

SISHEN IRON ORE COMPANY (PTY) LTD

SISHEN MINE

**EXTENSION OF MINING ACTIVITIES AT LYLYVELD,
UPGRADE OF THE TAILINGS STORAGE FACILITY &
IMPLEMENTATION OF TROLLEY ASSIST ELECTRICAL LINES**

KATHU, NORTHERN CAPE

ENVIRONMENTAL IMPACT ASSESSMENT

&

ENVIRONMENTAL MANAGEMENT PROGRAMME

PART B

DRAFT FOR PUBLIC AND AUTHORITY REVIEW

SAMRAD REFERENCE: NC-00112-MR/259 AND NC-00152-MR/259

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DRAFT FOR PUBLIC AND AUTHORITY REVIEW

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

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REF NUMBER: NC-00112-MR/259 and NC-00159-MR/259

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

PREPARED BY: EXM Advisory Services (Pty) Ltd

DATE: 2019/12/12

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Report Sign-Off			
Name	Designation	Signature	Date
Kerry Fairley	EAP Director Pr.Sci.Nat		2019/12/12
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ACRONYMS AND ABBREVIATIONS ACRONYMS AND ABBREVIATIONS

Abbreviation	Explanation
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
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 20 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		2019/12/12

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.

Sishen Mine is an existing mining operation, operating under an existing mining right (NC 259 MR) and approved Environmental Management Programme (2002, as amended) for the mining and processing of iron ore, located near Kathu in the Gamagara Local Municipality of the Northern Cape Province. Sishen proposes to conduct additional activities at the operations which include the extension of mining and associated activities at the existing Lylyveld North and South operations, upgrading of the existing Tailings Storage Facility (TSF) and to develop Trolley Assist (electrical lines to facilitate haul truck movement on certain ramps) Infrastructure.

The expansion of the Lylyveld operations will entail additional pit areas, expansion of the Waste Rock Dumps (WRD) and the product stockpile area. The expansion will allow for the continuation of the current mining activities at Lylyveld beyond the originally planned life (2022) in line with current production rates of approximately 1 million tons per annum until 2032 (i.e. the current life of mine).

The current TSF and associated infrastructure is old and needs to be upgraded in order to improve the effectiveness and efficiency of the operation of the tailings management at the site. The amendments will extend the life of the facility and ensure safe tailings management for the life-of-mine. An improved stormwater management system will also be installed as part of the upgrade project.

New electrical lines will be developed as a ring feed to the Trolley Assist Infrastructure to be developed along some of the haul road ramps at Sishen Mine. The Trolley Assist Infrastructure will be established on the authorised footprint of the Western Waste Rock Dumps (WRD) and Vliegveld Waste Rock Dump and within the southern pushback pit area which are constructed in a phased manner as required by the mining operations.

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.

NOTE: KEY ENVIRONMENTAL SENSITIVITIES ARE SURFACE WATER RESOURCES (WETLAND PANS AND GAMGARA RIVER) AND SURFACE INFRASTRUCTURE IN THE VICINITY OF THE LYLYVELD PROJECT THE TSF UPGRADE PROJECT AND THE TROLLEY ASSIST PROJECT WILL BE DEVELOPED WITHIN EXISTING DISTURBED AREAS.

