mineral resources

Department:
Mineral Resources
REPUBLIC OF SOUTH AFRICA

ENVIRONMENTAL IMPACT ASSESSMENT REPORT

And

ENVIRONMENTAL MANAGEMENT PROGRAMME REPORT

SUBMITTED FOR ENVIRONMENTAL AUTHORIZATIONS IN TERMS OF THE NATIONAL ENVIRONMENTAL MANAGEMENT ACT, 1998 AND THE NATIONAL ENVIRONMENTAL MANAGEMENT WASTE ACT, 2008 IN RESPECT OF LISTED ACTIVITIES THAT HAVE BEEN TRIGGERED BY APPLICATIONS IN TERMS OF THE MINERAL AND PETROLEUM RESOURCES DEVELOPMENT ACT, 2002 (MPRDA) (AS AMENDED).

NAME OF APPLICANT: ILIMA COAL COMPANY (PTY) LTD.

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FILE REFERENCE NUMBER SAMRAD: (MP30/5/1/2/2/10224MR)

1. IMPORTANT NOTICE

In terms of the Mineral and Petroleum Resources Development Act (Act 28 of 2002 as amended), the Minister must grant a prospecting or mining right if among others the mining "will not result in unacceptable pollution, ecological degradation or damage to the environment".

Unless an Environmental Authorisation can be granted following the evaluation of an Environmental Impact Assessment and an Environmental Management Programme report in terms of the National Environmental Management Act (Act 107 of 1998) (NEMA), it cannot be concluded that the said activities will not result in unacceptable pollution, ecological degradation or damage to the environment.

In terms of section 16(3)(b) of the EIA Regulations, 2014, any report submitted as part of an application must be prepared in a format that may be determined by the Competent Authority and in terms of section 17 (1) (c) the competent Authority must check whether the application has taken into account any minimum requirements applicable or instructions or guidance provided by the competent authority to the submission of applications.

It is therefore an instruction that the prescribed reports required in respect of applications for an environmental authorisation for listed activities triggered by an application for a right or a permit are submitted in the exact format of, and provide all the information required in terms of, this template. Furthermore please be advised that failure to submit the information required in the format provided in this template will be regarded as a failure to meet the requirements of the Regulation and will lead to the Environmental Authorisation being refused.

It is furthermore an instruction that the Environmental Assessment Practitioner must process and interpret his/her research and analysis and use the findings thereof to compile the information required herein. (Unprocessed supporting information may be attached as appendices). The EAP must ensure that the information required is placed correctly in the relevant sections of the Report, in the order, and under the provided headings as set out below, and ensure that the report is not cluttered with un-interpreted information and that it unambiguously represents the interpretation of the applicant.

2. OBJECTIVE OF THE ENVIRONMENTAL IMPACT ASSESSMENT PROCESS

The objective of the environmental impact assessment process is to, through a consultative process—

(a) determine the policy and legislative context within which the activity is located and document how the proposed activity complies with and responds to the policy and legislative context;

(b) describe the need and desirability of the proposed activity, including the need and desirability of the activity in the context of the preferred location;

(c) identify the location of the development footprint within the preferred site based on an impact and risk assessment process inclusive of cumulative impacts and a ranking process of all the identified development footprint alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects of the environment;

(d) determine the—-

(i) nature, significance, consequence, extent, duration and probability of the impacts occurring to inform identified preferred alternatives; and

(ii) degree to which these impacts—

(aa) can be reversed;

(bb) may cause irreplaceable loss of resources, and

(cc) can be avoided, managed or mitigated;

(e) identify the most ideal location for the activity within the preferred site based on the lowest level of environmental sensitivity identified during the assessment;

(f) identify, assess, and rank the impacts the activity will impose on the preferred location through the life of the activity;

(g) identify suitable measures to manage, avoid or mitigate identified impacts; and

(h) identify residual risks that need to be managed and monitored.

Ilima Coal Company Kranspan Project

Draft Environmental Impact Report

Application for Environmental Authorisation, Waste Management Licence and Integrated Water Use Licence

Carolina, Mpumalanga

June 2019

ABS Africa
Sustainability Advisors

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LIST OF ACRONYMS AND ABBREVIATIONS

CBA	Critical Biodiversity Area
CRR	Comment and Response Register
DEA	Department of Environmental Affairs
DMR	Department of Mineral Resources
DSR	Draft Scoping Report
DWS	Department of Water and Sanitation
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
EIA	Environmental Impact Assessment
EIR	Environmental Impact Report
EMPr	Environmental Management Programme
ESA	Ecological Support Area
FSR	Final Scoping Report
GW	Gigawatts
I&APs	Interested and Affected Parties
IDP	Integrated Development Plan
IRP	Integrated Resource Plan
IWULA	Integrated Water Use Licence Application
IWWMP	Integrated Water and Wastewater Management Plan
kg	kilogramme
Kcal/kg	Kilocalories per kilogramme
kl	Kilolitre
ktpa	Kilotons per annum
ktpm	Kilotons per month
l	litre
m	Metre
mamsl	Metres above mean sea level
Mj/kg	Megajoules per kilogramme
mm	Millimetre
MPRDA	Minerals and Petroleum Resources Development Act
MR	Mining Right
MRA	Mining Right Application
Mtpa	Million tons per annum
MW	Megawatts
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
NHRA	National Heritage Resources Act
NWA	National Water Act
p.a.	Per annum
PCD	Pollution Control Dam
PR	Prospecting Right

PRA	Prospecting Right Application
RBCT	Richards Bay Coal Terminal
S&EIR	Scoping and Environmental Impact Reporting
SAHRA	South African Heritage Resource Agency
SDF	Spatial Development Framework
WML	Waste Management Licence

ENVIRONMENTAL IMPACT REPORT

1 CONTACT PERSON AND CORRESPONDENCE ADDRESS

1.1 DETAILS OF THE EAP WHO PREPARED THE REPORT

NAME OF THE PRACTITIONERS:	Paul Furniss / Chané Pretorius ABS Africa (Pty) Ltd.
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1.2 EXPERTISE OF THE EAP

1.2.1 THE QUALIFICATIONS OF THE EAP

PRACTITIONER:	**PAUL FURNISS**	**CHANÉ PRETORIUS**
ACADEMIC QUALIFICATIONS:	➲ Bachelor of Agricultural Science in Animal Science: University of Pretoria, 1998 ➲ Bachelor of Science (Honours) in Wildlife Management: University of Pretoria, 1999 ➲ Master of Science in Environmental Science (Water Resource Management): University of Pretoria, 2000	➲ Bachelor of Science in Tourism: North West University, 2010 ➲ Bachelor of Science (Honours) in Geography: University of Johannesburg, 2011
PROFESSIONAL REGISTRATION:	➲ Registered Professional Natural Scientist (Environmental Science): The South African Council for Natural Scientific Professions, 2007	➲ None

1.2.2 SUMMARY OF THE EAPS PAST EXPERIENCE

ABS Africa (Pty) Ltd is a professional environmental advisory company with a focus on the mining environment. The ABS Africa personnel included in the project team structure for the independent environmental assessment have collectively completed more than 100 EIAs across the African continent.

Paul Furniss has 17 years environmental assessment and management experience in the energy, water, mining and infrastructure sectors. Please refer to Appendix 1 for a record of the experience of the EAPs.

Chané Pretorius has over 7 years' experience in coordinating and managing various environmental studies in the mining, infrastructure and energy sectors.

2 DESCRIPTION OF THE PROPERTY

2.1 OVERVIEW

Ilima Coal Company (Pty) Ltd. is applying for a mining right over nine (9) portions of the Farm Kranspan 49IT. The farm Kranspan is situated approximately 13 km South-West of Carolina and approximately 12 km North of Breyten in the Gert Sibande District of the Mpumalanga Province. The farm falls within the authority of the Chief Albert Luthuli Local Municipality (Appendix 3, Map 1).

2.2 PROPERTY DESCRIPTION

The farm Kranspan 49 IT is approximately 3 382 ha in size. Historically the area has been utilised for intensive commercial cultivation of annual crops and grazing of livestock with significant coal mining in close proximity (within 5 km. The site has largely been transformed by the intensive farming activities.

The R36 traverses the property from the North - Eastern border of the Kranspan Farm to the South – Eastern border. The surface topography is undulating, with gradual rises and falls over the area with the highest elevations towards the central portion of the Project area.

The vegetation of the general area and the proposed site consists of Eastern Highveld Grassland (Mucina & Rutherford 2006). Two large pans occur in the area that would have been focal points in antiquity.

TABLE 2-1: DESCRIPTION OF THE PROPERTIES

FARM NAMES:	Kranspan 49 IT
APPLICATION AREA (HA):	Approximately 3 382 ha
MAGISTERIAL DISTRICT:	Gert Sibande
MUNICIPALITIES	Chief Albert Luthuli Local Municipality
DISTANCE AND DIRECTION TO NEAREST TOWNS	Carolina is situated approximately 13 km north-east of the proposed mining right area

TABLE 2-2: 21 DIGIT SURVEYOR-GENERAL CODE FOR EACH FARM PORTION

FARM NAME	PORTION	TITLE DEED	21 DIGIT SURVEY OR GENERAL CODE FOR EACH FARM PORTION
Kranspan 49 IT	RE	T1717/2013	T0IT00000000004900000
Kranspan 49 IT	1	T38919/1972	T0IT00000000004900001
Kranspan 49 IT	2	T97271/2004	T0IT00000000004900002
Kranspan 49 IT	3	T2076/2012	T0IT00000000004900003

Kranspan 49 IT	4	T16244/1996	T0IT00000000004900004
Kranspan 49 IT	5	T97271/2004	T0IT00000000004900005
Kranspan 49 IT	6	T16243/1996	T0IT00000000004900006
Kranspan 49 IT	7	T175671/2003	T0IT00000000004900007
Kranspan 49 IT	8	T1717/2013	T0IT00000000004900008

2.3 LOCALITY MAP

The proposed mining right area comprises of the entire extent of the Kranspan Farm, which is situated approximately 13 km south-west of the town of Carolina in the Mpumalanga Province. Please refer to Appendix 3, Map 1.

3 DESCRIPTION OF THE SCOPE OF THE PROPOSED OVERALL ACTIVITY

3.1 LISTED AND SPECIFIED ACTIVITIES

(Please refer to Appendix 3, Map 2 for the proposed layout of the key infrastructure listed below).

TABLE 3-1: LISTED AND SPECIFIED ACTIVITIES

NAME OF ACTIVITY (ALL ACTIVITIES INCLUDING ACTIVITIES NOT LISTED) (E.G. EXCAVATIONS, BLASTING, STOCKPILES, DISCARD DUMPS OR DAMS, LOADING, HAULING AND TRANSPORT, WATER SUPPLY DAMS AND BOREHOLES, ACCOMMODATION, OFFICES, ABLUTION, STORES, WORKSHOPS, PROCESSING PLANT, STORM WATER CONTROL, BERMS, ROADS, PIPELINES, POWER LINES, CONVEYORS, ETC...ETC...ETC.)	AERIAL EXTENT OF THE ACTIVITY HA OR M²	LISTED ACTIVITY MARK WITH AN X WHERE APPLICABLE OR AFFECTED	APPLICABLE LISTING NOTICE / NOT LISTED	WASTE MANAGEMENT AUTHORISATION (INDICATE WHETHER AN AUTHORISATION IS REQUIRED IN TERMS OF THE WASTE MANAGEMENT ACT). (MARK WITH AN X)
Mine Contractors Camp	2 ha	X	GNR 984 (17)	-
Open Pit Mine Areas	777 ha	X	GNR 984 (17)	-
Overburden Stockpiles	181 ha	X	GNR 984 (17)	X
Topsoil Stockpiles	19 ha	X	GNR 984 (17)	-
Surface Discard Stockpile (alternative to in-pit discard disposal)	15.6 ha	X	GNR 984 (17)	X
Pollution Control Dams	6 ha	X	GNR 984 (17)	X
Fuel Storage Area and Back-Up Power Generation (generator sets)	0.04 ha	X	GNR 984 (17)	-
Explosives Storage Area (Rapid reload area 100m*50m) (Magazine 70m x 45m)	0.8ha	X	GNR 984 (17)	-
Mine Haul Road and Internal Roads – Main Roads (7km @15m wide)	10.5 ha	X	GNR 984 (17)	-

Mine Haul Road and Internal Roads – Pit Roads (3km @ 15m wide)	4.5 ha	X	GNR 984 (17)	-
Mine Haul Road and Internal Roads – Roads for Final Rehabilitation (2km @10m wide)	2.0 ha	X	GNR 984 (17)	-
ROM Stockpiles (Located near opencast pits)	6.4 ha	X	GNR 984 (17)	-
ROM Stockpile (Located near plant)	2.6 ha	X	GNR 984 (17)	-
Coal Processing Plant (Dry Crushing and Screening and Wash Plant)	1.7 ha	X	GNR 984 (17)	-
In-Pit Discard Disposal (Pit 5)	143 ha	X	GNR 984 (17)	X
Mine Support and Administration Block (Sewage treatment facility, workshops, offices, ablutions, change houses, lamp room, first aid station, stores, weighbridges, solid waste handling area, vehicle parking area, and vehicle wash bay, water supply boreholes)	1.7 ha	X	GNR 984 (17)	-
Mine Access Shaft and Ventilation Shaft	5.4 ha	X	GNR 984 (17)	-
Underground Mining Area	264 ha	X	GNR 984 (17)	-

Please refer to Section 4 for the list of NEMA and NEMWA activities applicable to the proposed development.

The mine planning and detailed engineering is ongoing and the surface area extent of the planned infrastructure may change.

Based on the mine planning studies completed to date, the following is proposed:

- Surface (open pit) mining focusing on extraction of the E Seam via the roll over mining method;
- Follow-up phases of mining focused on extraction of the E Seam will be achieved through underground mining via the bord and pillar method;
- Establishment and maintenance of topsoil and overburden stockpiles;
- Following extraction, the coal product will be dry crushed and screened on-site. To meet the export coal quality specifications, an estimated 70% of the coal will be beneficiated on site through an on-site coal washing plant with filter press;
- Coal discard from the wash plant will be disposed of in-pit as part of the rehabilitation of the surface mining. Alternatively, the discard will be disposed of in an engineered stockpile on surface. Both discard management options have been investigated and assessed in the S&EIR process;
- Dewatering of seepage water will be required for both the surface and underground mining over the Life of Mine (LOM). Water removed from pits and the underground workings, as well as dirty stormwater runoff, will be retained in Pollution Control Dams; and
- Establishment and maintenance of various ancillary mine support infrastructure will be required.

Below is a summarised list of the proposed mining activities to be undertaken.

- Exploration geophysical surveying, drilling, pit sampling and trenching;

- Clearing and grubbing (surface mining areas and surface infrastructure footprint);
- Topsoil removal and stockpiling (surface mining areas and surface infrastructure footprint);
- Overburden removal and stockpiling;
- Drilling and blasting (when necessary, for both the surface and underground mining);
- Excavation of coal and material transfer to the plant area (surface and underground mining);
- Dry crushing and screening at the product loading (plant) area;
- Beneficiation (washing) of the export coal product; and
- Loading, hauling and transport of coal product (surface and underground mining).

3.2 DESCRIPTION OF THE ACTIVITIES TO BE UNDERTAKEN[1]

3.2.1 MINING OVERVIEW

All the required mine infrastructure for the Project Area will be established within the proposed mining right area. The E Seam will initially be mined through opencast mining methodologies followed in time by underground (bord and pillar) mining.

The mine support and administration block will be situated towards the central-eastern interior of the Kranspan Farm (Portions 3 and 5).

The mine infrastructure will consist of the following:

- A mine contractors camp;
- Overhead powerlines and related electrical infrastructure from the nearest Eskom take-off position;
- Back-up power supply (generators);
- Bunded fuel storage area;
- Potable water supply infrastructure;
- Mine haul roads and associated stormwater control structures;
- Explosives storage area;
- Mine offices, parking area, first aid station, stores, laboratory, workshop, change house, ablution facilities and lamp room (pre-fabricated structures);
- Wash plant;
- Surface discard stockpile facility (if there is insufficient capacity for in-pit disposal of discard);
- Product stockpiles and loading area;
- Weighbridges;
- Brake test ramps;
- Crushing and screening plant;

1 The information in this section has primarily been summarised from the Kranspan Mining Works Programme (Ilima, 2018)

- Underground mine access adit and associated equipment;
- Upcast ventilation shaft and fans (underground mine), and
- Wastewater (sewage) treatment infrastructure for the contractor's camp and mine office block area.

The mine will operate on a 2-shift system 6 days per week and the coal preparation plant operates on a 3-shift system 7 days per week. Coal is out-loaded to rail 7 days per week. The raw coal handling, stockpiling, processing, and out-loading facilities are designed to cater for the differences between mining, coal preparation, and product handling operations.

A summary of selected key parameters defining the proposed mining activity is provided in Table 3-2.

TABLE 3-2: SELECTED KEY MINE OVERVIEW PARAMETERS

PARAMETER	UNIT	VALUE*
Life of Mine	Years	12
Total ROM Tonnage	Mt	24.8
Mine Tonnage (Surface Mining)	Mt	14.1
Mine Tonnage (Underground Mining)	Mt	10.7
Average Stripping Ratio	Ratio	8.7:1
Total Overburden Material Stockpile Volume	Mm^3	120.5
Total Topsoil Stockpile Volume	Mm^3	2.6
Maximum Depth of Surface Mining	m	40

** Source: Ilima Mine Works Programme (2018)*

3.2.2 OPENCAST MINING

A conventional strip mining (roll-over) method will be employed for each of the opencast pits. Material from the boxcut phase will be stored per overburden classification, with the bulk of the material placed in a position alongside the final strip, to facilitate filling of the final void (Figure 3-1).

Each of the steps in the open cast mining method is summarised below:

3.2.2.1 Topsoil

Topsoil will be removed two strips in advance of the current working strip and will be either stockpiled separately or placed directly on the rehabilitated area behind the advancing strip. Topsoil will be removed using excavators and hauled with Articulated Dump Trucks (ADTs).

The average depth of utilisable soil at Kranspan is 0.5 m.

3.2.2.2 Softs Removal

Soft subsoil will be removed one strip in advance of the current working strip and will be either stockpiled separately or placed directly on the rehabilitated area behind the advancing strip. Softs will be removed using excavators and hauled with Articulated Dump Trucks (ADTs).

Softs are generally the weathered material within the geological profile. At Kranspan, this material has an average thickness of approximately 6.65 m.

3.2.2.3 Overburden Drill and Blast

Drilling of the overburden will be done using a mobile drill rig drilling a 110 mm diameter hole and with a planned burden and spacing of 4 m x 5 m. This may be adjusted once mining has commenced.

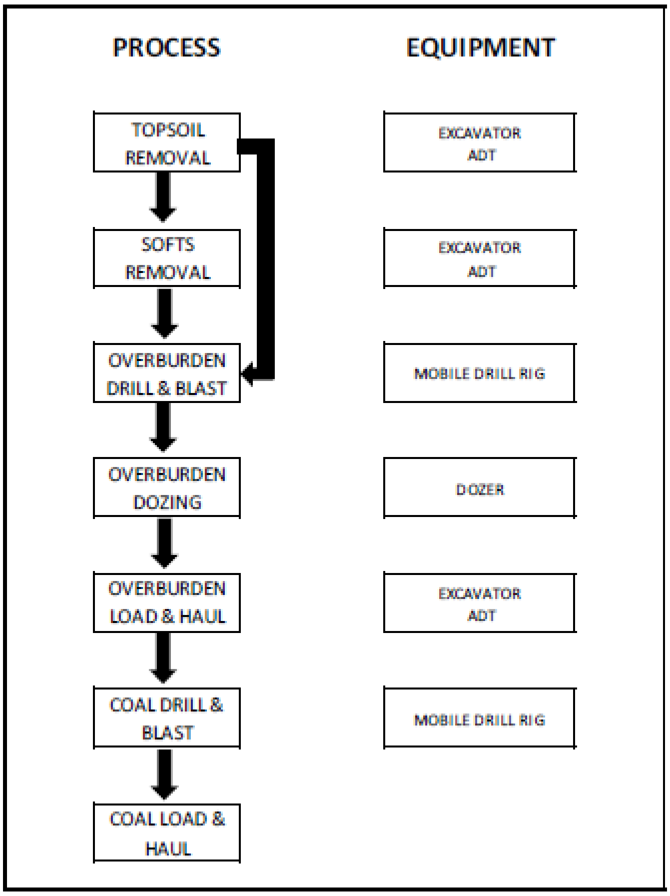


FIGURE 3-1: MINING METHOD

Hards overburden material typically comprises of unweathered sediments. At Kranspan, the average thickness of the hards material is 12 m.

3.2.2.4 Overburden Dozing

The first overburden removal process will be to doze overburden material to the spoil side. For modelling purposes, it is assumed that 30% of the overburden can be dozed. The assumption is based on current mining practice at similar sites.

3.2.2.5 Overburden Load and Haul

After dozing, remaining overburden will be loaded and hauled and dumped on the spoil side of the current strip. The load and haul will be conducted using excavators and ADTs.

3.2.2.6 Coal Drill and Blast

Drilling of the hard overburden and coal will be done using a mobile drill rig drilling a 110 mm diameter hole and with a planned burden and spacing of 7 m x 8 m. This may be adjusted once mining has commenced.

3.2.2.7 Coal Load and Haul

Permanent haul roads will be constructed in line with relevant safety requirements. The coal will be loaded and hauled to the Run of Mine (ROM) Stockpiles using excavators and ADTs.

3.2.2.8 Rehabilitation

Rehabilitation of the open pits will be done concurrently with the opencast mining using the recognised roll over method of mining and the stated mining sequence.

Materials are placed back into the void in the former stratigraphic sequence i.e. topsoil on the surface, subsoil directly below the topsoil and soft overburden, while all carbonaceous shales and hard material (sandstone and shale) is deposited in the bottom of the void. It is envisaged that the final reinstated surface level will be approximately 0.52 m above the original surface level. However, the existing surface drainage pattern will remain unchanged and the total disturbed area will be free draining. On completion of surface reinstatement, the area will be re-vegetated with suitable pasture grass species.

3.2.3 Underground Mining

The underground mining method will be a conventional bord and pillar mining operation deploying continuous miners with shuttle cars, supported by roof bolters for roof support and load haul dumpers for sweeping. The mine will be designed for the maximum extraction on the advance with no pillar extraction on retreat. The safety factors applied for main developments is 2.0 and for secondary production panels 1.6.

It is planned to establish three continuous miner production sections producing between 120,000 and 130,000 tpm. A stone development section will be established for developing through dykes and faults. This will ensure that the continuous miner sections focus on coal production only.

The mine design will allow for the introduction of additional production sections, if required in the future.

3.2.3.1 Underground Material Handling Systems

Broken ore will be transported from the production faces by means of an LHD and tipped into underground dump trucks for transporting to the underground crushing circuit.

Ore will be tipped directly onto a grizzly. The undersize will pass through the grizzly screen onto an apron feeder and vibrating grizzly, which will convey the ore to the underground crusher. Oversize will undergo secondary breakage using a hydraulic rock breaker.

Ore will be transferred via the underground conveyor to the adit entrance and loaded onto a surface stockpile where it will be transported to the plant via tipper trucks.

3.2.4 DRY CRUSHING AND SCREENING PLANT

Certain areas will be mined to produce a high Ash, medium Volatile, thermal coal product for power station consumption by screening and crushing the run of mine (ROM) coal. The crushing and screening plant will be situated at the plant area. A typical crushing and screening plant is shown in Figure 3-2.

At the crushing and screening plant, the raw coal is fed into the crushing plant by a FEL (Front End Loader). The coal is crushed mechanically in the plant by jaw crushers. This reduces the size of the raw coal so that it can be more easily handled. The crushed coal then moves into the screening plant where vibrating screens separate the crushed coal into different sizes or grades of coal.

This coal product is then loaded onto trucks for delivery to the Eskom market.

FIGURE 3-2: COAL PROCESSING PLANT

3.2.5 OVERBURDEN STOCKPILES

Several overburden stockpiles will be established during the LOM. These overburden stockpiles comprise of the hards and softs sub-soil material removed in order to gain access to the coal seam. The stockpiles have been placed as close to the pits as possible but outside of areas identified as environmentally sensitive. The proposed location of the stockpiles is shown in Appendix 3, Map 2.

Topsoil is stored separately to the overburden stockpiles.

The location and capacity of the PCDs is summarised in the table below and shown in Map 2, Appendix 3.

TABLE 3-3: SUMMARY LIST OF PLANNED OVERBURDEN STOCKPILES

LABEL	LENGTH	WIDTH	HEIGHT	AREA (M2)	VOLUME (M3)
H1	345	90	10	32 254	246 736
H2	400	95	10	38 532	318 838
S1	252	126	10	32 153	271 333
T1	180	36	5	8 258	24 732
H3	151	75	10	11 409	86 518
H4	150	70	10	15 511	79 608
H5	275	40	10	10 854	70 000
H6	301	40	10	6 938	78 949
S2	150	103	10	11 941	124 313
S3	206	50	10	12 450	72 429
T2	130	78	5	11 961	52 699
H26	232	87	10	21 466	156 600
H27	256	100	10	31 012	204 000
S21	250	100	10	27 720	199 100
H7	337	223	10	90 253	682 028
S4	355	196	10	71 707	627 470
T3	294	70	5	25 106	91 845
H8	540	72	10	39 814	312 663
H9	289	100	10	31 711	241 405
S5	480	105	10	50 112	431 319
T3A	400	45	5	24 356	76 035
S6	266	154	10	41 289	358 078
H10	458	106	10	47 686	415 486
H11	791	142	10	114 547	1 005 997
H12	576	129	10	101 869	628 800
S7	238	125	10	108 714	243 103
H13	280	158	10	45 703	384 028
S8	238	125	10	29 835	243 103
T4	221	101	5	20 578	101 576
S9	238	117	10	34 303	235 217
H14	278	123	10	39 149	292 809
S10	309	150	10	47 648	406 946
T5	339	45	5	15 424	64 262
H15	180	123	10	22 830	184 813
S11	126	126	10	16 921	128 701
H28	370	120	10	45 654	368 138
S22	441	75	10	31 472	256 224
H18	765	75	10	58 679	465 430

S13	765	75	10	51 556	465 430
T6	665	30	5	21 133	77 785
H19	371	100	10	34 217	312 910
H20	283	100	10	28 753	236 173
H21	270	90	10	24 962	199 117
H22	270	95	10	26 761	211 977
H23	270	99	10	25 969	222 265
H24	270	90	10	24 072	199 117
H25	140	95	10	13 290	105 117
S14	409	123	10	59 953	437 172
S15	270	80	10	21 600	173 397
S16	489	97	10	53 876	401 521
S17	270	80	10	21 600	173 397
S18	270	80	10	21 600	173 397
S19	270	80	10	21 586	173 397
S20	141	100	10	14 068	112 349
T7	270	50	5	13 500	57 535
T8	270	50	5	13 500	57 535
T9	270	50	5	13 500	57 535
T10	270	50	5	13 500	57 535
T11	141	80	5	11 280	49 603

The stockpiles are temporary in that they are only on surface for as long as it takes to extract the coal from the relevant pit. After the coal has been removed, the overburden material is placed back into the pit in the same order as it was removed, typically hards, softs and then topsoil. Whilst on surface, the overburden stockpiles are managed as part of the dirty water management area. Runoff from the stockpile areas thus drains and is contained in the PCDs.

3.2.6 ROM Stockpiles and Product Stockpile

Several ROM stockpiles will be established at the open cast mine areas. Raw coal extracted from the pits is temporarily stockpiled at these locations before being transported to the coal processing area either for dry crushing and screening or washing.

Following processing, the coal is placed on the product stockpile. The latter is situated adjacent to the processing plant. From here, the product is transported to the customer. The product stockpile will be in place for the LOM.

The ROM and product stockpile areas are managed as part of the dirty water management system. Runoff from the stockpile areas thus drains and is contained in the PCDs.

3.2.7 Dense Medium Beneficiation (Coal Washing) Plant

Washing of the raw coal is required for the approximately 70% of the coal product over the LOM. The purpose of washing is primarily to reduce the ash content of the coal so that it meets the quality requirements of the export market (Table 3-4).

TABLE 3-4: COAL QUALITY COMPARISON

PARAMETER	PRODUCT		
	KRANSPAN COAL	EXPORT – RB2 GRADE	ESKOM
Total Product tonnes per annum	2 160 000	1 162 296	498 127
Proportion of Total	100%	70%	30%
Gross Calorific Value (MJ/kg)	19.72 – 25.50	>25.30	19 - 24
Ash (%)	18.00 – 31. 65	<20	24 - 33
Volatile Matter (%)	20.07 – 23.77	>21	>20
Total Sulphur (%)	0.70 – 1.11	<1.20	<1.50
Abrasion Index (Mg Fe/kg)	280 - 420	n/a	<450

Source: Mine Works Programme (Ilima, 2019)

The raw coal handling facilities, coal preparation plant (wash plant) and product out-loading facilities are designed to receive and process coal from both opencast and underground mining operations and to produce 3.0 Mt/a of saleable product at 5,500 kcal/kg net as received which is to be out-loaded on rail for delivery to the RBCT. A typical coal washing plant is shown in Figure 3-3.

The coal preparation plant design capacity and product out-loading systems are calculated on the following basis:

- Raw coal feed 4.24 Mt/a AD
- Sales 3.00 Mt/a AD
- Operating time 6360 h/a
- Theoretical Yield 80.8%
- Plant Efficiency 87.6%
- Plant Yield 70.8% (+10% maximum -15% minimum)
- Average plant capacity 670 t/h AD
- Design plant capacity +10%-740t/h AD

The coal preparation plant is designed on a modular basis to allow for a phased build-up in coal production.

The washing plant design comprises of the following modules: -

- Dense medium (DM) cyclone modules each inclusive of de-sliming screen clean coal drain and rinse screen, 2 x 600 dense medium cyclones and associated tanks and pumps;
- Discard modules comprising 1 drain and rinse screen fed from 2 dense medium cyclone modules;
- Fines treatment plants fed from 2 dense medium cyclone modules each module inclusive of de-sliming cyclones, spirals, spiral clean coal dewatering cyclones and screens, spiral discard dewatering cyclones and water clarification system;

- Clean coal dewatering module fed from the 4 dense medium cyclone modules by a common conveyor feeding 2 clean coal centrifuges; and
- Plant services for magnetite addition, compressed air, and high-pressure water.

The modules are sized to handle the design tonnage plus 10% and the expected variations in yield and size consist as set down in the design criteria.

The 40 mm x 0 raw coal is fed onto fixed sieve panels followed by de-sliming screens where water is added and the 1mm x fines are removed. The 40 x 1 mm de-slimed raw coal is then mixed in a magnetite in water suspension and laundered to a dense medium cyclone feed tank from where it is pumped to 2 x 600 mm dense medium cyclones.

The cyclones are sized to handle the feed tonnage and particle top size. The 1 mm x 0 fines gravitate to a de-sliming tank and are pumped to the fines treatment for further processing.

The dense medium cyclones separate the coal by density into clean coal and discard fractions. Clean coal gravitates over a fixed sieve to a horizontal vibrating drain and rinse screen where medium is drained from the coal and the coal is then rinsed with water to remove any adhering medium. Discard from the cyclones similarly gravitates to a horizontal vibrating drain and rinse screen where medium is again drained from the coal and the coal is again rinsed with water to remove any adhering medium.

Correct medium from the fixed sieve and drainage section of the drain and rinse screens gravitates to a correct medium tank and is then pumped to a head-box from where it is distributed to the pump tank and bleed-off to dilute medium to remove excess water entering the circuit with the raw coal.

Dilute medium from the drainage section of the drain and rinse screens gravitates to a dilute medium tank from where it is pumped to a magnetic separator for recovery of the magnetite. Magnetic separator effluent is used as primary rinse water on the drain and rinse screens or flood box water on the de-sliming screen. Over dense magnetite from the magnetic separator gravitates to the correct medium tank.

An automatic nucleonic density controller measures the density of the correct medium and controls the addition of clarified water into the correct medium tank to maintain the correct density in the circuit.

Fresh magnetite slurry is periodically added at the required density to the correct medium tank from the magnetite mixing plant if the density of the medium or the tank level drops.

Clean coal from the drain and rinse screens is discharged onto a common collection conveyor and fed to clean coal centrifuges for further dewatering of the coal. Effluent from the centrifuges is pumped back via flood-box onto the drainage section of the clean coal drain and rinse screens.

Discard from the drain and rinse screens is collected on a common discard conveyor and conveyed to the discard bin. Floor clean-up sumps and pumps are provided in each module.

FIGURE 3-3: EXAMPLE OF A TYPICAL WASH PLANT

3.2.8 SLURRY AND DISCARD

Washing of the coal in the coal preparation plant will result in the generation of two coal waste streams, namely a coal slurry and a coal discard. The former comprises of fine coal particle material with a high moisture content as well as clay and shale. The presence of contaminants like clay and shale in the coal, and more especially the high moisture content thereof, present complications in the handling and use of the slurry. The Calorific Value of the slurry is however still adequate for application in markets like the cement industry.

3.2.9 DISCARD MANAGEMENT

Coal discard generated at the wash plant generally comprises of larger coal particle sizes and less moisture. Discard from the coal preparation plant is planned to be deposited back into the open pits, after extraction of the target coal seam has been completed. In accordance with the recommendations from the geochemical characterisation testwork, geochemical modelling and groundwater study, only Pit 5 is proposed to be used for the in-pit disposal of the discard material.

The volume of discard material which will be generated over the LOM is dependent on several factors including the tonnage of coal processed through the wash plant. This, in turn, is dependant on the quality of the coal seams and the difference in the export versus Eskom price of the coal per tonne. Both of these factors cannot be predicted with absolute certainty at the mine planning stage and are expected to fluctuate over the LOM.

Two discard management alternatives were assessed as part of the S&EIR Process, namely surface and in-pit discard disposal. These are discussed in the relevant specialist studies, summarised in Section 17 of the EIR. The alternatives analysis is presented in Section 6 of the EIR.

