ROM STOCKPILE	PROCESS PLANT & STOCKPILE AREAS	DISCARD DUMP AND DISCARD CONVEYOR	SLIMES DAM, RWD AND PIPELINES	DEWATERING INFRASTRUCTURE INCLUDING PIPELINES	NORTH AND SOUTH PITS	WASTE ROCK DUMPS	EXPLOSIVES MAGAZINE	
<b>5.3.7</b>	<b>MINIMISE ATMOSPHERIC EMISSIONS</b>															
5.3.7.1	Wet suppression to be undertaken on temporary site roads.	-	Ongoing	-	-	-	-	-	-	-	-	-	-	Y	Y	-
5.3.7.2	Chemical suppression on permanent unsurfaced roads on site.	-	Ongoing	-	Y	-	Y	Y	Y	Y	Y	Y	-	Y	Y	Y
5.3.7.3	Speed limit of 40 km/hr on site.	-	Ongoing	-	-	Y	-	-	-	-	-	-	-	-	-	-
5.3.7.4	Vegetation of exposed slope residue stockpiles in accordance with Kolomela Rehabilitation Strategy.	-	ASAP Ongoing	-	-	-	-	-	-	Y	Y	-	-	-	Y	-
5.3.7.5	Maintain dust extraction and dust suppression systems in proper working order.	-	Ongoing	-	-	-	-	Y	Y	Y	-	-	-	-	-	-
5.3.7.6	On site monitoring of PM <sub>2.5</sub> and PM <sub>10</sub> and dustfall on site and surrounding receptor points.	-	Continuous PM <sub>2.5</sub> & PM <sub>10</sub> Monthly Fallout	SITE AND SURROUNDS												
<b>5.3.8</b>	<b>NOISE IMPACTS</b>															
5.3.8.1	All vehicles and machinery must be kept in a high level of maintenance.	-	Ongoing	-	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
5.3.8.2	Maintain site roads.	-	Ongoing													
5.3.8.3	Monitor noise impacts at key receptor points.	-	Annually or in response to complaints	SURROUNDING RECEPTORS												
<b>5.3.9</b>	<b>REDUCE VISUAL IMPACTS</b>															
5.3.9.1	Implement 5.3.2.		As Required	-	-	-	-	-	-	Y	Y	-	-	Y	-	
5.3.9.2	Lighting should not cause light trespass, glare or contribute to night glow. This can be done by shielding and use of yellow rather than blue light.	-	On Implementation	-	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
5.3.9.3	Visual screening from key receptor areas.	-	On Implementation	Y	Y	-	-	-	-	Y	Y	-	-	-	-	-
<b>5.3.10</b>	<b>PROTECTION OF HERITAGE RESOURCES</b>															
5.3.10.1	LSA Shelters (HKZ 6-11) and LVW1 to be designated as no-go areas. Disturbance of these sites is to be prohibited.	-	Ongoing	SITE WIDE												
5.3.10.2	Chance Find Protocol for unearthed fossils.	Heritage Permit	On Implementation	-	-	-	-	-	-	-	-	-	-	Y	-	-
<b>5.3.11</b>	<b>PROTECTION OF LAND USE POTENTIAL AND LAND CAPABILITY</b>															
5.3.11.1	Ongoing rehabilitation of WRDs aimed at achieving sustainable vegetation resembling the cover and composition of the pre-mining and surrounding environment and suitable for livestock grazing and maintenance of wildlife.	-		Y	Y	Y	Y	Y		Y	Y	Y	Y	Y	Y	Y
<b>5.3.12</b>	<b>MAXIMISE LOCAL EMPLOYMENT</b>															
5.3.12.1	Preferential procurement of local service providers.	Kolomela SLP	Ongoing	SITE WIDE												

Action No.	IMPACT MANAGEMENT ACTION	APPLICABLE STANDARD	Scheduling	APPLICABLE ACTIVITIES												
				CONSTRUCTION VILLAGE, LAYDOWN AREAS, WORKSHOPS AND	ADMINISTRATION, ANCILLARY SERVICES, WORKSHOPS	ACCESS ROAD	RAIL LINK, BALLOON AND MAINTENANCE ROAD	PRIMARY AND SECONDARY CRUSHERS AND ROM STOCKPILE	PROCESS PLANT & STOCKPILE AREAS	DISCARD DUMP AND DISCARD CONVEYOR	SLIMES DAM, RWD AND PIPELINES	DEWATERING INFRASTRUCTURE INCLUDING PIPELINES	NORTH AND SOUTH PITS	WASTE ROCK DUMPS	EXPLOSIVES MAGAZINE	
5.3.12.2	Preferential employment of local persons as positions become available.	Kolomela SLP	Ongoing	SITE WIDE												
5.3.12.3	Continue with capacity building and skills development programmes.	Kolomela SLP	Ongoing													
<b>5.3.13</b>	<b>SUPPORT OF LOCAL ECONOMIC DEVELOPMENT</b>															
5.3.13.1	Identification of LED needs through participation in IDP and LED Forums and include in updates of SLP.	Kolomela SLP	Ongoing	SITE WIDE												
<b>5.3.14</b>	<b>SUPPORT TO MUNICIPALITY AND SOCIAL SERVICES</b>															
5.3.14.1	Continued support and collaboration with municipality institutions and organisations involved in combatting social ills.			SITE WIDE												
<b>5.3.15</b>	<b>PUBLIC RELATIONS</b>															
5.3.15.1	Continue to engage with public through existing structures and forums.		Ongoing	SITE WIDE												
5.3.15.2	Public Complaints to be addressed through the Kolomela Public Complaints Procedure.	Kolomela's Complaints Procedure	Ongoing	SITE WIDE												
<b>5.3.16</b>	<b>POTENTIALLY IMPACTED PARTIES</b>															
5.3.16.1	Continued communication of monitoring results and predicted impacts with potentially affected parties through existing forums.		Ongoing	IMPACTED NEIGHBOURS												
5.3.16.2	Memorandum of Understanding on addressing impacts on neighbouring water users applicable to Kolomela Mine to be applied to Heuningkranz.	Kolomela MOU	As required	IMPACTED NEIGHBOURS												