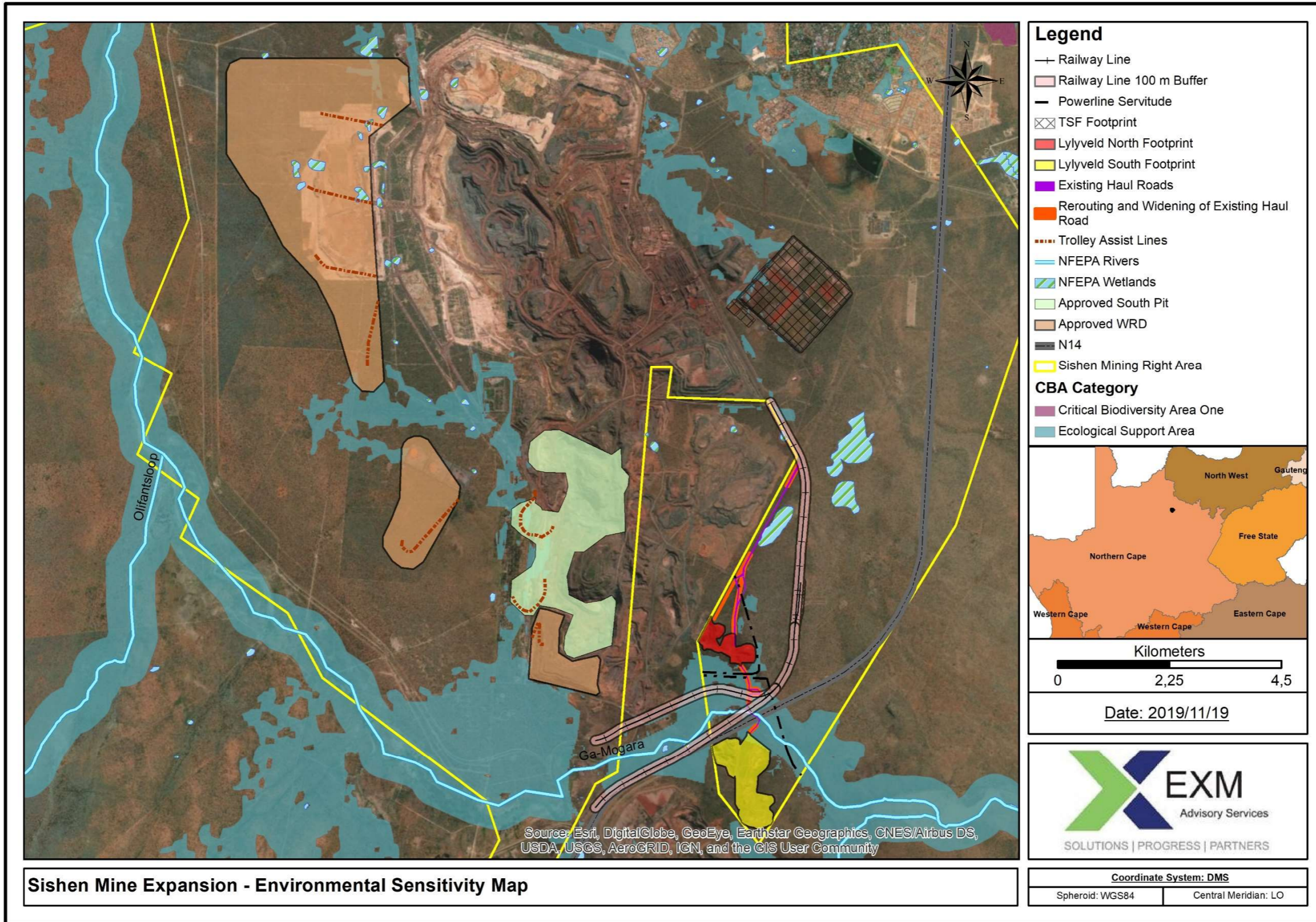


FIGURE 3-1: PROPOSED PROJECT LOCATION IN RELATION TO ENVIRONMENTAL SENSITIVITIES

4. IMPACT MANAGEMENT OBJECTIVES

4.1 Closure Objectives

The Lylyveld Expansion, upgrade of the TSF and the establishment of the Trolley Assist Infrastructure will be incorporated into Sishen Mine. Rehabilitation and closure will be undertaken as part of the closure planning for the mine.

As described in the Preliminary Closure Plan, the final land use at Sishen Mine is envisaged to include a combination of wilderness areas, agricultural and small industrial use.

The following are currently the overarching goals for the closure of Sishen Mine:

- All rehabilitated land is to be safe and useable, excluding the open pits and potentially the pit-facing slopes of waste rock dumps which will be wilderness;
- All rubble from plant decommissioning and related areas must not cause long term degradation or safety hazards;
- All waste dumps must be closed and rehabilitated as per legislative requirements;
- Land is to be physically and chemically stable;
- Rehabilitated areas must be used in a sustainable manner;
- Ground and surface water will not be polluted once the mine is closed; and
- Stakeholders will be engaged on final land use planning.

In order to meet the above objectives, provision has been made for:

- Removal of infrastructure associated with the Lylyveld expansion project;
- Remediation of landforms in line with final land use;
- Ripping of roads to allow for the establishment of vegetation;
- Removal or rubble and disposal of waste in accordance with legislative requirements;
- Remediation of the footprint area to a state that is free of contaminants and suitable for the establishment of sustainable vegetation;

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

The following mitigation measures are required to manage minimise environmental damage and ecological degradation:

4.2.1 Lylyveld Extension

- Implementation of project layout as per Mitigated Scenario.

- No widening of the haul road to be allowed within the 500 m buffer zone in the vicinity for the identified wetland pans.
- Adequate dust suppression measures must be implemented at the intersection of the haul road and DR 3333 regional road. Chemical suppressants must be applied 100 meters from the intersection. The intersection must be swept by mechanical sweeping to ensure that loose particles are cleared. Signage sizes are to be increased at the intersection.
- No blasting is to be undertaken within 500 m of the N14 or Transnet Railway Line unless the safety risk assessment is completed and in accordance with the Mine Health & Safety Act. The widening of the road will facilitate the safe passing of haul trucks and thus will improve the safety at the Lylyveld operations.
- Measures to for the management and containment of hydrocarbon spillages, including hard standing, bunding and spill management are to be put in place at the HME workshop area.
- The implementation of the approved Lylyveld PCD is to be prioritized to ensure the protection of the Gamagara River.
- Adequate stormwater management measures must be implemented. Clean water is to be diverted around any potentially polluting area including workshop areas, processing areas, ore stockpile areas, and residue stockpiles/dumps.
- Necessary permission to be obtained from Eskom the realignment of the haul road in the powerline servitude and requirements must be adhered to.
- Dust suppression to be conducted on exposed areas and haul roads.
- Licences/Permits must be obtained for the removal of Species of Conservation Concern.
- Opportunities for backfilling and ongoing rehabilitation of waste rock dumps are to be maximized.
- Groundwater monitoring to be expanded to include Lylyveld impacts.
- Implement Chance-Find Procedure for protection of heritage resources.

4.2.2 Tailings Storage Facility Upgrade

- Implement dust suppression in all laydown areas and areas of work as required to prevent entrainment of dust.
- Implement measure for the protection of soil and groundwater, including spill prevention and emergency response procedure. Laydown areas to be incorporated within Sishen Mine's existing dirty stormwater management.
- Licences/permits must be obtained for the removal of Species of Conservation Concern.
- Stormwater is to be directed to Sishen's existing stormwater management system. The implementation of the clean water diversion in the area is to be prioritised. Water management systems are to be maintained to ensure they operate at maximum capacity at all time.
- Implement Chance-Find Procedure for protection of heritage resources.

4.2.3 Trolley Assist Infrastructure

- None requires as development take place along ramps on pits and waste rock dumps.

4.3 Potential Risk of Acid Mine Drainage

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

The mineral waste streams (waste rock) produced and disposed at Lylyveld 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 (groundwater). 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).

Samples of the waste rock produced and disposed at the Lylyveld North and South WRD were collected and assessed according to the abovementioned norms and standards. The results of the waste assessment indicated that the waste rock is a Type 3 waste. However, due to the absence of leachable contaminants it is considered inert as medium- and long-term contamination of the groundwater and surface water from this material is unlikely.

Based on this and the fact that, although the waste rock produced elevated total concentrations of metals, which result in them being assessed as Type 3 wastes, it is unlikely that these waste will be subject to chemical processes that would mobilise metals and anions, i.e.

residues associated with Sishen Mine are generally resistant to chemical weathering and thus have very slow reaction rates (Exigo³, 2014). It is therefore considered that the WRD will not have a significant impact on the water environment.