Based on the mine planning undertaken to date and informed by the findings of the geochemical modelling, approximately 5 384 455 m^3 of discard material is proposed to be backfilled in Pit 5 as part of the rehabilitation of this pit. This comprises of a surface area of approximately 143 ha and is based on backfilling of the discard into the mined pit up to the average height of the roof of the coal seam. Should additional discard disposal capacity be required and the material be backfilled to above the pre-mining coal seam depth, geochemical and groundwater modelling will be undertaken to estimate this impact prior to the implementation of this management option.

This will limit the extent to which carbonaceous material is placed back in the pit at a different height to that which occurred naturally in the pre-mining profile. The height of the coal seam increases towards the north and north-west of Pit 5 and decreases towards the south. The backfilling height will follow the same gradient as the coal seam with greater height of discard material backfilled in the north and north-west of the pit. Plans showing the proposed area for the in-pit disposal of discard are shown in Appendix 4.

Current forecasts indicate that there will be enough capacity in Pit 5 for the in-pit disposal of all discard material that will be generated over the LOM. Should this change, Ilima will establish an engineered surface discard stockpile. This stockpile will be situated in proximity to the coal preparation plant (Appendix 3, Map 2) and will be designed in compliance with the Regulations regarding the Planning and Management of Residue Stockpiles and Residue Deposits, 2015 (as amended)[2].

3.2.10 CONVEYOR

Based on current mine plans, provisions has been made for the construction of underground conveyor which will convey coal to the surface stockpile. The underground shaft conveyor will be elevated to ~15 m, which allows for a 7,000-tonnes ROM coal stockpile on surface.

An overland conveyor was considered as part of the Mine Works Programme. Based on the current mine plans, the overland conveyor was considered less viable. However, the use of overland conveyor might be considered in future.

3.2.11 POWER

Based on the planned mining operation, surface plant, and product handling information planned for the Kranspan Project, the calculated Total Power Demand is 7.0 megavolt amperes (MVA). The Maximum Demand is dependent on correct operation of a Power Factor Correction (PFC) system to keep the Power Factor above 0.96. Should the PFC system fail, the Maximum Demand can substantially increase to 9.3 MVA.

Calculation of the Maximum Demand is based on:

- Underground power requirements
    - Three continuous miner sections;
    - Conveyor systems; and
    - Auxiliaries installations such as water reticulation systems.

[2] Government Notice No. R. 632 of 24 July 2015, promulgated in terms of the National Environmental Management: Waste Act 59 of 2008

- Surface power requirements
  - Office complexes;
  - Change house facilities;
  - Ventilation fans;
  - Incline conveyors;
  - Surface stockpile conveyors;
  - Crushing and screening plant;
  - Modular Coal Processing Plant;
  - Water purification and sewer plants; and
  - Workshops.

In order to mitigate risks to underground operations and to comply with legislation, an alternate power supply to the ventilation fans has been recommended and other critical infrastructure is mitigated by installing standby diesel generators for the purposes of fulfilling the alternate power supply.

The Surface Consumer Substation for Kranspan will typically consist of the following:

- Two 22 kV pole-mounted Ganged Isolators with surge arrestors.
- Two 22 kV / 11 kV 10 MVA DY11 skid-mounted Oil Natural Air-cooled transformers fitted with:
  - Automatic 16-step tap switch changer
  - Primary circuit breaker
  - Secondary circuit breaker
  - 25-Amp dry-type continuously rated Neutral Earthing Resistor
  - Primary, secondary, transformer, and neutral earthing resistor protection
  - Controllers
  - Automatic tap switch changer
  - 22 kV voltage transformer
- One skid-mounted breaker skid with:
  - Two incoming breakers
  - One lighting transformer
  - Bus section breaker
  - Two reactor capacitor inductive system feeders
  - Two underground feeders
  - Four surface feeders
- Earthing system as per SANS requirements.
- Two PFC systems.

A 22kV overhead power line, approximately 2.7 km in length will be required. The route of this power line is proposed to be established from a connection on Portion 1 from where it will cross the R36 and then broadly follow the alignment of the main mine access road to the mine offices.

3.2.12 Explosives Magazine

Explosives for blasting of overburden and coal will be stored at selected areas across the site. Storage areas will comply with all relevant legislation.

3.2.13 Pollution Control Dams

Six PCDs will be established on the mine site to collect and retain dirty water for reuse. The proposed location of the PCDs has been informed by the surface topography of the site in relation to the proposed mining areas (Appendix 3, Map 2). The location of the PCDs also avoids areas identified as environmentally sensitive. .

The capacity of the PCDs is based on a 1:50 year storm event[3].

The location and capacity of the PCDs is summarised in the table below.

PCD	CAPACITY	LOCATION (FARM PORTION)
PCD 1	49 000m3	Kranspan 49IT Portion 1
PCD 2	49 000m3	Kranspan 49IT Portion 1
PCD 3	49 000m3	Kranspan 49IT Portion 2
PCD 4	49 000m3	Kranspan 49IT Portion 3
PCD 5	49 000m3	Kranspan 49IT Portion 5
PCD 6	49 000m3	Kranspan 49IT Portion 7

3.2.14 Water Supply

Water requirements for use by the mine staff is calculated at 100 litres (L) per person per day. The total number of employees and subcontractors are estimated to be between 350 and 400 and the water supply capacity has therefore been calculated at 40 kilolitres (kL) per day.

Boreholes will be established to supply water for staff requirements. A small water treatment plant will be built at the mine to produce potable water from the borehole water.

Industrial water requirements include:

- Beneficiation Plant (Dense medium);
- Dust suppression (Surface and Underground);
- Cooling (Underground)

The processing plant water consumption has been estimated to be between 10,000 and 20,000 m^3 per month.

[3] A stormwater management plan has been compiled by JB Umwelttechnik (2019) and is attached as Appendix 8.

Two sources for the supply of water, especially to the beneficiation plant, have been identified, namely:

- Water from ground or surface water resources; and
- Water from dirty water containment facilities.

3.2.15 Sewage

New facilities for sewage will be constructed within the footprint of the process plant. The technology is likely to be a modular sewage package plant with a design throughout capacity suitable for the expected mine labour.

Chemical toilets will be used for the underground mining. These will be serviced at the required frequency by a licenced contractor.

3.2.16 Water Management

All dirty rainfall run-off will be separated from clean water through cut-off drains. The polluted run-off water collected will be stored in high-density polyethylene-lined (HDPE) pollution control dams (PCDs). The latter will be located adjacent to the screening and crushing plant and in proximity to the open pits. The water from the PCDs will be used for dust suppression around the plants and the ROM and product stockpiles.

Water management across the site will be in compliance with all requirements of Government Notice 704, promulgated in terms of the National Water Act, Act 36 of 1998, specifically in respect of the following:

- Collection of the water arising within any dirty area, including water seeping from mining operations, outcrops or any other activity, into a dirty water system;
- Design, construction, maintenance and operation of the clean water and dirty water management systems so that it is not likely for either system to spill into the other more than once in 50 years;
- Design, construction, maintenance and operation of any dam that forms part of a dirty water system to have a minimum freeboard of 0.8 m above full supply level, unless otherwise specified in terms of Chapter 12 of the Act;
- Design, construction, and maintenance of all water systems in such a manner as to guarantee the serviceability of such conveyances, for flows up to and including those arising as a result of the maximum flood, with an average period of recurrence of once in 50 years; and
- Prevention of erosion or leaching of materials from any residue deposit or stockpile from any area and containment of material or substances so eroded or leached in such area by providing suitable barrier dams, evaporation dams or any other effective measures to prevent this material or substance from entering and polluting any water resources.

3.2.17 Non-Mineral Waste Management

No solid waste disposal facilities are to be constructed as part of the mine development. All waste will be managed in accordance with the waste management hierarchy as required by the National Environmental Management: Waste Management Act 59 of 2008.

Waste will be segregated into general and hazardous waste and contractors will be appointed to remove the waste to licensed waste disposal facilities.

Recyclable waste like glass, wood and plastic will similarly be segregated on site and removed by licensed waste transporters. An oil recycling company will also be appointed to remove waste oil generated by the mining activities. Medical waste arising from the on-site clinic will also be removed from site by a contractor.

The on-site waste storage area is proposed to be located within the process plant footprint.

3.2.18 Main Mine Access Road and Internal Haul Roads

The Project Area will be directly accessed from the R36 Provincial Road, which runs in a north to south direction from Carolina to Breyten. The administrative offices, main store, main workshop, and the wash plant infrastructure will be constructed approximately 2 km from the proposed junction of the main mine access road with the R36. This is an existing junction with the R36, used by current landowners and site occupiers. A weighbridge will be installed on the main mine access road.

The main access road would consist of a 10-15m wide gravel road with softs material berms along both sides of the roads. These roads will be equipped with all the required storm water systems and structures to prevent any possible flooding. Dust from these roads will be controlled by applying road binders and regular watering with water tankers.

Stormwater runoff from the roads within the mining right area will be regarded as dirty water and managed through the mine's dirty water management system.

3.2.19 Rail

No new rail infrastructure is proposed to be constructed as part of the Kranspan Project. Product destined for the export market will be transported via truck to an existing rail siding. The rail route links to the RBCT mainline at Ermelo and onto the export facility at Richards Bay.

The rail haul route from the Project Area to Majuba Power Station goes south to Ermelo, and then onto the newly constructed rail line that links the export rail line at Ermelo with the Majuba Power Station.

3.2.20 Offices, Workshops and Change Houses

Based on the anticipated management structure at the Kranspan Project, office and ablution facilities have been designed to accommodate all on-site personnel. The office design contains the reception area, eight offices, boardroom, male and female ablution facilities, kitchen, change house and laundry facility. The office design will, as far as possible, make use of existing buildings (farmhouses).

The processing wash plant offices will be incorporated into the main office complex that is situated close to the plant.

An office complex, including offices, a small boardroom, a change house, stores, lamp room, and workshops will also be established at the underground adit area.

4 POLICY AND LEGISLATIVE CONTEXT

Table 4-1 provides a description of the legislation which has particular importance to the S&EIR process being undertaken for the development. A non-exhaustive summary list of the various legislation applicable to the proposed development is provided in Appendix 2.

TABLE 4-1: POLICY AND LEGISLATIVE CONTEXT

APPLICABLE LEGISLATION AND GUIDELINES USED TO COMPILE THE REPORT (A DESCRIPTION OF THE POLICY AND LEGISLATIVE CONTEXT WITHIN WHICH THE DEVELOPMENT IS PROPOSED INCLUDING AN IDENTIFICATION OF ALL LEGISLATION, POLICIES, PLANS, GUIDELINES, SPATIAL TOOLS, MUNICIPAL DEVELOPMENT PLANNING FRAMEWORKS AND INSTRUMENTS THAT ARE APPLICABLE TO THIS ACTIVITY AND ARE TO BE CONSIDERED IN THE ASSESSMENT PROCESS);	REFERENCE WHERE APPLIED
Acts	
National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA)	NEMA provides 18 specific principles relating to Environmental Management. Of key importance are the precautionary principle and the polluter pays principle. The 18 principles of NEMA are to be recognised during the undertaking of the Impact Assessment Process and play a key role during the decision-making process. Section 24 of NEMA requires environmental authorisation to be obtained for certain activities identified in three listing notices, published on 4 December 2014. The procedure for obtaining an environmental authorisation requires either a basic assessment (activities in Listing Notice 1 and 3) or scoping and Environmental Impact Assessment (activities in Listing Notice 2) process to be undertaken to inform the application for authorisation. **The proposed mining and associated activities fall within the ambit of various listed activities in Listing Notice 1, 2 and 3. Since activities in Listing Notice 2 apply to the proposed mining activities, a S&EIR process is being followed. The S&EIR process is being undertaken in compliance with the requirements of NEMA and the EIA Regulations, 2014 (as amended)**
Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002) (MPRDA)	The MPRDA regulates the acquisition, use and disposal of mineral and petroleum rights. **Ilima is applying for a mining right in terms of section 22 of the MPRDA.**

National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) (NEM:WA)	The NEM: WA provides for the reform of waste management legislation and repeals or amends the legislation under which waste was previously regulated. Part 4 of the NEM: WA pertains to listed waste management activities. In accordance with section 19(2) of the NEM: WA, the Minister published a schedule of listed waste management activities in Government Notice (GN) 921 of 29 November 2013. These are considered activities that have or are likely to have a detrimental effect on the environment. According to regulation 2 of GN 921, no person may commence, undertake, or conduct a listed waste management activity unless a licence is issued in respect of that activity. **The Kranspan Project will require a WML for the PCDs, and mine residue stockpiles. Mine residue stockpiles are included in the definition of hazardous waste in NEMWA. In addition, all mineral and non-mineral waste generated by the mine activities will need to be managed in accordance with the provisions of NEMWA and its associated regulations, norms and standards.**
Mine Health and Safety Act, 1996 (Act No. 29 of 1996) (MHSA)	The objective of the Act is to cover all aspects relating to health and safety of employees and other persons on the mine property. The Act places the responsibility on the mine owner for ensuring that the mine is designed, constructed and equipped in a manner which allows for a safe and healthy working environment. **The safety precautions in Section 7 of the MHSA have been incorporated in the environmental sensitivity map compiled for the Kranspan Project.**
The National Water Act, 1998 (Act No. 36 of 1998) (NWA)	The National Water Act, 1998 (Act No. 36 of 1998), identifies 11 consumptive and non-consumptive water uses, which must be authorised under a tiered authorisation system, which include Scheduled uses, General Authorisations, or Licenses. In terms of the National Water Act, the following water uses are identified: (a) Taking water from a water resource; (b) Storing water; (c) Impeding or diverting the flow of water in a watercourse; (d) Engaging in a stream flow reduction activity contemplated in section 36; (e) Engaging in a controlled activity identified as such in section 37(1) or declared under section 38(1); (f) Discharging waste or water containing waste into a water resource through a pipe, canal, sewer, sea outfall or other conduit; (g) Disposing of waste in a manner which may detrimentally impact on a water resource; (h) Disposing in any manner of water which contains waste from, or which has been heated in, any industrial or power generation process; (i) Altering the bed, banks, course or characteristics of a watercourse;

	(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; and (k) Using water for recreational purposes. **The proposed mining activities require a water use licence for several listed water uses. An Integrated Water Use Licence Application (IWULA) has been compiled in parallel with the S&EIR process.**
National Environmental Management: Air Quality Act 2004 (Act No. 39 of 2004)(NEM:AQA)	The main objectives of the NEM: AQA are to protect the environment by providing reasonable legislative and other measures to prevent air pollution and promote conservation and secure ecologically sustainable development. **The Project will involve the generation of emissions to atmosphere, including nuisance dust and air pollutants which may have an impact on health. These will need to be monitored and managed in accordance with the requirements of the Act. The Project site is also situated near a declared air quality priority area, namely the Highveld Priority Area, which was declared in 2007.** **No AEL application has been identified as being necessary for the Kranspan Project.**
Hazardous Substances Act (Act No. 15 of 1973)	The objective of the Act is to provide for the control of substances which may cause injury or ill health to or death of human beings due to their toxic, corrosive, irritant, strongly sensitizing or flammable nature or the generation of pressure. In terms of the Act, substances are divided into schedules, based on their relative degree of toxicity and the Act provides for the control of importation, manufacture, sale, use, operation, application, modification, disposal and dumping of substances in each schedule. **The chemicals typically found in petroleum products, for example, benzene, are regulated in terms of this Act. The coal preparation plant, chemical storage area, proposed fuel storage facility and refuelling bay, with all appropriate controls in place, will not conflict with the Act. The EMPr will provide details in this regard.**
National Heritage Resources Act, 1999 (Act No. 25 of 1999) (NHRA)	The NHRA describes the importance of heritage in the South African context, and designates the South African Heritage Resource Agency (SAHRA) as guardian of the national estate which may include heritage resources of cultural significance that link to biodiversity, such as places to which oral traditions are attached or which are associated with living heritage, historical settlements, landscapes and natural features of cultural significance, archaeological and paleontological sites, graves and burial grounds, or movable objects associated with living heritage. Section 38 of the Act requires a Heritage Impact Assessment (HIA) to be undertaken for various types of development. If the HIA demonstrates that the development will have an impact on a heritage resource, approval from the South African Heritage Resource Agency, or the relevant provincial heritage authority is needed prior to proceeding with the development.

	An HIA is being undertaken as part of the environmental authorisation process.
GUIDELINES	
Department of Environmental Affairs Guideline Series 7: Public Participation (2012)	The public participation guideline outlines the importance of public participation as well as the minimum legal requirements for the public participation process, the steps to be taken and the guideline for planning a public participation process. **The public participation process for this application has incorporated relevant requirements of the guideline.**
Department of Environmental Affairs Guideline Series 9: Need and Desirability (2012)	The need and desirability guideline highlights the importance of establishing and assessing the need and desirability for a project. The consideration of need and desirability in the EIA decision making process requires the consideration of the strategic importance of the development alongside the broader societal need and public interests. **The need and desirability description for the proposed development has taken cognisance of this guideline.**
Department of Environmental Affairs, Department of Mineral Resources, Chamber of Mines, South African Mining and Biodiversity Forum, and South African National Biodiversity Institute. Guideline: Mainstreaming biodiversity into the mining sector (2013)	This Guideline provides a tool to facilitate the sustainable development of South Africa's mineral resources in a way that enables regulators, industry and practitioners to minimise the impact of mining on the country's biodiversity and ecosystem services. It provides the mining sector with a practical, user-friendly manual for integrating biodiversity considerations into the planning processes and managing biodiversity during the operational phases of a mine, from exploration through to closure. **This guideline has been taken into consideration avoiding sensitive areas and reducing the impacts on biodiversity as far as reasonably possible.**
Department of Water and Sanitation best practice guidelines for water (2007).	The DWAF has developed a series of Best Practice Guidelines (BPGs) for mines in line with International Principles and Approaches towards sustainability. Utilisation by the mining sector as input for compiling water use licence applications (and other legally required documents such as EMPs, EIAs, closure plans, etc.) and for drafting licence conditions. Serve as a uniform basis for negotiations through the licensing process prescribed by the NWA. Used specifically by DWAF personnel as a basis for negotiation with the mining industry, and likewise by the mining industry as a guideline as to what the DWAF considers as best practice in resource protection and waste management. Inform Interested and Affected Parties on good practice at mines. **The guideline series have been considered and implemented where applicable throughout the EIR, EMPr and IWWMP.**

4.1 LISTED ACTIVITIES IDENTIFIED IN TERMS OF NEMA, NEM:WA AND NWA

TABLE 4-2: NEMA LISTED ACTIVITIES APPLICABLE TO THE KRANSPAN PROJECT

NEMA LISTED ACTIVITIES		
REGULATION	**ACTIVITY NUMBER**	**SUMMARY DESCRIPTION**
GN R.983, 8 December 2014 (as amended on 7 April 2017) Listing Notice 1: Basic Assessment	1(2)	The development and related operation of facilities or infrastructure for the generation of electricity from a non-renewable resource where (i) the electricity output is more than 10 megawatts but less than 20 megawatts or (ii) the output is 10 megawatts or less but the total extent of the facility covers an area in excess of 1 hectare. **The back-up power requirements (diesel generator sets), in the event of a power failure, may fall within the ambit of this activity.**
	1(9)	The development of infrastructure exceeding 1 000 metres in length for the bulk transportation of water or storm water. **Mine support infrastructure will include pipelines for potable water, storm water and dewatering of the open pits and underground mine workings.**
	1(10)	The development and related operation of infrastructure exceeding 1 000 metres in length for the bulk transportation of sewage, effluent, process water, waste water, return water, industrial discharge or slimes. **Mine support infrastructure may include pipelines for transportation of sewage and for water from pollution control dams.**
	1(12)	The development of (i) dams or weirs, where the dam or weir, including infrastructure and water surface area, is expanded by 100 square metres or more; or (ii) infrastructure or structures where the physical footprint is expanded by 100 square metres or more; where such development occurs— (a) within a watercourse; (b) in front of a development setback; or (c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse. **The placement of dams required for effectively managing water on the site, including pollution control dams, as well as road infrastructure and material stockpiles, may fall within the ambit of this activity. Avoidance of these areas is prioritised as part of the environmental sensitivity planning undertaken in the S&EIR Process.**
	1(13)	The development of facilities or infrastructure for the off-stream storage of water, including dams and reservoirs, with a combined capacity of 50 000 cubic metres or more, unless such storage falls within the ambit of activity 16 in Listing Notice 2 of 2014. **The dams required for effectively managing water on the site, including pollution control dams, may exceed a combined capacity of 50 000 m^3 whilst not necessarily failing within the ambit of activity 16 in Listing Notice 2.**
	1(14)	The development and related operation of facilities or infrastructure, for the storage, or for the storage and handling, of a dangerous good, where such storage occurs in containers with a combined capacity of 80 cubic metres or more but not exceeding 500 cubic metres.

		This includes explosives, solvents, lubricants, vehicle and generator fuel, waste oils etc. Various storage containers and storage areas, each of different sizes will be required for the different dangerous goods that will be necessary for the mining activity.
	1(19)	The infilling or depositing of any material of more than 10 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 10 cubic metres from a watercourse. **The placement of dams required for effectively managing water on the site, including pollution control dams, open pits, as well as road infrastructure and material stockpiles, may fall within the ambit of this activity. Avoidance of these areas is prioritised as part of the environmental sensitivity planning undertaken in the S&EIR Process.**
	1(20)	Any activity including the operation of that activity which requires a prospecting right in terms of section 16 of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002), including (a) associated infrastructure, structures and earthworks, directly related to prospecting of a mineral resource; or (b) the primary processing of a mineral resource including winning, extraction, classifying, concentrating, crushing, screening or washing; but excluding the secondary processing of a mineral resource, including the smelting, beneficiation, reduction, refining, calcining or gasification of the mineral resource in which case activity 6 in Listing Notice 2 applies. **This activity may be triggered by prospecting activities for minerals applied for by the Applicant.**
	1(21)	Any activity including the operation of that activity which requires a mining permit in terms of section 27 of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002), including (a) associated infrastructure, structures and earthworks, directly related to the extraction of a mineral resource; or (b) the primary processing of a mineral resource including winning, extraction, classifying, concentrating, crushing, screening or washing; but excluding the secondary processing of a mineral resource, including the smelting, beneficiation, reduction, refining, calcining or gasification of the mineral resource in which case activity 6 in Listing Notice 2 applies. **This activity may be triggered by the establishment of borrow pits and other small-scale mining of minerals applied for by the Applicant.**
	1(24)	The development of a road— (i) for which an environmental authorisation was obtained for the route determination in terms of activity 5 in Government Notice 387 of 2006 or activity 18 in Government Notice 545 of 2010; or (ii) with a reserve wider than 13,5 meters, or where no reserve exists where the road is wider than 8 metres but excluding a road (a) which is identified and included in activity 27 in Listing Notice 2 of 2014; (b) where the entire road falls within an urban area; or (c) which is 1 kilometre or shorter. **This activity may be triggered by the cumulative extent of internal mine haul roads developed to provide safe and efficient movement of man and materials across the site.**
	1(25)	The development and related operation of facilities or infrastructure for the treatment of effluent, wastewater or sewage with a daily throughput capacity of more than 2 000 cubic metres but less than 15 000 cubic metres. **A wastewater treatment facility will be required for the treatment of sewage while a treatment facility for contaminated water may also be necessary.**

	1(28)	Residential, mixed, retail, commercial, industrial or institutional developments where such land was used for agriculture, game farming, equestrian purposes or afforestation on or after 1 April 1998 and where such development will occur outside an urban area, where the total land to be developed is bigger than 1 hectare. **The area to be affected by mining and infrastructure development exceeds 1 ha.**
	1(56)	The widening of a road by more than 6 metres, or the lengthening of a road by more than 1 kilometre (i) where the existing reserve is wider than 13,5 meters; or (ii) where no reserve exists, where the existing road is wider than 8 metres; excluding where widening or lengthening occur inside urban areas. **This activity may be triggered by the cumulative extent of widening or lengthening existing roads necessary for the safe and efficient transport of man and materials.**
GN R.984, 8 December 2014 (as amended on 7 April 2017) Listing Notice 2: Scoping and EIA	2(6)	The development of facilities or infrastructure for any process or activity which requires a permit or licence or an amended permit or licence in terms of national or provincial legislation governing the generation or release of emissions, pollution or effluent, excluding— (i) activities which are identified and included in Listing Notice 1 of 2014; (ii) activities which are included in the list of waste management activities published in terms of section 19 of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) in which case the National Environmental Management: Waste Act, 2008 applies; (iii) the development of facilities or infrastructure for the treatment of effluent, polluted water, wastewater or sewage where such facilities have a daily throughput capacity of 2 000 cubic metres or less; or (iv) where the development is directly related to aquaculture facilities or infrastructure where the wastewater discharge capacity will not exceed 50 cubic metres per day. **The mining operation will require a water use licence as per the NWA.**
	2(11)	The development of facilities or infrastructure for the transfer of 50 000 cubic metres or more water per day, from and to or between any combination of the following — (i) water catchments; (ii) water treatment works; or (iii) impoundments; excluding treatment works where water is to be treated for drinking purposes. **Although considered unlikely, the removal of water from the dewatering of the underground mine workings may fall within the ambit of this activity.**
	2(15)	The clearance of an area of 20 hectares or more of indigenous vegetation, excluding where such clearance of indigenous vegetation is required for— (i) the undertaking of a linear activity; or (ii) maintenance purposes undertaken in accordance with a maintenance management plan. **More than 20 ha of indigenous vegetation is planned to be removed for the development of the mine.**

	2(17)	Any activity including the operation of that activity which requires a mining right as contemplated in section 22 of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002), including (a)associated infrastructure, structures and earthworks, directly related to the extraction of a mineral resource; or (b) the primary processing of a mineral resource including winning, extraction, classifying, concentrating, crushing, screening or washing. **This application for EA / WML is submitted in support of a mining right application as per the Mineral and Petroleum Resources Development Act 84 of 2002.**
GN R.985, 8 December 2014 (as amended on 7 April 2017) Listing Notice 3: Basic Assessment	3(4)	The development of a road wider than 4 metres with a reserve less than 13,5 metres (i) outside urban areas (ee) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans. **The development of mine roads may trigger this activity. Avoidance of these areas is prioritised as part of the environmental sensitivity planning to be undertaken in the S&EIR Process.**
	3(10)	The development and related operation of facilities or infrastructure for the storage, or storage and handling of a dangerous good, where such storage occurs in containers with a combined capacity of 30 but not exceeding 80 cubic metres (i) outside urban areas (ee) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans (hh) Areas within a watercourse or wetland, or within 100 metres of a watercourse or wetland. **The proposed fuel storage facilities may trigger this activity. Avoidance of these areas is prioritised as part of the environmental sensitivity planning to be undertaken in the S&EIR Process.**
	3(12)	The clearance of an area of 300 square metres or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a maintenance management plan (i) Within any critically endangered or endangered ecosystem listed in terms of section 52 of the NEMBA or prior to the publication of such a list, within an area that has been identified as critically endangered in the National Spatial Biodiversity Assessment 2004 (ii) within critical biodiversity areas identified in bioregional plans (iv) On land, where, at the time of the coming into effect of this Notice or thereafter such land was zoned open space, conservation or had an equivalent zoning. **Cumulative removal of more than 300 m^2 of indigenous vegetation from sections identified as a critical biodiversity area and/or endangered ecosystem may be required. Avoidance of these areas is prioritised as part of the environmental sensitivity planning to be undertaken in the S&EIR Process.**
	3(14)	The development of (i) dams or weirs, where the dam or weir, including infrastructure and water surface area exceeds 10 square metres; or (ii) infrastructure or structures with a physical footprint of 10 square metres or more; where such development occurs— (a) within a watercourse; (b) in front of a development setback; or (c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse

		(i) outside urban areas (ff) Critical biodiversity areas or ecosystem service areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans **The placement of dams required for effectively managing water on the site, including pollution control dams, as well as road infrastructure and material stockpiles, may fall within the ambit of this activity. Avoidance of these areas is prioritised as part of the environmental sensitivity planning to be undertaken in the S&EIR Process.**
	3(18)	The widening of a road by more than 4 metres, or the lengthening of a road by more than 1 kilometre. (i) outside urban areas (ee) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans. **The development of mine roads may trigger this activity. Avoidance of these areas is prioritised as part of the environmental sensitivity planning to be undertaken in the S&EIR Process.**
	3(23)	The expansion of (i) dams or weirs, where the dam or weir, is expanded by 10 square metres or more; or (ii) infrastructure or structures where the physical footprint is expanded by 10 square metres or more; where such expansion occurs— (ii) infrastructure or structures with a physical footprint of 10 square metres or more; where such development occurs— (a) within a watercourse; (b) in front of a development setback adopted in the prescribed manner; or (c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse (i) outside urban areas (ff) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans **The placement of dams required for effectively managing water on the site, including pollution control dams, as well as road infrastructure and material stockpiles, may fall within the ambit of this activity. Avoidance of these areas is prioritised as part of the environmental sensitivity planning to be undertaken in the S&EIR Process.**

TABLE 4-3: NEMWA LISTED ACTIVITIES

REGULATION	ACTIVITY NUMBER	SUMMARY DESCRIPTION
GN R.921, 29 November 2013 Category A: Basic Assessment	1	The storage of general waste in lagoons. **The pollution control dams, needed for management of dirty stormwater, are regarded as evaporation dams, as per the definition of lagoon in GN R. 921.**
GN R.921, 29 November 2013 Category A: Basic Assessment	12	The construction of a facility for a waste management activity listed in Category A of this Schedule (not in isolation to associated waste management activity). **The construction of the pollution control dams will fall within the ambit of this activity.**
GN R.921, 29 November 2013 Category B: Scoping and EIA	1	The storage of hazardous waste in lagoons excluding storage of effluent, wastewater or sewage. **The pollution control dams, needed for management of dirty stormwater, are regarded as evaporation dams, as per the definition of lagoon in GN R. 921.**
GN R.921, 29 November 2013 Category B: Scoping and EIA	10	The construction of a facility for a waste management activity listed in Category B of this Schedule (not in isolation to associated waste management activity). **The construction of the pollution control dams and residue stockpiles will fall within the ambit of this activity.**
GN R.921, 29 November 2013 Category B: Scoping and EIA	11	The establishment or reclamation of a residue stockpile or residue deposit resulting from activities which require a mining right, exploration right or production right in terms of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002). **The material stockpiles (topsoil, overburden) and the discard disposal options (in-pit and surface discard stockpile facility) fall within the definition of a residue stockpile.**

TABLE 4-4: POTENTIAL WATER USES IDENTIFIED FOR THE PROPOSED PROJECT

PROPERTY AND PORTION NUMBER	WATER USE	DESCRIPTION
Kranspan 49	Section 21 (a)	Taking of water from a water resource
	Section 21(c)	Impeding or diverting the flow of water in a water course
	Section 21(i)	Altering the bed, banks, course or characteristics of a water course
	Section 21 (g)	Disposing of waste in a manner which may impact on a water resource
	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

The Integrated Water Use Licence Application (IWULA) and IWWMP specifies the water uses per farm portion associated with the preferred site infrastructure layout options.

4.2 REQUIRED ENVIRONMENTAL LICENCES

The proposed mine development requires a Mining Right as contemplated in section 22 of the Mineral and Petroleum Resources Development Act No. 28 of 2002 (MPRDA). In addition to the Mining Right, the proposed activities also require that the applicant obtain the following:

- Environmental Authorisation in terms of the National Environmental Management Act 107 of 1998 (NEMA);
- Waste Management Licence in terms of the National Environmental Management: Waste Act 59 of 2008; and
- Water Use Licence in terms of the National Water Act 36 of 1998.

5 NEED AND DESIRABILITY OF THE PROPOSED ACTIVITIES

5.1 ILIMA COAL COMPANY

Ilima is a coal mining company. Although considered small in comparison with the bigger coal mining companies, it contributes significantly to local and regional economic development through, among others, royalties and taxes, direct and indirect employment and procurement of various goods and services.

The SA Chamber of Mines (2018) noted the following with respect to the contribution of the coal mining sector as a whole to the economy of South Africa for the year 2016:

- The coal industry employed 77,506 people, representing 17% of total employment in the mining sector;
- Employees earned R21 billion in wages and salaries;
- R 60 billion was spent on the procurement of goods and services, most of it locally. This contributed to creating and maintaining jobs in other industries; and
- Indirectly, the coal industry created 173,093 jobs mainly in the transport and storage sector where almost 120,000 jobs were created representing 69% of all indirect jobs created by the coal industry.

The Ilima intention is to provide value to their shareholders through responsibly developing the Kranspan Colliery, managing it safely and in a manner that does not result in a significant detrimental impact to the environment and in compliance with the requirements of the relevant legislation.

The establishment of the Kranspan Colliery is an important component of the company's business development and future planning. Design and licensing of the mine is needed to ensure that the company can continue to operate when it has completed mining and rehabilitation activities at its other mining right area in the Carolina region.

Over and above the Ilima need for the Kranspan Colliery, the broader need and desirability aspects of the proposed coal mine, are discussed below.

5.2 NEED

The proposed mining rights area comprises part of the Mpumalanga coal fields. The latter accounts for over 82% of South Africa's coal production (SA Chamber of Mines, 2018).

At a macro-level, there are essentially three market segments for bituminous coal, these are (Ilima, 2018):

- Eskom Low Grade Coal (19.0 Mj/kg – 23.3 Mj/kg)
- Export RB1 Grade Steam Coal (>5,900 Kcal/kg)
  RB2 Grade Steam Coal (>5,500 Kcal/kg)
- Metallurgical High-Grade Coal

In 2016, South Africa produced 253.1 Mt of coal of which 181.4 Mt was sold internally with a value of R 61.5 billion while 68.9 Mt, worth R 50.5 billion, was exported (SA Chamber of Mines, 2018).

Given the size and quality of the reserve, the proposed Kranspan Colliery intends to target both the export and Eskom markets and will be a multiproduct operation (Ilima, 2018).

5.2.1 ESKOM MARKET

Coal plays an important role in the South African economy and is the primary energy source for electricity generation (Department of Energy, 2018). At present, approximately 82% of South Africa's power generation is from coal (SA Chamber of Mines, 2018).