## 5.4 Decommissioning and Closure

Action No.	IMPACT MANAGEMENT ACTION	APPLICABLE STANDARD	Scheduling	APPLICABLE ACTIVITIES											
				CONSTRUCTION VILLAGE, LAYDOWN AREAS, WORKSHOPS	ADMINISTRATION, ANCILLARY SERVICES, WORKSHOPS	ACCESS ROAD	RAIL LINK, BALLOON AND MAINTENANCE ROAD	PRIMARY AND SECONDARY CRUSHERS AND ROM	PROCESS PLANT & STOCKPILE AREAS	DISCARD DUMP AND DISCARD CONVEYOR	SLIMES DAM, RWD AND PIPELINES	DEWATERING INFRASTRUCTURE INCLUDING PIPELINES	NORTH AND SOUTH PITS	WASTE ROCK DUMPS	EXPLOSIVES MAGAZINE
<b>5.4.1</b>	<b>PROTECTION OF SOILS</b>														
5.4.1.1	All available topsoil or suitable growth medium (where soils are not available) will be replaced on disturbed footprints and waste dump slopes.	-	Commence during operations where possible & complete during decommissioning	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
5.4.1.2	The fertility of the topsoil is to be investigated and augmented as required.	-	Commence during operations where possible & complete during decommissioning	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
5.4.1.3	Areas where contamination of soil is expected, are to be investigated and remediated as required.	-	During decommissioning	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
5.4.1.4	Erosion of rehabilitated surfaces is to be monitored and remediated as required.	-	During decommissioning	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
<b>5.4.2</b>	<b>MINIMISE LANDFORM CHANGE (TOPOGRAPHY)</b>														
5.4.2.1	The waste rock dumps, slimes dam and discard dump to be rehabilitated in accordance with the Rehabilitation Strategy.	-	Commence during operations where possible and complete during decommissioning	-	-	-	-	-	-	Y	Y	-	-	Y	-
5.4.2.2	All infrastructure (not to be used in the future, through an agreement) will be removed and all surfaces to be reshaped to the pre-mining contours.	-	During decommissioning	-	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
5.4.2.3	Infrastructure platforms are to be landscaped to resemble the surrounding landscape.	-	During decommissioning	Y	Y	Y	Y	Y	Y	-	-	Y	-	-	Y
<b>5.4.3</b>	<b>PROTECTION OF GROUNDWATER RESOURCES</b>														
5.4.3.1	All sources of residue, soils and sediment that may present a contamination risk are to be removed from site as part of decommissioning.	-	During decommissioning	-	Y	-	-	Y	Y	Y	Y	-	Y	Y	Y
5.4.3.2	Groundwater monitoring is to continue until closure.	-	Quarterly	-	-	-	-	-	-	-	-	-	Y	-	-
<b>5.4.4</b>	<b>PROTECTION OF WATERCOURSES</b>														
5.4.4.1	Diversion berms, channels, PCDs and RWDs are to be removed only when it can be demonstrated that rehabilitated surfaces are stable and not at risk of erosion.	-	During decommissioning	-	Y	-	-	Y	Y	Y	Y	-	Y	Y	Y
5.4.4.2	Diversions of watercourses around impedances such as WRDS and pits areas are not to be removed as part of decommissioning and remain in place post-closure to ensure that run-off returns to the natural catchments.	-	Ongoing	-	Y	-	-	Y	Y	Y	Y	-	Y	Y	Y