The absence of sulfates in waste streams and the alkaline nature of the ore and wastes mean that any risk of acid-mine drainage is not a relevant risk for Sishen Mine.

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

Acid-mine drainage is not applicable to Sishen Mine. Furthermore, as indicated in Section 4.3.1, the waste rock is considered to be inert and do not present a significant risk of contamination of groundwater and no barriers are required to protect the groundwater.

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. Refer to section 4.3.2.

4.4 Volumes and rate of water use required for mining

There is an existing borehole at Lylyveld licenced under Section 21 (a) of the National Water Act to supply 36 500 m³/annum (100m³/day) of water for dust suppression and domestic water use at Lylyveld. The only activities that will require additional water related to the HME maintenance area for potable purposes and to maintain machinery. It is not anticipated that the allowed volumes will be exceeded by the HME workshop requirements.

4.5 Water use licence application

Sishen Mine has an Integrated Water Use Licence (amended in 2016). A WUL amendment application has been submitted to accommodate the proposed expansions to provide for the expanded and new waste rock dumps under Section 21(g) of the National Water Act. No additional dewatering under Section 21(j) is required to accommodate the expansions to the pits. Application for amendment of the water use licence is in process (Sishen Water Use Licence Consolidation) and includes application for expansion of the waste rock dumps under Section 21(g) for extension of WRDs at Lylyveld. Note that the water use licence is pending.

The water use licence application provides for the following in term of Section 21 (g):

TABLE 4-1: WATER USES APPLIED FOR IN TERMS OF SECTION 21(G) OF THE NATIONAL WATER ACT

WATER USE(S)	PURPOSE	CAPACITY, DIMENSIONS & VOLUME (M ³ /ANNUM, M ³ & TONNES/ANNUM)	PROPERTY DESCRIPTION	CO-ORDINATES
Expansion of Waste Rock dump at Lylyveld south	Lylyveld South waste dump 2 (main dump)-expansion of existing dump	<u>Capacity</u> 8 960 000m ³ <u>Footprint: 64 ha</u> <u>Throughput</u> 426 500 t/a	Farm Lylyveld 545 (Remaining Extent of)	S 27°49' 39.05" E 23° 01' 38.51"
Development of new Waste Rock dump at Lylyveld south	Lylyveld South waste dump – new WR dump	<u>Capacity</u> 6 300 000m ³ <u>Footprint: 45 ha</u> <u>Throughput</u> 420 000 t/a	Farm Lylyveld 545 (Remaining Extent of)	S 27°49' 56.76" E 23° 02' 12.41"
Pollution control sump at hazardous waste storage yard	Pollution control sump at hazardous waste storage yard	<u>Capacity</u> 500m ³ <u>Throughput</u> 87 600 m ³ /a	Farm Sims 462 (Portion 1)	S 27° 43' 40.46" E 23° 00' 37.73"
Expansion of North eastern Waste Rock dump at Lylyveld North	Lylyveld North-expansion of existing dump	<u>Capacity:</u> 1 568 000 m ³ <u>Footprint: 11.5 ha</u> <u>Throughput:</u> 104 300 t/a	Farm Lylyveld 545 (Remaining Extent of)	S27° 48' 15.26 E23° 01' 37.39"
New western Waste Rock dump at Lylyveld North	Lylyveld North western waste dump – new WR dump	<u>Capacity:</u> 3 220 000 m ³ <u>Footprint: 23 ha</u> <u>Throughput:</u> 215 000 t/a	Farm Lylyveld 545 (Remaining Extent of)	S27° 48' 29.44" E23° 01' 55.88"
Development of new Waste Rock dump at Lylyveld North	Lylyveld North waste dump – new WR dump	<u>Capacity</u> 2 240 000m ³ <u>Footprint: 10 ha</u> <u>Throughput</u> 94 000 t/a	Farm Lylyveld 545 (Remaining Extent of)	S 27°48' 31.64" E 23° 01' 24.59"

5. ENVIRONMENTAL MANAGEMENT PROGRAMME

The Lylyveld Expansion, upgrade of the TSF and the establishment of the Trolley Assist Infrastructure will be integrated into the overall environmental management programme at Sishen Mine.

The environmental actions provided in this section thus describe **additional measures** that are to be implemented at the mine as a result of the project and serve to supplement the existing programme.

5.1 Lylyveld Extension

5.1.1 Planning and Design/Pre-Construction

Action No.	IMPACT MANAGEMENT ACTION	APPLICABLE STANDARD	Scheduling
BIODIVERSITY PROTECTION			
1	A protected plant survey is to be undertaken prior to the disturbance of expansion areas.	National Forests Act Northern Cape Nature Conservation Act	Prior to disturbance of new areas
2	Protected plant licences/permits to be obtained from DAFF/DENC as required prior to the removal of any protected plant species		
PROTECTION OF SOILS AND GROUNDWATER			
3	Laydown areas to be located in existing disturbed areas.	-	Layout Planning
4	All areas where chemicals, hydrocarbons or other potential pollutants are stored or handled are to be provided with impervious surfaces and measures to contain spillages of such substances.	Sishen Mine Procedures	HME Workshop Design
5	Provide sufficient storage of hazardous and general waste on site for incorporation into Sishen's waste management system.	Sishen Mine Procedures	HME Workshop Design
6	Expand groundwater monitoring to include Lylyveld area	-	ASAP