The domestic demand for coal is led by electricity generation (53%), then the basic iron and steel sector (20%), followed by the synthetic fuel and chemical industries (10%).

Security of energy supply is recognised throughout the world as a key factor for the economic and social development of a country. In addition, the availability of a secure electricity supply is a fundamental consideration for any investment decision, particularly for energy-intensive sectors like industry and manufacturing. South Africa's economic development policies and plans, including the National Development Plan 2030, provide a strong focus on the latter and the availability of a cost-effective and consistent quality electricity supply is therefore vital for the country's economy.

The National Development Plan 2030 also identifies the need for South Africa to reduce its reliance on coal for power generation. The draft Integrated Resource Plan (IRP), published by the Department of Energy in August 2018, indicates that by 2030, coal will comprise approximately 44% of total installed power generation capacity (Figure 5-1). This is inclusive of the planned decommissioning of approximately 12 GW of installed coal capacity over the same period. Other notable aspects from the draft 2018 IRP with respect to coal include:

- An additional 1 000 MW of new installed coal power generation is planned for the period 2023-2024; and
- By 2040, coal is projected to contribute less than 30% of the energy supplied and less than 20% by 2050.

	Coal	Nuclear	Hydro	Storage (Pumped Storage)	PV	Wind	CSP	Gas/Diesel	Other (CoGen, Biomass, Landfill)	Embedded Generation
2018	39,126	1,860	2,196	2,912	1,474	1,980	300	3,830	499	Unknown
2019	2,155					244	300			200
2020	1,433				114	300				200
2021	1,433				300	818				200
2022	711				400					200
2023	500									200
2024	500									200
2025					670	200				200
2026					1,000	1,500		2,250		200
2027					1,000	1,600		1,200		200
2028					1,000	1,600		1,800		200
2029					1,000	1,600		2,850		200
2030			2,500		1,000	1,600				200
TOTAL INSTALLED	33,847	1,860	4,696	2,912	7,958	11,442	600	11,930	499	2,600
Installed Capacity Mix (%)	44.6	2.5	6.2	3.8	10.5	15.1	0.9	15.7	0.7	

Installed Capacity

Committed/Already Contracted Capacity

New Addional Capacity (IRP Update)

Embedded Generation Capacity (Generation for own use allocation)

Source: https://www.cliffedekkerhofmeyr.com/en/news/publications/2018/projects/energy-alert-28-august-the-draft-integrated-resource-plan-2018-the-roadmap-for-future-generation-capacity-.html

FIGURE 5-1: ENERGY MIX IN THE 2018 INTEGRATED RESOURCE PLAN

From the above, it can be concluded that the demand for coal for use in the electricity sector will decrease as other primary energy sources and the related installed generation capacity is established. However, there will be a need for coal for the country's power generation requirements for at least the next three decades.

5.2.2 Export Market

South Africa is a net exporter of coal and exports amount to 6% of total global exports (SA Chamber of Mines, 2018). Almost all coal exported from South Africa is steam coal, most of which is exported through RBCT.

In 2016, total coal exports were valued at R 50.5 billion. Although subject to significant price volatility, the average export price per tonne is typically higher than the average domestic price per tonne. Approximately 70% of the proposed Kranspan Colliery is planned to be sold to the export market via the RBCT (Ilima, 2018).

Between 2004 and 2009, the export market was previously dominated by export to countries in Europe (Netherlands, Spain, and the United Kingdom). From 2009 to 2014, China and India were the most important export markets for South African coal. Almost 45% of all export coal from South Africa is currently shipped to India.

The SA Chamber of Mines (2018) indicates that India's coal demand is expected to increase in the foreseeable future, despite that country's commitment to reduce its GHG emissions intensity by between 20% to 25% by 2020. Other potential markets are noted to be Pakistan, Malaysia, Taiwan, Bangladesh and South Korea. Export risk factors which may influence the export market for South African coal are:

- Demand reduction as a result of more stringent environmental legislation in importing countries; and
- The adoption of new coal power generation technology which requires a higher quality coal.

5.3 DESIRABILITY

The desirable aspects of the proposed Kranspan Colliery include the significant socio-economic benefits associated with employment, procurement of goods and services. Community benefits such as skills development and education opportunities will also be realised from the implementation of the mine Social and Labour Plan.

Furthermore, royalties and taxes from the coal mine will accrue to the government of South Africa.

Notwithstanding these benefits, coal extraction and processing does present several physical, social and environmental hazards. These hazards can generally be managed through the application of various engineering design standards and the health, safety and environmental procedures and plans which the operating company implements during the day to day operation of the site.

Other specific aspects related to the desirability of the proposed Kranspan Colliery include:

- The proposed colliery will introduce a new source of air emissions near to the Highveld Priority Area. Coal mining, handling and transportation results in the release of various airborne pollutants like NO_2, SO_2 and particulate matter which, depending on pollutant concentration and duration of exposure among others, can have a negative impact on human and ecosystem health;
- The mining will have an impact on surface and groundwater resources. The impact is however expected to be limited to the boundaries of the mining right area;
- Given the proximity of mining to surface and groundwater resources, there is a high likelihood of water pollution if water management on the site is not properly practiced;
- For the Life of Mine, the colliery will result in an increase in traffic volume on the R36, including heavy vehicles like ADTs. This may negatively influence traffic flows, accelerate degradation of the road surface and possibly result in collision incidents;
- The agricultural activities presently being undertaken on the site are not compatible with open cast mining and the associated handling and transportation of the coal product. These activities will only be able to resume once the mining has been completed and the land rehabilitated;
- The post-rehabilitation crop yield is unlikely to be the same as the pre-mining crop yield;
- The proposed development will result in a loss of some remaining natural habitat within a vulnerable threatened ecosystem (Eastern Highveld Grassland) as well as functional wetland units; and
- In response to climate change concerns and the dominant contribution of CO_2 emissions from coal combustion, several developed economies in the world are selecting low carbon

alternatives to coal-fired power plants. Recently, global institutions like the Organisation for Economic Co-operation and Development (OECD), World Bank Group and various financial institutions have agreed to limit public financing of coal-fired power plants.

The desirability of the Project, within the context of the above, is summarised as follows:

- The Project will result in the availability of an additional source of coal for the Eskom market;
- Benefits will accrue with respect to royalties and taxes to the Government of South Africa;
- Direct and indirect employment opportunities will be created at a time when unemployment in the country is historically at its highest. If the Kranspan Colliery were not to proceed, it would likely require the restructuring of the Ilima workforce;
- South Africa has committed to becoming less reliant on coal and moving towards a low carbon economy. However, this transition is expected to be gradual, with the draft IRP (2018) identifying the need for coal for power generation for at least the next two decades;
- With the appropriate environmental controls in place, the proposed development is considered to be compatible with surrounding land uses;
- With stringent control measures in place, including ongoing monitoring and adaptive management, impacts to surface and water quality resources can be satisfactorily mitigated;
- The proposed development is consistent with the spatial development planning context applicable to the area; and
- With proper rehabilitation and mine closure planning and implementation, the land surface can be restored to productive use post-mining with no latent or residual environmental impacts.

6 MOTIVATION FOR THE PREFERRED DEVELOPMENT FOOTPRINT WITHIN THE APPROVED SITE INCLUDING A FULL DESCRIPTION OF THE PROCESS FOLLOWED TO REACH THE PROPOSED DEVELOPMENT FOOTPRINT WITHIN THE APPROVED SITE

6.1 DETAILS OF THE DEVELOPMENT FOOTPRINT ALTERNATIVES CONSIDERED

6.1.1 METHODOLOGY

The broad approach to determining the development footprint was as follows:

- Review applicant mine works programme and initial mine and infrastructure layout plan;
- Develop an understanding of the technical and economic aspects of the development that influence the location and extent of the proposed mining development;
- Develop an environmental sensitivity plan based on the findings of the specialist studies;
- Compare the initial mine and infrastructure layout plan against the environmental sensitivity plan and identify areas of conflict; and
- Apply the mitigation hierarchy to refine the mine and infrastructure layout plan.

In assessing the footprint, several alternatives were identified and analysed.

These were as follows:

- Mining method - Underground mining versus surface mining;
- Product processing - Onsite wash plant versus offsite wash plant;
- Site location - Onsite wash plant location;
- Discard management – Surface discard facility versus in-pit discard disposal;
- Placement of infrastructure; and
- No-go alternative.

The alternatives analysis was undertaken qualitatively, based on a comparison of the options against selected criteria.

The evaluation of these alternatives is discussed in the sections that follow.

6.1.2 The Property on which or Location Where it is Proposed to Undertake the Activity

No other properties were considered as an alternative as the property boundaries for the application are determined by the prospecting right. The location of the mining and placement of associated infrastructure within the proposed mining right area is determined primarily by the location and extent of the coal seam which is being targeted and which has been defined through the prospecting activities. Refinement of the location of mining and infrastructure placement was undertaken in response to the environmental sensitivity plan developed through the S&EIR Process. The approach to the development and application of the environmental sensitivity plan is described in section 6.1.4.

6.1.3 The Type of Activity to be Undertaken

The applicant intends to mine the shallower coal seam via opencast mining (roll-over or strip mining) and the deeper coal seam via underground mining (bord and pillar). Both methodologies are proven and safe methods for the extraction of coal.

Surface mining is generally considered to have a greater cumulative impact on the environment due to the significant change in the landscape that occurs. Underground mining of the entire coal resource was thus considered as an alternative to the proposed combination of underground mining and open cast mining.

The results of the qualitative comparative analysis are presented in Table 6-1.

TABLE 6-1: QUALITATIVE COMPARATIVE ANALYSIS OF MINING ACTIVITIES

CRITERIA	COMMENT	OPENCAST AND UNDERGROUND MINING	UNDERGROUND MINING
TECHNICAL AND ECONOMIC FEASIBILITY	➲ The capital required to establish an underground operation includes shaft development, fans, conveyors and underground equipment and is generally 4-5 times more capital intensive than opencast establishment. ➲ Opencast mining extraction has >90% productivity. The tons mined per month is higher than an equivalent capital cost for an underground operation. ➲ Underground mining extraction is dependent on the Safety Factor to be applied to protect the underground workings. The Salamon and Munro Formula is used to determine the Safety Factor and is a function of the depth of the seam, the seam height and bord and pillar width. An average 45% of the underground reserves would be sterilised over the Kranspan Project if the recommended Safety Factors and Barrier Pillars between panels are applied. ➲ Underground mining is generally not viable at depths less than 20 m since there is insufficient hard material above the working to constitute a safe roof for the underground workings. With lower capital cost, higher productivity and lower unit cost per ton, the opencast methodology allows for a more effective utilisation of the resource and more sustainable and economically viable operation. ➲ If the resource excludes all coal at a depth of less than 20 m, approximately 80% of the resource would be sterilised.		
BIOPHYSICAL AND SOCIAL IMPACT	➲ Underground mining of the Kranspan coal reserves will require significantly less surface area disturbance as no open pits will need to be excavated. ➲ Provided there is no subsidence from underground mining, the latter will, in comparison with opencast and underground mining, have significantly less impact to environmental aspects like soils, surface water, and vegetation. ➲ Dust and particulate matter emissions would also be generated during underground mining of the Kranspan coal reserves but the impact of these emissions on ambient air quality will be significantly less than for the combined opencast and underground mining. ➲ The noise and visual impact of an underground mine will be significantly less than for both underground and opencast mining.		

Note: *The green arrow indicates the option which is deemed to be better in terms of the criterion.*

The above analysis concluded that although the underground mining only option will have less of an overall environmental impact, underground mining alone is not an economically viable option for the proposed mining project.

6.1.4 The Design or Layout of the Activity

6.1.4.1 Product processing

Two alternatives for the wash plant were considered:

- Establishment of a new onsite wash plant; and
- Transport the coal to the existing wash plant at Ilima's operating coal mine situated approximately 15 km from Kranspan (Offsite wash plant).

The results of the qualitative comparative analysis are presented in Table 6-2.

TABLE 6-2: QUALITATIVE COMPARATIVE ANALYSIS OF PRODUCT PROCESSING OPTIONS

CRITERIA	COMMENTS	ONSITE	OFFSITE
TECHNICAL AND ECONOMIC FEASIBILITY	➲ The existing Ilima wash plant is currently operating at its design capacity and would thus need to be upgraded if it were to be used for washing of coal from Kranspan. ➲ Similarly, the discard disposal facility at Ilima would have insufficient capacity and would thus need to be upgraded, and the associated environmental permissions and licenses obtained. ➲ The logistics associated with transporting the coal, by road, to the existing plant would add 30% to the cost of the coal.	⬆	⬇
BIOPHYSICAL AND SOCIAL IMPACT	➲ The use of the existing plant would reduce the extent of new infrastructure required to be established at Kranspan. Consequently, less vegetation would need to be cleared for the offsite option and this would result in a reduced loss of habitat. ➲ An offsite wash plant would mean that no discard disposal facility would be required for the Kranspan Project. This would have a positive impact on water resources and wetland features. ➲ Dust, noise, and visual impact are likely to be the same for both the onsite and offsite option.	⬇	⬆
TRANSPORT	➲ Transportation to the offsite wash plant would require haul trucks to transport coal through Carolina. This would result in a greater number	⬆	⬇

	of vehicles travelling through Carolina than would be the case for onsite washing. ➲ The additional vehicles would have a negative impact on road infrastructure and increase road health and safety risks.		

Note: *The green arrow indicates the option which is deemed to be better in terms of the criterion.*

The above analysis concluded that although the offsite wash plant option is preferable in that it will result in less biophysical impacts at Kranspan and reduce the potential for impacts to water resources, overall, an onsite wash plant is the preferred option for the following reasons:

- Upgrading of the plant and discard facility at Ilima's other mine will be required to process the coal from Kranspan. These upgrades may incur further biophysical impacts at that site;
- The transportation of the coal to the existing wash plant will also result in a significant increase in the number of heavy vehicles moving through Carolina, which is undesirable; and
- Use of the offsite wash plant will increase the price of the coal by 30%.

6.1.4.2 Location of wash plant

Three locations for the wash plant were considered within the proposed mining right area. Each of the sites were considered in the relevant specialist studies.

The outcome of the site selection and screening criteria has been presented in Table 6-3 and the location of the preferred plant and alternatives are shown in Appendix 3, Map 2.

TABLE 6-3: SCREENING OF WASH PLANT SITE OPTIONS

FEATURE / ASPECT	PORTION 2 (OPTION 1)	PORTION 2 AND 5 (OPTION 2)	PORTION 3 AND 5 (OPTION 3) – *PREFERRED OPTION*
TECHNICAL			
ENVIRONMENTAL SENSITIVITY	➲ The proposed wash plant footprint is almost entirely within the 500m buffer from a wetland or river. ➲ This option would require a water use licence in terms of Section 21 (c&i).	➲ The proposed wash plant is situated within a valley-bottom wetland and would have significant negative impact on this wetland, resulting in a High impact significance.	➲ The proposed wash plant is situated mostly in Modified Habitat, although a portion does overlap a wetland surrounding a pan as well as some untransformed grassland, modifying the layout of the preferred site to avoid the wetlands and untransformed grassland would

FEATURE / ASPECT	PORTION 2 (OPTION 1)	PORTION 2 AND 5 (OPTION 2)	PORTION 3 AND 5 (OPTION 3) – *PREFERRED OPTION*
			reduce the impact significance to Moderate.
	➲ The proposed wash plant footprint is not within a CBA or ESA.	➲ The proposed wash plant footprint is almost entirely within a CBA.	➲ The proposed wash plant footprint has a large section that has been identified as a CBA.
	➲ The proposed wash plant traverses a small section which is classified with a high ecological sensitivity. A small colony of *Khadia carolinensis* is located within close proximity to the proposed wash plant which could threaten these colonies through excessive dust productive or chemical spillage resulting in a High impact significance rating.	➲ The proposed wash plant footprint is almost entirely within a high ecological sensitive zone. ➲ It is recommended in the specialist report that these areas are avoided entirely.	➲ The proposed wash plant footprint has a large section that has been identified as a high ecological sensitive zone. It is recommended in the specialist report that these areas are avoided entirely.
HERITAGE SENSITIVITY	The wash plant is located in close proximity to the heritage feature KP 2O. According to the specialist report this heritage feature is of low significance unless identified as a grave.	No heritage features were identified.	Several heritage features were identified within the proposed wash plant footprint. The heritage features range between having a high social significance to low heritage significance. The graves were identified within this footprint and will need to be demarcated with a 50 m buffer or relocated.
AIR QUALITY	This alternative would require longer haul distances from the various opencast pit areas to the plant. Vehicle entrainment of dust is normally a large source of emissions, and the impact would be higher if the plant is situated at this site.	This alternative would require longer haul distances from the various opencast pit areas to the plant. Vehicle entrainment of dust is normally a large source of emissions, and the impact would be higher if the plant is situated at this site.	The preferred plant location would have a lower impact due to the shorter distance from the opencast pits to the plant.

FEATURE / ASPECT	PORTION 2 (OPTION 1)	PORTION 2 AND 5 (OPTION 2)	PORTION 3 AND 5 (OPTION 3) – *PREFERRED OPTION*
NOISE	The alternative plant has a closer proximity to the sensitive receptors located south-west and north-west of the main project area and may thus have a higher impact on these communities.	The alternative plant has a closer proximity to the sensitive receptors located south-west of the main project area and may thus have a higher impact on these communities.	The preferred plant location would have a lower impact due to its proximity to sensitive receptors.

From the above analysis, the following is concluded:

- The western alternative site (Option 1) is adjacent to small colonies of a threatened plant species (*Khadia carolinensis*), which could threaten these colonies through excessive dust productive or chemical spillage.
- The eastern alternative site (Option 2) is situated within a valley-bottom wetland and would have significant negative impact on this wetland. The only option within the mitigation hierarchy that could reduce the biodiversity impact significance at Option 1 and Option 2 would be Avoidance.
- The preferred site (Option 3) is situated mostly in Modified Habitat, although a portion does overlap a wetland surrounding a pan as well as some untransformed grassland.
- Avoiding the two alternative sites and modifying the layout of the preferred site to avoid the wetlands and untransformed grassland would reduce the biodiversity impact significance to Moderate.
- No heritage features are present within the Option 2 footprint and would thus be the preferred option. However, Option 1 could also be a viable option if the heritage feature KP 20 is avoided. The heritage study does not recommend option 3 unless the heritage features can be avoided.
- Based on this analysis and other factors, including the recommendation from the groundwater study to move facilities further away from the identified geological fault, the final site layout has located the wash plant and other facilities to the north of Option 3.

6.1.4.3 Discard Management

Current forecasts indicate that there will be enough capacity in Pit 5 for the in-pit disposal of all discard material that will be generated over the LOM. Should this change, Ilima will also establish an engineered surface discard stockpile. The alternatives analysis therefore considers the risks associated with both of these discard options but with the understanding that both facilities may in fact be required for management of discard over the LOM.

There are several design options for in-pit disposal of mine wastes which have been used successfully in the world. A summary of these is shown in Figure 6-1.

In addition to in-pit disposal of the discard material, the Applicant may be required to establish an engineered surface discard stockpile. Surface discard disposal facilities sterilise post-mining land-use, remain a long-term source of dust pollution, can be susceptible to spontaneous combustion, require long-term management of the structure and present a long-term risk to groundwater resources.

The impacts of a surface discard facility can generally be managed through the proper engineering, construction, and operation of the facility but it will constitute a permanent change in the landscape.

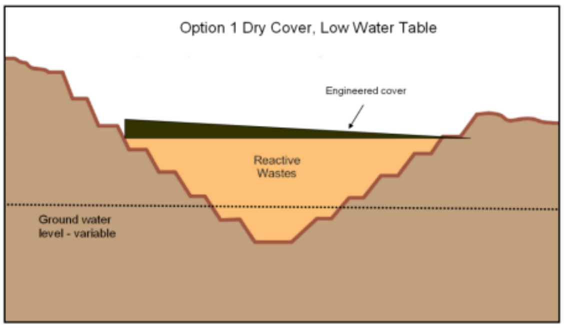
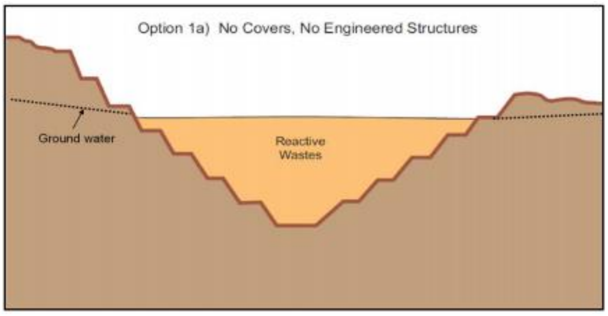
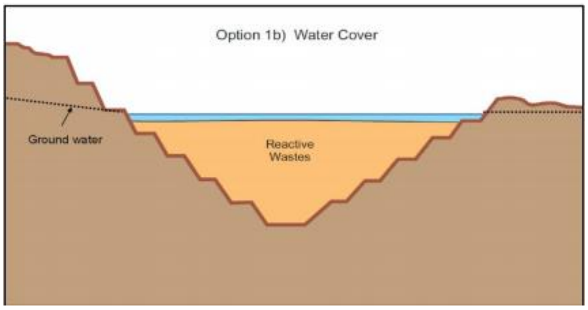
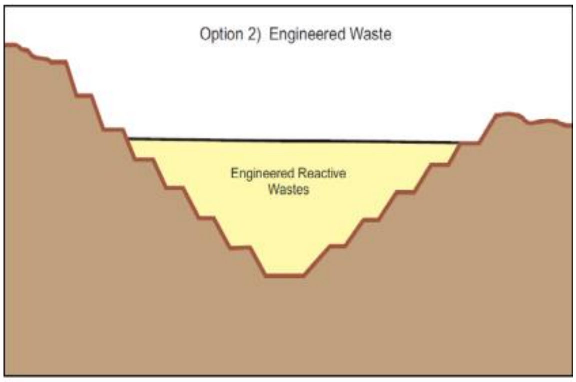
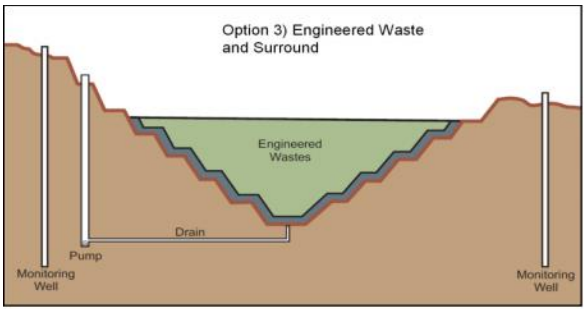
ARCADIS Canada Inc. (2015)[4] notes that in-pit disposal has become a well-accepted practice in many jurisdictions and is, in some instances, a regulatory policy requirement. According to ARCADIS Canada Inc. (2015), the benefits of in-pit disposal include:

- Environmental
    - Prevention and control of acid generation;
    - Reduction of metal leaching and isolation of dissolved metals;
    - Permanent physical isolation of wastes;
    - Minimisation of the need for engineered control systems and long-term monitoring;
    - Return of waste rock and tailings to the original geochemical conditions; and
    - Restoration of pre-mining conditions.
- Physical
    - Stabilization of pit walls;
    - Elimination of potential accidental release of solids;
    - Reduction of long-term waste management care and maintenance; and
    - Elimination of potential for unauthorized removal of wastes.
- Financial, legal and social
    - Potential lower cost;
    - Potential earlier return of the land to previous and traditional uses;
    - Improved acceptability by various stakeholders including permitting agencies; and
    - Improved site aesthetics on closure.

The most significant environmental risk associated with in-pit disposal, especially with potentially reactive material like coal discard, is to the groundwater resource. In accordance with the Best Practice Guideline for Water Management for Mine Residue Deposits (DWAF, 2007)[5], the groundwater model was thus used to simulate the long-term impact of mining and discard disposal on groundwater quality (Appendix 8).

[4] ARCADIS Canada Inc, 2015. Inpit-Disposal of Reactive Mine Wastes: Approaches, Update and Case study Results. MEND Report 2.36.1b. http://mend-nedem.org/wp-content/uploads/2.36.1b-In-Pit-Disposal.pdf. Accessed on: 28 May 2019

[5] Department: Water Affairs and Forestry, 2007. Best Practice Guideline A2: Water Management for Mine Residue Deposits

	
Dry cover in-pit disposal	Water-saturated in-pit disposal. (Proposed design option for Kranspan)
	
Water-covered in-pit disposal	Chemically and physically engineered waste
	
Engineered waste and engineered surrounding environment	

Source: ARCADIS Canada Inc. (2015)

FIGURE 6-1: DESIGN OPTIONS USED INTERNATIONALLY FOR IN-PIT DISPOSAL

This was achieved by evaluating four scenarios namely:

- Scenario 1: the long-term impact if all rehabilitation measures are implemented and deterioration in groundwater quality does not take place during the operational phase of mining. Post closure, sulphate concentrations were assumed to increase as a result of acidification, which is likely based on the results of static geochemical tests.
- Scenario 2: tested the impact of placing discard material into the mined-out pits. Although it is acknowledged that this will not take place in all of the pits as the volume of discard generated will be less than the void space available in all the pits, the model was used to identify the impact of backfilling all the pits with discard. This will allow identification of pits that may be more suitable for backfill with discard. In order to complete this scenario, it was assumed that the discard material will acidify during the operational phase as well as post-closure resulting in an increase in sulphate concentrations. In the absence of more specific data, it was assumed that sulphate concentrations of up to 3000 mg/l would leach from the discard material. This assumption must be tested and re-evaluated once the results of the kinetic testing is available.
- Scenario 3: evaluates the impact of placing discard in a stockpile on surface within the plant area. The scenario assumes that the discard stockpile will not be lined, and the rate of seepage would be governed by the permeability of the weathered aquifer.
- Scenario 4: tested the effect of lining the surface discard stockpile with a Class C liner.

For the purpose of the modelling, and to simulate the impact of worst-case conditions, it was assumed that the in-pit disposal would occur above the water table and thus that the discard material would oxidise. In addition, the model conservatively assumed all pits would be used for in-pit disposal. The model was run for a period of 100 years after mining stops.

The results are summarised below for each of the discard options:

Surface Discard Facility

- The most significant impact of an unlined discard stockpile will be on the weathered aquifer, the pan and the wetlands present down gradient of the facility;
- It is anticipated that an unlined discard stockpile will have a negative impact on pit water quality and thus long-term decant quality at Pit 1;
- With time after the simulation period of 100 years, the contamination that will leach from an unlined discard dump will however migrate towards the pan. This will result in an increased salt load to the pan;
- A lined facility is not expected to add significantly to sulphate contamination. Groundwater quality in the long-term will however still be impacted on by the surrounding mining activities; and
- The discard facility design should take cognisance of the position of the fault zone and if necessary, must be moved to ensure that it does not overly the fault, if this is identified as the preferred alternative for discard management.

In-Pit Discard Disposal

- The quality of decant from the pits post closure will be negatively affected by this activity. It is not possible to say with certainty what the decant quality will look like with the available dataset, but modelling results suggests that sulphate concentrations may increase by 30% in the long-term inside the pits. The results of the kinetic testing indicate that the discard material will most likely acidify in the long-term, which will compound the impact on groundwater quality, the wetlands and private boreholes;
- The pits around the largest pan should not be used for discard backfilling due to the anticipated negative long-term impact on the pan and the wetlands in this area. One of the known preferential flow paths to groundwater transects the pan and the mining area and for this reason it is not recommended that additional contamination potential is introduced in this area. The pits that should not be used for discard backfill due to proximity to the largest pan, wetlands and the presence of a preferential groundwater flow path include Pit 1, Pit2, Pit 3, Pit 4 and Pit 9;
- In addition, Pits 6 and 11 should also not be used for discard backfill due to the fact that the lineaments (preferential groundwater flow paths) transect the pits;
- It is furthermore not recommended that discard is placed in Pits 7, 8 and 10 due to the fact that they are situated immediately adjacent to non-perennial streams that drains the mining area. Should decant take place from these pits in the long-term, the streams will be directly impacted;
- Based on the current understanding of the project site, the only pit that can be considered for discard backfill is Pit 5. The pit is however not ideal, as it is situated adjacent to the second largest pan and two of the decant points identified will drain towards the pan. If discard is however placed in the bottom of the northern most section of this pit, leachate may be contained more successfully than in the other pits. The coal floor contours suggest that the seam dips in a northerly direction and that this would be the deepest point of the pit. It is however noted that interflow between Pits 5 and 6 are possible in this area. It is important to maintain the boundary strip along the farm portion boundary in this area to avoid that from happening; and
- It is strongly recommended that this assessment is tested and possibly re-evaluated once the results of the kinetic geochemistry testing are available.

The following is concluded:

- Both surface and in-pit disposal facilities may be required over the LOM. Both are acceptable methods used internationally for the management of discard material;
- Both in-pit and surface discard facilities require careful design, planning, implementation and monitoring in order to ensure that risks to the environment are minimised;
- Surface discard facilities constitute a permanent change in the landscape and remain a risk for spontaneous combustion and a potential source of groundwater pollution and emissions to air;
- The most significant environmental risk associated with in-pit disposal, especially with potentially reactive material like coal discard, is to the groundwater resource;
- The groundwater modelling indicates that a lined surface discard disposal facility will have less impact than an unlined surface discard facility;

- Due to the presence of a preferential flow path to groundwater resources (geological fault) and proximity of the mining to surface water resources (pans, streams and wetlands), the groundwater study recommends that only one pit (Pit 5) be considered for in-pit discard disposal;
- The groundwater modelling demonstrates that if the discard material is not below the water table, it will oxidise and become acid-generating and this will result in poor quality water in the pit which, if not contained, may decant into nearby surface water resources; and
- In-pit disposal is an acceptable option for discard management under the following conditions:
- The material will be backfilled to the level of the pre-mining coal seam depth. Should additional discard disposal capacity be required and the material be backfilled to above the pre-mining coal seam depth, that geochemical and groundwater modelling is undertaken to estimate this impact prior to the implementation of this management option. The outcome of these simulations must guide the extent to which discard can be placed above the coal seam depth.
- The full extent of the discard material will be placed below the regional rest (pre-mining) groundwater table. Additional mitigation measures[6] may need to be implemented to further the risk to groundwater resources. This will be informed by the outcome of the updated groundwater model inclusive of the kinetic leach testwork[7].

6.1.4.4 Location of Opencast Mining and Infrastructure Placement

The location of the opencast mining and broad placement of the surface infrastructure was informed by an environmental sensitivity plan which considered the location of identified sensitive physical, social and environmental features within the Mining Rights Application surface area:

- Natural features, for example wetlands, and existing physical structures, such as roads and railways were identified;
- The extent of the proposed coal seam, as presently understood, to be mined over the Life of Mine was delineated; and
- Other development activities in the area, current and planned, were identified.

Buffer distances (minimum safe distances), determined from legislation, including GN704 and the MHSA, and the findings from the relevant specialist studies were then applied (Table 6-4).

The resulting final site layout map in relation to the identified sensitive areas is shown in Appendix 3, Map 11. The environmental sensitivity plan resulted in several changes to the initial site layout map.

Table 6-4 summarises these changes. Map 15, Appendix 3 shows the changes.

[6] Options include chemical or physical alteration of the discard material, dry-cover disposal and engineered liner systems

[7] The kinetic leach testwork requires at least 9 months to be complete

TABLE 6-4: CHANGES BETWEEN INITIAL SITE LAYOUT AND FINAL SITE LAYOUT

MAP ID	CHANGE FROM ORIGINAL LAYOUT	REASON FOR CHANGE
1A	➲ Revised position for mine plant, ROM pad, product stockpile and office administration facilities and possible surface discard facility ➲ Moved approximately 600 m to the north of the previous location	➲ To avoid identified wetland and heritage features as recommended by specialists ➲ Place key mine support infrastructure further (more than 500 m) from the geological fault identified in the geophysical survey ➲ Provide for sufficient topsoil/overburden facilities (replace facilities which were previously in areas identified as sensitive by specialists)
1B	➲ Previous location of mine plant and possible surface discard facility ➲ New topsoil/overburden facilities on a no-coal zone in the area where the possible surface discard disposal facility was initially planned	
2	➲ Reduction in surface area of opencast mining and associated overburden facilities	➲ To avoid identified wetland and heritage features as recommended by specialists ➲
3		
4		
5		
6		
7		
8	➲ Increase in surface area of opencast mining and topsoil/overburden facilities	➲ Provide for sufficient topsoil/overburden facilities (replace facilities which were previously in areas identified as sensitive by specialists) ➲ Affected wetland features designated as low priority by specialist
9	➲ Reduction in surface area of opencast mining	➲ To avoid identified wetland features as recommended by specialist ➲
10	➲ Reduction in surface area of opencast mining and associated overburden facilities ➲ Change in location of ROM Pad	➲ To avoid identified wetland features as recommended by specialist
11	➲ Increase in topsoil/overburden facilities ➲ Revised position of ROM Pad ➲ The underground in this area will not be mined	➲ Provide for sufficient topsoil/overburden facilities (replace facilities which were previously in areas identified as sensitive by specialists)
12	➲ Reduction in surface area of opencast mining	➲ To avoid identified heritage features as recommended by specialist

TABLE 6-5: ENVIRONMENTAL BUFFER ZONES

INFRASTRUCTURE	BUFFER (M)	LEGISLATION / COMMENT
Buildings	100	MHSA and Regulations
Roads		
Railways		
Tailings Storage Facility and Waste Rock Dump		
Structures		
Restricted areas	50	MHSA GN93
Watercourses	100	NWA GN704
Wetlands	500	NWA GN704 GN1199
Powerlines	25	A proposed buffer (either side of centre-line) for protection of powerline infrastructure

A comparative summary of the extent to which the mining and supporting infrastructure shown on the initial site layout and final site layout overlaps with areas of environmental sensitivity is provided in Table 6-6 below.