Action No.	IMPACT MANAGEMENT ACTION	APPLICABLE STANDARD	Scheduling	APPLICABLE ACTIVITIES												
				CONSTRUCTION VILLAGE, LAYDOWN AREAS, WORKSHOPS	ADMINISTRATION, ANCILLARY SERVICES, WORKSHOPS	ACCESS ROAD	RAIL LINK, BALLOON AND MAINTENANCE ROAD	PRIMARY AND SECONDARY CRUSHERS AND ROM	PROCESS PLANT & STOCKPILE AREAS	DISCARD DUMP AND DISCARD CONVEYOR	SLIMES DAM, RWD AND PIPELINES	DEWATERING INFRASTRUCTURE INCLUDING PIPELINES	NORTH AND SOUTH PITS	WASTE ROCK DUMPS	EXPLOSIVES MAGAZINE	
<b>5.4.5</b>	<b>PROTECTION OF WETLANDS</b>															
5.4.5.1	Wetland pans and catchments to be designated as sensitive sites and protected during decommissioning.	-	Ongoing	GENERAL												
5.4.5.2	No unnecessary disturbance of wetland areas.	-	Ongoing	GENERAL												
<b>5.4.6</b>	<b>BIODIVERSITY PROTECTION</b>															
5.4.6.1	Rehabilitation in accordance with Kolomela Rehabilitation Strategy aimed at achieving final land capability and land use objectives.	-	Annually	-	-	-	-	-	-	-	-	-	-	Y	Y	-
5.4.6.2	Removal of internal fences and linear infrastructure to promote the movement of animals on the site.	-	Ahead of disturbance	-	-	-	-	-	-	-	-	-	-	Y	Y	-
5.4.6.3	Implementation of alien invasive monitoring and management plan until closure.	-	Ongoing	SITE WIDE												
5.3.6.4	Continue implementing biomonitoring programme until closure.	-	Every 2 years	SITE WIDE AND DOWNSTREAM												
<b>5.4.7</b>	<b>MINIMISE ATMOSPHERIC EMISSIONS</b>															
5.4.7.1	Create self-sustaining vegetation communities on rehabilitated footprints, mine residue and WRDs.	-	Ongoing	-	-	-	-	-	-	-	-	-	-	Y	Y	-
5.4.7.2	Sources of potential residual air quality impacts are to be investigated and actions implemented as required.	-	Ongoing	-	Y	-	Y	Y	Y	Y	Y	-	Y	Y	Y	Y
5.4.7.3	Wet suppression to be used during rehabilitation in work areas prone to entrainment of dust.	-	Ongoing	-	-	Y	-	-	-	-	-	-	-	-	-	-
<b>5.4.8</b>	<b>REDUCE VISUAL IMPACTS</b>															
5.3.8.1	All infrastructure (not to be used in the future, through an agreement) will be removed and all surfaces to be reshaped to the pre-mining contours.	-	During decommissioning													
5.3.8.2	Implement 5.4.2 .	-	As Required	-	-	-	-	-	-	Y	Y	-	-	Y	-	-
<b>5.4.9</b>	<b>PROTECTION OF HERITAGE RESOURCES</b>															
5.3.9	LSA Shelters (HKZ 6-11) and LVW1 to be designated as no-go areas. Disturbance of these sites is to be prohibited.	-	Ongoing	SITE WIDE												
<b>5.4.10</b>	<b>PROTECTION OF LAND USE POTENTIAL AND LAND CAPABILITY</b>															
5.4.10.1	Rehabilitation aimed at achieving sustainable vegetation resembling the cover and composition of the pre-mining and surrounding environment and suitable for livestock grazing and maintenance of wildlife.	-	On Closure	Y	Y	Y	Y	Y		Y	Y	Y	Y	Y	Y	Y
<b>5.4.11</b>	<b>MAXIMISE LOCAL EMPLOYMENT</b>															
5.4.11.1	Preferential procurement of local service providers during decommissioning.	-	During Decommissioning	SITE WIDE												
5.4.11.2	Preferential employment of local persons involved in decommissioning.	-	During Decommissioning	SITE WIDE												

Action No.	IMPACT MANAGEMENT ACTION	APPLICABLE STANDARD	Scheduling	APPLICABLE ACTIVITIES										
				CONSTRUCTION VILLAGE, LAYDOWN AREAS, WORKSHOPS	ADMINISTRATION, ANCILLARY SERVICES, WORKSHOPS	ACCESS ROAD	RAIL LINK, BALLOON AND MAINTENANCE ROAD	PRIMARY AND SECONDARY CRUSHERS AND ROM	PROCESS PLANT & STOCKPILE AREAS	DISCARD DUMP AND DISCARD CONVEYOR	SLIMES DAM, RWD AND PIPELINES	DEWATERING INFRASTRUCTURE INCLUDING PIPELINES	NORTH AND SOUTH PITS	WASTE ROCK DUMPS
5.4.11.3	Local employment commitments for contractors in line with Kolomela/Kumba's targets.	-	During Decommissioning	SITE WIDE										
5.4.11.4	Continue to engage with public through existing structures and forums.	-	Ongoing	SITE WIDE										

## **6. FINANCIAL PROVISION**

### **6.1 Closure objectives and the extent to which they have been aligned with the baseline environment**

The overall rehabilitation goal for Kolomela Mine is to undertake concurrent rehabilitation in order to stabilise a land capability that is amendable to the local habitat types that is suitable for the sustaining of game farming as the next land use over the mine site, post closure. Furthermore, for the purposes of Heuningkranz, the objectives should be expanded to ensure that the land is capable of sustaining livestock grazing and support wildlife. The aim should be to obtain sustainable vegetation that resembles the pre-mining or surrounding environment in terms of cover and composition.

### **6.2 Confirmation of consultation of closure objectives with landowners**

The Environmental Impact Assessment Report and the Environmental Management Programme will be subjected to a public participation process in accordance with Regulations 41 of the EIA Regulations (GNR. 982 of 4 December 2014, as amended). The annual rehabilitation compiled in terms of Appendix 3 of the Financial Provision Regulations (GNR. 1147 of 20 November 2015 as amended by GN. 1314 of 26 October 2016) will be compiled by Kolomela Mine including Heuningkranz within 39 months after the coming into effect of the regulations and will be updated annually thereafter. This report will be made available for public review and comment on an annual basis.