Action No.	IMPACT MANAGEMENT ACTION	APPLICABLE STANDARD	Scheduling
PROTECTION OF SURFACE WATER			
7.	Investigate clean and dirty water separation requirements for Lylyveld North and implement stormwater management measures as required. .	GNR. 704	Prior to expansion
8.	Provide for expansion of stormwater management measure for the diversion of clean water and containment of dirty water at Lylyveld South	GNR. 704	Prior to expansion
9.	Define 500 m buffer zone for wetland pans as exclusion zone for disturbances.	National Water Act	Prior to widening of haul roads
PROTECTION OF SURROUNDING INFRASTRUCTURE			
10.	Consult with Eskom and obtain necessary permissions (wayleave) prior to rerouting of haul road below the servitude.	-	Planning
11.	Define 100 m development exclusion zone from N14 road at Lylyveld South.	Mine Health and Safety Act	Planning
12.	Undertaken risk assessment and obtain necessary permissions from DMR for blasting within 500 m of N14 road/railway line. SANRAL and Transnet to be consulted.	Mine Health and Safety Act	Prior to blasting
MINIMISATION OF DISTURBANCE			
13	Demonstrate the maximisation of opportunities for infilling of mined out areas with waste rock.		Mine planning
ROAD SAFETY			
14.	Investigate the need to construct a proper intersection at the DR 3333 road crossing including the surfacing of approaches of 40 m long.		ASAP

5.1.2 Construction phase (Stockpile Area/Haul Road Widening)

Action No.	IMPACT MANAGEMENT ACTION	APPLICABLE STANDARD	Scheduling
BIODIVERSITY PROTECTION			
1	Restrict vehicle movement outside demarcated areas.		Throughout Construction
2	Restrict footprint of construction to the predetermined extent / demarcated area.		Throughout Construction
3	No trapping or hunting of any faunal species is to take place.		Throughout Construction
4	No protected plant is to be removed within the expansion area without the necessary licences/permits in place.	National Forests Act Northern Cape Nature Conservation Act	Prior to disturbance of new areas
PROTECTION OF SOILS AND GROUNDWATER			
5	Hazardous substances must be stored in bunded areas and handled on impervious surfaces.	Sishen Mine Procedures	Throughout Construction
6	Waste to be stored in allocated areas in line with regulatory requirements.	Sishen Mine Procedures	Throughout Construction
7	Good housekeeping practices must be implemented at all times.	Sishen Mine Procedures	Throughout Construction
8	Drip trays are to be provided where mobile equipment has the potential to drip oil.		
9	Implement spill prevention and emergency response procedure.	Sishen Mine Procedures	
10	Soils contaminated with oil due to accidental leaks and spillages are to be removed and bioremediated.	Sishen Mine Procedures	Construction

Action No.	IMPACT MANAGEMENT ACTION	APPLICABLE STANDARD	Scheduling
11	Available soil is to be stripped prior to the disturbance of new areas. Such soils are to be stockpiled and protected from erosion for use in rehabilitation.		Prior to disturbance of new areas.
AIR QUALITY MANAGEMENT			
12	Enforce speed limits on site roads.		
13	Conduct dust suppression in areas of work.		As required throughout Construction
PROTECTION OF HERITAGE RESOURCES			
14	Implement Chance-Find Procedure	Chance-Find Procedure	Throughout Construction
PUBLIC AND LABOUR RELATIONS			
15	Implement Sishen's Procurement Plan and objectives for maximising local procurement	SLP	Procurement of Goods & Services
16	Implement Resourcing Plan for the project in line with Sishen's objectives for local recruitment	SLP	Recruitment
17	Enforce Sishen's requirements for the protection of human rights (including housing of staff) and industrial relations on contractors	Contract	During Appointment of Services Providers and Monitored throughout Construction

5.1.3 Operational phase

Action No.	IMPACT MANAGEMENT ACTION	APPLICABLE STANDARD	Scheduling
BIODIVERSITY PROTECTION			
1	No protected plant is to be removed within the expansion area without the necessary licences/permits in place.	National Forests Act Northern Cape Nature Conservation Act	Prior to disturbance of new areas
2.	Ongoing rehabilitation of disturbed areas aimed at restoring available habitat.	Anglo American Biodiversity Standards	Throughout operations
PROTECTION OF SOILS AND GROUNDWATER			
2	Hazardous substances must be stored in bunded areas and handled on impervious surfaces.	Sishen Mine Procedures	Throughout operations
4	Waste to be stored in allocated areas in line with regulatory requirements.	Sishen Mine Procedures	Throughout operations
5	Good housekeeping practices are to be practised at all time.	Sishen Mine Procedures	Throughout operations
6	Groundwater monitoring network to be expanded to include Lylyveld.		Immediately
7	Drip trays are to be provided where mobile equipment has the potential to drip oil.		Throughout operations
8	Implement spill prevention and emergency response procedure.	Sishen Mine Procedures	Throughout operations
9	Surface water monitoring network to include PCD (parameters to include hydrocarbons)		When PCD in place
10	Soils contaminated with oil due to accidental leaks and spillages are to be removed and bioremediated.	Sishen Mine Procedures	As required

Action No.	IMPACT MANAGEMENT ACTION	APPLICABLE STANDARD	Scheduling
11	Available soil is to be stripped prior to the disturbance of new areas. Such soils are to be stockpiled and protected from erosion for use in rehabilitation.		Prior to disturbance of new areas.
PROTECTION OF SURFACE WATER			
12	Clean water is to be diverted from any potentially dirty area. Potential contaminated (dirty water) is to be contained and prevented from entering into any clean water system.	GNR. 704	Throughout operations
PROTECTION OF SURROUNDING INFRASTRUCTURE			
13	No blasting is to take place within 500 m of N14 infrastructure without the necessary consultation with SANRA and approvals from DMR.	Mine Health & Safety Act	Throughout operations
AIR QUALITY MANAGEMENT			
14	Implement Sishen Mine dust management plan.	Sishen Dust Management Plan	Throughout operations
15	Enforce speed limits on site roads.		Throughout operations
16	Conduct dust suppression on unpaved road, i.e. wet suppression or chemical stabilisation.		Throughout operations
17	Continue to implement complaints management procedure.	Sishen Mine Procedures	Throughout operations
18	Continue with emissions monitoring (dust, PM10 and PM2.5)		Throughout operations
19	Proper maintenance of dust monitoring equipment.		Throughout operations
20	Management of tipping heights to reduce entrainment of dust.		Throughout operations
21	Ongoing rehabilitation of disturbed areas	Sishen Mine Rehabilitation Plan	Throughout operations
ROAD SAFETY			
22	Adequate dust suppression must be conducted on the haul road. Apply chemical dust suppression on haul road 100 meters before and after the intersection.		ASAP
23	Conduct regular sweeping at the intersection to get rid of loose particles.		ASAP
24	Adequate signage must be placed at the intersection.		ASAP