For the purpose of this comparison, the environmental sensitivity was compiled from data provided by the various specialist studies and national datasets. These were then categorised into three classes: No-Go, high sensitivity, and low sensitivity:

No-Go Areas

- CBA (Irreplaceable)
- Communities
- Heritage sites (inclusive of a 50 m buffer)
- R36 road (inclusive of a 100 m buffer)
- Threatened species (inclusive of a 250 m buffer)
- High to tertiary priority wetlands and buffers according to specialist study
- Wet soils and rivers/pan of the soils study that fall within the high to tertiary wetland priorities classification

High Sensitivity

- CBA (Optimal)

- 100 m River centre line buffer

Low Sensitivity

- CBA (heavily or moderately modified)
- Low priority wetlands and buffers according to specialist study

TABLE 6-6: COMPARATIVE SUMMARY OF INITIAL AND FINAL SITE LAYOUT

AREA	FINAL SITE LAYOUT	INITIAL LAYOUT	DIFFERENCE (%)
	AREA OF OVERLAP (HA)	AREA OF OVERLAP (HA)	
NO-GO	203.29	470.36	57% less area affected
HIGH SENSITIVITY	109.24	110.64	10% less area affected
LOW SENSITIVITY	684.81	558.97	14% more area affected

6.1.5 The Technology to be used in the Activity and the Operational Aspects of the Activity

A conventional strip mining (roll-over) method will be employed for each of the opencast pits and bord and pillar mining will be implemented for underground mining. The coal preparation plant (wash plant) is a modular dense medium cyclone. The mining method and wash plant technology are proven technologies used in widely in the coal mining and processing industry.

Dry crushing and screening was initially considered as an alternative to the establishment of a wash plant. The benefit of dry crushing and screening is that it would have a lower water consumption and also remove the requirement for discard disposal.

However, current dry-processing technologies are not suitable to prepare export-quality coal and therefore the markets that are available are limited. If the coal processing is limited to dry crushing screening, the only market that can then be considered would be Eskom, which is not as profitable as potential export markets.

6.1.6 The Option of not Implementing the Activity

The no-go option has been defined as the project not proceeding and the current land-uses continuing as they are at present. No mining of coal on the Kranspan Farm would thus take place and there would be no establishment of the mine support infrastructure needed for the coal mining activities.

There are several positive and negative aspects to the no-go option. These are summarised as follows:

Negative

- The current Ilima resource base will be depleted in the next 5-7 years. With no alternative areas to mine, it would result in the retrenchment of 350 people and closure of the company;
- Loss of R100 million investment in the development of the Kranspan Colliery;
- The royalties and tax revenue from mining will not accrue to the South African Government;
- The local economic development opportunities associated with the procurement of local goods and services to support the mine activities will not be realised;

- The various social development projects under discussion with local government as part of the applicant's social and labour plan commitments, will not be implemented; and
- An additional supply of coal needed for power generation will not be available to Eskom.

Positive

- Even with the application of the mitigation measures, the project will have a residual impact on the environment. The no-go option would prevent any of the post-mitigation impacts from occurring. The impacts to the environment would thus be from the current land-uses (primarily agriculture) with a likely increased cumulative impact on Kranspan from the coal mining already taking place on adjacent properties to the north-east and north-west of the proposed mining right area;
- No impact to ambient air quality in the local and regional airshed;
- The possible social disruption and health impacts arising from the development would be prevented;
- Destruction of wetlands and sensitive environments would be prevented; and
- The land at the proposed sites would be unaltered and remain available for alternative use, although it is likely that the land would be pursued by mining companies bordering the proposed mining boundary.

7 DETAILS OF THE PUBLIC PARTICIPATION PROCESS FOLLOWED

The manner in which I&APs were identified and engaged with as part of the Public Participation Process (PPP), including the type of engagement followed, communication method and languages used, was informed by the requirements of the EIA Regulations (2014), applicable guideline documents, review of population data available for the area and feedback from I&APs during the S&EIR Process.

7.1.1 Prior Consultation and Existing Agreements

Prior to the commencement of the S&EIR Process, several Interested and Affected Parties (I&APs), including landowners, land users and surrounding landowners/land users, have been consulted with as part of the original prospecting right application and in advance of the exploration work undertaken by Ilima.

7.1.2 Scoping Phase

As part of project notification, a Draft Scoping Report was made available for public review and comment for a period of 30 days from 7 December 2018 to 28 January 2018. The report was made available as follows:

- By download: http://www.abs-africa.com/project-documents/
- By e-mail on request: kranspan@abs-africa.com
- Hard copies were made available publicly for review at the Carolina Public Library, 11 Voortrekker Street, Carolina

Registered I&APs were notified of the application and the availability of the Draft Scoping Report (DSR) through letters sent by e-mail and where no e-mail address was provided, through registered mail. The application and availability of the DSR was also announced through messaging applications (SMS and WhatsApp). . Notices were also made available in isiZulu at the container shop on Portion 1 of Kranspan.

Newspaper advertisements were placed in a local and regional newspaper in two languages (isiZulu and English). Letter notifications were distributed in Afrikaans and English and sms notifications were sent in Afrikaans. Site notices were placed in English and Afrikaans.

Key stakeholder meetings undertaken as part of the Notification Phase of the Project are summarised in Table 7-1. The minutes to this meeting are included in Appendix 6.

TABLE 7-1: STAKEHOLDER MEETINGS

STAKEHOLDER	DATE
Mr. Klein (Landowner of Portion 4 of the Farm Kranspan)	8 January 2019

The register of I&APs, copies of written and notifications by messaging applications, site notices and newspaper notices developed and distributed to date are provided in Appendix 6.

7.1.3 COMMUNITY SURVEY

A local community is situated on Portion 1 of the Farm Kranspan, within the mining right area. . A community survey was undertaken on the 27th of February 2019 to engage with the community as well as adjacent communities to the proposed mining right area, to establish the socio-economic dynamics of the community and record the concerns of the community in terms of the proposed mining project. In accordance with the requirements of Regulation 41(2)(e), the survey was also used to determine levels of literacy, and preferred language and communication methods.

From the survey, it was noted that the community consists of approximately 12 families, residing in approximately 50 informal structures.

The findings of the consultative survey are discussed in the Social Impact Report (Appendix 8).

It is understood that the community is in negotiations with Msobo Coal (Pty) Ltd. regarding the potential relocation of the community. This relocation is independent of the planned activities by Ilima and will thus proceed regardless of the outcome of the Ilima application for a mining right. Although the potential impacts of the proposed Ilima mining activities on this community have been assessed in the S&EIR Process, it is understood that the community is likely to be relocated before the proposed Ilima mining activities proceed.

7.1.4 EIA PHASE

This Draft EIR will be made available for a 30-day comment period. Notification of the availability of the draft report will be advertised (newspaper notices and site notices) and sent (e-mail and/or registered mail and messaging applications) in the same manner as the Draft Scoping Report. The Draft EIR will also be made available in the same way as was done for the Scoping Report.

The comments received from registered I&APs on the Draft EIR will be included in an updated Comments and Response Report (Table 7-2).

Registered I&APs will be notified in writing of the submission of the Final EIR. A copy of the Final EIR will be made available on the ABS Africa website and on request from ABS Africa.

Regulation 24(1) of Government Notice R.982 provides that the DMR must review the Final EIR and EMPr and issue a decision on the EA and WML application within 107 days of submission of the document.

7.1.5 Notification of Decision

Upon receipt of the decision on the EA the EIA Project Team will assist the applicant in making the application decisions available to all registered I&APs and notifying them of the appeal procedure to be followed in terms of the National Appeal Regulations [Government Notice No. R.993 promulgated in terms of section 44(1a) and 43(4) of NEMA].

7.1.6 Summary of Issues Raised by I&APs

Comments and responses are included in Table 7-2. Comments received during the review period for this Draft EIR will be included in the Final EIR.

TABLE 7-2: SUMMARY OF ISSUES RAISED BY I&APS

INTERESTED AND AFFECTED PARTIES LIST THE NAMES OF PERSONS CONSULTED IN THIS COLUMN; AND MARK WITH AN X WHERE THOSE WHO MUST BE CONSULTED WERE IN FACT CONSULTED[8]		DATE COMMENTS RECEIVED	ISSUES RAISED	EAPS RESPONSE TO THE ISSUES RAISED
AFFECTED PARTIES				
Landowner/s (Owners of land included in the Mining Rights Area Boundary)	**X**			
G. Klein Portion 4 Kranspan		Comments recorded during a meeting held on 8 January 2019	Please refer to the minutes of the meeting in Appendix 6.	
Koos Jordaan Remaining Extent Kranspan		No Comments Received		
Attie Prinsloo Portion 1 Kranspan				
Rudi Prinsloo Portions 2, 5 Kranspan		No Comments Received		
Jaco Papenfus				

[8] The I&AP Register in Appendix 6 provides the list of I&APs consulted and a record of consultation methods and dates

Portion 3 Kranspan				
Kobus Papenfus Portions 6, 7 Kranspan				
Koos Jordaan Portion 8 Kranspan				
Occupiers of the Site (Parties using land within the Mining Rights Area Boundary)	**X**			
Community member on Portion 1		Comment received verbally during community survey on the 27 February 2019	Concerns relate to relocation due to the proposed Kranspan mining project and blasting impacts from Msobo mine.	No relocation of the community is being proposed by Ilima. The nearest proposed Ilima mining activities to the community is on the other side of the R36, more than 100 m from the nearest housing structure. It is the EAPs understanding that the community on Portion 1 will be relocated by Msobo Coal before the construction phase of the proposed Kranspan Project. Notwithstanding this, the impacts of the proposed Ilima mining activities on the community, including blasting, have been assessed and mitigation measures proposed by the specialist will be implemented. It is recommended that complaints pertaining to blasting impacts from adjacent mines be discussed with those mines directly.
Frans Marais Private Lessee Portion 4 Kranspan		No Comments Received		

Rudi Prinsloo Roodebloem Trust Portion 8 Kranspan				
Koos Jordaan Baadtjiesbult Boerdery PTY Ltd. Portion 1 Kranspan				
Sydwiel Habindele Community Leader Portion 1 Kranspan				
Adjacent Landowners (Owners of land immediately adjacent to the Mining Rights Area Boundary)	**X**			
Sibongile Booi Portion 1 Roodebloem 51 Ingwe Surface Holdings Ltd, (a subsidiary of South32)		Comment received via email on 16 January 2019	Would you send me a copy of the acceptance for this mining right application? I am requesting the above in order for me to establish who I need to involve internally.	You are welcome to contact Allan Bullock for further information on the mining right application and associated queries not relating to the Scoping and Environmental Impact process.
G. Klein Portion 14 Naudesbank 172		Comments recorded during a	Please refer to the minutes of the meeting in Appendix 6.	

		meeting held on 8 January 2019		
Dirk Swart Northern Coal PTY LTD		No Comments Received		
Mashudu Gangazhe MSOBO COAL PTY LTD				
Job Nkosi Private Landowner				
Rosina Mango Nkosi Private Landowner				
Christina Lukele		No Comments Received		
Adjacent Occupiers of Site (Occupiers and users of land immediately adjacent to the Mining Rights Area Boundary)	**X**			
Community Member Portion 1 of Witbank 209		Comment received verbally during community survey on the 27th of February	This community was not aware of the proposed mining project and is concerned of the potential impacts due to blasting at Kranspan. The blasting from surrounding mines already has an impact on this community.	A key purpose of the community survey was to inform communities of the project. Notifications sent out to date include written notification to landowners, placement of several site notices on the boundary of the proposed mining right area and placement of notices in local and regional newspapers. Notifications have been provided in English, Afrikaans and isiZulu. The impact from blasting on surrounding communities has been assessed by a specialist and the findings are discussed in this report. The complete blasting specialist assessment is provided in Appendix 7. It is recommended that complaints pertaining to blasting impacts from adjacent mines be discussed with those mines directly.

Community Member Farm Vaalbank 212		Comment received verbally during community survey on 27 February 2019	Concerns during survey captured pertain to blasting impacts from surrounding mines. This community member has also noted degradation of surface water quality.	It is recommended that complaints pertaining to blasting impacts and the degradation of surface water quality, as a result of the activities of adjacent mines, be discussed with those mines directly.
Competent Authorities	**X**			
Vusi Khoza Department of Rural Development and Land Reform		Comment received via email on 10 December 2018	Kindly note that your enquiry has been received and forwarded to Mr Ntokozo Nkambule who will respond to you.	Comment noted.
Municipal Councillor	**X**			
Mxolisi Gumede Chief Albert Luthuli Local Municipality		Comment received via email on 18 December 2018	Herewith Areas where I am looking for more information in future studies of clarity as per current draft report: Section 5.2 (bullet 2) Clarity on the mentioned possible mining impact of surface/ground water bodies. What kind of impacts, are they on quality or quantity (how can the Municipality as a Water Service Authority, plan to cope with such impacts).	The impacts of the proposed mining project on surface and groundwater resources will be assessed through the specialist studies as described in Section 10 of the Final Scoping Report. These studies will be incorporated into the Draft Environmental Impact Report (EIR). On completion of the studies, registered I&APs will be provided with an opportunity to review the Draft EIR, including the specialist study reports.
Mxolisi Gumede Chief Albert Luthuli Local Municipality		Comment received via email on 18 December 2018	Section 5.2 (bullet 5) The mentioned climate change related impacts (what % contribution will the mining impact have in the region?)	The climate change impacts in Section 5.2 of the Scoping Report relate to coal combustion, particularly from coal-fired power stations, and not coal mining. The greenhouse gas emissions generated by the proposed mining activities will be considered in the air quality specialist study.

Mxolisi Gumede Chief Albert Luthuli Local Municipality		Comment received via email on 18 December 2018	Section 5.2 (bullet 11&12) Please recheck the SPLUMA or perhaps is the SPLUMA of another municipality (not Chief Albert Luthuli Local Municipality)	Comment noted. The spatial planning context will be discussed in more detail in the Draft EIR.
Mxolisi Gumede Chief Albert Luthuli Local Municipality		Comment received via email on 18 December 2018	Section 8.1.6 Please check the applicability of the EMP that was done by SRK in 2008/9 for Gert Sibande District Municipality	Thank you for notifying us of this document. Any relevant aspects thereof will be incorporated into the Draft EIR.
Local and District Municipality	**X**			
Paulos Nkosi Lovedale Mavumbela D Nkosi (Mayor) Chief Albert Luthuli Local Municipality: Mayor		No Comments Received		

MG Chirwa (Mayor) B Phiwe Gert Sibande District Municipality: Roads		No Comments Received		
Traditional Leaders	**N/A**			
There is no traditional leadership structure known to be applicable to the Mining Right Application Area.				
Department of Mineral Resources				
Azwihangwisi Nemulodi		Letter received on 12 April 2019.	**Acceptance of the Scoping Report submitted in terms of Regulation 21 of the Environmental Impact Assessment Regulations, 2014 as amended for the Mining Right in respect of the farm Kranspan 49 IT for Ilima Coal Company (PTY) LTD, situated in the magisterial district of Ermelo: Mpumalanga Region.** The Scoping Report (SR) and Plan of study for Environmental Impact Assessment received by the Department on 08 February 2019 refers. a) The Department has evaluated the submitted SR and Plan of the study for environmental Impact Assessment submitted on 08 February 2019 and is satisfied that the documents comply with the minimum requirements of Appendix 2(2) of the National environmental Management Act, 1998 (as amended) (NEMA) Environmental Impact Assessment (EIA) Regulations, 2014. The SR is hereby accepted with conditions by the	No response necessary

			Department in terms of Regulation 22(a) of the NEMA EIA Regulations, 2014 as amended. b) You may proceed with the environmental impact assessment process in accordance with the tasks contemplated in the Plan of study for environmental Impact assessment as required in terms of the NEMA EIA regulations, 2014 as amended.	
Azwihangwisi Nemulodi Department of Mineral Resources		Letter received on 12 April 2019.	c) It should be noted that the Department requires the following to be provided/included and form part of the final Environmental Impact Assessment report (EIAr) and Environmental Management Programme (EMPr) to be submitted. • Please ensure that comments from all relevant stakeholders including the responses are submitted to the Department with the Environmental Impact Assessment Report (EIAr). **This includes but is not limited to the Provincial Heritage Resource Authority, Department of Agriculture, Forestry and Fisheries (DAFF), Department of Water and Sanitation (DWS), Mpumalanga Department of Public Works, Roads and Transport and the local municipality.** Proof of correspondence with the various	The listed stakeholders are included in the I&AP register. All comments received to date has been included and responded to in the Comments and Response Table. The comments received on the Draft EIR will be included in an updated version of the Comments and Response Table in the Final EIR and correspondence from I&APs will be submitted to the DMR.

			stakeholders must be included in the EIAr. Should you be unable to obtain comments, proof of the attempts that were made to obtain comments should be submitted to the Department. Please note that the above mentioned commentes and responses from public participation regarding the EIAr and not the scoping report	
Azwihangwisi Nemulodi Department of Mineral Resources		Letter received on 12 April 2019.	• The surrounding communities must also be consulted and proof and results of such engagements must be attached in the EIAr. The provisions of regulation 41 (2) (e) of the EIA Regulations, 2014 as amended must be used.	Surrounding communities have been included in the public participation process. Notifications sent out include written notification to landowners, placement of several site notices on the boundary of the proposed mining right area and placement of notices in local and regional newspapers. Notifications have been provided in English, Afrikaans and isiZulu. A community survey was also undertaken on 27 February 2019 to engage with the community on Portion 1 of Kranspan as well as adjacent communities to the proposed mining right boundary. Please refer to the I&AP register for the list of I&APs consulted, method and date of consultation. The relevant PPP materials are attached in Appendix 5. The proof of consultation undertaken for the Draft EIR will be included in the Final EIR.
Azwihangwisi Nemulodi Department of Mineral Resources		Letter received on 12 April 2019.	• The occupiers of the land in question and the adjacent land owners must be included in the public participation process and proof and results must be included in the EIAr.	The occupiers and landowners within the mining right boundary as well as adjacent landowners and occupiers have been included in the consultation process. Please refer to the I&AP register for the list of I&APs consulted, method and date of consultation.

				The relevant PPP materials are attached in Appendix 6
Azwihangwisi Nemulodi Department of Mineral Resources		Letter received on 12 April 2019.	• Public participation must also include the private land owners of the Chrissiesmeer Panveld area.	The Chrissiesmeer Protected Environment Landowner's Association has been notified of the proposed project and has been added to the I&AP database.
Azwihangwisi Nemulodi Department of Mineral Resources		Letter received on 12 April 2019.	• Public Participation Process must be transparent and all comments received during the process must be incorporated into the comments and response report of the final Environmental Impact Report. Newspaper adverts, notice boards, written notice meetings e.t.c should form part of proof of public participation.	This requirement is noted. The relevant PPP materials are attached in Appendix 6. These will be updated for the Final EIR.
Azwihangwisi Nemulodi Department of Mineral Resources		Letter received on 12 April 2019.	• Kindly make sure that during public participation for the EIA, interested and affected parties (especially communities at close proximity are made aware of the proposed working hours and the impacts (e.g. noise, dust, house cracks) and mitigation measures are outlined in details to those communities (this must be included in the EIAr).	This requirement is noted. The nearest proposed Ilima mining activities to the community is on the other side of the R36, more than 100 m from the nearest housing structure. It is the EAPs understanding that the community on Portion 1 will be relocated by Msobo Coal before the construction phase of the proposed Kranspan Project. Notwithstanding this, the impacts of the proposed Ilima mining activities on the community including blasting, have been assessed and described in the EIR.
Azwihangwisi Nemulodi		Letter received on 12 April 2019.	• It has been noted that there will be blasting on site should the project be approved, please also include this issue during public	The impacts from blasting have been assessed by a specialist and the findings and mitigation measures

Department of Mineral Resources			participation as mentioned above and give details on how the impacts such as house cracks and vibrations will be mitigated (this must be included in the EIAr).	are discussed in this report. The complete blasting specialist assessment is provided in Appendix 7. It is the EAPs understanding that the community on Portion 1 will be relocated by Msobo Coal before the construction phase of the proposed Kranspan Project.
Azwihangwisi Nemulodi Department of Mineral Resources		Letter received on 12 April 2019.	• The table regarding the summary of issues raised by I&Aps must be completed in full i.e issues raised by I&Aps and the responses by the EAP or company must be summaried in this table. It has been noted that in the second report, not all issues raised and responses were cuptured in the same table of the EIAr.	This requirement is noted.
Azwihangwisi Nemulodi Department of Mineral Resources		Letter received on 12 April 2019.	• Please use the amended GNR number for listed activities in the EIAR.	This requirement is noted. The listed activities table has been updated accordingly.
Azwihangwisi Nemulodi Department of Mineral Resources		Letter received on 12 April 2019.	• All specialist studies mentioned in section 10.3 of the scoping report must be conducted and attached to the EIAr. • The specialist study must also focus on the possible impacts on the Chrissiesmeer Panveld.	All specialist studies undertaken have been attached in Appendix 7. The terrestrial biodiversity study has assessed the impact of the proposed project on the applicable listed ecosystem type (Eastern Highveld Grassland) relevant to the study area. The remaining extent of the Chrissiesmeer Panveld ecosystem type is largely restricted to the Chrissiesmeer Protected Environment, which is situated approximately 9 km to the east of the proposed mining right area. It is not anticipated that the proposed mining development will have an

				impact on the Chrissiesmeer Protected Environment as the zone of impact, as determined by the relevant specialist studies (geohydrological and air quality), is assessed to be within 1 km to 2 km of the boundary of the proposed mining right area.
Azwihangwisi Nemulodi Department of Mineral Resources		Letter received on 12 April 2019.	• The EIAr must contain the details of the mintigation measures regarding the current land use and the final land use and how the proposed project will coexist with the said land uses. The final rebilitation in relation to the current land use must also be detailed.	This information has been presented in Part B (EMPr) and the relevant specialist study reports namely the Soils and Hydropedology specialist report and the Closure Report, both of which are attached in Appendix 7.
Azwihangwisi Nemulodi Department of Mineral Resources		Letter received on 12 April 2019.	• Further, it must be reiterated that, should an application for Environmental Authorisation be subjected to any permits or authorisations in terms of the provisions of any Specific Environmental Management Acts (SEMAs), proof of such application will be required.	This requirement is noted. An application for a Waste Management Licence, in terms of the National Environmental Management: Waste Act 39 of 2008 (as amended) has been submitted.
Azwihangwisi Nemulodi Department of Mineral Resources		Letter received on 12 April 2019.	• The EIAr must also include a detailed closure plan with the current land use and the final land use as a baseline.	A closure plan has been compiled and is attached in Appendix 7 of the EIR. A summary of the closure plan has been provided in Section 32 of the EIR,
Azwihangwisi Nemulodi Department of Mineral Resources		Letter received on 12 April 2019.	• Any other matters required in terms of Appendix 3 (3) and Appendix 4 of the EIA Regulation 2014.	All requirements have been adhered to.

Azwihangwisi Nemulodi Department of Mineral Resources		Letter received on 12 April 2019.	d)	The applicant is hereby reminded to comply with the requirements of regulation 3 of the EIA regulations, 2014 with regards to the time and period allowed for complying with the requirements of the Regulations.	All requirements have been adhered to.
Azwihangwisi Nemulodi Department of Mineral Resources		Letter received on 12 April 2019.	e)	Please be ensure that the EIAR includes the A3 size locality map of the area and illustrates the exact location of the proposed development. The map must be of acceptable quality and as a minimum, have the following attributes, maps are related to one another, Co-ordinates, Legible legends, Indicate alternative, Scale and Vegetation types of the study area.	The locality map and other maps comply with this requirement and are attached in Appendix 3.
Azwihangwisi Nemulodi Department of Mineral Resources		Letter received on 12 April 2019.	f)	Your attention is brought to Section 24F of the NEMA which stipulates "that no activity may commence prio to an environmental authoriwsation being granted by the competent authority".	This requirement is noted.
Seapei Sekgetho Martha Mokonyane Matshilele Ratsela	No Comments Received				

Department of Mineral Resources				
Department of Environmental Affairs	**X**			
Tinyiko Nxumalo Office of the HOD Support DEDT		Comment received via email on 30 January 2019	Dear Ms Nkosi, Kindly receive the attached correspondence for your attention and further management.	Noted.
Surgeon Marabane		No comments Received		
Organs of State with Jurisdiction	**N/A**			
Thabo Rasiuba Inkomati Usuthu Catchment Management Agency (IUCMA)		Comment received via email on 15 January 2019	Kindly send hard copies to Inkomati-Usuthu Catchment Management Agency for comment.	A hard copy of the Draft Scoping Report has been delivered to the IUCMA for review as requested. Please note that comments should reach ABS Africa by 28 January.
Dzhangi Thandi Inkomati Usuthu Catchment Management Agency (IUCMA)		Comment received via email on 8 February via email and attached letter	The Inkomati Usuthu Catchment Management Agency (IUCMA) assessed the report and the following comments are made:	No response necessary.
Dzhangi Thandi Inkomati Usuthu Catchment Management Agency (IUCMA)		Comment received via email on 8 February via email and attached letter	1. Page 11: Opencast Mining: It is indicated that a conventional strip mining method will be used for each of the opencast pits. *The material from the boxcut phase must be stored as per overburden classification. Stock-pilling of any material should not be located within 1:100-year flood line, delineated riparian zone or 100m from the watercourse, whichever is greatest. Stripped off topsoil*	This requirement is noted and has been incorporated into the EMPr. Identified sensitive environmental features across the proposed mining right area has been assigned buffers so as to avoid impacting on these areas.

			must be re-used to rehabilitate any disturbed land and must not be used for maintenance of access roads. If and where possible concurrent rehabilitation of all disturbed areas shall be done on an ongoing basis to prevent degradation of the natural environment.	
Dzhangi Thandi Inkomati Usuthu Catchment Management Agency (IUCMA)		Comment received via email on 8 February via email and attached letter	2. From the report and identified activities, the possible water uses that will be triggered in terms of Section 21 of the National Water Act (Act 36 of 1998) (NWA) are as follows: • Section 21 (a) – taking of water from a borehole for domestic water uses • Section 21 (c) and (i) – encroaching regulated areas (s) by mining and related activities within 500m of a wetland. • Section 21 (g) – the disposal of discard material on the engineered discard dump and establishment of pollution control dams (PCDs)	Please refer to section 4 for an extensive list of water uses identified. This is further discussed in the IWWMP.
Dzhangi Thandi Inkomati Usuthu Catchment Management Agency (IUCMA)		Comment received via email on 8 February via email and attached letter	3. Page 17: Sanitation-It is indicated that the new facilities for sewage management will be constructed on site and chemical toilets will be used for underground mining. *The use of potable toilets is supported, and the contents must be disposed into the authorised wastewater treatment facility. The IUCMA will request proof of service level agreement between the Applicant and the*	This requirement is noted and has been incorporated into the EMPr.

			owner of the wastewater treatment facility. The Applicant shall ensure that no sanitary system is located within 1: 100 year-flood line or delineated riparian zone, whichever is greatest	
Dzhangi Thandi Inkomati Usuthu Catchment Management Agency (IUCMA)		Comment received via email on 8 February via email and attached letter	4. Page 18: General Waste – It is indicated that there will be no solid waste disposal landfill on site and that the waste will be segregated into general and hazardous waste and contractors will be appointed to remove the waste to the licenced waste disposal facilities. *The IUCMA will require proof of Service Level Agreement between the applicant and the facility owner.*	This requirement is noted.
Dzhangi Thandi Inkomati Usuthu Catchment Management Agency (IUCMA)		Comment received via email on 8 February via email and attached letter	5. Page 18 Stormwater Management – It is indicated that the applicant will employ bets practice of clean and dirty water separation where dirty water is channelled and stored into PCD. *The footprint of the dirty area must be minimised to effectively manage dirty stormwater generated on site. The clean stormwater must be diverted away from the dirty areas. The dirty stormwater disposed into the PCD must be evaporated or be used for dust suppression provided it is authorised. The PCD must be operated and maintained to have a minimum freeboard of 0.8 metres above full supply level and all other dirty water systems related thereto must be operated is such a manner that it is at all times capable of handling the 1: 50 year flood-event on top of its mean operating level.*	These requirements have been summarised in Section 3.2.12 of the Draft EIR.

Dzhangi Thandi Inkomati Usuthu Catchment Management Agency (IUCMA)		Comment received via email on 8 February via email and attached letter	6. Page 43: Water Resources – It is indicated that there are three wetlands in the project areas. *The applicant is advised to prevent high ecological impact development around the perimeter of those wetlands. No activities should be located within 1: 100 year flood line, delineated riparian zone or 100m from a watercourse, whichever is the greatest without authorisation.*	The placement of infrastructure and mining pits have considered these wetlands and the associated buffers have been applied. The necessary water use licences have been applied for where intrusion within these buffers cannot be avoided
Dzhangi Thandi Inkomati Usuthu Catchment Management Agency (IUCMA)		Comment received via email on 8 February via email and attached letter	7. In terms of section 22 (1) of the NWA "a person may only use water- *(a) Without a licence-* *I. If water use is permissible under Schedule 1;* *II. If water use is permissible as a continuation of an existing lawful use (section 32); or* *III. If that water use is permissible in terms of general authorisation issued under section 39;* *(b) If the water use is authorised by a licence under this Act; or* (c) *If the responsible authority has dispensed with a licence requirement under subsection (3)'* Therefore, any other water use activities associated with this project that are not permissible as indicated above, must be authorised prior to such water use activities taking place.	All water use activities and associated licences required for the proposed project is summarised in Section 4 and the IWWMP and the relevant authorisation has been applied for.

Dzhangi Thandi Inkomati Usuthu Catchment Management Agency (IUCMA)		Comment received via email on 8 February via email and attached letter	8. Any pollution incident(s) originating from the proposed mining activity must be reported to the IUCMA within 24 hours.	This requirement is noted and has been incorporated into Section 20.
Dzhangi Thandi Inkomati Usuthu Catchment Management Agency (IUCMA)		Comment received via email on 8 February via email and attached letter	9. The water user is therefore advised to engage with IUCMA or Department of Water and Sanitation (DWS) for the guidance on the requirements for water use authorisation process. Additionally, water use applications ca be lodged on-line on the eWUULAS platform accessible at www.dws.gov.za	No response necessary.
Nonqubeko Mfeka Department of Rural Development and Land Reform		Comment received via email on 8 January 2019	Kindly advise if the involvement of the Commission is required in the matter. Kindly indicate the location of the farm so that I can refer you to the relevant person in the Department whom will be able to participate in the process.	You are receiving notifications to the Kranspan Project because you have been identified as an organ of state with jurisdiction. Please see the attached locality map for the proposed project near Carolina.
Masala Mulaudzi Department of Water and Sanitation		No Comments Received		
Johan van Aswegen Department of Water and Sanitation				
Lazarus Masuku Department of Rural Development and Land reform		No Comments Received		
Bongani Mlomo				

Department of Rural Development and Land Reform				
Prudence Nkosi Mpumalanga Department of Economic Development and Tourism		No Comments Received		
Sam Nkosi Department of Rural Development and Land Reform		No Comments Received		
Bheki Nyathikazi Mpumalanga Department of Agriculture, Rural Development, Land and Environmental Affairs		No Comments Received		
Other Competent Authorities Affected	**X**			
Tinyiko Nxumalo Office of the HOD Support DEDT		Comment received via email on 30 January 2019	Dear Ms Nkosi, Kindly receive the attached correspondence for your attention and further management.	Comment noted.
Other Affected Parties	**N/A**			
No other affected parties identified to date.				
Interested Parties	**X**			
Jack Armour		Comment received via email on 7 January 2019	As the potentially affected area falls outside of the Free State, I refer this to Robert Davel of our Agri Mpumalanga office. If you do any work in the Free State affecting agricultural land, I'll be happy to assist / register as IAP and to forward to our members.	Comment noted. The correct contact has been added to the I&AP register.

Koos Davel		Comment received via email and attached letter on 8 May 2019	It is assumed that the applicant and mining house (Ilima Coal Company) would meet with all legislation as well as with the spirit of these legislation. This is referred to in the proposed scoping document (See the above reference). The purpose of this document is to raise our concerns and to proposed a broadening of the scope of study as well as detailing of mitigation measures. Aspects related to the Mining, Environmental impact and mitigation as determined by the National Environmental Management Act and its regulations to be investigated.	Noted. No response necessary.
Koos Davel		Comment received via email and attached letter on 8 May 2019	**1. Water related risk identification**	Responses have been provided individually to the specific comments.
Koos Davel		Comment received via email and attached letter on 8 May 2019	1.1 Back ground quality of the environmental water to be established. This investigation should include the water quality of boreholes, fountains, pans, vlei areas, streams surrounding and run-off the mining area as well as in the identified protected areas. Water in the downstream Nooitgedacht dam to be profiled.	These aspects have been addressed, as relevant to the application, by the various specialist studies. Please refer to the hydrology, geohydrology, soils and hydropedology and surface water ecosystems specialist reports attached in Appendix 8.
Koos Davel		Comment received via email and attached letter on 8 May 2019	1.2 A waste classification and pollution potential to be established (Waste Act regulation 23 Aug 2013 R6363) on: (it is expected that this classification would at least be Class 3 waste, requiring a type 3 liner) 1.2.1 Material to be placed back in all open pit voids 1.2.2 Water captured in the open cast pits 1.2.3 Surface water as captured in the proposed PCD's 1.2.4 Process water	A classification of the relevant waste materials has been undertaken in accordance with the legislative requirements. Please refer to the waste classification report in Appendix 8.