### **6.3 Rehabilitation Plan**

A Site-Wide Operational Rehabilitation Strategy for Kolomela Mine is provided in Part C - Appendix 15. The strategy will be updated as necessary and applied to Heuningkranz.

Kolomela Mine will submit an annual rehabilitation plan compiled in terms of Appendix 3 of the Financial Provision Regulations within 39 months after the coming into effect of the regulations. In accordance with the regulations the rehabilitation plan will be updated annually.

The following key rehabilitation objectives are applicable to Heuningkranz:

- Rehabilitation will be undertaken in accordance with the Kolomela Rehabilitation Strategy as authorised at the time.
- Establish a safe, stable, non-polluting healthy environment with predominantly grazing potential
- Topsoil is to be stripped in all areas of disturbance and conserved for use in rehabilitation activities.

- Spill prevention and response is to be in place, aimed at the protection of soils and water resources. Soils contaminated with hydrocarbons are to be bioremediated and used for the purposes of rehabilitation.
- The opportunity for in-pit dumping of waste rock should be maximised through future mine planning.
- All infrastructure is to be removed at closure and footprint areas to be rehabilitated.
- Waste rock dumps rehabilitation should be maximised during the life of the operation, with the reshaping of benches to resemble natural landforms and slopes not susceptible to erosion. The Kolomela Rehabilitation Strategy provides for a final slope of 18°.
- Mine residue stockpiles including the discard dump and slimes dam should also be reshaped to resemble a natural landform.
- All areas are to be vegetated with an indigenous (to the local area) vegetation mix that is equal or better in terms of grazing potential when compared to pre-mining conditions but suitable to the rehabilitation conditions.

#### **6.4 Explain how the rehabilitation plan is compatible with the closure objectives**

The achievement of the rehabilitation objects will allow for the successful implementation of the final land-use plan which will allow for livestock grazing (currently Kolomela's final land-use plan is game farming) and the maintenance of wildlife.

#### **6.5 Quantum of Financial Provision required to manage and rehabilitate the environment**

The Heuningkranz Project is planned for commencement in 2031. Current activities at the site involve prospecting activities by SIOC under the existing Prospecting Right (File Ref. 10506PR). ABSA Capital submitted a financial guarantee of R 2 486 101.90 (excl VAT) to the DMR for the Heuningkranz prospecting area in 2012. Application has been made in terms of Section 102 for the inclusion of the Heuningkranz Project area into the Kolomela mining right area. The inclusion of Heuningkranz into Kolomela Mine would mean that any closure liability associated with disturbance at Heuningkranz would need to be included in the annual financial provision calculation for rehabilitation at Heuningkranz.

The latest calculation of the financial provision for rehabilitation of activities at Heuningkranz (November, 2017) is included in Part C, Appendix 14 and summarised in Table 6-1. This presents the current liability at Heuningkranz and is estimated at **R 1 797 405**.

**TABLE 6-1: CURRENT CLOSURE LIABILITY HEUNINGKRA NZ PROJECT**



<b>Current Closure Liability Heuningkranz (10506PR)</b>	
<b>Description</b>	<b>Amount</b>
Capping & casing of boreholes	R 30,856.00
General surface rehabilitation	R 288,144.00
Removal of sludge and drill chips or residue	R 75,895.00
Placement of drill socks	R 36,120.00
Testing of boreholes for contamination with hydrocarbons	R 68,400.00
Surface Maintenance of rehabilitated sites including:	
Ripping of compacted areas	R 83,022.00
Erosion repair	R 41,511.00
Physical removal of weed and invasive species	R 181,353.75
Flattening of mounds	R 83,022.00
Removal of rocks and calcrete	R 120,902.50
Brushpacking	R 20,755.50
Removal of drill chips or residue	R 208,976.00
Augmentation of growth as required (seeding and fertilization)	R 17,145.55
Remediation of downhole contamination of sites	R 283,042.00
Closure Planning	R 94,860.00
Contingencies (10%)	R 163,400.53
<b>Total</b>	<b>R 1,797,405.83</b>

### 6.5.1 LOM Closure Provision

EXM Advisory Services has conducted a detailed closure estimate for the Heuningkranz Project. The Closure Costing Report is provided as Part C, Appendix 14. The cost has been based on the Kolomela Closure Costing of July 2017 and updated to include the decommissioning and rehabilitation of infrastructure associated with the Heuningkranz Project. An additional **R241 081 229** is required for the final rehabilitation of Heuningkranz. A summary of the LOM Closure Costs for Kolomela Mine and Heuningkranz are provided in Table 6-2.