Action No.	IMPACT MANAGEMENT ACTION	APPLICABLE STANDARD	Scheduling
PROTECTION OF HERITAGE RESOURCES			
20	Implement Chance-Find Procedure	Chance-Find Procedure	Throughout Operations
PUBLIC AND LABOUR RELATIONS			
21	Implement Sishen's Procurement Plan and objectives for maximising local procurement	SLP	Procurement of Goods & Services
22	Implement Resourcing Plan for the project in line with Sishen's objectives for local recruitment	SLP	Recruitment
23	Enforce Sishen's requirements for the protection of human rights (including housing of staff) and industrial relations on contractors	Contract	Monitored throughout Operation
24	Enforce Sishen's local procurement and employment requirements on contractors.	Contractual	Appointment of Service Providers
25	Implement Sishen's Social Management Plan	Anglo American Social Standards	Throughout Operations
26	Implement Stakeholder Engagement Plan aimed at managing community expectations	Anglo American Social Standards	Throughout Operations
27	Complaints to be managed through Sishen's complaints procedure.	Sishen Mine Procedure	Throughout Operations

5.1.4 Decommissioning and Closure

Action No.	IMPACT MANAGEMENT ACTION	APPLICABLE STANDARD	Scheduling
PROTECTION OF SOILS AND GROUNDWATER			
1	Infrastructure not to be used in the future is to be demolished and disposed of in accordance with legal requirements.		During Decommissioning
2	Footprint areas are to be checked for signs of contamination and remediated as required.		During Decommissioning

3	Soils to be checked for fertility and augmented as required to promote the establishment of vegetation.		During Decommissioning
PROTECTION OF SURFACE WATER RESOURCES			
4	Stormwater run-off from potentially contaminated areas is to be contained and prevented from entering any clean water environment.	GNR. 704	Until Closure
5	Clean water is to be diverted around potentially contaminated areas.	GNR. 704	Until Closure
FINAL LAND USE			
6	Waste rock dumps to be reshaped to conform to the final land form required for the implementation of the end-use.	Sishen Mine Rehabilitation Plan	During Decommissioning
7	Vegetate surfaces to achieve final cover required for implementation of desired end-use.		During Decommissioning
8	Monitor vegetation cover and augment as required until self-sustaining.		Until Closure

5.2 Upgrade of Tailings Storage Facility

5.2.1 Planning and Design/Pre-Construction

Action No.	IMPACT MANAGEMENT ACTION	APPLICABLE STANDARD	Scheduling
BIODIVERSITY PROTECTION			
1	Protected plant licences/permits to be obtained from DAFF/DENC as required prior to the removal of any protected plant species	National Forests Act Northern Cape Nature Conservation Act	Prior to disturbance of new areas
PROTECTION OF SOILS AND GROUNDWATER			
3	Laydown areas to be located in existing disturbed areas.	-	Layout Planning

Action No.	IMPACT MANAGEMENT ACTION	APPLICABLE STANDARD	Scheduling
4	All areas where chemicals, hydrocarbons or other potential pollutants are stored or handled are to be provided with impervious surfaces and measures to contain spillages of such substances.	Sishen Mine Procedures	Layout Planning
5	Provide for sufficient storage of hazardous and general waste on site for incorporation into Sishen's waste management system.	Sishen Mine Procedures	Layout Planning
PROTECTION OF SURFACE WATER RESOURCES			
6	Develop a maintenance procedure for surface water management systems	Sishen Mine Procedures	Prior to operations

5.2.2 Construction Phase

Action No.	IMPACT MANAGEMENT ACTION	APPLICABLE STANDARD	Scheduling
BIODIVERSITY PROTECTION			
1	No protected plant is to be removed within the expansion area without the necessary licences/permits in place.	National Forests Act Northern Cape Nature Conservation Act	Prior to disturbance of new areas
PROTECTION OF SOILS AND GROUNDWATER			
3	Hazardous substances must be stored in bunded areas and handled on impervious surfaces.	Sishen Mine Procedures	Throughout Construction
4	Waste to be stored in allocated areas in line with regulatory requirements.	Sishen Mine Procedures	Throughout Construction
5	Good housekeeping practices must be implemented at all laydown and work areas	Sishen Mine Procedures	Throughout Construction
6	Equipment which has the potential to leak oil or other chemicals are to be stored on impervious surfaces within bunded areas.	Sishen Mine Procedures	Throughout Construction
7	Drip trays are to be provided where mobile equipment has the potential to drip oil.	Sishen Mine Procedures	Throughout Construction
8	Implement spill prevention and emergency response procedure.	Sishen Mine Procedures	Throughout Construction
10	Soils contaminated with oil due to accidental leaks and spillages are to be removed and bioremediated.	Sishen Mine Procedures	Throughout Construction
11	Available soil is to be stripped prior to the disturbance of new areas. Such soils are to be stockpiled and protected from erosion for use in rehabilitation.	Sishen Mine Procedures	Prior to disturbance of new areas.
AIR QUALITY MANAGEMENT			

Action No.	IMPACT MANAGEMENT ACTION	APPLICABLE STANDARD	Scheduling
12	Enforce speed limits on site roads.		Throughout Construction
13	Conduct dust suppression in areas of work.		As required throughout Construction
PROTECTION OF HERITAGE RESOURCES			
14	Implement Chance-Find Procedure	Chance-Find Procedure	Throughout Construction
PUBLIC AND LABOUR RELATIONS			
15	Implement Sishen's Procurement Plan and objectives for maximising local procurement	SLP	Procurement of Goods & Services
16	Implement Resourcing Plan for the project in line with Sishen's objectives for local recruitment	SLP	Recruitment
17	Enforce Sishen's requirements for the protection of human rights (including housing of staff) and industrial relations on contractors	Contract	Monitored throughout Operations