Koos Davel		Comment received via email and attached letter on 8 May 2019	1.3 Planned water management from the mining pits should include and specify: 1.3.1 Decant points from each pit. This should be included in the floor plan of each pit profile. (This to be made available in a recognised survey format) 1.3.2 The pollution plume progress from each pit. This should include saturated as well as unsaturated flow conditions. This pollution extend should be indicated on drawing of the area, referring to the duration of the impact.	This has been addressed in the geohydrogical modelling. Please refer to the geohydrology report in Appendix 8.
Koos Davel		Comment received via email and attached letter on 8 May 2019	1.4 It was noted with concern, that planned opencast mining activities is planned on the edge of the wetlands, pans and event within already recognised (legal) buffer zones. The mine and consultant to propose specific mitigation measures. (a 21g application after the mining event would not be acceptable)	The mitigation hierarchy has been applied to the development. Please refer to Section 6 of the EIR for a description of the layout has been amended in this regard. Further mitigation measures for reducing the impact on wetlands and other sensitive features have been proposed in the EMPr (Part B of the EIR).
Koos Davel		Comment received via email and attached letter on 8 May 2019	**2. Mitigation Measures** The Ermelo coal field is known as Acid Mine generation. The following mitigation measures are identified and needs to be quantified and should be included in the scoping document:	The mitigation hierarchy has been applied to the development. Please refer to Section 6 of the EIR for a description of the layout has been amended in this regard. Further mitigation measures for reducing the impact on wetlands and other sensitive features have been proposed in the EMPr (Part B of the EIR).
Koos Davel		Comment received via email and attached letter on 8 May 2019	2.1 Water leaving the mining site should be of an acceptable standard. This include surface and all seepage water. The water quality should meet with the environmental acceptable standard (not drinking water quality). The scoping document should include: 2.1.1 The volume of the water that would be impacted on by the mining activities. This include seepage from the environment as well as rainfall on the mining area (Hopkins)	The mitigation hierarchy has been applied to the development. Please refer to Section 6 of the EIR for a description of the layout has been amended in this regard. Further mitigation measures for reducing the impact on wetlands and other sensitive features have been proposed in the EMPr (Part B of the EIR).

			2.1.2 Separation of dirty and clean water in terms of GN 704 of the Water Act	
Koos Davel		Comment received via email and attached letter on 8 May 2019	2.2 The introduction of a water treatment plant is proposed. The scoping study should cover (at least): 2.2.1 Nature of this water treatment plant to meet with the required water quality as determined in par 1.1. i.e. the environmental water quality 2.2.2 Capital and establishment cost of this plant construction. Commissioning cost and time to be specified 2.2.3 Operational cost of the water treatment plant for the duration of the impact. (Duration to be identified and quantified). The following specifics regarding the water treatment plant is required: 2.2.3.1 Manning, technical skills and maintenance requirements 2.2.3.2 Emergency procedures considering electrical power supply, industrial action, equipment failure 2.2.3.3 Brine and waste on site storage method and cost. Disposal site to be identified with take-off cost and method 2.2.3.4 The infrastructure collecting AMD/polluted water to be treated. This lay out to be specified with a lay-out and operating philosophy 2.2.3.5 Service life and maintenance schedule to be specified on, this to include: • HDPE liners • Electrical motors • Pumps • Reverse osmose filters • Pipe lines and valves	A water treatment plant is not a definite requirement at this stage in the planning of the mine. It may, depending on the findings of the groundwater monitoring programme recommended by the specialist, be required as a mitigation measure for improving the quality of water prior to discharge to the environment. If a treatment plant is considered necessary, the financial provisioning for the rehabilitation and closure of the mine will be updated accordingly, as is required by the legislation.

			• Buildings and structures • Security and protection to the water treatment plan 2.2.3.6 A trust fund (or financial guarantee) providing for the above items, over the impact duration to be established, prior to commencement of mining.	
Koos Davel		Comment received via email and attached letter on 8 May 2019	2.3 The design calculations on all PCD and evaporation ponds to be supplied.	Please refer to the Stormwater Management Plan and Water Balance Report in Appendix 8.
Koos Davel		Comment received via email and attached letter on 8 May 2019	2.4 Lining of open cast pits and water storage facilities as per the abovementioned Waste Act Regulations. This would meet with GN 704 requirements	The legislation requires that a risk analysis be undertaken to inform the pollution control measures needed for mine residue stockpiles like discard facilities. The risk analysis is discussed in Section 16 of the EIR. Please also refer to the Stormwater Management Plan (Appendix 8) for the details regarding the pollution control dams.
Koos Davel		Comment received via email and attached letter on 8 May 2019	**3. Internalisation of cost and impacts**	Responses to each of the specific comments are provided below.
Koos Davel		Comment received via email and attached	The principle of internalisation of all impacts as result of the proposed mining activities is applicable. The following to be investigated and reported on: 3.1 Impact on roads due to the additional load of coal haul trucks. This to include a report on the service life of	The impact on roads and associated road safety risk was considered as part of the impact assessment and alternatives analysis. It is noted that there are several mining companies operating in the Carolina area that make use of the

		letter on 8 May 2019	the road(s) as well as the maintenance and repair cost to roads. (placing this burden on the tax payer would not be acceptable)	public road infrastructure. The relevant local and provincial road authorities have the legislative mandate for upgrading and maintaining public road infrastructure. The Applicant is responsible for construction, maintenance and rehabilitation of all road infrastructure established within the mining right area. Ilima will indirectly contribute to the maintenance and upgrading of roads and other infrastructure by meeting its obligations with respect to the payment of the applicable rates and taxes as determined by legislation.
Koos Davel		Comment received via email and attached letter on 8 May 2019	3.2 Road damage due to truck through the streets of the local town to be specifically addressed	The impact on roads and associated road safety risk was considered as part of the impact assessment and alternatives analysis. The relevant local and provincial road authorities have the legislative mandate for upgrading and maintaining public road infrastructure.
Koos Davel		Email sent on 2 May 2019	What is the timing on this?	Your telephonic discussion with Mr. Janru Reynders has reference. Please follow the link below to access the Final Scoping Report for the proposed Kranspan project. Please also note that you have been registered on our I&AP database and that all future correspondence regarding the proposed project will be sent to you for consideration. The application for the mining right and environmental authorisation was submitted in December, the Final Scoping Report was accepted by DMR in April 2019, the Draft EIR is expected to be

				distributed for public review and comment in May 2019.
Koos Davel		Email sent on 14 May 2019	Correct Chrissiemeer protected area Pse register as IAP	Is my understanding correct that you are representing the landowners of the Chrissiesmeer Panveld? Thank you for the feedback. You have been registered as an I&AP.
		Email received on 14 May 2019	Are there any public meetings planned? And when How do you do public participation if you do not hold a meeting with all stake holders? I public meeting give protection to the process, further more does it give opportunity for verbal presentation Do you really want to go this route?	There are no public meetings planned, but we can arrange a meeting with you if required? The public participation process is required to adhere to the requirements of Chapter 6 of the EIA Regulations, 2014 (as amended). In terms of Chapter 6, is not a requirement to hold a public meeting as part of a public participation process. Rather, interested and affected parties are required to be provided with information containing all relevant facts in respect of the application and to be provided with a reasonable opportunity to comment on the application. For the Kranspan application, this is being addressed in several ways including: • Written notifications to occupiers of the site and adjacent occupiers of the site

			I am not going to fight you or trying to convince you about how you do this process. It needs to be transparent, none of the aspects mentioned below meet with this criteria.	• Placement of site notices and newspaper notices advertising the application and the availability of draft reports for comment • Providing a hard copy of draft reports for comment at the Carolina library • Providing soft copies of draft reports to all registered interested and affected parties • Provision of e-mail and telephonic contact details for queries and comments from registered interested and affected parties • Holding focus group meetings with interested and affected parties who prefer to make verbal comment Please let us know if you would like us to arrange a focus group meeting with yourself. It is suggested that this meeting be held during the comment period on the Draft EIR. Your comments have been noted and will be added to the comments and response report which will be included in the draft EIR.

8 THE ENVIRONMENTAL ATTRIBUTES ASSOCIATED WITH THE SITES

8.1 BASELINE ENVIRONMENT - TYPE OF ENVIRONMENT AFFECTED BY THE PROPOSED ACTIVITY

8.1.1 CLIMATE

The rainfall characteristics of the study area are documented in the Surface Water Resources of South Africa 1990 Volume VI and within the X1A rainfall zone as per Map No 1.3 in the Book of Maps. The closest rainfall station to the study area is the South African Weather Station 0480267W – Kranspan which is located on the south-western boundary of the study area (Peens & Associates, 2019).

8.1.1.1 Mean Annual and Monthly Rainfall

The mean annual rainfall for South African Weather Station 0480267W – Kranspan is 698mm based on 44 years of data as indicated in the TR102 Southern African Storm Rainfall from PT Adamson. The mean monthly rainfall distributions as listed in the Surface Water Resources of South Africa 1990 Volume VI Appendix 2.2 were used to calculate the mean monthly rainfall and the annual standard deviation was used to estimate the typical wet and dry seasons (Peens & Associates, 2019).

The mean monthly rainfall distributions from Surface Water Resources of South Africa 1990 Volume VI Appendix 2.2 are listed in the table and shown in the figure below.

TABLE 8-1: MEAN MONTHLY RAINFALL DISTRIBUTIONS IN PERCENTAGE (%)

MONTH	OCT	NOV	DEC	JAN	FEB	MAR	APR	MA	JUN	JUL	AUG	SEP
DISTRIBUTION	10.8	17.4	16.1	17.1	12.5	10.5	5.9	2.2	1.2	1.0	1.2	4.1

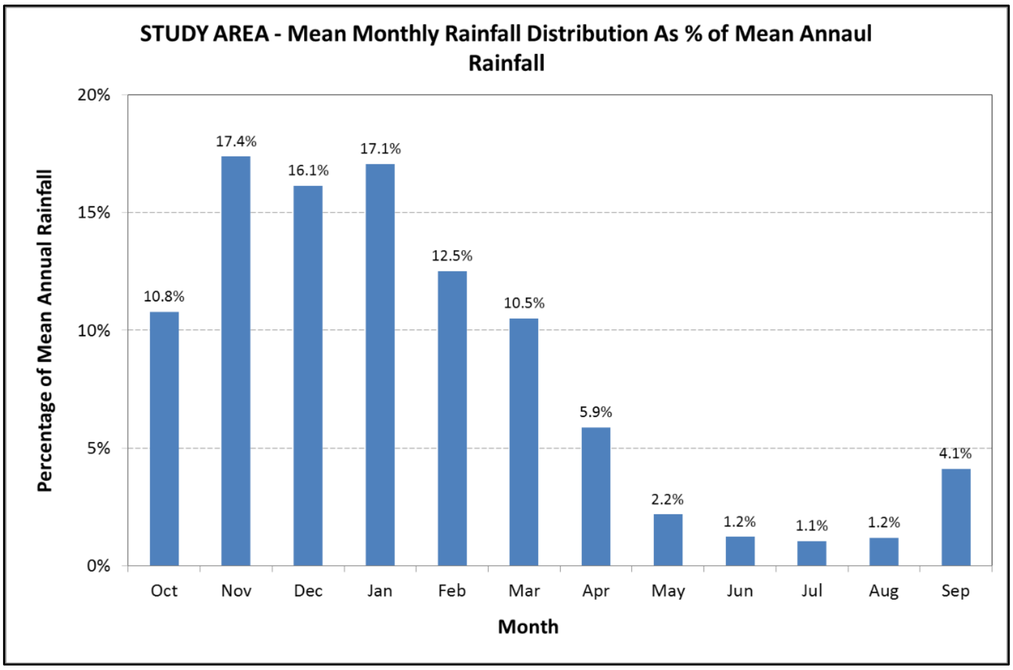


FIGURE 8-1: PERCENTAGE MEAN MONTHLY DISTRIBUTION OF MEAN ANNUAL RAINFALL (MAP)

The mean monthly and annual rainfall as well as that for typical wet and dry years is listed in the table below.

TABLE 8-2: MEAN MONTHLY AND ANNUAL RAINFALL (MM)

MONTH	OCT	NOV	DEC	JAN	FEB	MAR	APR	MA	JUN	JUL	AUG	SEP	ANNUAL
WET	87	139	129	137	100	84	47	17	11	8	10	33	802
MEAN	75	121	113	119	87	73	41	15	9	7	9	29	698
DRY	64	103	96	101	74	62	35	13	8	6	8	24	594

8.1.1.2 Surface Wind Field

The wind field for the study area is described with the use of wind roses. Wind roses comprise 16 spokes, which represent the directions from which winds blew during a specific period (Airshed, 2019).

The period wind field and diurnal variability in the wind field are shown in Figure 8-2. Seasonal variations in the wind field are provided in Figure 8-3.

The wind field was predominantly from the west-northwest and north-east. Calm conditions occurred 4.70% of the time. There is a significant contrast between day-time and night-time wind fields. During the day, winds occurred more frequently from the north-westerly sector, with 4.75% calm conditions. Night-time airflow showed increased wind speeds which occurred most frequently from the north-easterly sector. The frequency of night-time calm conditions decreased to 4.65%. From Figure 8-3, autumn and winter show similar wind direction profiles to the period average, while summer shows more frequent winds from the east-northeast and a decrease in wind speeds from the north-west. There is an increased frequency of wind speeds of 3 m/s or more in spring.

According to the Beaufort wind force scale[9] wind speeds between 6-8 m/s equates to a moderate breeze, with wind speeds between 9-11 m/s referred to as a fresh breeze. Wind speeds between 11-14 m/s are described as a strong breeze with winds between 14-17 m/s near gale force winds and 17 - 21 m/s as gale force winds (Airshed, 2019).

Based on the three years of WRF data, wind speeds between 6 m/s and 8 m/s occurred 10.4% of the time; wind speeds between 9 m/s and 11 m/s occurred 5.4% of the time and wind speeds higher than11 m/s occurred 0.3% of the time (Airshed, 2019).

[9] https://www.metoffice.gov.uk/guide/weather/marine/beaufort-scale

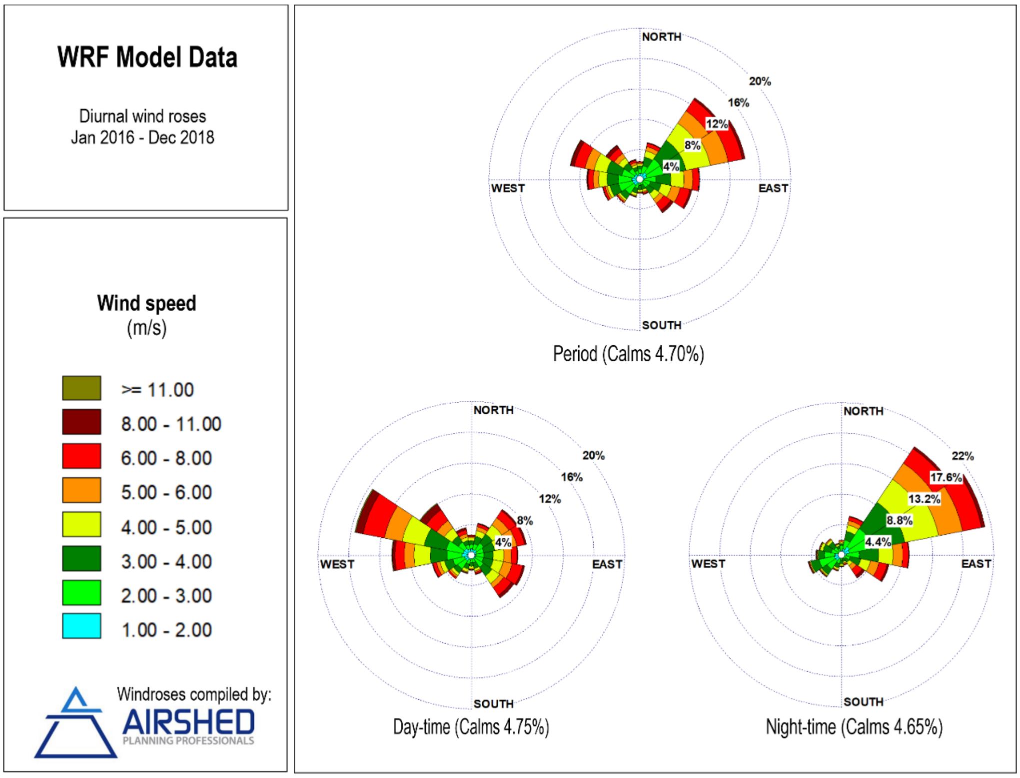


FIGURE 8-2: PERIOD, DAY- AND NIGHT-TIME WIND ROSES (WRF DATA; 2016-2018)

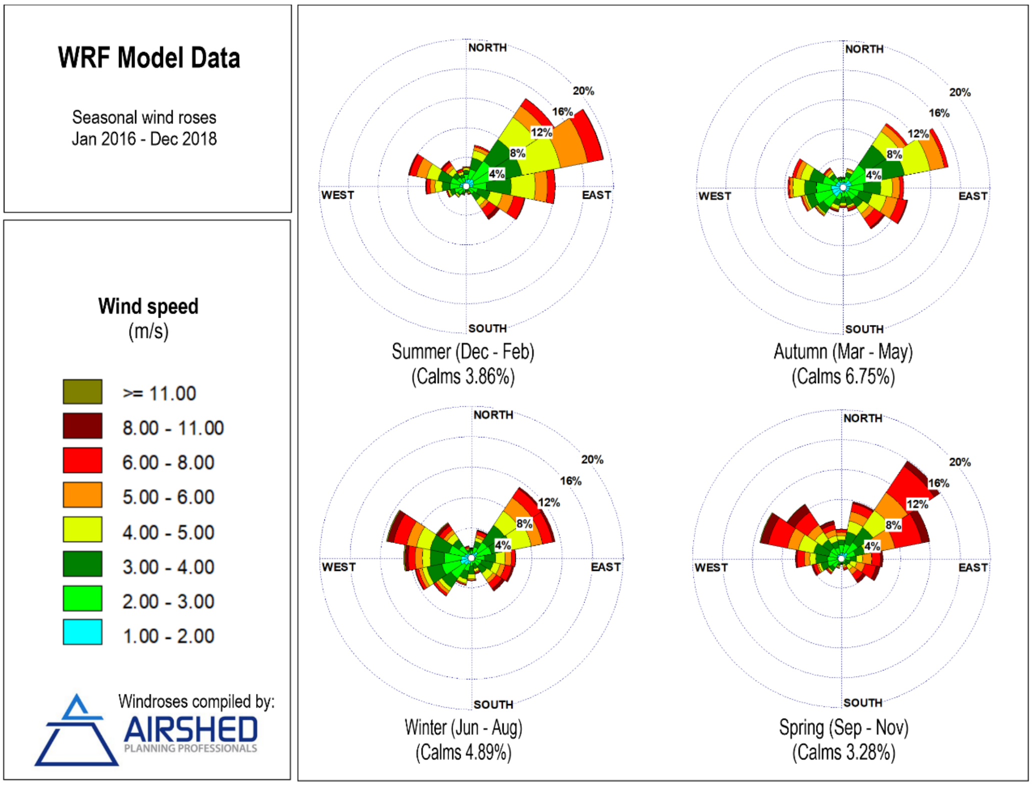


FIGURE 8-3: SEASONAL WIND ROSES (WRF DATA; 2016-2018)

8.1.1.3 Temperature

The monthly temperature pattern is shown in Figure 8-4. The area experienced mild temperatures during summer. Winter temperatures were relatively low especially in the month of July. Average maximum temperatures range from 33.3°C in December to 21.9°C in July, with minima ranging between -2.8°C in July and 7.8°C in December.

The diurnal temperature profile for the site is given in Figure 8-5. During the day, temperatures increase to reach maximum at around 12:00 in the afternoon. Ambient air temperature decreases to reach a minimum at around 05:00 i.e. just before sunrise.

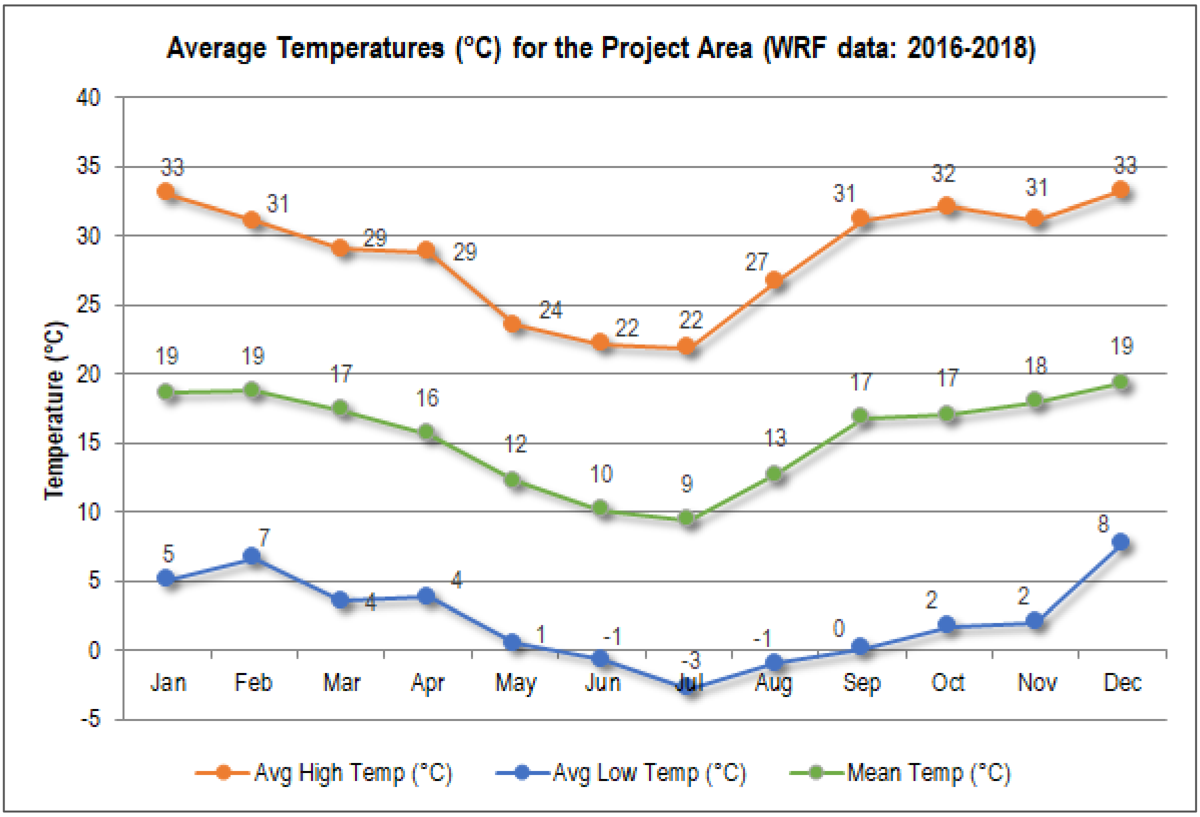


FIGURE 8-4: MONTHLY TEMPERATURE PROFILE (WRF DATA; 2016-2018)

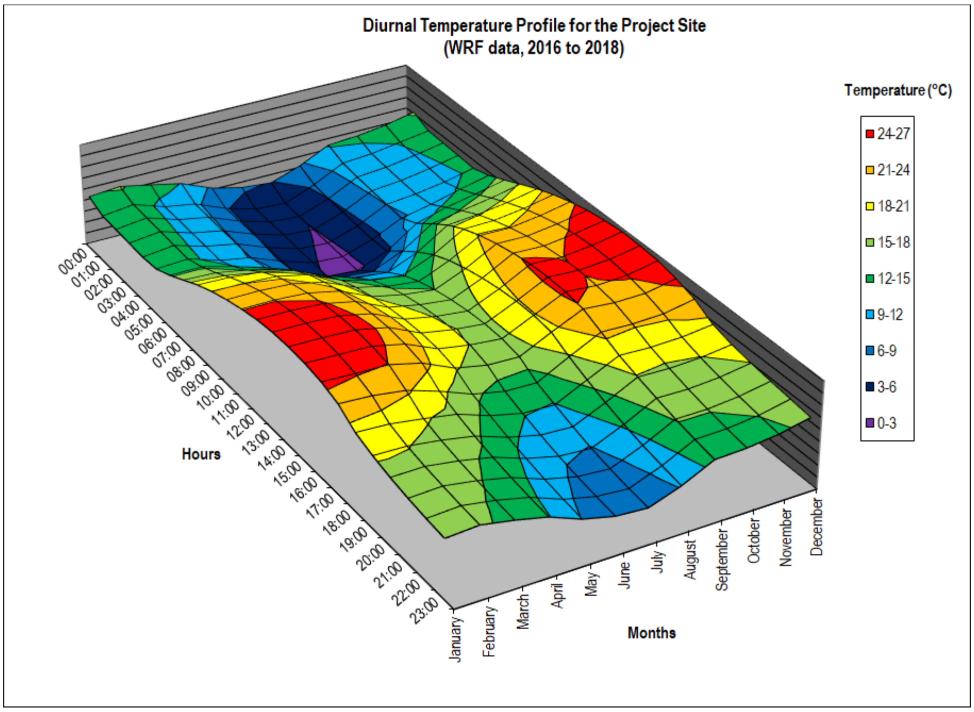


FIGURE 8-5: DIURNAL TEMPERATURE PROFILE (WRF DATA; 2016-2018)

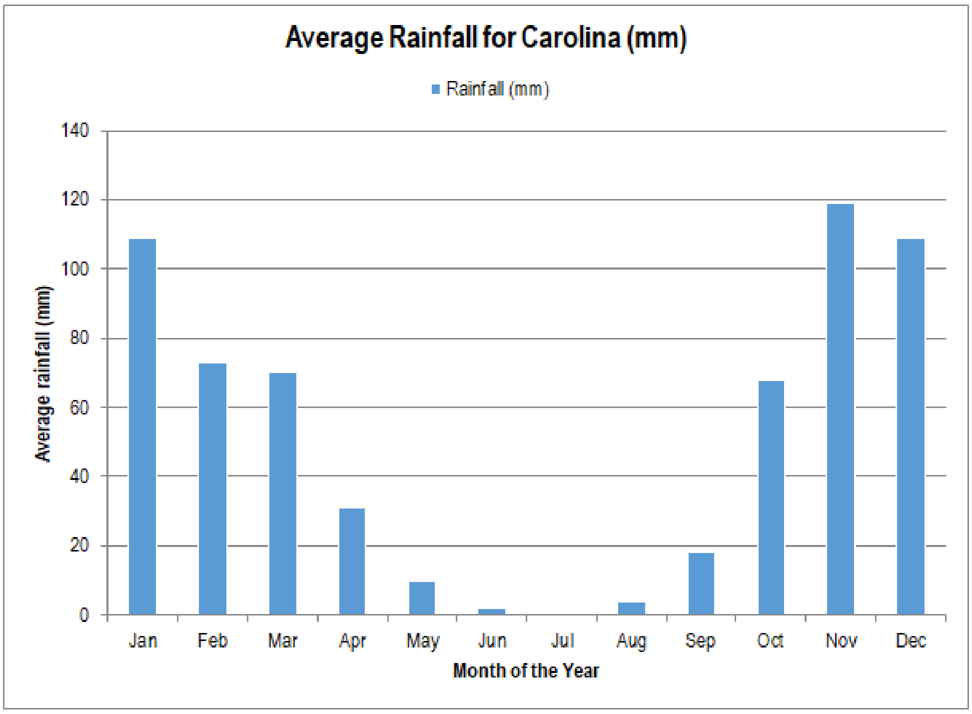


FIGURE 8-6: MONTHLY PRECIPITATION (HTTP://WWW.SAEXPLORER.CO.ZA/SOUTH-AFRICA/CLIMATE/CAROLINA_CLIMATE.ASP)

8.1.2 TOPOGRAPHY

From a regional topographical perspective, the largest part of the Gert Sibande District Municipality is situated on the Highveld Grasslands of Mpumalanga. Undulating to strongly undulating landscape with intermittent hills are generally associated with this district. The intensity of the undulations generally increases from west to east, in the direction of the Drakensberg Escarpment and Swaziland. Once past the escarpment (in the general direction of Piet Retief), the landscape is characterised by undulating hills and lowlands. The far north-eastern and south-eastern extents of the District (in the direction of Barberton and Volksrust / Wakkerstroom) are characterised by the occurrence of low to high mountains (IDP, 2017).

Appendix 3, Map 4 shows the topography across the proposed mining right area. The highest elevation is in the western and central western parts of the area. The highest elevation is at approximately 1738 m and the lowest elevation, towards the north of the mining right area is at approximately 1650 m.

8.1.3 GEOLOGY

The study area is underlain by Karoo Supergroup sedimentary rocks of the Vryheid Formation of the Ecca Group. These are largely comprised of sandstone, mudstone, shale, siltstone, and coal seams.

The Vryheid coal is classified as follows (Jeffrey, 2005) :

- E Seam- High quality and low ash and has a thickness of 3 m,
- D Seam- is overlain by a sandstone layer followed by a persistent shale layer and has a thickness of 0.5 m,
- C Seam-The C seam consists of a C Lower Seam which is 1.5 m in thickness with sandstone partings in upper section and a C Upper Seam which varies from 0.7m–4 m in thickness. The C Lower Seam is the most important seam as it is the main source of export coal whereas The C Upper Seam is generally of poorer quality.
- B Seam- Consist of a B upper and a B lower seam separated by a sandstone parting. Coal in this seem has a low quality and high ash content
- A Seam – This seem has mainly been removed by recent erosion and has thickness of 0–1.5 m.

8.1.4 SOILS, LAND CAPABILITY AND HYDROPEDOLOGY

A soils and hydropedology assessment was undertaken by Earth Science Solutions (ESS) (2019). Land capability and land use was also considered in the study. A summary of the report is provided below and the complete report is provided in Appendix 8

8.1.4.1 Soil Forms

The major soils encountered/mapped across the proposed mining right area are:

- Hutton (Hu);
- Clovelly (Cv);
- Griffin (Gf);

- Pinedene (Pn);
- Glencoe (Gc);
- Avalon (Av);
- Westleigh (We);
- Kroonstad (Kd);
- Katspruit (Ka);
- Glenrosa (Gs);
- Dresden (Dr); and
- Mispah (Ms) Form soils

The dominant soils mapped are described in terms of their pedological classification (Taxonomic System); the capability of the land being rated in terms of the overall geomorphology of the site (soils, climate, geology and topography).

Hutton (Hu)/Clovelly (Cv) and Glencoe (Gc)

The Hutton, Clovelly and deeper Glencoe Form soils comprise predominantly sandy loams and sandy clay loams, varying from fine to very fine, single grained to apedel structure, with pale red brown to yellow red colours in the top soils, and dark orange reds and dark red colours in the sub soil horizons. Clay contents vary from less than 10% in the top soils (where the soils are derived from the sandstone parent materials), to between 12% and 30% for the topsoil associated with the more clay rich shale's and mudstones. Subsoil clay percentages range from 28% to 42% depending on the parent material from which they ate derived, and the position of the soils mapped in the topography.

In almost all cases mapped, the soils are classified as having a dystrophic leaching status and are generally luvic in character. For the most part, these soils occupy the upper and upper mid slopes and are generally found upslope of the hydromorphic Form soils.

Effective rooting depths vary from 400 mm to 1,200 mm, with some deeper rooting depths associated with the weathered sandstone lithologies on the ridge and midslope positions.

Pinedene (Pn), Bloemdal (Bd), Avalon (Av) and Bainsvlei (Bv)

The Pinedene, Bloemdal, Avalon and Bainsvlei Forms mapped fall into the hydromorphic category. These soils are generally found associated with, and down slope of the Clovelly and Hutton Form soils. Chemically, their characteristics are similar, comprising a moderate to low nutrient status, with deficiencies of potassium and sodium, low organic carbon values, and a range of pH values.

By definition, these soils vary in the degrees of wetness at the base of their profile, i.e. the soils are influenced by a rising and falling water table, hence the mottling within the lower portion of the profile.

Depths of utilisable agricultural soil (to top of mottled horizon) vary from 600 mm to 1,200 mm, and in places as deep as 1,500 mm.

Westleigh (We), Kroonstad (Kd), Longlands (Lo) and Katspruit (Ka)

The Westleigh, Kroonstad and Katspruit Forms mapped, have been grouped based on their similarities. They are all shallow hydromorphic, varying in the degree of wetness, and the strength of gleying with depth. In all cases, they are at least one degree wetter, and are associated with wetlands and/or moist grasslands areas.

Chemically, these soil forms are very similar, returning moderate to poor levels of most nutrients (Al, P and N materialisation capacity). Consequently the salts (K and Zn) return as higher levels, resulting in a greater potential for salinity/sodicity problems (moderate to severe).

Physically these soils returned higher clay contents (>38%) with resultant high water holding capacities and they are generally less well drained. The intake rates range from medium to poor with drainage and erosion hazards deemed to be the major problems to be managed on these soils.

Structurally the Katspruit and Kroonstad Forms are difficult to work, and they are generally shallower (400-800 mm) with a “wet foot”, while the Westleigh Form (300 mm-1200 mm) isfound associated with wetlands.

Better than average management of both erosion as well as compaction will be needed to retain the usability of these soils during the rehabilitation process. There will be no disturbance of these soil forms by the proposed project.

8.1.4.2 Soil Chemical Characteristics

The chemistry of the soils is typical of the sedimentary lithologies that make up the major part of the study area, with some distinctive differences associated with the relatively much younger intrusive/volcanic lithologies that occur within and cross cutting the bedded/layered sedimentary lithologies.

The soils are characteristically:

- Variable in pH with more alkali pH values for the sedimentary derived soils, of between 5,25 and 7.5, and slightly more acidic to neutral pH on the intrusive derived soils of between 6.5 and 7.5;
- A generally good supply of calcium and magnesium in a ratio of 3:1;
- Under subscribed with potassium and phosphorous and in places zinc, and
- Low to very low organic carbon matter content (0.045 – 0.45 C%)

Overall, and as a generalised statement, these soils require significant amounts of nutrient input if they are to be used for commercial farming ventures on a full rotation system. Grazing of livestock on the natural pastures requires good management and larger areas of land to sustainably accommodate grazing.

8.1.4.3 Soil Physical Characteristics

Soil physical characteristics in the study area are as follows:

- Topsoil clay percentages range from as low as 10% on the sandy and silty loams, to more than 18% depending on the host/parent geology from which they are derived, and their position in the topography (Crest Slopes versus colluvial and/or alluvial bottom slope deposits);
- Subsoil clays that range from 15% to greater than 35%,
- Moderate to high in-situ permeability rates (0.90 m/day to 2.10 m/day) on the sandy clay loams and structured clay rich (plinthic) form soils respectively,
- Moderate to good intake (infiltration) rates (8 mm/m to 12 mm/m, depending on the type of clay present,
- Moderate to good (60 to 120 mm/m) water holding capacities, and
- Moderate to poor agricultural potential (nutrient status).

The physical characteristics are highly influenced by the parent materials from which the soils are derived, and to a lesser extent by their position in the topography.

The structure of the soils varies from single grained or apedel for the most part, with minor areas of weak crumby to blocky structure on the clay loams and gleycutanic materials respectively.