**TABLE 6-2: LOM CLOSURE COSTS FOR PROPOSED KOLOMELA MINE & HEUNINGKRA NZ PROJECT**

<b>Area</b>	<b>Kolomela LOM (2034)</b>	<b>Heuningkranz LOM (2048)</b>
Buildings & Structures	R 35,330,172.64	R 11,461,435.29
Plant & Related Infrastructure	R 122,267,961.83	R 68,642,636.70
Pits Areas	R 56,570,319.17	R 32,102,168.60
Mine Residue Deposits	R 34,935,580.83	R 58,582,902.41
Overland & General Infrastructure	R 51,680,323.37	R 31,107,086.43
Maintenance & Monitoring	R 57,488,368.48	R 39,185,000.00
<b>Total</b>	<b>R 358,272,726.32</b>	<b>R 241,081,229.43</b>

### 6.6 Confirm how the financial provision will be provided

The quantum of the financial provision for premature closure is updated on an annual basis. Kolomela Mine undertakes to submit an annual update of the financial provision in accordance with the Financial Provision Regulations (GN. 1147 of 20 November 2015, as amended by GN.

1314 of 26 October 2016), within 39 months after the coming into effect of the regulations, and annually thereafter submit updated rehabilitation plan in support of an updated calculation of the financial provision. In 2031 the liability will need to be updated to include the Heuningkranz Project.

The inclusion of Heuningkranz into Kolomela Mine would mean that any closure liability associated with disturbance at Heuningkranz would need to be included in the annual financial provision calculation for rehabilitation at Heuningkranz. The latest calculation of the environmental liabilities associated with Heuningkranz is ~ **R 1 797 405**. Should the current guarantees for Kolomela not be adequate to cover the additional liability, an additional guarantee is to be obtained to cover the premature closure liability associated with current disturbance at Heuningkranz. This liability is currently covered by a guarantee issued against the prospecting right.

## 7. MECHANISMS FOR MONITORING COMPLIANCE

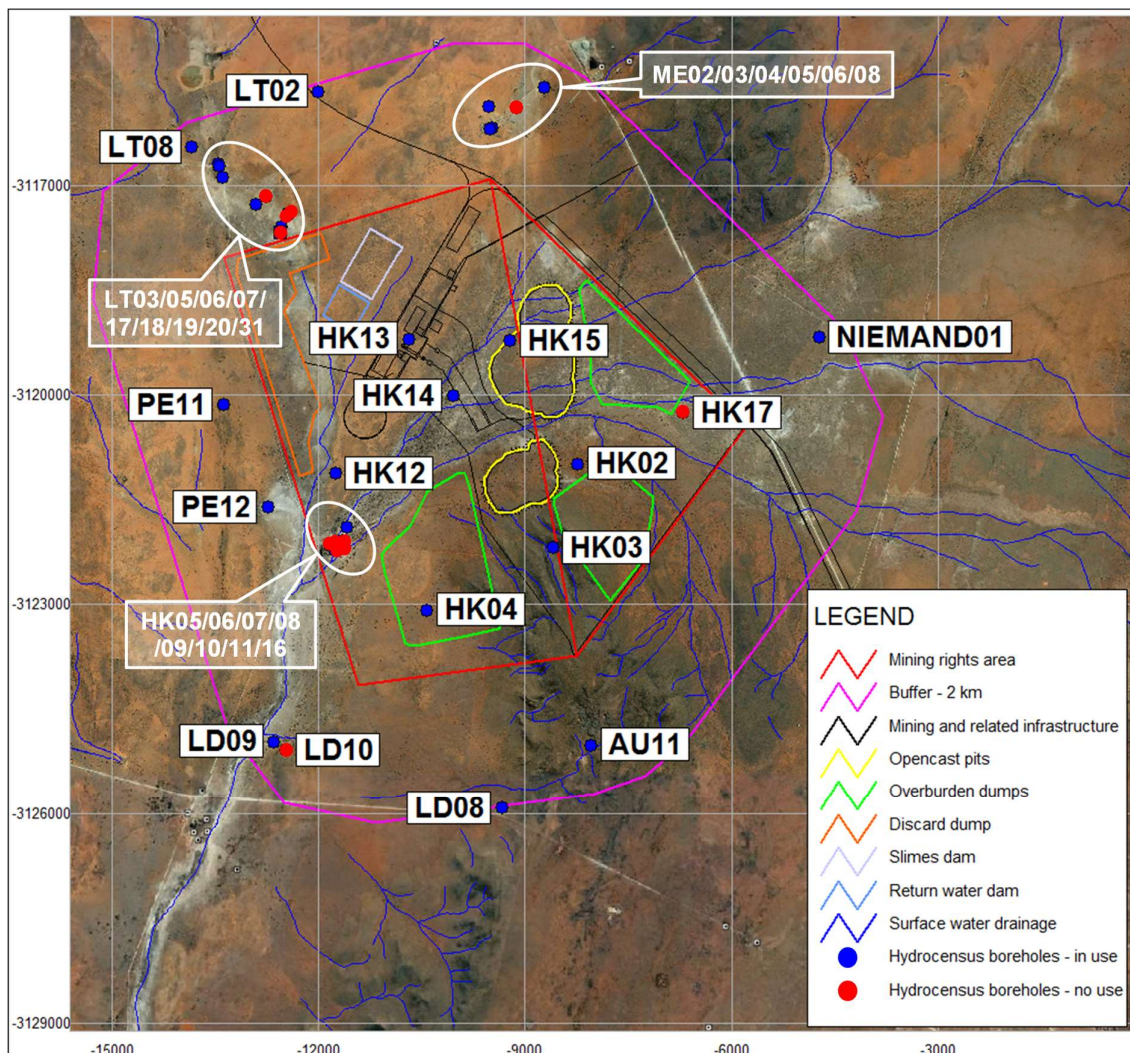
### 7.1 Groundwater monitoring

It is recommended that groundwater monitoring should take place annually on site and at receptor boreholes within 2 km of the site boundary (see Figure 7-1). Groundwater monitoring frequency should be increased to quarterly 1 year prior to the commencement of construction and pre-stripping activities at the site.