5.2.3 Operational phase

Action No.	IMPACT MANAGEMENT ACTION	APPLICABLE STANDARD	Scheduling
PROTECTION OF SURFACE WATER & GROUNDWATER RESOURCES			
1	Water management systems are to be maintained and kept free of vegetation and debris to ensure that operation is maintained at maximum capacity.	Sishen Mine Procedure GNR. 704	Throughout operations
2	Clean water is to be diverted from any potentially dirty area. Potential contaminated (dirty water) is to be contained and prevented from entering into any clean water system.	GNR. 704	Throughout operations
3	Implement spill management and emergency procedures	Sishen Mine Procedure	Throughout Operations

5.2.4 Decommissioning and Closure

Action No.	IMPACT MANAGEMENT ACTION	APPLICABLE STANDARD	Scheduling
1	Delivery and return water pipelines to be removed	Sishen Mine Rehabilitation Plan	During Decommissioning
2	Solution trench and other surface water management infrastructure to be removed.		
3	Road infrastructure to be removed, compacted surfaces to be ripped.		
4	Footprint areas are to be checked for signs of contamination and remediated as required.		During Decommissioning
5	Vegetate surfaces to achieve final cover required for implementation of desired end-use.		During Decommissioning
6	Monitor vegetation cover and augment as required until self-sustaining.		As required

5.3 Trolley Assist Infrastructure

Action No.	IMPACT MANAGEMENT ACTION	APPLICABLE STANDARD	Scheduling
PROTECTION OF SOILS, GROUNDWATER AND SURFACE WATER			
1	Laydown areas to be located in existing disturbed areas.	-	Layout Planning Phase
2	All areas where chemicals, hydrocarbons or other potential pollutants are stored or handled are to be provided with impervious surfaces and measures to contain spillages of such substances.	Sishen Mine Procedures	Layout Planning Construction Phase

Action No.	IMPACT MANAGEMENT ACTION	APPLICABLE STANDARD	Scheduling
3	Provide for sufficient storage of hazardous and general waste on site for incorporation into Sishen's waste management system.	Sishen Mine Procedures	Layout Planning Construction Phase
4	Implement Sishen's Procurement Plan and objectives for maximising local procurement	SLP	Procurement of Goods & Services
5	Implement Resourcing Plan for the project in line with Sishen's objectives for local recruitment	SLP	Recruitment
6	Enforce Sishen's local procurement and employment requirements on contractors.	Contract	During appointment of Service Providers and Monitored throughout Construction
7	Enforce Sishen's requirements for the protection of human rights (including housing of staff) and industrial relations on contractors	Contract	During Appointment of Services Providers and Monitored throughout Construction

6. FINANCIAL PROVISION

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

In order to achieve the final land-use plan, the following rehabilitation objectives have been set for the mine:

- All rehabilitated land is to be safe and useable, excluding the open pits and potentially the pit-facing slopes of waste rock dumps which will be wilderness;
- All rubble from plant decommissioning and related areas must not cause long term degradation or safety hazards;
- All waste dumps must be closed and rehabilitated as per legislative requirements;
- Land is to be physically and chemically stable;
- Rehabilitated areas must be used in a sustainable manner;
- Ground and surface water will not be polluted once the mine is closed; and
- Stakeholders will be engaged on final land use planning.

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 Sishen Mine 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

The Preliminary Closure Plan is provided in Part C-Appendix 6. In line with the plan, the rehabilitation actions are required for the additional infrastructures at Sishen Mine as a result of the proposed project:

- Removal of infrastructure associated with the Lylyveld Extension Project;
- Removal of infrastructure (pipelines, canals and roads) associated with the TSF Upgrade Project;

- Removal of infrastructure associated with the Trolley Assist Project;
- Remediation of landforms in line with final land use;
- Ripping of roads to allow for the establishment of vegetation;
- Removal or rubble and disposal of waste in accordance with legislative requirements;
- Remediation of the footprint area to a state that is free of contaminants and suitable for the establishment of sustainable vegetation;
- Implementation of stormwater management at contaminated areas (if required);
- Establishment of suitable indigenous vegetation on rehabilitated footprint areas;
- Maintenance and monitoring of revegetated areas to self-sustaining state.

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

The final land use at Sishen Mine is currently envisaged to include a combination of wilderness areas, agricultural and small industrial use. The achievement of the rehabilitation objectives will allow for the successful implementation of agricultural (livestock grazing) or industrial use (should the process plant infrastructure be needed for some future agreed use).

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

The closure liability costing associated with the Lylyveld expansion, TSF upgrade and Trolley Assist Infrastructure amount to **R 4,935,517.03** (premature closure) and **R 32,966,672.41** at LOM (Table 6-1).

TABLE 6-1: ADDITIONAL CLOSURE COSTS FOR THE LYLYVELD EXPANSION, TSF UPGRADE AND TROLLEY ASSIST INFRASTRUCTURE

Item	PREMATURE CLOSURE LIABILITY	LOM CLOSURE LIABILITY
LYLYVELD EXTENSION		
Waste Rock Dump		18,763,093.26
Opencast Pit		9,268,062.12
Stockpile area	3,172,606.63	3,172,606.63
Overland Infrastructure	82,435.00	82,435.00
Total	3,255,041.63	31,286,197.01
TSF UPGRADE		
Overland Infrastructure	1,150,551.71	1,150,551.71
Total	1,150,551.71	1,150,551.71
Trolley Assist Infrastructure		
Overland Infrastructure	529,923.68	529,923.68
Total	529,923.68	529,923.68

GRAND TOTAL	4,935,517.03	32,966,672.41
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6.6 Confirm how the financial provision will be provided

The developments will result in an additional premature liability of ~ R35 155718.01. Should the current guarantees for Sishen Mine not be adequate to cover the additional liability, an additional guarantee is to be obtained to cover the premature closure liability.