8.1.4.4 Land Capability

A summary of the land capability of the proposed mining right area is provided below. The baseline soils map is shown in Appendix 3, Map 16

<u>Arable</u>

The land capable of sustaining arable crop production comprises the deep well-drained, red (Hutton) and yellow-brown (Clovelly) soils that generally occur on the midslope and upper midslope positions. The study area has significant areas that rate as having a moderate arable land capability potential, albeit that the nutrient stores are low.

<u>Grazing</u>

The majority of the study area classifies as low intensity grazing land in its natural state. These areas comprise the moderate to deep well drained soils and more shallow dry sandy loams. The soils are generally darker in colour, and are not always free draining to a depth of 750 mm, but are capable of sustaining palatable plant species on a sustainable basis especially since only the subsoil's (at a depth of 500 mm) are periodically saturated, and there are no restrictions to rooting in the upper horizons.

<u>Wilderness</u>

The areas that classify as either conservation or wilderness land are found associated with shallow rocky soils and some of the transition zone sites upslope of the wetlands.

<u>Wet Based Soils</u>

The wet based soils (highly sensitive sites) are defined in terms of the wetland delineation guidelines, which use both soil topography as well as botanic criteria to define the domain limits.

These areas are associated with hydromorphic soils, but do not have any plant life that is associated with aquatic processes. The soils are generally dark grey to black in the topsoil horizons, are high in transported clays and show signs of mottling on gleyed backgrounds in the sub soils (600 mm to 1,200 mm).

Transitional Zone

The transitional zone is defined as the area between the wetland zone or hydromorphic soil zone and the dry soils. This zone is periodically wetted by rising soil water and is often influenced by seepage water that moves sub-horizontally within the upper vadose zone. Classically, this zone shows weak mottling at depth (>50 cm b.g.l).

These soils are typically found upslope of the wetlands proper and define an area of sensitivity that is conducive to dryland vegetation but has hydromorphic characteristics in the soil at depth.

8.1.4.5 Hydropedology

As part of the baseline assessment the area delineated for development was mapped to determine the topographic land forms and natural water ways, the extent of the possible wetlands and any artificial modifiers that are evident. These features were delineated using a combination of aerial survey and Google Earth Imagery.

The desktop study was followed by a more detailed site survey (part of the pedological assessment study) in which the soils and geomorphology of the area were mapped.

The soils were classified using the Taxonomic Soil Classification System developed for South Africa. In addition, a number of infiltration tests were carried out across the soil catena to determine the soil permeability and water flow characteristics in more detail. In addition, note was made of the land use and any historical impacts that might have been caused to the area. These observations were correlated and referenced to the Present Ecological State (PES) and Ecological Importance and Sensitivity (EIS) findings already reported as part of the ecological and wetland delineation studies[10]), taking cognisance of the vegetation indicators as reported in the baseline ecological assessment[11].

The overall geomorphology and pedology have been discussed briefly earlier in this document. The topography combined with the horizontally layered nature of the sedimentary geology that underlie the site result in a land form of alternating hard and less hard strata that has resulted in confined wetland zones that are controlled by the drainage lines. Relic land forms are a resultant feature that control the hydropedology of the site. The presence of Pan Structures in upper and crest slope positions in the land scape are testament to perched surface water (rainfall and surface inflow) being contained on top of the highly impermeable hard plinthite.

The soil catena typical of this area is represented by:

- Crest slopes comprising red and red brown fine to medium grained red to red brown apedal mesotrophic soils (moderate leaching status), with high chroma colours that are

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[10] Enviross, 2019. Surface water ecosystems study

[11] Ecorex, 2019. Terrestrial ecology study

generally free draining for all but the sites where the soils are underlain by hard pan (relic) ferricrete horizons, where the soil infiltration is inhibited and forced to flow laterally;

- Vertical flow into, through and out of the profile are the dominant hydrological pathways (recharge soils), and are likely recharging the local groundwater aquifers or bedrock;
- On the lower slopes the soils returned restricted horizons at their base, the saprolite, bedrock or hard plinthic layer restricting the vertical infiltration resulting in lateral flow or interflow soils. Lateral flow occurs due to differences in the conductivity of horizons. The lower chroma colours of the soil horizons is further support that lateral flow is the dominant system, with mottles (red, yellow and grey colours) in the 'sp' horizon the result of a fluctuating water table.
- Low chroma grey colours in the lower B and C horizon and the dark colours in the topsoil horizon are indications that this profile is saturated for long periods of time. These soils were mapped along the lower slopes and drainage lines, the semi saturated to saturated nature of these soils resulting in overland flow (or surface runoff) downslope. These soils are termed responsive soils due to their rapid response to rain events.

The results of the geomorphological (soils, geology, climate, topography and ground roughness analysis) and hydropedological studies conclude that the topographic controls, horizontal bedding of the underlying lithologies (sediments) and the sub-tropical climate result in a moderately typical soil catena for the terrain and parent materials from which the soils are derived.

The moderately deep to deep sandy loam to loamy soils that colonise the crest and midslopes comprise well developed recharge soils, while the lower midslopes returned more restrictive saprolite and plinthic horizons at depth that result for the most part in lateral flow (interflow) conditions.

The wetlands comprise shallow rooted and semi-saturated to saturated clay rich gleycutanic and plinthite horizons (responsive soils) that returned predominantly overland flow during rain events and return flows to the streams and riverine environment during the drier periods.

8.1.5 TERRESTRIAL ECOLOGY – VEGETATION

A terrestrial ecology study was undertaken by ECOREX (2019). A summary of the report is provided below and the complete report is provided in Appendix 8.

8.1.5.1 National Vegetation Types

The study area is situated within the Grassland Biome, which dominates the high central and eastern plateau of South Africa (Highveld), as well as the mountainous region of Mpumalanga, western KZN and the Eastern Cape (Drakensberg). This area is characterised by summer rainfall and winter drought, and regular frost in winter (Mucina & Rutherford, 2006).

Local plant species richness is high in the Grassland Biome and five centres of plant endemism have been described within the biome. Four geographically distinct bioregions are present within this biome, namely Drakensberg Grassland, Dry Highveld Grassland, Mesic Highveld Grassland and Sub-escarpment Grassland. The study area is situated within the Mesic Highveld Grassland Bioregion within the Eastern Highveld Grassland national vegetation type (Gm12). (Appendix 3, Map 6).

8.1.5.2 Eastern Highveld Grassland

This vegetation type is endemic to Gauteng and Mpumalanga provinces, occurring from the East Rand in the west to Belfast in the east, and extending as far south as Bethal, Ermelo and Piet Retief. Terrain comprises slightly to moderately undulating plains with scattered rocky outcrops and pan depressions. Soils are mostly red to yellow sandy soils on shale and sandstone of the Madzaringwe Formation (Karoo Supergroup). Mean annual precipitation varies from 650 to 900 mm, of which almost all occurs in summer, and frost incidence varies from 13-42 days per year. Floristic composition and important taxa are indicated in Table 8-3 below.

Eastern Highveld Grassland has a conservation status of Endangered because of a very high level of habitat loss (44%) and very low level of protection.

TABLE 8-3. FLORISTIC COMPOSITION AND IMPORTANT TAXA IN EASTERN HIGHVELD GRASSLAND

IMPORTANT TAXA	
Dominant Grasses	*Aristida aequiglumis, A. congesta, A. junciformis, Brachiaria serrata, Cynodon dactylon, Digitaria monodactyla, D. tricholaenoides, Elionurus muticus, Eragrostis chloromelas, E. curvula, E. plana, E. racemosa, E. sclerantha, Heteropogon contortus, Loudetia simplex, Microchloa caffra, Monocymbium ceresiiforme, Setaria sphacelata, Sporobolus africanus, S. pectinatus, Themeda triandra, Trachypogon spicatus, Tristachya leucothrix.*
Herbaceous Plants	*Berkheya setifera (dominant), Haplocarpha scaposa (dominant), Justicia anagalloides (dominant), Pelargonium luridum (dominant), Acalypha angustata, Dicoma anomala, Helichrysum aureonitens, H. callicomum, H. oreophilum, Pentanisia prunelloides, Senecio coronatus, Hilliardiella oligocephala, Wahlenbergia undulata.*
Geophytes	*Gladiolus crassifolius, Haemanthus humilis subsp. hirsutus, Hypocis rigidula, Ledebouria ovatifolia.*
Succulents	*Aloe ecklonis.*
Low Shrubs	*Anthospermum rigidum, Stoebe plumosa.*

An azonal national vegetation type that is embedded throughout Eastern Highveld Grassland and is relevant to the study area is Eastern Temperate Freshwater Wetlands (AZf3). This is a widespread vegetation type occurring in Northern Cape, Eastern Cape, Free State, North-West, Gauteng, Mpumalanga and KwaZulu-Natal, and is associated with shallow stagnant or slow-moving waterbodies such as pans, seasonally flooded vleis and sluggish rivers.

8.1.5.3 Centres of Plant Endemism

The study area is not situated within any centres of plant endemism as defined by Van Wyk & Smith (2001).

8.1.5.4 Threatened Ecosystems

Eastern Highveld Grassland is a listed Threatened Ecosystem (Vulnerable) under Notice 1002 of Government Gazette 34809, 9 December 2011.

8.1.5.5 Local Context – Vegetation Assemblages

SANBI's Botanical Database of Southern Africa (BODATSA) lists 401 plant species from 74 families for a 20 km radius of the project area (ECOREX, 2018). Since 341 plants species were recorded from the project area during the January 2019 fieldwork, which is 85% of the BODATSA total, the true plant species diversity of the district is likely to be significantly higher than 401 species. The full list of 341 plant species confirmed to occur in the project area during fieldwork is provided in Appendix 1 of the specialist report. The dominant plant families in the flora are Poaceae (69 spp), Asteraceae (47 spp), Cyperaceae (26 spp) and Fabaceae (23 spp).

Three broad-scale vegetation communities that represent Natural Habitat as defined by IFC (2012) have been identified within the project area. These were classified on the basis of vegetation structure (thicket, grassland, wetland), floristic composition (dominant and diagnostic species) and position in the landscape (crest, slope, valley bottom). An overview of each of these vegetation communities is given below.

Areas that can be classified as Modified Habitat, such as cultivated lands, buildings and tree plantations, cover a large proportion of the project area. These areas are not dealt with in the descriptions below.

<u>Low Shrubland on rocky outcrops and ridges</u>

This vegetation community is represented by small and fragmented patches of shrubland or thicket occurs along sandstone ridges or outcrops in the project area. Vegetation structure is Low Closed Shrubland to Low Thicket (sensu Edwards, 1983) as illustrated in Figure 8-7. *Diospyros lycioides* subsp. *guerkei* is the dominant and diagnostic woody shrub throughout this community, with grass species such as *Aristida junciformis, Eragrostis plana, E. racemosa* and *Melinis repens* being dominant understory species. Numerous species are diagnostic for this community, meaning that they do not occur elsewhere in the project area, such as *Searsia tumulicola, Asparagus laricinus, Felicia filifolia, Helichrysum caespititium, Cyanotis lapidosa* and *Crassula setulosa*.

A total of 138 species (40% of the entire list) was recorded from Low Shrubland (Appendix 1 of the specialist report), which is remarkably high considering the small area covered by this community. Median species richness along three TMSs was 70. Species fidelity, which is closely linked to community uniqueness, is high, with 46 species (33% of the community list) occurring nowhere else in the study area.

Only one conservation-important species was recorded, namely *Gladiolus dalenii* (Table 8-4). This is not considered to be of conservation concern as defined by Raimondo et al. (2009), but is protected under the Mpumalanga Nature Conservation Act (No. 10 of 1998).

FIGURE 8-7: PHOTOS OF LOW SHRUBLAND ON ROCKY RIDGES

<u>Untransformed Grassland</u>

Much of the Natural Habitat represented in the project area comprises Untransformed Grassland, much of which has been seriously overgrazed for years and is moderately to poorly representative of Eastern Highveld Grassland (Figure 8-8). Two slopes in this vegetation community in the project area are characterised by numerous small, fragmented patches of sheetrock that are exposed above the surface, and is referred to as the Grassland – Sheetrock Mosaic, which is mapped separately in Appendix 8.

Vegetation structure is mostly Low Closed Grassland (*sensu* Edwards, 1983) with sheetrock areas being devoid of vegetation apart from small patches of succulents or dwarf herbs. Dominant grasses are *Themeda triandra, Eragrostis plana* and *E. racemosa*, while other common species include *Alloteropsis semialata, Aristida junciformis, Cymbopogon pospischilii, Eragrostis chloromelas, E. gummiflua, Melinis nerviglumis* and *Panicum natalense*. Forbs and geophytes are reasonably diverse and include species such as *Helichrysum rugulosum, Hypochaeris radicata, Ipomoea oblongata, Acalypha villicaulis, Hilliardiella oligocephala, Indigofera hilaris, Eucomis autumnalis* subsp. *clavata* and *Ledebouria ovatifolia*. Xerophytic species typical of sheetrock habitat include *Selaginella dregei, Cyperus rupestris, Khadia carolinensis* and *Crassula capitella* and *C. vaginata*. Shrubs are scarce in this community, although *Diospyros lycioides* subsp. *guerkei* occasionally occurs at the edge of sheetrock, while *Seriphium plumosum* is present in areas that have been overgrazed.

Two hundred and ten species (62% of the entire list) were recorded from Untransformed Grassland, which is the highest species richness for any community in the project area, with 66 species being confined to the Grassland – Sheetrock Mosaic. Separate lists for Untransformed Grassland and the Grassland – Sheetrock Mosaic are presented in Appendix 1 of the specialist report. Median species richness along four TMSs in Untransformed Grassland was 47.5, while along two TMSs in the Grassland – Sheetrock Mosaic it was 65 (Appendix 2 of specialist report). Species fidelity, which is closely linked to community uniqueness, is very high, with 102 species (49% of the community list) occurring nowhere else in the project area.

Twelve conservation-important species were recorded (Table 8-4), which is the highest number of these species for any vegetation community in the project area. One of these is considered to be of conservation concern as defined by Raimondo *et al.* (2009), namely *Khadia carolinensis*, which is classified as Vulnerable. The remaining eleven species are protected under the Mpumalanga Nature Conservation Act (No. 10 of 1998). Seven SCC were only located in the Grassland – Sheetrock Mosaic, which also has the highest median species richness in the project area, highlighting the high conservation value of this part of the Untransformed Grassland vegetation community.

FIGURE 8-8: PHOTOS OF MODERATELY GRAZED (LEFT) AND HEAVILY OVERGRAZED (RIGHT) UNTRANSFORMED GRASSLAND

Wetlands

Three distinct wetland types are scattered throughout the project area (Figure 8-9).

- Pans – relatively saline, shallow pans surrounded by wetlands that are confined to the seasonally inundated margins; Kranspan is the largest of these pans, covering approximately 125 ha;
- Unchannelled Valley-bottom Wetlands and Seeps - seasonal wetlands occurring on gentle mid- to lower slopes and valley bottoms;
- Depression Wetlands – these are depressions within valley bottoms that are more permanently inundated than adjacent unchannelled wetlands and contain some standing water, although marginal and emergent vegetation is dominant, unlike endorheic pans.

Photos of these wetlands are presented in Figure 5. All three wetland types are dominated by sedges (Cyperaceae) and grasses (Poaceae), although species composition differs noticeably in each type. Dominant sedges and grasses throughout the wetland communities are *Leersia hexandra*, *Cyperus compressus* and *C. denudatus*, while common sedges and grasses in each wetland type include:

- Pans – Kyllinga species, *Schoenoplectus corymbosus, Agrostis eriantha, Andropogon eucomus, Calamagrostis epigejos, Imperata cylindrica*;
- Unchannelled Valley-bottom Wetlands and Seeps - *Pycreus nitidus, Kyllinga erecta, K. melanosperma, Agrostis eriantha, Arundinella nepalensis*, and

- Depression Wetlands – *Eleocharis dregeana, Schoenoplectus corymbosus*.

One hundred and two species (30% of the entire list) were recorded from the three Wetland communities, with Unchannelled Valley-bottom Wetlands and Seeps having the highest species richness (73 species), followed by Endorheic Pans (56 species) and Depression Wetlands (29 species) (Appendix 1 of the specialist report). Species richness along two TMSs at Pans varied from 35-38 species, with a median of 36.5, which was marginally higher than Unchannelled Valley-bottom Wetlands and Seeps, which varied from 30-36 species (n=3) with a median of 36. The single TMS in Depression Wetlands produced 24 species. Species fidelity, which is closely linked to community uniqueness, is very high in Wetlands, with 65 species (64% of the community list) occurring nowhere else in the project area.

Three conservation-important species were recorded in Wetlands (Table 8-4), none of which are considered to be of conservation concern as defined by Raimondo *et al.* (2009). All three species are protected under the Mpumalanga Nature Conservation Act (No. 10 of 1998) and were confined to Wetlands in the project area.

FIGURE 8-9: PHOTOS OF WETLANDS IN THE PROJECT AREA. WETLAND AT EDGE OF PAN (TOP LEFT); UNCHANELLED VALLEY-BOTTOM WETLAND (TOP RIGHT); PAN (BOTTOM LEFT); DEPRESSION WETLAND (BOTTOM RIGHT)

TABLE 8-4: CONSERVATION-IMPORTANT SPECIES CONFIRMED TO OCCUR IN THE PROJECT AREA

TAXA	RED DATA	PROTECTED	VEGETATION COMMUNITIES						
			OUTCROP SHRUBLAND	UNTRANSFORMED GRASSLAND	UNTRANSFORMED GRASSLAND WITH SHEETROCK	PANS	UNCHANNELLED VALLEY-BOTTOM WETLANDS AND	DEPRESSION WETLANDS	TRANSFORMED / DEGRADED/ CROPS
Family Aizoaceae									
Khadia carolinensis L. Bolus	VU				+				
Family Amaryllidaceae									
Boophone disticha (L.f.) Herb.		MNCA		+					
Brunsvigia radulosa Herb.		MNCA		+	+				
Haemanthus humilis Jacq. subsp. *hirsutus* (Baker) Snijman		MNCA			+				
Family Asphodelaceae									
Aloe ecklonis Salm-Dyck		MNCA			1				
Family Hyacinthaceae									
Eucomis autumnalis subsp. *clavata* (Baker) Reyneke		MNCA			1				
Family Iridaceae									
Gladiolus crassifolius Baker		MNCA			+				
Gladiolus dalenii Van Geel subsp. *dalenii*		MNCA	+						
Gladiolus papilio Hook.f.		MNCA					+		
Gladiolus permeabilis F.Delaroche		MNCA		+	+				
Family Orchidaceae									
Disa versicolor Rchb.f.		MNCA		+		+	+	+	
Eulophia foliosa (Lindl.) Bolus		MNCA		+			+		
Eulophia hians Spreng. var. *hians*		MNCA			+				
Satyrium sp. (no flowers)		MNCA			+				
Total	1	13	1	5	9	1	3	1	0

VU = Vulnerable

MNCA = Mpumalanga Nature Conservation Act

+ = rare, only represented by scattered individuals

1 = uncommon; moderate number of individuals but nowhere common

8.1.5.6 Species of Conservation Concern

Thirteen Species of Conservation Concern (SCC) have been recorded from the two quarter-degree grids that the project area is situated in (2629BB, 2630AA) (Appendix 4 of the specialist report). Ten of these are classified as threatened (Critically Endangered, Endangered or Vulnerable), although most of these have a low likelihood of occurrence because of a lack of suitable habitat and / or altitude. One of these species, *Khadia carolinensis* (VU), was confirmed to occur during fieldwork and is discussed in more detail below. Two other species were not encountered during fieldwork but are small, easily overlooked species and are still thought to have a moderate likelihood of occurring. Both species are discussed in more detail below.

Khadia carolinensis

This small succulent is also endemic to Mpumalanga, occurring in Highveld grassland between Belfast and south of Carolina. It is associated with exposed rocky outcrops, especially sandstone sheetrock, usually on well-drained, sandy loam soils (Lötter et al., 2007). Much of the global population of this species is located over extensive coal reserves for which mining rights have been applied for, and the primary future threat to this species is open-cast coal mining, resulting in a conservation status of **Vulnerable** (Lötter et al., 2007). A small population was confirmed in the project area during fieldwork. Plants were found on small areas of sandstone sheetrock in untransformed grassland, in ten small colonies varying in size from 3-38 plants. Photos of this species are shown in Figure 8-10.

FIGURE 8-10: PHOTOS OF *KHADIA CAROLINENSIS* IN THE PROJECT AREA

Alepidea longeciliata

This small herb is endemic to Highveld Grassland in Mpumalanga, occurring in a small area between Breyten, Lothair, Middelburg and Stoffberg, although the records from Middelburg and Stoffberg are putative and its distribution seems to be centred on the Carolina area (De Castro & McCleland, 2015). *Alepidea longeciliata* occurs in grassland overlaying Karoo sandstone and is specifically associated with seasonally wet soils on hillslope seeps in hygrophilous grassland. It is threatened primarily by habitat loss to agriculture and mining, particularly coal mining, and has been assessed as **Endangered** (von Staden et al., 2009). A population is known from a property adjacent to Kranspan 49-IT (De Castro & McCleland, 2015) and it thus has a high likelihood of being present in the study area.

Aspidoglossum xanthosphaerum

This species is a slender herb that is nearly endemic to Mpumalanga, occurring in grassland above 1600 masl. It has been assessed as **Vulnerable** by Nicholas & Victor (2006). Even though *Aspidoglossum xanthosphaerum* is currently only known from four widely separated areas between Breyten and Wakkerstroom, it is very easily overlooked and is likely to be present on more localities than those currently known. Specific habitat requirements are poorly known, but specimens collected from near Breyten were located in short grassland on gentle hillslopes, habitat that is present in the project area (De Castro, 2006). It is thus considered to have a moderate likelihood of occurring, even though there are no records from adjacent properties and it was not located during fieldwork.

8.1.5.7 Endemic Species

Even though the project area is not situated within any centres of plant endemism as defined by Van Wyk & Smith (2001), eleven range-restricted species that are endemic to Mpumalanga are known to occur in the quarter-degree grids that the project area is situated in (ECOREX 2018), although only one of these was located during fieldwork, namely *Khadia carolinensis,* while *Aspidoglossum xanthosphaerum* and *Alepidea longeciliata* have a moderate likelihood of being present. Each of these species is discussed in the section above.

8.1.5.8 Protected Species

Thirty-seven plant species occurring in the general vicinity of the project area are protected under Schedule 11 of the Mpumalanga Nature Conservation Act No. 10 (1998) (ECOREX 2018). Eleven of these species were confirmed to occur during fieldwork (Appendix 1 of the specialist report).

8.1.5.9 Invasive Alien Species

Approximately 10% of the plant species recorded during fieldwork (36 species) are non-indigenous or alien, of which nine species are declared invasive species under the National Environmental Management: Biodiversity Act 2004 (Act No. 10 of 2004), Alien and Invasive Species Lists, 2014 (Table 8-5).

TABLE 8-5: ALIEN SPECIES RECORDED IN THE PROJECT AREA

ALIEN SPECIES	LISTED INVASIVE ALIEN SPECIES CATEGORY	VEGETATION COMMUNITIES						
		OUTCROP SHRUBLAND	PLAINS GRASSLAND WITH SHEETROCK	PLAINS GRASSLAND	PAN EDGE WETLAND	HILLSLOPE WETLAND	FRESHWATER PAN	TRANSFORMED / DEGRADED/ CROPS
Acacia mearnsii De Wild.	2							x
Agrimonia procera Wallr.	1b	x						
Amaranthus hybridus L.		x						x
Bidens bipinnata L.		x						x
Bidens pilosa L.		x						x
Cirsium vulgare (Savi) Ten.	1b	x		x	x	x		x
Cosmos bipinnatus Cav.		x		x	x			x
Crepis hypochaeridea (DC.) Thell.		x		x				
Cuscuta sp.	1b	x	x					
Cymbopogon pospischilii (K.Schum.) C.E.Hubb.		x	x					
Cyperus esculentus L.								x
Datura stramonium L.	1b							x
Erigeron sumatrensis Retz.		x	x	x	x	x		x
Eucalyptus camaldulensis Dehnh.	2							x
Glycine max (L.) Merr.								x
Gomphrena celosioides Mart.		x		x				x
Hibiscus trionum L.				x		x		
Oenothera rosea L'Hér. ex Aiton			x	x				
Paspalum urvillei Steud.						x		
Physalis peruviana L.		x						
Portulaca oleracea L.		x						
Quercus robur L.								x
Ranunculus multifidus Forssk.						x		
Raphanus raphanistrum L.								x
Richardia brasiliensis Gomes		x	x	x	x			x
Rubus sp.		x						
Rumex acetosella L. subsp. *angiocarpus* (Murb.) Murb.		x	x	x		x		
Rumex crispus L.				x		x		
Salix babylonica L.								x
Solanum elaeagnifolium Cav.	1b		x	x				
Solanum nigrum L.		x						

Solanum sisymbriifolium Lam.	1b	x	x	x				
Sonchus oleraceus (L.) L.				x	x			
Verbena bonariensis L.	1b		x	x	x	x		
Verbena tenuisecta Briq.								
Zea mays L.								x
	9	18	9	14	6	8	0	17

Listed Invasive Species Categories

1b = invasive species that must be controlled

2 = invasive species which requires a permit to carry out a restricted activity within an area specified in the Notice or an area specified in the permit

8.1.6 Terrestrial Ecology - Fauna

8.1.6.1 Mammals

Regional Context

The study area is situated within the Grassland biome, which is confined to the cool, high-lying plateau of eastern South Africa, Swaziland and Lesotho, as described by Mucina & Rutherford (2006). A number of small mammal species are endemic to this biome, of which only two have been confirmed to occur within the general vicinity of the study area (Friedman & Daly, 2004): Hottentot's Golden Mole (*Amblysomus hottentotus*) and Highveld Golden Mole (*A. septentrionalis*).

Species Richness

Thirty-three mammal species have been recorded in the QDSs in which the project area is situated (ECOREX, 2018). Fifteen species were recorded during January 2019 fieldwork (Appendix 5 of the specialist report), although this isn't an accurate indication of mammal species richness in the project area since no trapping for rodents or nocturnal surveys for bats were undertaken. However, even though these groups are underrepresented in this survey, it is unlikely that trapping and dedicated bat surveys would have produced data that would have changed the sensitivity analysis.

Species of Conservation Concern

Ten species of conservation concern occur on the Highveld in the general vicinity of the project area, of which eight have been recorded in the quarter-degree grids in which the project area is situated (Appendix 7 of the specialist report). Five of these have a moderate to high likelihood of occurring in the project area, all of which are classified as Near Threatened (NT). One of these species, Serval (*Leptailurus serval*), was confirmed to occur in several habitats in the project area during fieldwork. Another NT species, Southern African Hedgehog (*Atelerix frontalis*), was found on adjacent property during ECOREX fieldwork for De Castro & McCleland (2015) and thus has a high likelihood of being present in the project area. Two additional species for which there are no records in the vicinity of the project area, but which have a moderate likelihood of occurring are one Vulnerable (VU) species (Spotted-necked Otter *Hydrictis maculicollis*) and one NT species (African Clawless Otter *Aonyx capensis*).

8.1.6.2 Birds

Regional Context

The study area is situated within the Afrotropical Highlands biome as defined by Fishpool & Evans (2001). This biome is located in fragmented patches throughout the Afromontane belt of Africa and corresponds to the Grassland Biome in South Africa. Twenty-four species occurring in South Africa are listed by Barnes (1998) as being endemic to the biome, i.e. not occurring outside of the biome. Many of these are forest species that will not occur in the study area, and only one biome-restricted endemic (Southern Bald Ibis *Geronticus calvus*) has been confirmed to occur in the same quarter-degree grids in which the study area is situated during the current Southern African Bird Atlas Project (SABAP2).

Kranskop 49-IT is situated along the eastern boundary of the Amersfoort – Bethal – Carolina District Important Bird Area (IBA) and the Chrissie Pans IBA is located to the south-east of the study area (Marnewick *et al.*, 2015).

Species Richness and Assemblages

Prior to fieldwork for this study, the quarter-degree grids 2629BB and 2630AA, in which the project area falls, had a combined list of 212 bird species recorded during the ongoing second Southern African Bird Atlas Project (SABAP2)12, a total probably approaching true species diversity for the district. SABAP2 data also indicated that 134 bird species had been recorded from the four pentads (mapping units) in which the project area is situated (2610_3000, 2605_3000, 2610_2955, 2605_2955) (ECOREX 2018). A pentad is a much smaller mapping unit than a quarter-degree grid, measuring approximately 77 km^2, and is thus a better indication of which species are likely to occur in the project area. However, none of the pentads listed above had been surveyed more than three times during SABAP2 prior to fieldwork for this study and were thus significantly undersampled and likely to support more species than indicated.

January 2019 fieldwork produced a list of 120 bird species in the project area (Appendix 5 of the specialist report), representing 90% of the previously known species richness for the area. A species accumulation curve from MacKinnon list data presented in Appendix 6 of the specialist report indicates that sufficient sampling has been undertaken to represent the bird species present in the project area during fieldwork (Table 8-5).

12 http://sabap2.adu.org.za/ Accessed 13 November 2018

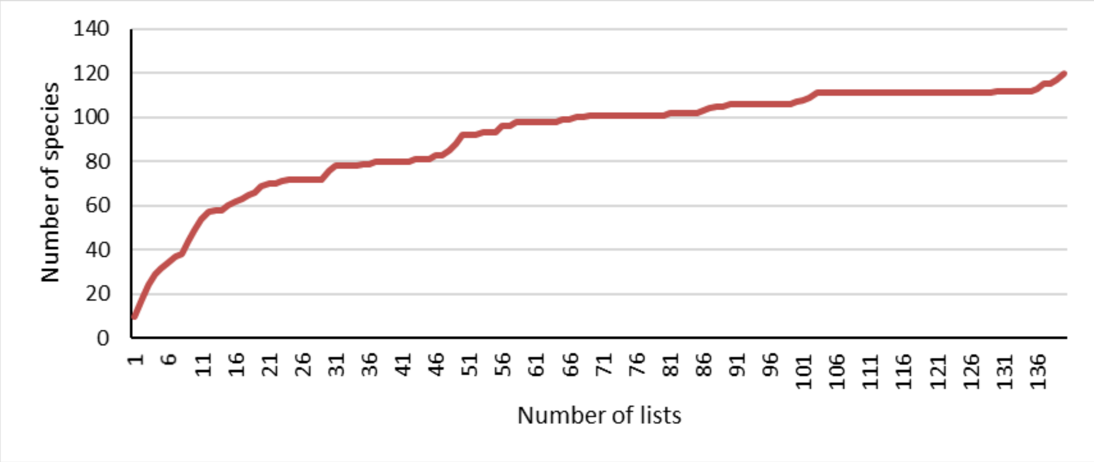


FIGURE 8-11: SPECIES ACCUMULATION CURVE BASED ON MACKINNON LIST FIELDWORK DATA

Four distinct bird assemblages are present in natural habitat, while two bird assemblages are present in modified habitat. Each of these assemblages is briefly described below.

Grassland Assemblage

This is the second most diverse bird assemblage in the project area and is associated with areas of untransformed grassland. Fifty-two species were recorded during fieldwork, representing 43% of the bird list (Appendix 5 of the specialist report). The most frequently encountered species include grassland habitat specialists that were not encountered in other assemblages in the project area, such as Cape Longclaw (*Macronyx capensis*) and Wing-snapping Cisticola (*Cisticola ayresii*). Other diagnostic species for this assemblage include Blue Korhaan (*Eupodotis caerulescens*), Spike-heeled Lark (*Chersomanes albofasciata*), Eastern Clapper Lark (*Mirafra fasciolata*), Cloud Cisticola (*Cisticola textrix*) and Ant-eating Chat (*Myrmecocichla formicivora*), all of which are strict Highveld grassland habitat specialists in Mpumalanga. No bird SCC were found in this assemblage during fieldwork, although a number of species potentially occur, such as Pallid Harrier (*Circus macrourus*), Southern Bald Ibis (*Geronticus calvus*), Blue Crane (*Grus paradiseus*) and Secretarybird (*Sagittarius serpentarius*).

Rocky Ridge Assemblage

This is a very small assemblage confined to the few rocky outcrops in the project area. Only 16 species were confirmed during fieldwork (Appendix 5 of the specialist report).. However, limited time was spent surveying this assemblage and true species richness is likely to be slightly higher, although the limited amount and fragmented character of the ridge habitat makes it unlikely that a diverse bird assemblage is supported. Diagnostic species include Mountain Wheatear (*Myrmecocichla monticola*), a rock-dwelling specialist that is unlikely to visit other habitats in the project area, Malachite Sunbird (*Nectarinia famosa*), which is an irregular visitor when certain plant species are in flower in the outcrop shrubland / thickets, and Horus Swift (*Apus horus*). A feature of this assemblage is the high proportion of aerial insectivores that forage low over the rocky areas, such as Greater Striped Swallow (*Cecropis cucullata*), Barn Swallow (*Hirundo rustica*), Banded Martin (*Riparia cincta*), Common Swift (*Apus apus*) and White-rumped Swift (*Apus caffer*). One SCC was seen flying around rocky ridges but is unlikely to be a frequent member of this assemblage, namely Black-winged Pratincole (*Glareola nordmanni*), which is classified as NT.

Wetland Assemblage

This is the most diverse bird assemblage in the project area, comprising 55 species (Appendix 1 of the specialist report) and is a reflection of the diversity of wetland habitat present. The most frequently encountered species included a number of habitat specialists such as Levaillant's Cisticola (*Cisticola tinniens*), Pale-crowned Cisticola (*C. cinnamomeus*) and Long-tailed Widowbird (*Euplectes progne*). This is a very distinctive assemblage, with 26 species not being found elsewhere in the project area and three species only being shared with the Open Water Assemblage. These diagnostic species include strict wetland specialists such as Red-chested Flufftail (*Sarothrura rufa*), African Purple Swamphen (*Porphyrio madagascariensis*) and African Snipe (Gallinago nigripennis). The most important SCC in the project area occur in this assemblage, particularly African Marsh Harrier (*Circus ranivorus*), which is classified as Endangered (EN), and African Grass Owl (*Tyto capensis*), which is Vulnerable (VU). Two other SCC in this assemblage were Lesser Jacana (*Microparra capensis*) (VU), which is a very rare vagrant to the Highveld and is unlikely to occur regularly in this assemblage, and Black-winged Pratincole (NT).