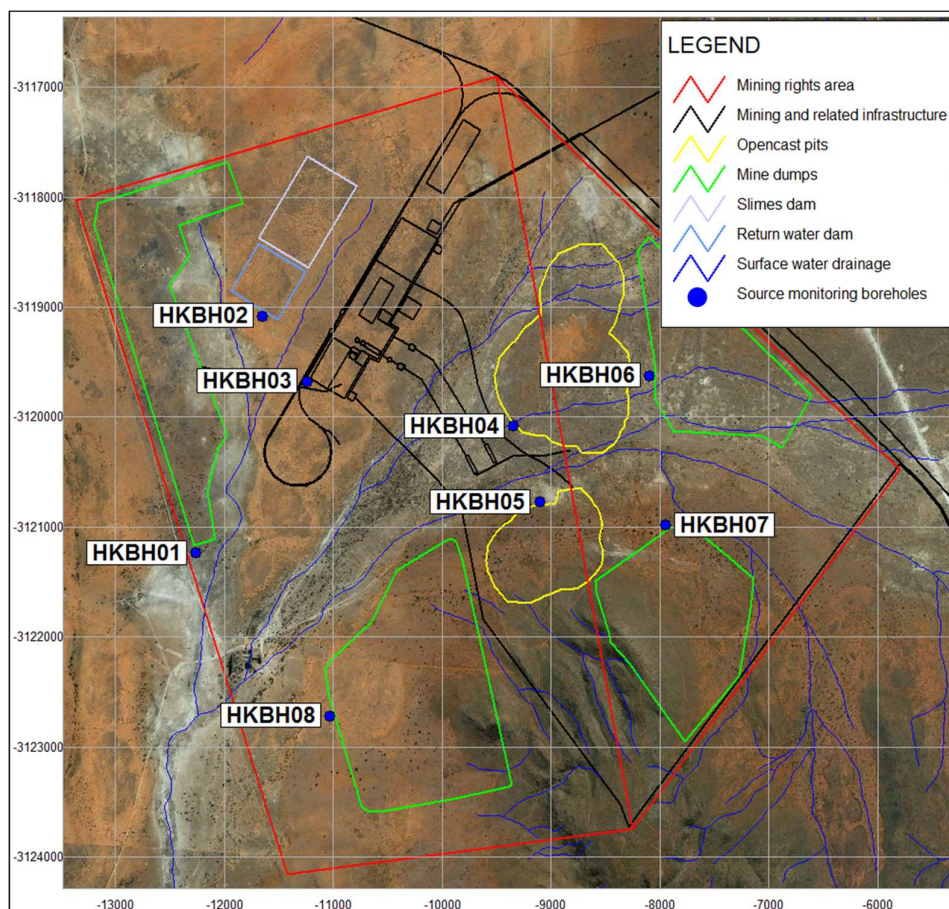
Information is to be collated for all properties (prior to implementation) within the predicted area of impact as to: location of water abstraction points and associated infrastructure, current water use at each of the points, any proposed future uses that the farmer may have planned.

Data loggers at strategic points are to be put in place prior to the implementation of the project.

In addition, monitoring should take place from potential contaminations sources (see Figure 7-2), commencing at least 1 year prior to implementation and undertaken on a quarterly basis.



**FIGURE 7-1: POSITION OF USER GROUNDWATER MONITORING POINTS**



Source: Groundwater Complete (January 2018)

**FIGURE 7-2: POSITION OF PROPOSED SOURCE MONITORING**

It must be mentioned that this monitoring schedule should be re-assessed by a qualified geohydrologist at a later stage in terms of stability of water levels and quality. If the sampling programme requires changes, it should be done so in consultation with the appropriate authorities. Groundwater samples should be analysed at a SANAS accredited laboratory for chemical and physical constituents normally associated with iron ore mining and related activities; see Table 7-1.

**TABLE 7-1: GROUNDWATER CONSTITUENTS FOR ROUTINE ANALYSIS**

Monitoring	Variable
Annually Quarterly 1 year prior to implementation	EC, pH, TDS, total hardness, total alkalinity, calcium, magnesium, sodium, potassium, chloride, sulphate, fluoride, nitrate, iron, manganese, aluminium and turbidity. <i>E. coli</i> should also be included to assess impact on reserve requirements.

Monitoring boreholes should be closed and secured at all times. Borehole depths should be measured quarterly, and boreholes purged before sampling, as needed.

The impact of activities of the mine waste water quality containment facilities shall not exceed the groundwater quality chemistry detailed in Table 7-2 which presents the water quality reserve for the area (Kolomela Water Use Licence, 13 March 2016).