7. MECHANISMS FOR MONITORING COMPLIANCE

7.1 Surface Water Monitoring

Surface water monitoring is conducted at various locations in and around Sishen Mine, including in the Gamagara River. The parameters analysed for are listed in Table 7-1. The monitoring schedule is re-assessed annually during the update of the Integrated Water and Waste Management Programme. The Gamagara water quality (if surface water present) upstream and downstream of the Lylyveld PCD is to be assessed for hydrocarbon contamination as per the parameters in Table 7-1.

TABLE 7-1: SURFACE WATER MONITORING PARAMETERS

Monitoring	Variable
Receiving environment (monthly)	EC, pH, TDS, total alkalinity, total suspended solids, COD, total coliform, total hardness, calcium, magnesium, E-coli, sodium, potassium, chloride, sulfate, fluoride, iron, manganese, aluminium, cobalt, lead, oil & grease, nitrate, orthophosphate and ammonium, Diesel Range Organics, Gasoline Range Organics, Gasoline Range Organics, PAH, TPH

The Lylyveld PCD is to be included in the water monitoring programme as per Table 7-2.

Monitoring	Variable
Process water localities (monthly)	EC, pH, TDS, total alkalinity, total suspended solids, COD, total hardness, calcium, magnesium, sodium, potassium, chloride, sulfate, fluoride, iron, manganese, aluminium, cobalt, lead, oil & grease, nitrate and ammonium, orthophosphate, Diesel Range Organics, Gasoline Range Organics, Gasoline Range Organics, PAH, TPH

7.2 Groundwater Monitoring

There is an extensive groundwater monitoring network at Sishen Mine (see Figure 7-1). It is recommended that the monitoring network be expanded to include Lylyveld.

TABLE 7-2: GROUNDWATER MONITORING PARAMETERS

Monitoring	Variable
Groundwater monitoring points (monthly)	EC, pH, TDS, total alkalinity, total suspended solids, COD, total organic carbon, turbidity, total hardness, calcium, magnesium, sodium, potassium, chloride, sulfate, fluoride, iron, manganese, aluminium, cobalt, lead, oil & grease, nitrate, orthophosphate and ammonium, Diesel Range Organics, Gasoline Range Organics, PAH, TPH

7.3 Air quality monitoring

Existing dust fallout monitoring points surrounding Sishen Mine are shown in Figure 7-2. PM₁₀ and PM_{2.5} are monitored at Kathu, Sesheng and Dingleton. No additional monitoring points are required for the projects.