Open Water Assemblage

This assemblage is associated with the large, shallow pans in the project area. Only 23 species were recorded in this assemblage during fieldwork (Appendix 5 of the specialist report), although water levels were very low and species richness is likely to be much higher when habitat is optimal. The most frequently encountered species with ducks and geese being particularly prominent. Distinct feeding guilds in this assemblage include surface foraging waterfowl, such as Yellow-billed Duck (*Anas undulata*), Maccoa Duck (*Oxyura maccoa*), Red-knobbed Coot (*Fulica cristata*) and Little Grebe (*Tachybaptus ruficollis*), aerial insectivores such as Common Swift and White-rumped Swift, and wading birds that forage along the shoreline, such as Black-winged Stilt (*Himantopus himantopus*). The most diagnostic species in this assemblage are those that depend on open water or foraging and these species are unlikely to be found elsewhere in the project area, apart from some generalist species that also occur on man-made dams, such as Egyptian Goose (*Alopochen aegyptiaca*) and Little Grebe. The only SSC confirmed to occur in this assemblage was Maccoa Duck, which is classified as NT, although Black-winged Pratincole (NT) has a high likelihood of foraging over open water as well.

Modified Habitat Assemblage (Cultivated Lands)

This is an artificial assemblage that is associated with Modified Habitat, in this case Cultivated Lands. Twenty-seven species were recorded in this assemblage during fieldwork, most of which are habitat generalists with a wide range of habitat tolerance, such as Helmeted Guineafowl (*Numida meleagris*), Southern Fiscal (*Lanius collaris*) and Cape Sparrow (*Passer melanurus*). Six of the most frequently encountered species are seed-eaters, indicating the primary food source in this habitat. No SSC were recorded.

Modified Habitat Assemblage (Plantations, Homesteads)

This is another artificial assemblage associated with Modified Habitat, in particular plantations of alien trees and homesteads. Thirty-eight species were recorded during fieldwork (Appendix 5 of the specialist report) and, as with the previous assemblage habitat generalists are dominant. A number of the most frequently encountered species are forest / woodland species that have adapted to living in alien tree plantations, such as Cape Robin-chat (*Dessonornis caffer*), Willow Warbler (*Phylloscopus trochilus*), Greater Honeyguide (*Indicator indicator*) and Black-collared Barbet (*Lybius torquatus*), while other species have adapted to breeding and feeding on man-made structures such as buildings, including House Sparrow (*Passer domesticus*), Greater Striped Swallow (*Cecropis cucullata*) and Speckled Pigeon (*Columba guinea*). No SCC were recorded.

Species of Conservation Concern

Eight threatened bird species have been recorded in the quarter-degree grids in which the project area is situated, namely one Critically Endangered (CR) species (Wattled Crane *Grus carunculatus*), two Endangered (EN) species (Grey Crowned Crane *Balearica regulorum*, Cape Vulture *Gyps coprotheres*) and five Vulnerable (VU) species (Southern Bald Ibis, Secretarybird *Sagittarius serpentarius*, White-bellied Korhaan *Eupodotis senegalensis*, Denham's Bustard *Neotis denhami* and African Grass Owl *Tyto capensis*). Four of these species have a moderate likelihood of occurring in the project area (ECOREX 2018), while both African Grass Owl and African Marsh Harrier (Circus ranivorus) (EN), which was not previously recorded within the QDS, were confirmed to occur in Unchannelled Valley-bottom Wetland habitat.

Five NT species have been recorded in the quarter-degree grids in which the project area is situated and have a moderate to high likelihood of being present in the project area (Appendix 7 of the specialist report). One of these, Maccoa Duck, was confirmed on Kranspan, while an additional NT species not previously recorded in the area, Black-winged Pratincole (Glareola nordmanni), was seen foraging over grassland habitat. Blue Korhaan (Eupodotis caerulescens) was recorded in Untransformed Grassland and is possibly resident. Two NT species are only likely to be recorded in open water habitat at Kranspan, namely Lesser Flamingo (Phoeniconaias minor) and Greater Flamingo (Phoenicopterus roseus), while one species is most likely to occur in Untransformed Grassland habitat, namely Blue Crane (Grus paradiseus).

Three additional species for which there are no records in the vicinity of the project area have a moderate likelihood of occurring (Appendix 7 of the specialist report). One of these is classified as VU (Lanner Falcon Falco biarmicus), while the other two are NT (Chestnut-banded Plover Charadrius pallidus, Pallid Harrier Circus macrourus).

8.1.6.3 Herpetofauna (Reptiles and Amphibians)

Regional Context

The project area is situated within the Grassland biome, which is confined to the cool, high-lying plateau of eastern South Africa, Swaziland and Lesotho, as described by Mucina & Rutherford (2006). Numerous reptile and amphibian taxa are endemic to this biome, although the project area is situated in an area of moderate to low endemism, with three endemic reptile species per QDS (Bates et al., 2014) and 4-6 endemic frog species per QDS (Minter et al., 2004).

Species Richness

Thirty reptile species and 14 amphibian species have been recorded from the two QDSs in which the project area is located, with a mean of 20 reptile species and 12 amphibian species per QDS (ECOREX, 2018). Given the relatively small size of the project area and low habitat heterogeneity, it is unlikely that this full list of species will be present in the project area. Nine reptile species and six amphibian species were recorded during fieldwork (Appendix 5 of the specialist report), although trapping of reptiles and more extensive nocturnal surveys would have increased this total. However, even though herpetofauna are underrepresented in this survey, it is unlikely that these additional intensive surveys would have produced data that would have changed the sensitivity analysis.

Species of Conservation Concern

No reptile species of conservation concern as assessed by Bates et al. (2014) have been observed within the vicinity of the project area, while one species that has been regionally assessed by the Mpumalanga Tourism & Parks Agency (MTPA) as NT (Spotted Harlequin Snake *Homoroselaps lacteus*) has been recorded in 2629BB (ECOREX, 2018). Three additional NT reptiles have been recorded in other QDSs in the general vicinity of the project area (Coppery Grass Lizard *Chamaesaura aenea*, Large-scaled Grass Lizard *C. macrolepis*, Striped Harlequin Snake *Homoroselaps dorsalis*), but these have a low likelihood of being present in the project area. No reptile SCC were recorded during fieldwork.

No amphibian species of conservation concern have been recorded from the vicinity of the project area, although one species has a low likelihood of occurring, namely Giant Bullfrog (*Pyxicephalus adspersus*), which has been classified as NT and is a protected species under NEMBA (2004). This species breeds in shallow temporary pans which are present within the project area and adjacent properties but is very rare on the eastern Highveld and there are no recent records from the relevant QDSs. No amphibian SCC were recorded during fieldwork.

8.1.7 Ecological Sensitivity

8.1.7.1 Mpumalanga Biodiversity Sector Plan

All of the Natural Habitat (untransformed vegetation) within the project area falls within Critical Biodiversity Areas (CBAs) according to the Mpumalanga Biodiversity Sector Plan (MBSP) (Lötter et. al, 2014). Just over half of the untransformed grassland in the project area (736 ha) has been classified as CBA: Irreplaceable, while the pans, wetlands and other grassland have been classified as CBA: Optimal (Appendix 3, Map 9).

These are the most sensitive habitats in the project area and represent the areas where impacts on ecology would be most significant. Critical Biodiversity Areas are areas that are essential for meeting biodiversity targets for species, ecosystems or ecological processes. The desired management objectives for CBAs are that they be kept in a natural or near-natural state, with no further loss of habitat or species. Only low-impact, biodiversity-sensitive land-uses such as low-intensity livestock grazing are considered appropriate, while land-uses such as any form of mining or prospecting, conversion of natural habitat for agriculture or plantation forestry, expansion of existing settlements or infrastructure, and the building of new infrastructure or linear developments such as roads, railways, pipelines, etc., are considered inappropriate. All the transformed areas, such as cultivated lands, are classified as either Heavily Modified or Moderately Modified: Old Lands. Areas falling within the Modified category are the preferred areas for a wide variety of land-use types, which includes mining development. Figure 8-12 shows the MBSP classification of land units within the project area.

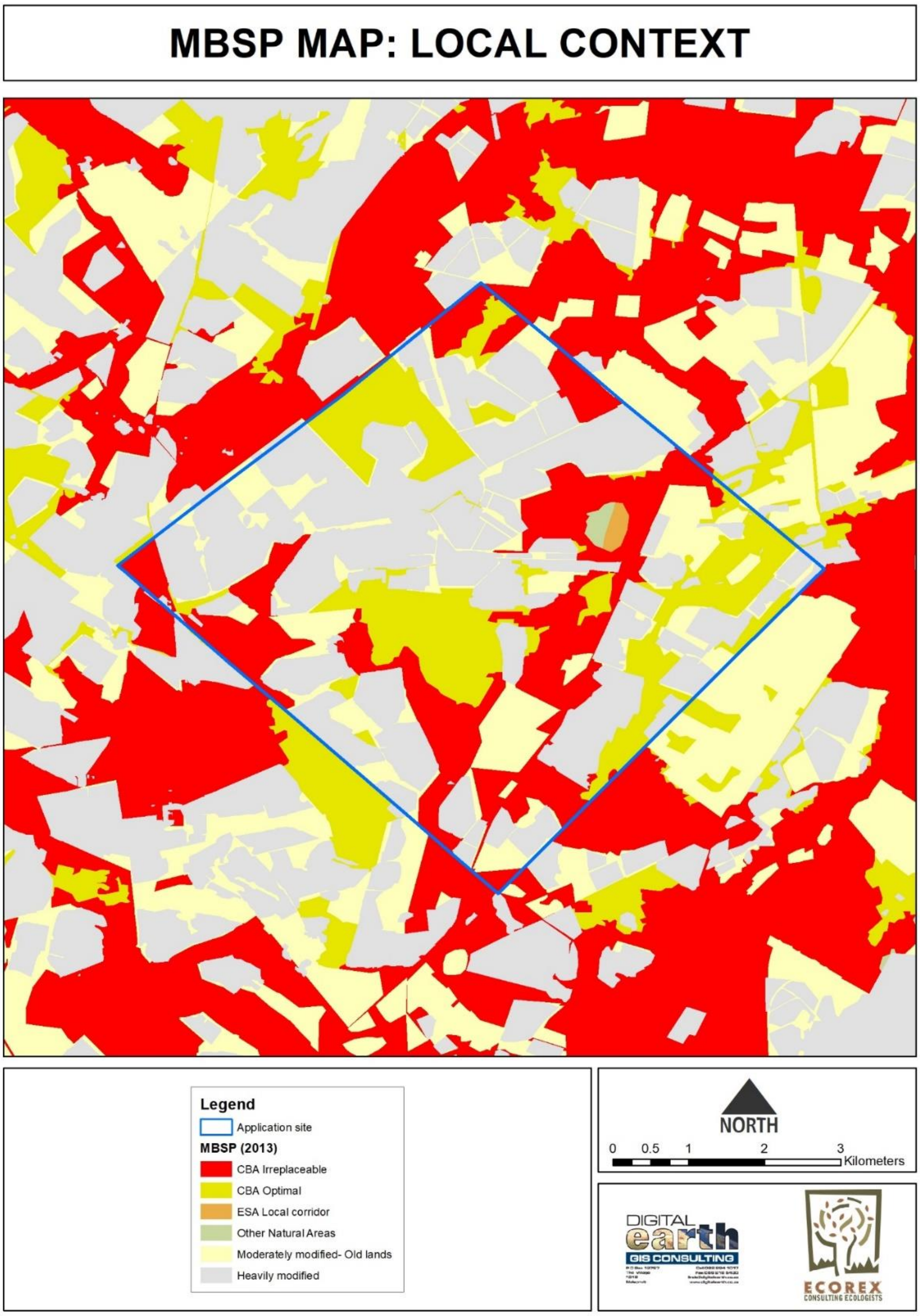


FIGURE 8-12: MBSP CLASSIFICATION OF LAND UNITS WITHIN AND ADJACENT TO THE PROJECT AREA

8.1.7.2 Site-specific Ecological Sensitivity Analysis

An Ecological Sensitivity analysis of each of the vegetation communities represented in the project area was undertaken using the methodology described in section 4 of the specialist report. Table 8-6 shows the calculation of the Receptor Sensitivity Index (RSI) for each community and Table 8-7 shows the calculation of Ecological Sensitivity, which is displayed in Figure 8-12. Almost all the vegetation communities in the project area have low Resilience, meaning that they can only be restored ecologically with significant human intervention, or cannot be restored at all. However, the Vulnerability to degradation / impact varies significantly, depending on how frequently impacts in these communities occur (e.g. Untransformed Grassland is highly favoured for agriculture and thus very vulnerable to degradation). This has resulted in a variable RSI, with Untransformed Grassland having the highest RSI.

TABLE 8-6: VULNERABILITY AND RESILIENCE OF VEGETATION COMMUNITIES IN THE PROJECT AREA

VEGETATION COMMUNITY / HABITAT	VULNERABILITY	RESILIENCE	RECEPTOR SENSITIVITY INDEX
OUTCROP SHRUBLAND	Medium	Medium	Medium
UNTRANSFORMED GRASSLAND	Very High	Low	High
PANS	High	Low	Med-High
UNCHANNELLED VALLEY-BOTTOM WETLANDS & SEEPS	High	Low	Med-High
DEPRESSION WETLANDS	Medium	Low	Medium
TRANSFORMED / MODIFIED HABITAT	Low	Low	Low

The Conservation Value (CV) of all Natural Habitat in the project area is mostly High (Untransformed Grassland, Pans, Depression Wetlands) or Very High (Unchannelled Valley-bottom Wetlands and Seeps). These communities have such high ratings as a result of representation of highly threatened vegetation types, confirmed presence of threatened species, and / or high functional value (such as flood attenuation functions of Unchannelled Valley-bottom Wetlands). The integration of CV and RSI results in High Ecological Sensitivity for two vegetation communities in the project area, namely Untransformed Grassland and Unchannelled Valley-bottom Wetlands. These represent the areas where impacts on ecology will be most significant and where the Avoidance option of the Mitigation Hierarchy should be applied.

TABLE 8-7: ECOLOGICAL SENSITIVITY OF VEGETATION COMMUNITIES IN THE PROJECT AREA

VEGETATION COMMUNITY / HABITAT	CONSERVATION VALUE	RECEPTOR SENSITIVITY INDEX	ECOLOGICAL SENSITIVITY
OUTCROP SHRUBLAND	Med-High	Medium	Medium
UNTRANSFORMED GRASSLAND	High	High	High
PANS	High	Med-High	Med-High
UNCHANNELLED VALLEY-BOTTOM WETLANDS & SEEPS	Very High	Med-High	High
DEPRESSION WETLANDS	High	Medium	Medium
TRANSFORMED / MODIFIED HABITAT	Low	Low	Low

8.1.8 SURFACE WATER

Specialist studies on hydrology [Peens & Associates (2019)] and surface water ecosystems [Enviross (2019)] have been undertaken. The complete reports with the baseline information and impact assessment results are provided in Appendix 8. A summary of these reports is provided below.

8.1.8.1 Drainage Region

The study area is situated in the X11B quaternary sub-catchment of the Komati River Drainage Region as per the Volume VI: Water Resources of South Africa 1990.

The Nooitgedacht Dam is the major water body of the X11B quaternary sub-catchment that might be impacted by the proposed mine. The Nooitgedacht Dam total catchment area, i.e. quaternary sub-catchments; X11A, X11B and X11C combined is 1 588 km^2. The mean annual runoff (MAR) into Nooitgedacht Dam is 64.1 million m^3 per annum.

Quaternary sub-catchment X11B under laying geology is basic or mafic and ultramafic intrusive lavas, which forms part of the igneous group. Igneous rocks are formed by volcanic activities and in moderate to wet regions it degrades to form clay. The overburden soils are moderate to deep sandy loam.

The mean annual rainfall/ precipitation (MAP) of the quaternary sub-catchment is 714 mm and he mean annual runoff (MAR) is 44mm. Quaternary sub-catchment X11B has a catchment area of 597 km^2 and its Nett MAR is 26.2 million m^3 per annum.

The DWS has designated Present Ecological State (PES), Ecological Importance (EI) and Ecological Sensitivity (ES) for all of the catchment areas nationally. The quaternary catchment of X11B has a PES of C (moderately modified), an EI of moderate and an ES of high (DWS, 2014). The Boesmanspruit has retained a PES of B (near natural) up until it drains into Nooitgedacht Dam, after which the Komati River (which is the main watercourse leaving the dam) has a PES of C (moderately modified) (SANBI, 2009 & NFEPA, 2010).

8.1.8.2 Major Rivers and Receiving Water Bodies

The proposed mining right area is in the Boesmanspruit catchment area on the watershed between the Boesmanspruit and the Vaalwaterspruit catchments. Both the Boesmanspruit and the Vaalwaterspruit are tributaries of the Nooitgedacht Dam and the Komati River.

Three pans are located within the proposed mining right area of which two have no outflow and their catchment areas can therefore be classified as endoreic areas that do not contribute to the runoff towards Nooitgedacht Dam.

The proposed mining right area is 33.8 km^2 in size of which 37.6% (12.7km^2) is endorheic areas; hence the portion of study area contribution to the Boesmanspruit runoff is 21.1 km^2. Thus the portion of the study area that contributes to runoff in the Boesmanspruit is 3.5% of the Boesmanspruit catchment, which has a total catchment of 597 km^2.

8.1.8.3 Minor Rivers / Watercourses in Study Area

The proposed mining right area consists both of endorheic areas and non- endorheic areas. Nodes S1 and S2 are accumulation points of such endorheic areas, node S3 acts as an attenuation system with only extreme flood events discharging into the catchment of node S4.

However the discharge from S3 will never contribute to the flood peaks of S4 as the response times of the catchments will not synchronise with the same storm events. The locations for nodes S4 and S5 were selected to obtain the minimum catchment area of each stream that will be affected by the study area. The catchment areas mainly consist of grass lands and cultivated fields with predominantly flat slopes. The overburden soils are moderate to deep sandy loam and are classified as permeable soils.

TABLE 8-8: SUMMARY OF WATERCOURSES CATCHMENTS ON SITE

Node Name	Effective Catchment Area (km2)	Stream Length (Km)	10-85 Method Avg. Slope (1:..)	Overland Flow Length (Km)	Overland Avg. Slope (1:..)
S1	15.490	3.62	49.35	-	-
S2	2.485	-	-	1.77	32.18
S3	2.222	-	-	3.37	134.77
S4	11.86	5.74	107.64	-	-
S5	16.49	4.62	86.66	-	-

FIGURE 8-13: SUB-CATCHMENTS AND NODES

8.1.8.4 Surface Water Ecosystems

The specialist report with the baseline information and impact assessment results is provided in Appendix 8.

The desktop review reiterated by a ground-truthing field survey showed that the proposed development area has an association with relatively large expanses of wetland units. Being located relatively high in the catchment area, valley-head seep zones feeding into unchannelled and channelled valley-bottom wetland units were common. Valley-bottom wetland units were also supplemented by hillslope seepages. Depression wetland units were also noted to be relatively common within the survey area. The main present land use is formal agriculture and much of the outer wetland zones are impacted by cultivation. Impoundments are also commonplace and impact all of the watercourses, which have been historically constructed to aid in agricultural practices.

The main present pressures and drivers of ecological change were shown to be the formal agriculture (cultivation) that surrounds the majority of the wetland units, and the numerous impoundments along all watercourses. The impact of mining activities within the northern areas was evident in the altered water quality of the one depression wetland that would be the recipient of runoff water from these areas. The water quality (following laboratory analysis) of the remaining surface waters has retained relatively good status, barring elevation of components that one would expect from the dominant land use being cultivation.

The proposed development area was delineated into three main surface water ecosystem units. The WETLAND-IHI rated all of these units to within a C Present Ecological State (PES) category (moderately modified), with a relatively high ecological importance and sensitivity.

8.1.9 GROUNDWATER

A geohydrological (groundwater) specialist study was undertaken by ILEH (2019). The complete report with the baseline information and impact assessment results is provided in Appendix 8. A summary of the report is provided hereunder.

8.1.9.1 Hydrocensus

A hydrocensus was completed in order to identify and characterise private groundwater use in the vicinity of the proposed Kranspan Mine.

During the hydrocensus 26 groundwater sites (boreholes and springs) were identified and included 19 boreholes and 7 springs. In terms of private groundwater use, the following information was obtained:

- 12 boreholes are in use:
  - 3 boreholes fitted with submersible pumps;
  - 8 boreholes fitted with windpumps;
  - 1 borehole fitted with solar submersible pump;
- 2 boreholes are equipped, but not in use (old windpumps); and
- 5 open boreholes are not currently in use.

The depth to groundwater level varied between a maximum depth of 22.38 m bgl (borehole KR7 as shown in Appendix 3, Map 14), and the surface elevation for the springs where the water table daylights. The average depth to groundwater in the hydrocensus boreholes is 14,7 m, if the springs and seeps are excluded from the calculation.

Based on communication with the landowners, the springs in the area are seasonal, with the exception of KR-Spring3 and KR-Spring5 that flow throughout the year. The springs serve as water supply to livestock and wildlife in the area. KR-Spring3 is the most prominent spring identified during the hydrocensus (based on flow rate). During the hydrocensus the discharge rate was approximately 86m^3/d (3,600 L/h) and the water quality is good.

Detailed information in terms of borehole construction and yields are not available for the identified private boreholes. The information provided by the landowners indicated low borehole yields for most of the Kranspan project area.

Based on the geophysical survey results and an understanding of the local geology, Groundwater Abstract identified 8 suitable drilling positions for groundwater characterisation purposes. Data collected include the recording of geological formations at 1 metre intervals, water strike depths, the cumulative final blow yield and final rest water level. A summary of the results is presented in Table 2 of the specialist report.

The new Kranspan percussion boreholes produced blow yields between zero litres per hour (L/h) (thus dry) and 10,000 L/h, as detailed in Table 2 of the specialist report. In general, borehole yields throughout the project area are low, indicating minor aquifer systems.

The base of the weathered zone yielded some water, but in very low quantities. Most water strikes produced low yields (1,000 to 2,000 L/h). The highest yielding water strike (>10,000 L/h) is associated with one of the north-south lineaments (borehole PM3). The water yielding zones can be classified as follow:

- Weathered sandstone – 1,000 to 2,000 L/h.
- Fractures in sandstone – 2,500 to 10,000 L/h.
- Dolerite top contact – 1,500 L/h.
- Dolerite bottom contact – 1,000 L/h.
- Sandstone shale contact 1,000 L/h.

Based on the percussion drilling results coal was found in borehole 1-130 only.

The depth of weathering varies between 3 and 50 m bgl; mostly around 7 to 9 metres below surface.

8.1.9.2 Aquifer Testing

Following completion of the drilling programme, an aquifer test programme was initiated to determine the hydrogeological characteristics of the local aquifers.

The following has been concluded from the aquifer test data:

- Two of the 6 boreholes tested showed a connection between the shallow and the deep borehole during the 12-hour aquifer testing. These are boreholes 6-220 and PM3. Both boreholes are located along the eastern boundary of the study area and on, or close to the north-south lineament. It appears that these north-south lineaments are possibly fault zones, possibly intruded by dolerite and with secondary fracturing, which as mentioned act as preferential flow paths to groundwater in the horizontal and vertical directions.
- The north-south lineaments are preferred groundwater flow paths, with higher T-values compared to the dolerite sills and sandstone or shale.
- The three sets of boreholes drilled close to the large pans indicate slow groundwater level recovery after pumping stopped. The exception is borehole PM1, where the borehole recovered to 100% of the original rest water level within 40 minutes after pump shut-down.
- The dolerite sill yielded water along the top and bottom contact; in the order of 1,000 L/h.
- Clay was only observed in the boreholes close to the largest pan, in boreholes PM1, PM2 and 2-50.
- The two boreholes with the highest blow yield and constant pump rate (5-110 and PM3) indicate very slow water level recovery after pumping. This suggests that the fractures into which these boreholes were drilled carry water, but that once these fractures are dewatered, the rate at which groundwater flows towards the boreholes from the surrounding aquifers is low.

- ➲ The shallow monitoring borehole at Site 8b yielded approximately 5,000 L/h (blow yield) and the deeper borehole only 1,000 L/h. During the aquifer test conducted on borehole Site 8 (deeper borehole) there was no response in the shallow, high yielding borehole. This suggests that the stress imposed on the fractured aquifer during the pumping test was not large enough or the aquifer test not long enough to induce vertical flow.

Two main aquifers are typically found in the Karoo sediments of the Ermelo Coal Field. These are a shallow weathered aquifer and a deeper fractured rock aquifer. These are discussed in more detail in the specialist report (Appendix 8).

8.1.10 AIR QUALITY

An air quality impact assessment was undertaken by Airshed Planning Professionals (2019). A summary of the report is provided below and the complete report is provided in Appendix 8.

8.1.10.1 Air Quality Sensitive Receptors

Air Quality Sensitive Receptors (AQSRs) primarily refer to places where people reside; however, it may also refer to other sensitive environments that may adversely be affected by air pollutants.

Prior to dispersion modelling, 14 receptors were identified in the vicinity of the Project (within the 20-by-20 km modelling domain). Sensitive receptors include schools, residential areas, informal housing and farmsteads (Figure 8-14:

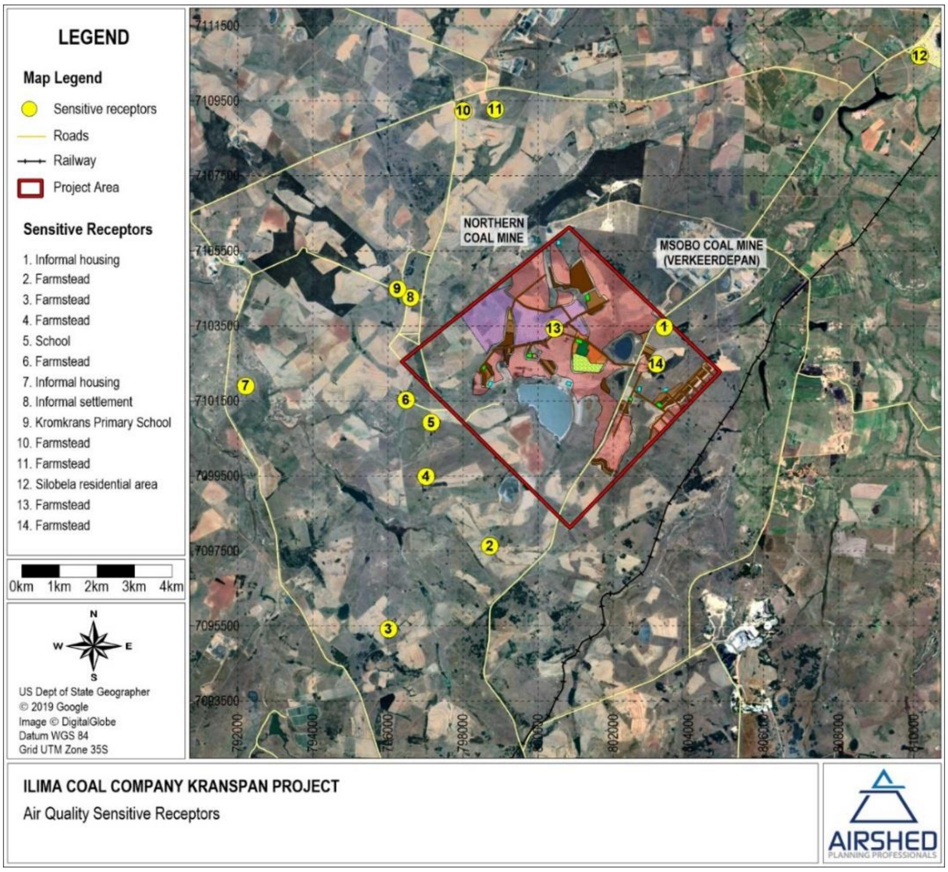


FIGURE 8-14: LOCATION OF POTENTIAL AIR QUALITY SENSITIVE RECEPTORS

8.1.10.2 Existing Sources of Emissions near the Project Site

Power generation, mining activities, farming and residential land-uses occur in the region. These land-uses contribute to baseline pollutant concentrations via vehicle tailpipe emissions, household fuel combustion, biomass burning and various fugitive dust sources. Long-range transport of particulates, emitted from remote tall stacks and from large-scale biomass burning in countries to the north of South Africa, has been found to contribute to background fine particulate concentrations within the South African boundary (Andreae, et al., 1996; Garstang, Tyson, Swap, & Edwards, 1996; Piketh, Annegarn, & Kneen, 1996).

Power Generation

Operational power stations are further west – Hendrina Power Station and Komati Power Station, at distances of 40km and 50km respectively; to the south (Camden Power Station, some 48km away); and to the northwest (Arnot Power Station, 30km away). The main emissions from such electricity generation operations are carbon dioxide (CO_2), SO_2, NOx and ash (PM). Fly-ash particles emitted comprise various trace elements such as arsenic, chromium, cadmium, lead, manganese, nickel, vanadium and zinc. Small quantities of volatile organic compounds are also released from such operations.

Mining Operations

Fugitive emissions from open cast and underground mining operations mainly comprise of land clearing operations (i.e. scraping, dozing and excavating), materials handling operations (i.e. tipping, off-loading and loading, conveyor transfer points), vehicle entrainment from haul roads, wind erosion from open areas, drilling and blasting. These activities mainly result in particulates and dust emissions, with small amounts of oxides of nitrogen (NO_x), carbon monoxide (CO), SO_2, methane and CO_2 being released during blasting operations. There are two known operational mines adjacent to the proposed Project, namely Northern Coal Mine and Msobo Coal Mine (previously known as Verkeerdepan Mine). Tselentis Colliery is located approximately 7.5km to the south.

Agricultural operations

Agriculture is a land-use within the area surrounding the site. Particulate matter is the main pollutant of concern from agricultural activities as particulate emissions are deriving from windblown dust, burning crop residue, and dust entrainment as a result of vehicles travelling along dirt roads. In addition, pollen grains, mould spores and plant and insect parts from agricultural activities all contribute to the particulate load. Should chemicals be used for crop spraying, they would typically result in odoriferous emissions. Crop residue burning is an additional source of particulate emissions and other toxins.

Miscellaneous Fugitive Dust Sources

Fugitive PM emissions are generated through entrainment from local paved and unpaved roads, and erosion of open or sparsely vegetated areas. The extent of particulate emissions from the main roads will depend on the number of vehicles using the roads and the silt loading on the roadways. Major paved roads in the area include the R36 main road to Carolina/Breyten. The extent, nature and duration of road-use activity and the moisture and silt content of soils are required to be known in order to quantify fugitive emissions from this source. The quantity of windblown dust is similarly a function of the wind speed, the extent of exposed areas and the moisture and silt content of such areas.

Vehicle Tailpipe Emissions

Air pollution from vehicle emissions may be grouped into primary and secondary pollutants. Primary pollutants are those emitted directly into the atmosphere, and secondary, those pollutants formed in the atmosphere as a result of chemical reactions, such as hydrolysis, oxidation, or photochemical reactions. Notable primary pollutants emitted by vehicles include CO_2, CO, hydrocarbons (HCs), SO_2, NO_x, DPM and Pb. Secondary pollutants include: NO_2, photochemical oxidants (e.g. ozone), HCs, sulphur acid, sulphates, nitric acid, nitric acid and nitrate aerosols. Hydrocarbons emitted include benzene, 1.2-butadiene, aldehydes and polycyclic aromatic hydrocarbons (PAH). Benzene represents an aromatic HC present in petrol, with 85% to 90% of benzene emissions emanating from the exhaust and the remainder from evaporative losses. Vehicle tailpipe emissions are localised sources and unlikely to impact far-field.

Both small and heavy private and industrial vehicles travelling along the R36 (public) road as well as unpaved public and private roads, are notable sources of vehicle tailpipe emissions.

Household Fuel Burning

Domestic households are known to have the potential to be one the most significant sources that contribute to poor air quality within residential areas. Individual households are low volume emitters, but their cumulative impact is significant. It is likely that households within the local communities or settlements utilize coal, paraffin and/or wood for cooking and/or space heating (mainly during winter) purposes. Pollutants arising from the combustion of wood include respirable particulates, CO and SO_2 with trace amounts of polycyclic aromatic hydrocarbons (PAHs), in particular benzo(a)pyrene and formaldehyde. Particulate emissions from wood burning have been found to contain about 50% elemental carbon and about 50% condensed hydrocarbons.

Coal is relatively inexpensive in the Mpumalanga region and is easily accessible due to the proximity of the region to coal mines and the well-developed coal merchant industry. Coal burning emits a large amount of gaseous and particulate pollutants including SO_2, heavy metals, PM including heavy metals and inorganic ash, CO, PAHs (recognized carcinogens), NO_2 and various toxins. The main pollutants emitted from the combustion of paraffin are NO_2, particulates, CO and PAHs.

8.1.10.3 Modelled Ambient Air Pollutant Concentrations

The Project is located outside the Highveld Priority Area (Figure 8-15) and therefore the modelled PM_{10} predictions and PM_{10} hotspots, as provided in the Highveld Priority Area Management Plan, are not relevant to this study.