**TABLE 7-2: GENERAL CHEMISTRY OF WATER RESOURCE**

Chemical Parameter	Target Water Quality Ranges	
	Units	Class II
pH		4-5 & >9.5-10
EC	mS/m	150-370
TDS	mg/l	1000-2450
Calcium	mg/l	150-300
Magnesium	mg/l	70-100
Sodium	mg/l	200-400
Chloride	mg/l	200-600
Sulfate	mg/l	400-600
Nitrate	mg/l	10-20
Fluoride	mg/l	1.5-3.5
Faecal coliforms	Counts/100 ml	1-10

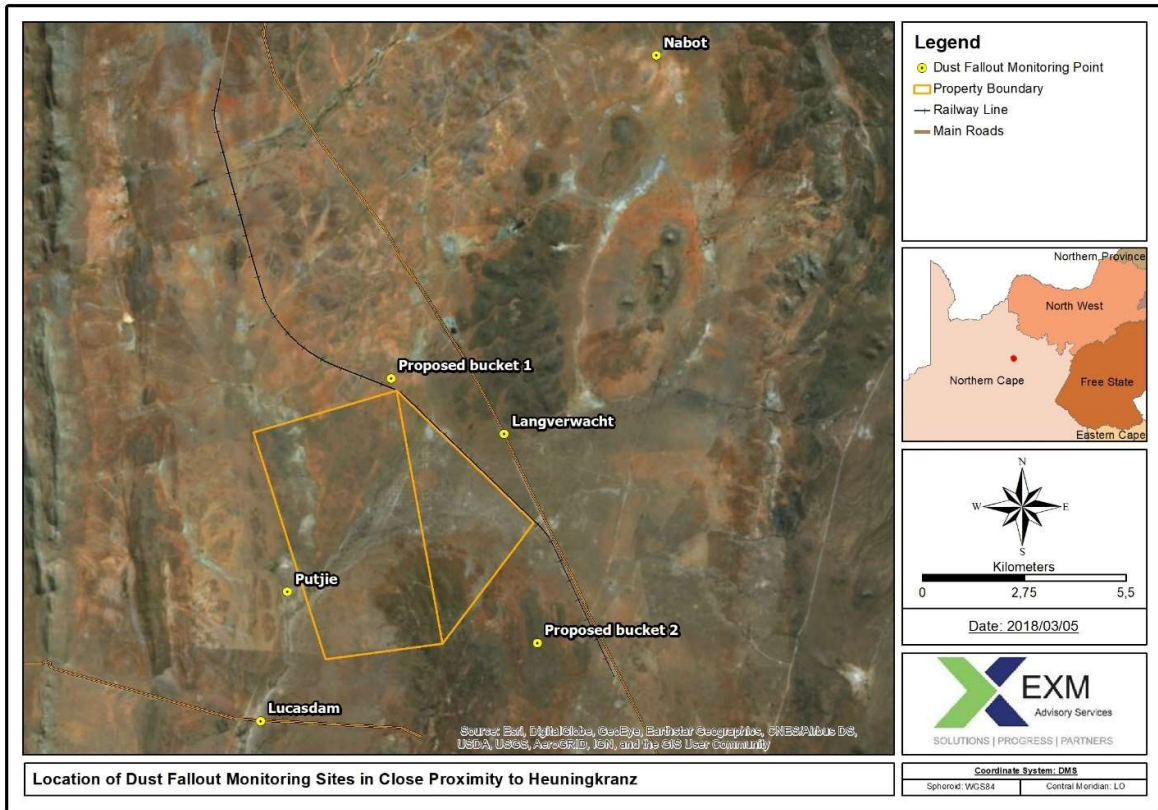
It is also recommended that Laboratory results should be analysed against the target water quality guidelines for domestic use, the aquatic environment, livestock watering and irrigation (according to the South African National Standards for drinking water; SANS 241:2015).

The volumes of water used on site are to be monitored on a monthly basis. These should include:

- Water pumped from each borehole;
- Raw water used on site;
- The volumes recycled from various sources;
- Water seeping into pit areas;
- Water used in dust suppression.

## **7.2 Air quality monitoring**

It is recommended that, as a minimum dustfall, PM<sub>10</sub> and PM<sub>2.5</sub> as well as meteorology monitoring continue at Heuningkranz as part of the project's air quality management plan. This should continue from now and continue throughout the life of the project. This will also be for an establishment of a comprehensive baseline prior to the implementation of the Heuningkranz Project. Monitoring positions including additional recommended sampling locations are shown in Figure 7-3.