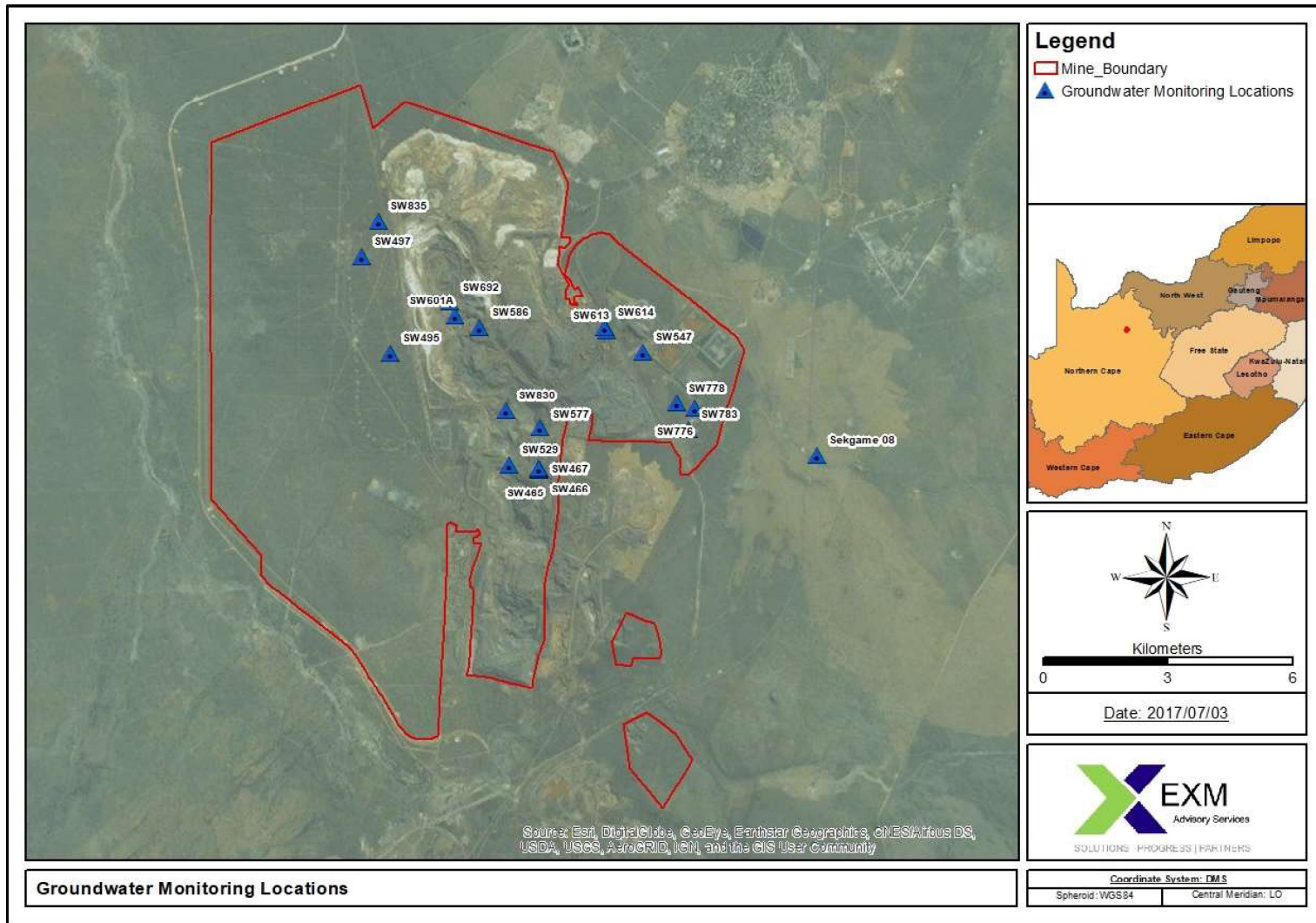


FIGURE 7-1: EXISTING GROUNDWATER MONITORING POINTS AT SISHEN MINE

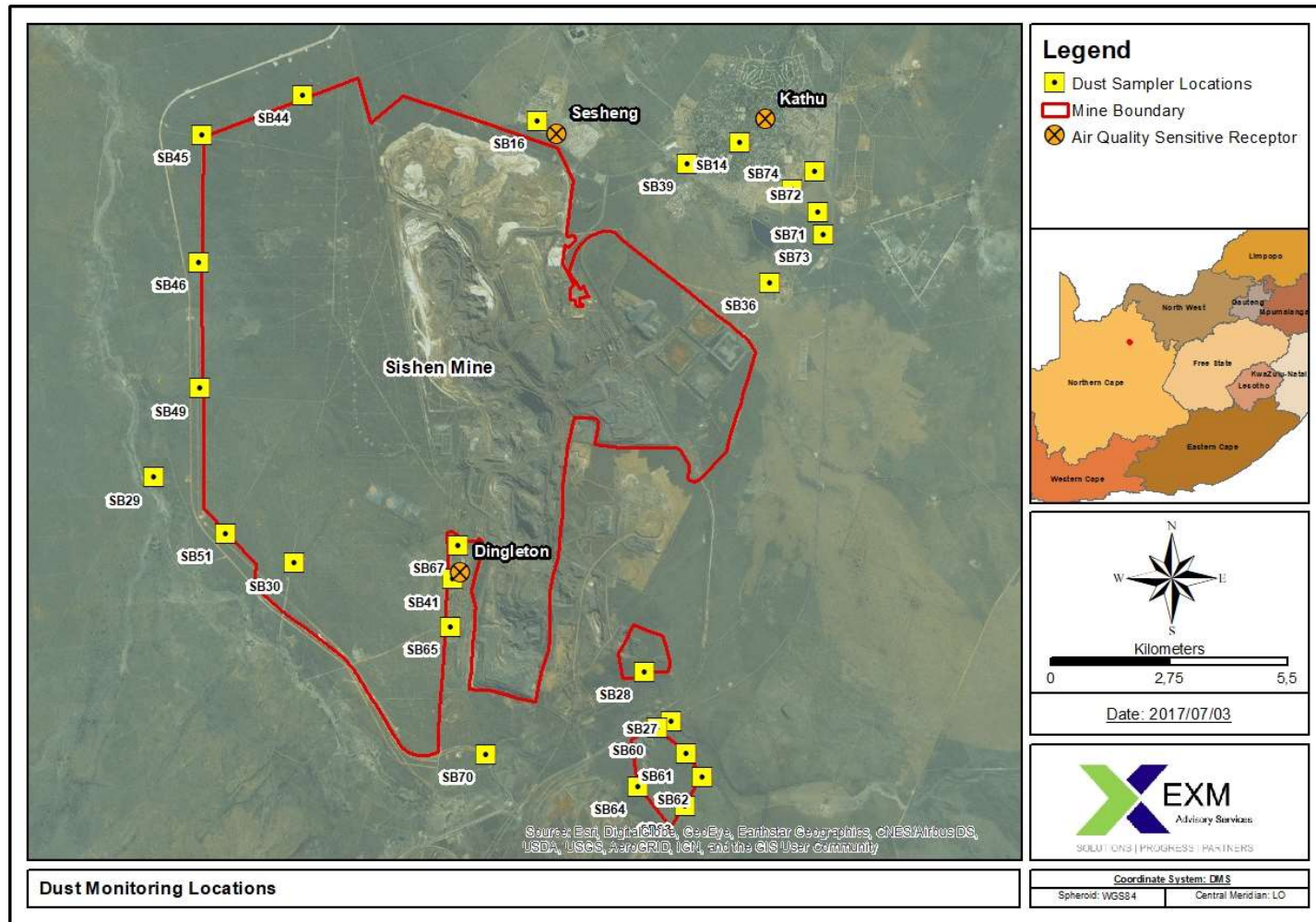


FIGURE 7-2: LOCATION OF DUST MONITORING STATIONS AND KEY RECEPTORS AT SISHEN MINE .

7.4 Noise monitoring

Sishen Mine undertakes summer and winter monitoring in neighbouring sensitive receptors: Sesheng, Kathu, Dingleton, and Kathu Agricultural Holdings and farmsteads to the west of Sishen Mine. No additional monitoring is required for the proposed project. dbAcoustics (February 2018) has recommended the following Noise Management Plan:



FIGURE 7-3: NOISE MANAGEMENT PLAN

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

Sishen Mine developed an awareness and training programme describing the manner in which its employees may be exposed to environmental risk which may result from their work and the manner in which the risks must be dealt with in order to avoid safety incidents and pollution or the degradation of the environment. The operation also has awareness programmes aimed at educating its people and the community about the activities undertaken at the mine and the impacts of these activities on the environment. Shift workers are trained on a weekly basis on environmental focus topics of the month as well as significant environmental aspects on the mine.

All persons involved in the project will be incorporated into the existing training and awareness programmes. No additional training is considered necessary.


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.

Report Sign-Off			
Name	Designation	Signature	Date
Kerry Fairley	EAP Director Pr.Sci.Nat		2019/12/12