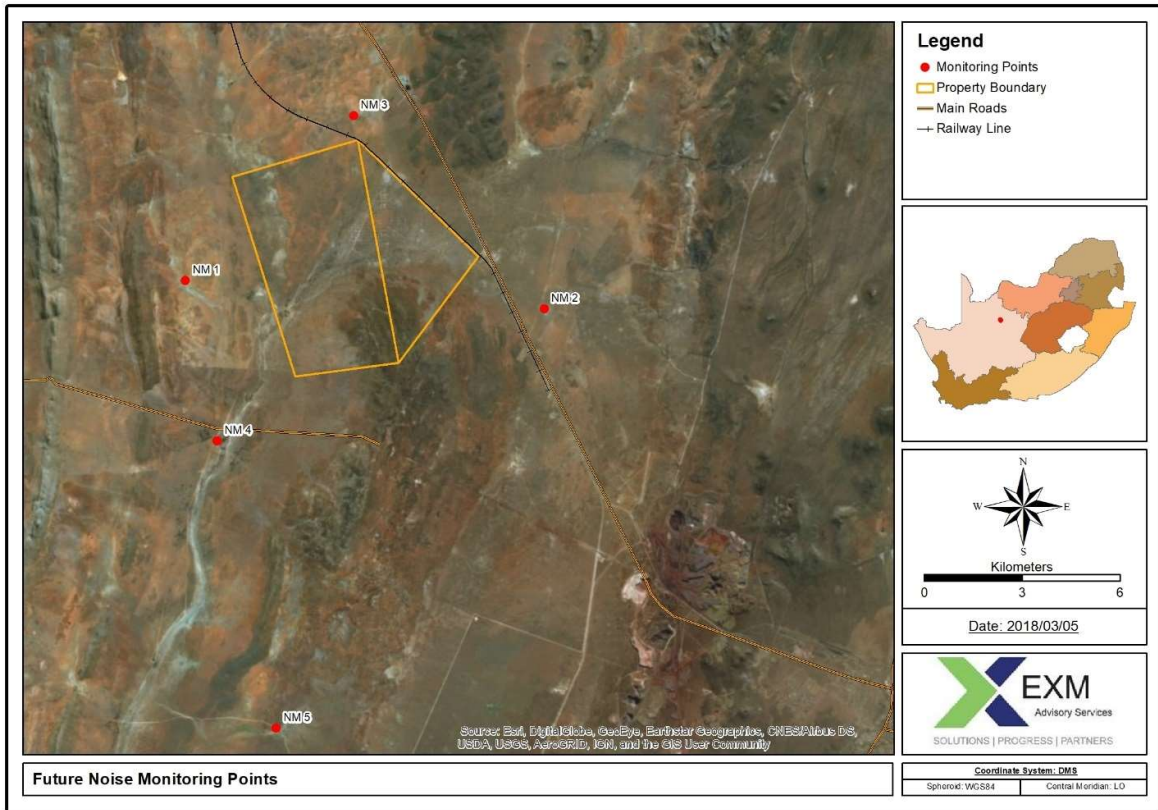
Source: Airshed Planning Professionals<sup>1</sup> (February 2018)

**FIGURE 7-3: DUST FALLOUT MONITORING POSITIONS FOR HEUNINGKRA NZ INCLUDING PROPOSED ADDITION SINGLE FALLOUT BUCKET LOCATIONS.**

### 7.3 Noise monitoring

It is recommended that annual noise monitoring be undertaken from now and throughout the life of the Heuningkranz Project. It is recommended that annual monitoring be undertaken. Annual monitoring should include monitoring over an extended period (7 days) to obtain a better understanding of the baseline noise and then potential future impacts.

The noise receptor points are shown in Figure 7-4.



Source: Airshed Planning Professionals<sup>2</sup> (February 2018)

**FIGURE 7-4: NOISE MONITORING POINTS**

In the event that noise related complaints are received short term (24-hour); ambient noise measurements should be conducted 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 SLM that meets all appropriate IFC 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 environment should be taken.
- The following acoustic indices should be recorded and reported:  $L_{Aeq}(T)$ ,  $L_{Aeq}(T)$ , statistical noise level  $LA_{90}$ ,  $LA_{Fmin}$  and  $LA_{Fmax}$ , octave band or 3<sup>rd</sup> 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 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 environment of each site.

The investigation of complaints, should include an investigation into equipment or machinery that likely result or resulted in noise levels annoying to the community. This could be achieved with source noise measurements.

#### **7.4 Biodiversity monitoring**

Kolomela Mine has implemented a comprehensive biomonitoring programme focussed on assessing the secondary impacts of the mining operations. The biodiversity monitoring is to be expanded to include Heuningkranz and the tributary of the Soutloop River downstream of Heuningkranz.

The biomonitoring undertaken every 2 years is to include:

- Soil and land capability;
- Aquatic invertebrates (wetland pans and tributary of Soutloop downstream of Heuningkranz);
- Amphibians;
- Reptiles;
- Birds;
- Mammals (small and large);
- Vegetation;
- Alien invasive species; and
- Bush encroachment.



## **8. SUBMISSION OF PERFORMANCE ASSESSMENTS**

Performance Assessments/Compliance Audits will be compiled in accordance with legislative requirements (as applicable at the time) including:

- (1) Regulation 34 of the EIA Regulations (GN. 982 of 4 December 2014, as amended);
- (2) Regulation 55 of the Minerals and Petroleum Resource Development Act.

The Performance Assessments/Compliance audits will be submitted annually or in accordance with the Environmental Authorisation.

## **9. ENVIRONMENTAL AWARENESS PLAN**

The Kolomela Mine has an existing environmental training and awareness programme which has been developed as part of the health and safety system for the mine. This programme includes:

- Induction training for new employees;
- Job-specific and procedures training;
- Ad hoc environmental awareness training; and
- Contractor training.

The training and awareness programme is to be updated to include sensitivities related to Heuningkranz. All persons employed by the Mine will undergo the above training. A separate induction will be provided to visitors of the Mine.

## **10. SPECIFIC INFORMATION REQUIRED BY THE COMPETENT AUTHORITY**

None applicable.

## **11. UNDERTAKING**

I, **Kerry Colleen Fairley**, acting as independent environmental assessment practitioner hereby confirm:

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