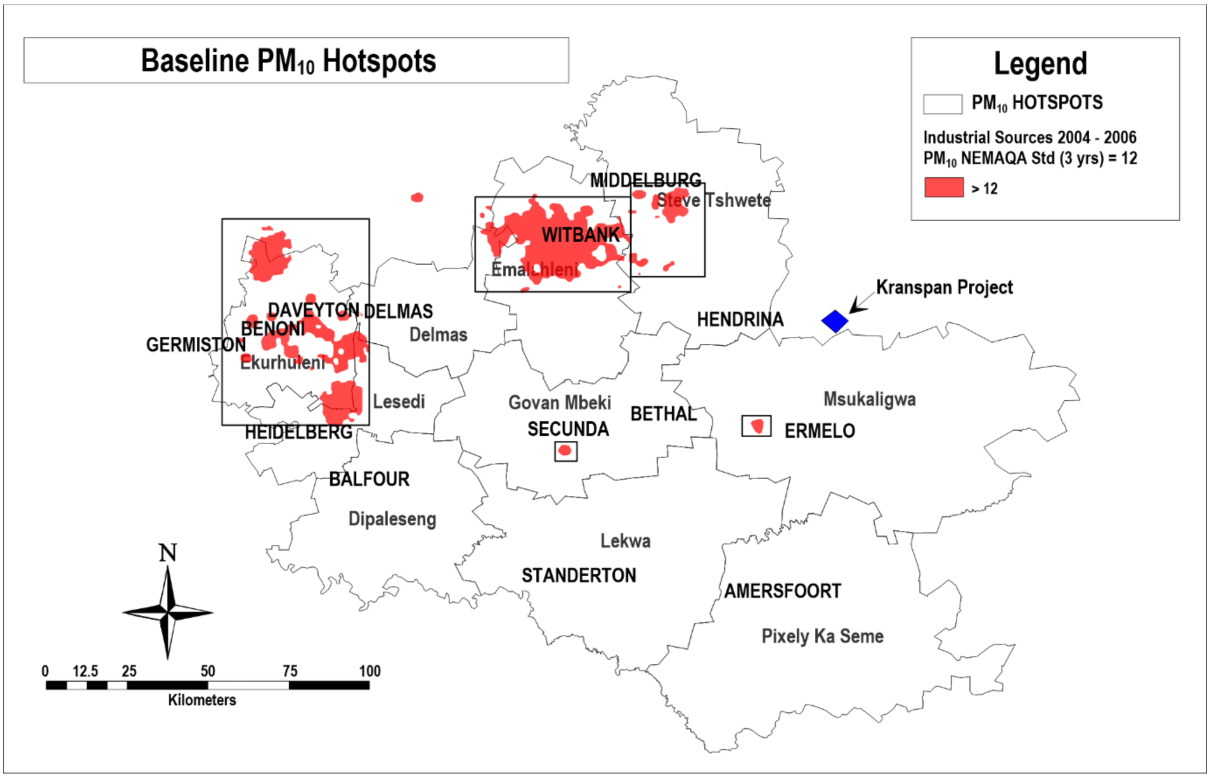


FIGURE 8-15: LOCATION OF THE PROJECT (OUTSIDE THE HIGHVELD PRIORITY AREA BOUNDARY)

8.1.10.4 Monitored Ambient Concentrations

The DEA monitoring network has ambient monitoring stations to measure the ambient air quality within the Highveld Priority Area. The ambient monitoring stations are located at Ermelo, Hendrina, Middelburg, Secunda, and Witbank. The closest monitoring station to the Project is Hendrina (~24 km west) (see Figure 8-15).

The measured PM10 and PM2.5 daily ground level concentrations from the Hendrina monitoring station for the period February 2018 to January 2019 are provided in Figure 8-16 and Figure 8-17 respectively (data obtained from SAAQIS website (Department of Environmental Affairs, 2019)). No data was available for September to November 2018, and the data availability is only 68%.

The measured PM10 and PM2.5 concentrations exceed the respective daily NAAQS's mainly during the winter period. The annual average concentration was calculated from the monthly concentrations over the measuring period and was estimated to be 30 µg/m^3 for PM10 and 17 µg/m^3 for PM2.5 respectively.

It should be noted that the Hendrina monitoring station, which would be measuring local and far-afield emission sources, may not be representative of the background PM10 and PM2.5 concentrations at the Project site.

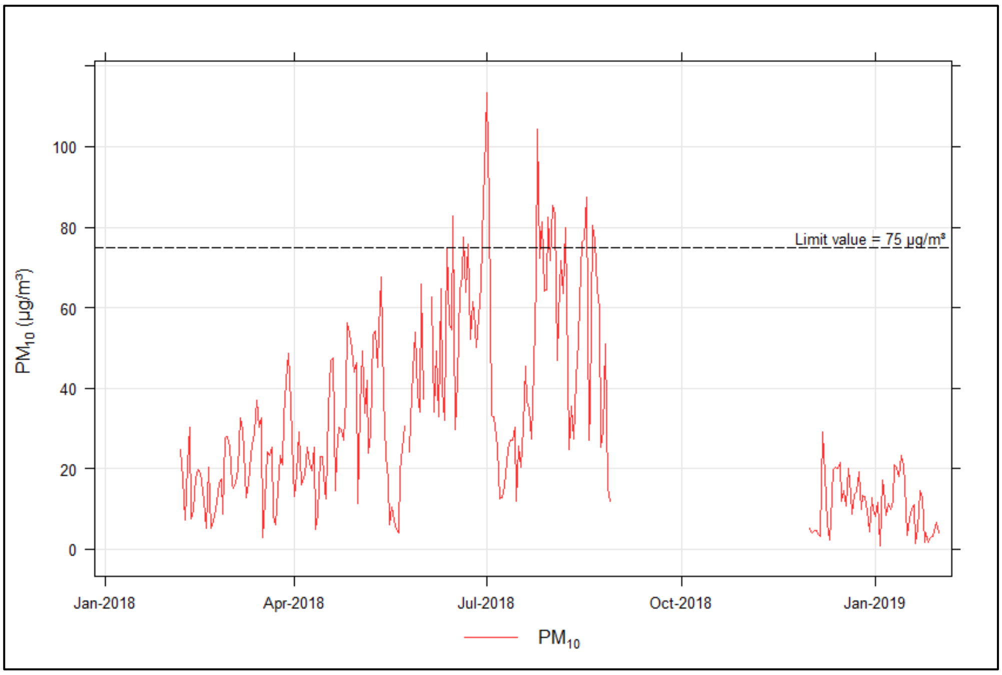


FIGURE 8-16: OBSERVED DAILY AVERAGE PM_{10} CONCENTRATIONS AT HENDRINA FOR THE PERIOD FEB 2018 TO JAN 2019

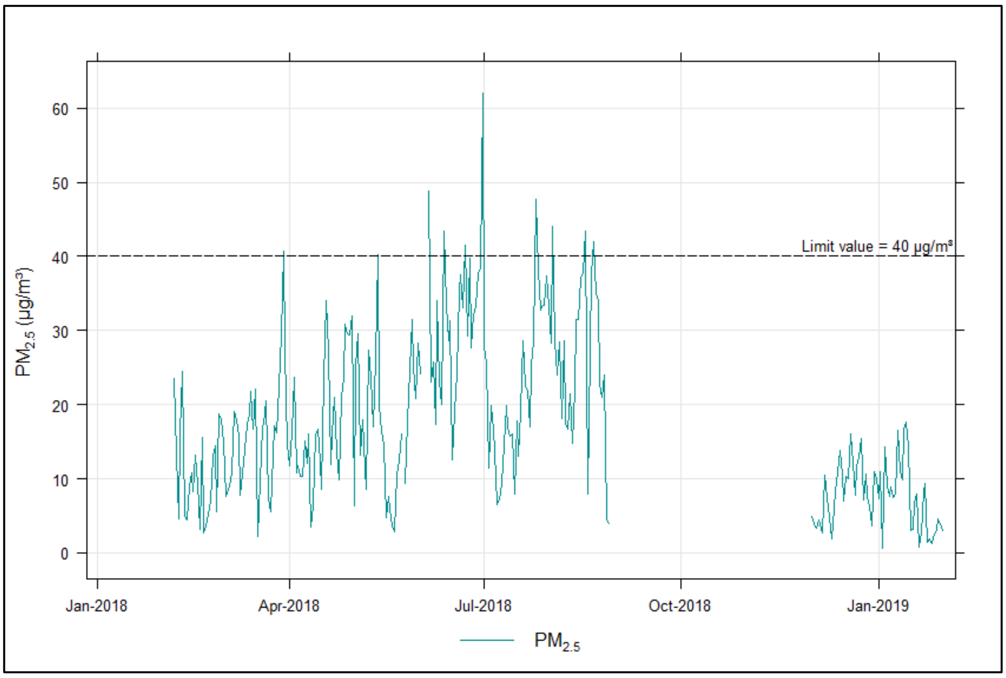


FIGURE 8-17: OBSERVED DAILY AVERAGE $PM_{2.5}$ CONCENTRATIONS AT HENDRINA FOR THE PERIOD FEB 2018 TO JAN 2019

The daily 99th percentiles for PM_{10} exceed the limit value (75 µg/m³) at Hendrina station for 6% of the time during the 1-year period (Figure 8-18), whereas the daily 99th percentiles for $PM_{2.5}$ exceed the limit value (40 µg/m³) at Hendrina station for 3% of the time during the same period (Figure 8-19).

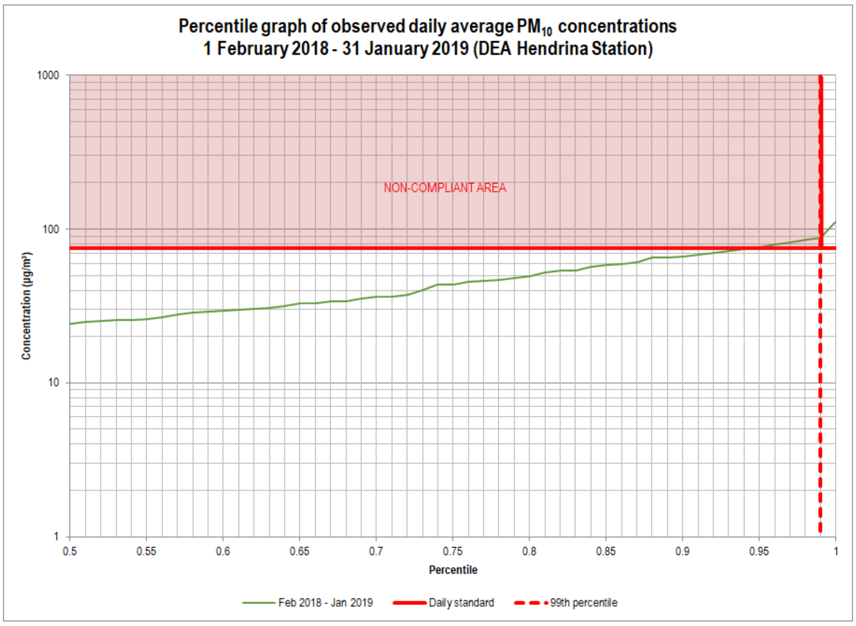


FIGURE 8-18: PERCENTILE GRAPH OF OBSERVED DAILY AVERAGE PM_{10} CONCENTRATIONS AT HENDRINA

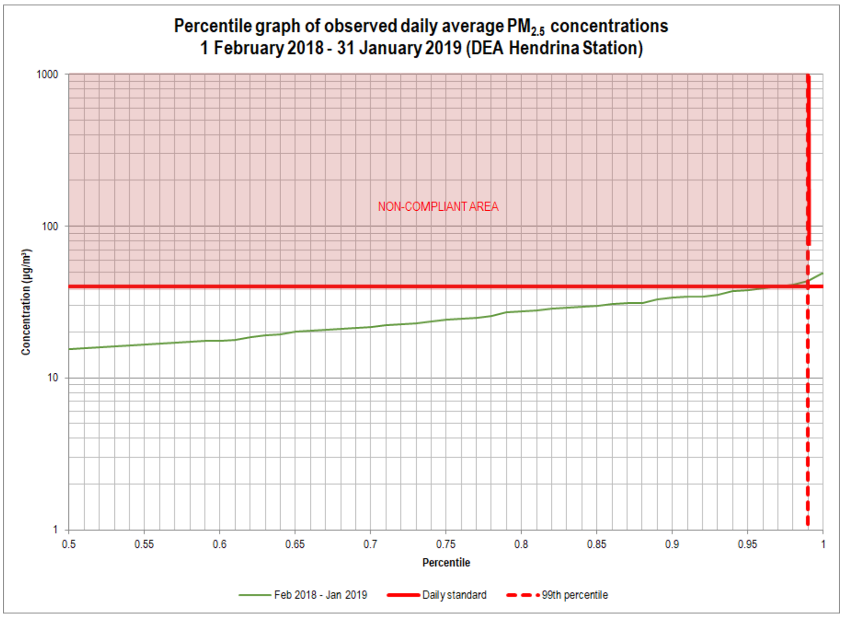


FIGURE 8-19: PERCENTILE GRAPH OF OBSERVED DAILY AVERAGE $PM_{2.5}$ CONCENTRATIONS AT HENDRINA

Particulate concentrations recorded at the DEA Hendrina monitoring station show high concentrations from nearby sources to the west-northwest and northwest (Komati and Hendrina Power Stations respectively) at low wind speeds (below 4 m/s) (Figure 8-20). Sources in the north-easterly and south-easterly sectors contribute the lowest concentrations, especially at higher wind speeds. Higher PM10 concentrations (between 30 µg/m^3 and 40 µg/m^3) under high wind speed conditions (> 4 m/s) to the northeast indicate wind-dependent sources.

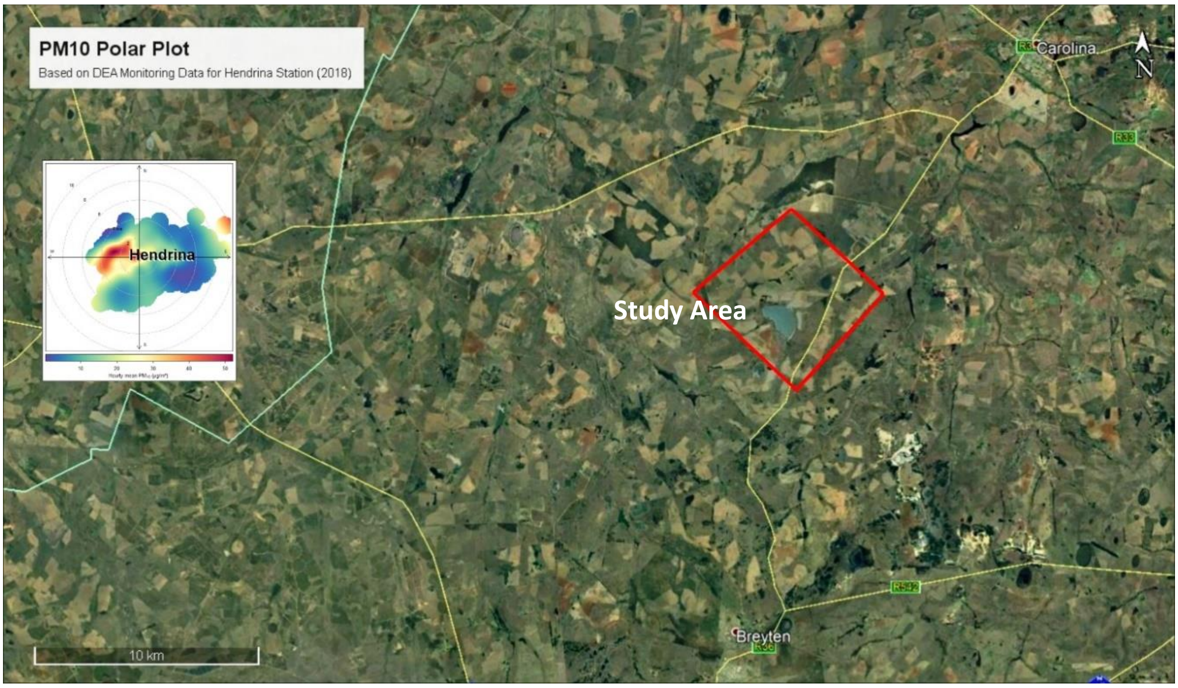


FIGURE 8-20: POLAR PLOT OF HOURLY MEAN PM10 CONCENTRATION OBSERVATIONS AT HENDRINA (FEBRUARY 2018 – JANUARY 2019)

8.1.10.5 Dustfall Rates

The dustfall monitoring network, which consists of six buckets (shown in Figure 8-21), was established taking into consideration the position of the proposed plant, residential and non-residential areas in the vicinity of the premises, prevailing winds and areas where the most dust is visible, so as to determine baseline dust fallout levels. Dustfall rates as measured by the National Occupational Health and Safety (NOHS) Consultants Company during the period January 2019 are shown in Figure 8-21. The values were very low and did not exceed the residential or non-residential limits of 600 mg/m2/day and 1200 mg/m2/day respectively.

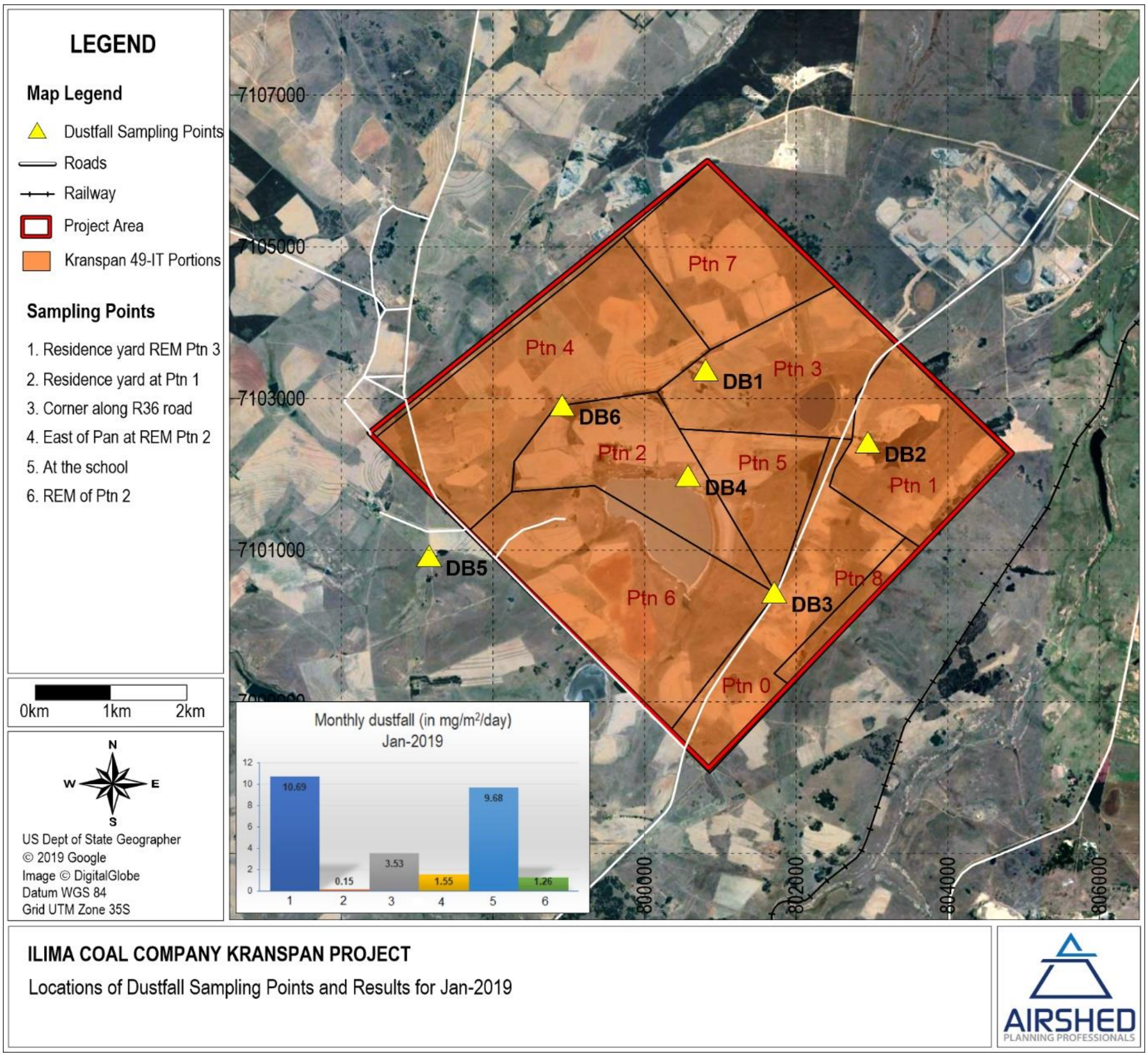


FIGURE 8-21: NOHS DUST MONITORING POINTS RELATIVE TO THE SITE BOUNDARY AND FIRST RESULTS FOR JAN-2019

8.1.11 ENVIRONMENTAL NOISE

An environmental noise impact assessment was undertaken by Airshed Planning Professionals (2019). A summary of the report is provided below and the complete report is provided in Appendix 8.

This section provides details of the receiving acoustic environment which is described in terms of:

- Local NSRs;
- The local environmental noise propagation and attenuation potential; and
- Current noise levels and the existing acoustic climate.

8.1.11.1 Noise Sensitive Receptors

Noise sensitive receptors generally include places of residence and areas where members of the public may be affected by noise generated by mining, processing and transport activities.

The impact of an intruding industrial/mining noise on the environment rarely extends over more than 5 km from the source (Airshed, 2019). Noise sensitive receptors within 5 km of the project (indicated in Figure 4 of the specialist report), include individual homesteads and small informal settlements.

8.1.11.2 Baseline Noise Survey and Results

Survey sites were selected after careful consideration for future mining activities planned at Kranspan, accessibility, potential noise sensitive receptors, and safety restrictions. A total of five survey sites were selected. The locations of these are shown in Appendix 3, Map 15. Verkeerdepan Mine is located directly northeast of the proposed project.

The survey results are visually presented in Figure 8-22 (day-time results) and Figure 8-23 (night-time results).

The following is noted:

- Measurements were conducted on 29 and 30 January 2019.
- Weather conditions:
  - During the day weather conditions started out mostly cloudy (80%-60%) but opened up as measurements continued, with temperatures between 20 ºC and 26ºC. Slight wind conditions with wind speeds between 1 and 2 m/s mostly from a westerly direction.
  - At night, skies were clear with temperatures between 16ºC and 18ºC. Slight wind conditions with wind speeds between 0.5 and 1 m/s mostly from a northerly direction.
- Through subjective observations during measurements and frequency analysis of recorded 3rd octave frequency spectra, it was determined that pure tones were not present during any of the measurements.
- Day-time baseline noise levels:
  - Measurements indicate day-time ambient noise levels that are comparatively quiet but influenced by occasional noisy incidents such as vehicle passing by.
  - LAeq's ranged between 34 dBA and 63 dBA which is considered typical of rural to urban areas according to SANS 10103.
  - Recorded LAeq's during the day were within IFC guidelines for residential, institutional and educational receptors (55 dBA) with the exception of site KN 1 (63 dBA).
- Night-time baseline noise levels:
  - Measurements indicate night-time ambient noise levels that are quiet but influenced by occasional noisy incidents such as vehicle passing by.
  - Mining activities from Verkeerdepan Mine were clearly audible at all 5 sites (KN 1 to KN 5) during the night.
  - On-site LAeq's ranged between 37 dBA and 62 dBA which is considered typical of rural to urban areas according to SANS 10103.
- Recorded LAeq's during the night were within IFC guidelines for residential, institutional and educational receptors (45 dBA) with the exception of Site KN 1 (62 dBA).

For detailed time-series, frequency spectra and statistical results, the reader is referred to Appendix D of the specialist report. Field log sheets containing weather records are included in Appendix C of the specialist report.

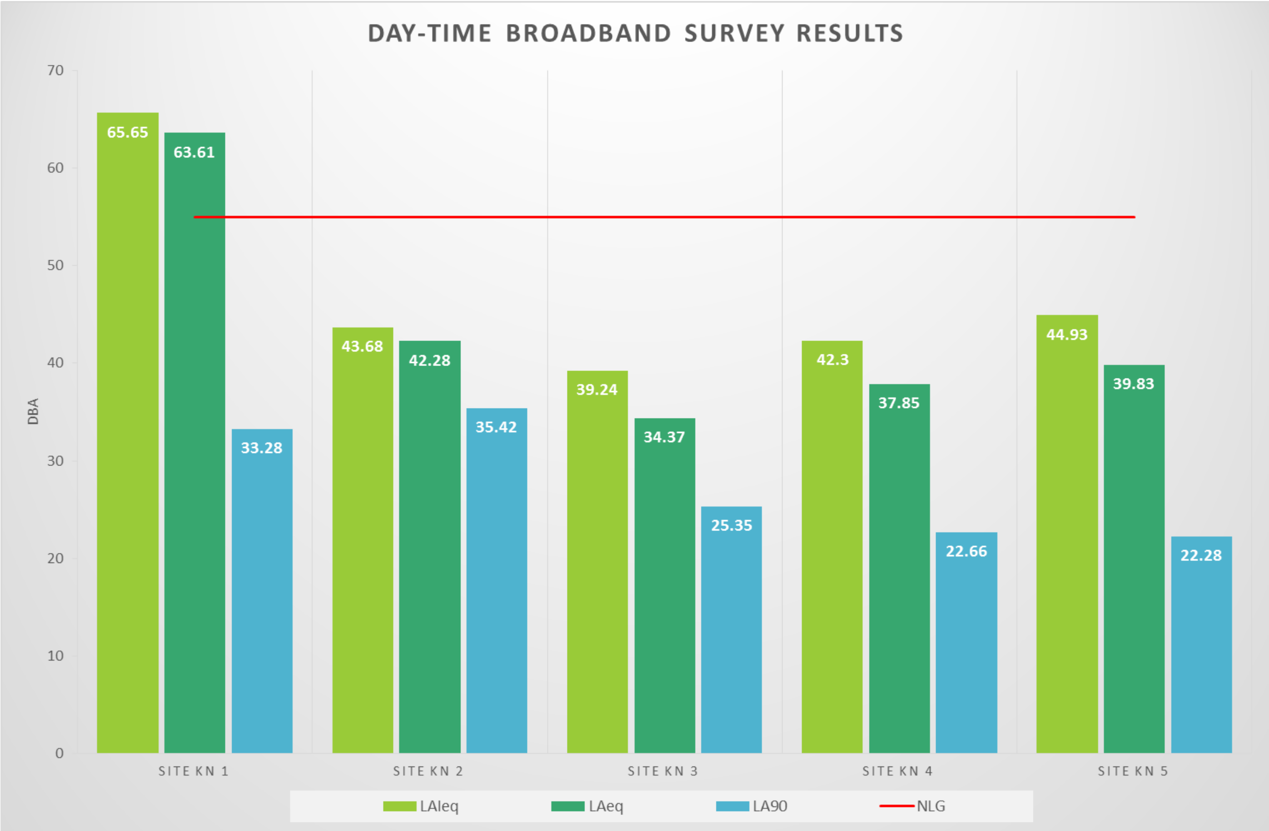


FIGURE 8-22: DAY-TIME BROADBAND SURVEY RESULTS

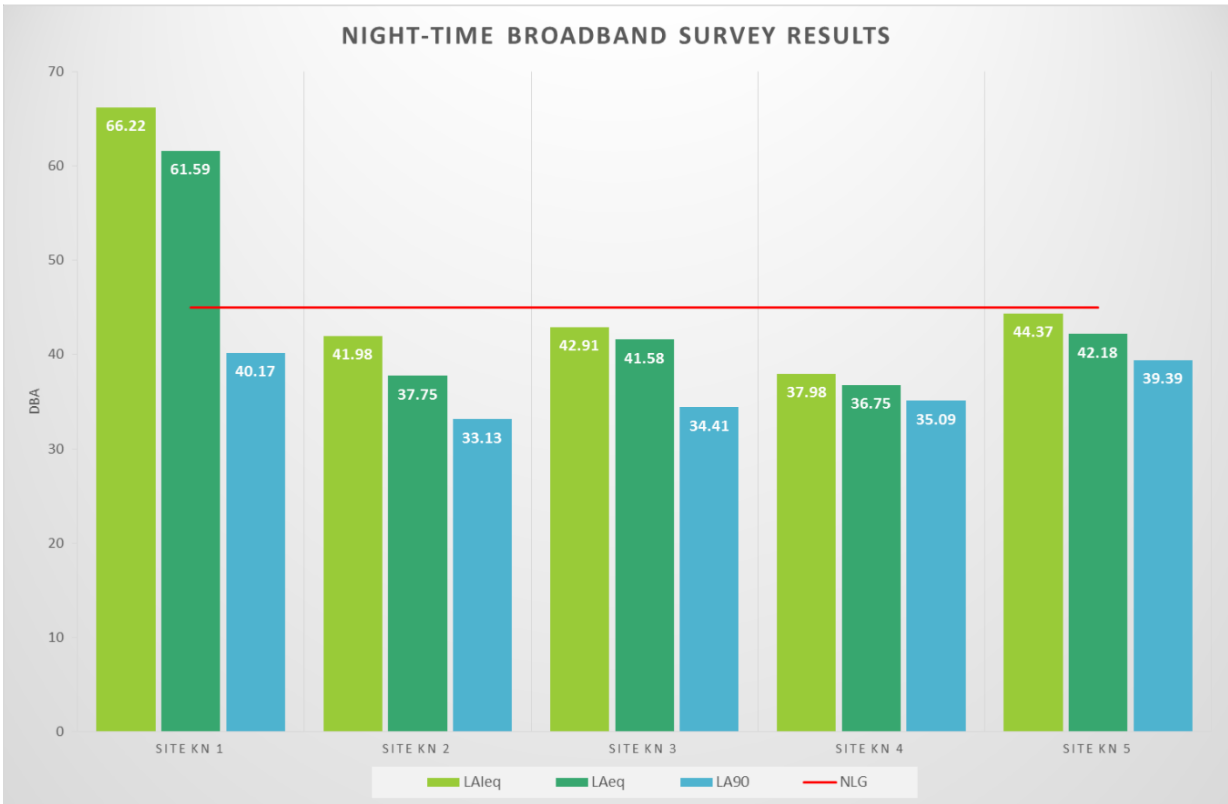


FIGURE 8-23: NIGHT-TIME BROADBAND SURVEY RESULTS

8.1.12 HERITAGE

A heritage Impact Report was undertaken by HCAC (2019). A summary of the report is provided below and the complete report is provided in Appendix 8.

8.1.12.1 Early Stone Age

The Early Stone Age in southern Africa is defined by the Oldowan complex, primarily found at the sites Sterkfontein, Swartkrans and Kromdraai, situated within the Cradle of Humankind, just outside Johannesburg (Kuman, 1998). Within this complex, tools are more casual and expediently made, and tools consist of rough cobble cores and simple flakes. The flakes were used for such activities as skinning and cutting meat from scavenged animals. This industry is unlikely to occur in the study area.

The second complex is that of the more common Acheulean, defined by large handaxes and cleavers produced by hominids at about 1.4 million years ago (Deacon & Deacon, 1999). No Acheulian sites are on record near the project area, but isolated finds are possible. However, isolated finds have little value.

8.1.12.2 Middle Stone Age

During the Middle Stone Age, significant changes start to occur in the evolution of the human species. These changes manifest themselves in the complexity of the stone tools created, as seen in the diversity of tools, the standardisation of these tools over a widespread area, the introduction of blade technology, and the development of ornaments and art.

The repeated use of caves indicates that MSA people had developed the concept of a home base and that they could make fire. These were two important steps in cultural evolution (Deacon & Deacon, 1999).

Accordingly, if there are caves in the study area, they may be sites of archaeological significance. MSA artefacts are common throughout southern Africa, but unless they occur in undisturbed deposits, they have little significance.

8.1.12.3 Later Stone Age

The Later phases of the Stone Age began at around 20 000 years BP (Before Present). This period was marked by numerous technological innovations and social transformations within these early hunter-gatherer societies. Hunting tools now included the bow and arrow.

These people may be regarded as the first modern inhabitants of Mpumalanga, known as the San or Bushmen. They were a nomadic people who lived together in small family groups and relied on hunting and gathering of food for survival. Evidence of their existence is to be found in numerous rock shelters throughout the Eastern Mpumalanga where some of their rock paintings are still visible.

Three late Stone Age sites are on record in the greater area. The sites are Welgelegen Skuiling close to Ermelo, Chrissiesmeer (also known for rock art) and lastly Groenvlei close to Carolina; this area is also known for rock art (Bergh 1999).

8.1.12.4 Iron Age

The Iron Age as a whole represents the spread of Bantu speaking people and includes both the pre-Historic and Historic periods. It can be divided into three distinct periods:

- The Early Iron Age: Most of the first millennium AD.
- The Middle Iron Age: 10th to 13th centuries AD
- The Late Iron Age: 14th century to the colonial period.

The Iron Age is characterised by the ability of these early people to manipulate and work iron ore into implements that assisted them in creating a favourable environment to make a better living.

8.1.12.5 Early and Middle Iron Age

No sites dating to this period are on record close to the study area.

8.1.12.6 Late Iron Age

Stonewalled settlements are well known around the Watervalboven and Machadodorp area to the north of the study area, in fact, these settlements are found all along the Mpumalanga escarpment, from Ohrigstad in the north, all the way to Carolina in the south (Maggs 2007). These settlements consist of roughly circular homesteads linked by walled roads or cattle tracks associated with agricultural terraces.

8.1.12.7 Anglo-Boer War

FIGURE 8-24: THE WITKLOOF MONUMENT (HTTP://WWW.BOERENBRIT.COM).

The Witkloof Monument (Figure 9) stands testament to an interesting battle that took place in the larger area namely the battle of Leliefontein. According to the map (Figure 10) from J.S. Bergh (red), Geskiedenisatlas van Suid-Afrika, Die vier noordelike provinsies, p. 54, there were two concentration camps located to the north of the study area close to Belfast. These sites will not be impacted by the development.

8.1.12.8 Built Environment

Several farm labourer dwellings and farm homesteads occur in the study area. These structures have not been recorded individually as they are not older than 60 years and of no heritage significance.

 Farm labourer dwelling in study area.	 Modern farmstead.
 Abandoned farmstead	 Modern farmstead with manicured lawns

Nine ruins were recorded. The record structures' potential to contribute to aesthetic, historic, scientific and social aspects are low to moderate and it is therefore of low heritage significance. If structures (KP 9, 12, 17, 21 and 22) are older than 60 years, they are protected by the NHRA and a permit application process would have to be followed if the structures are to be impacted on in any way. It should also be noted that the recorded farm labourer dwellings are often associated with unmarked graves.

8.1.12.9 Burial Grounds and Graves

In terms of Section 36 of the Act 6 cemeteries and approximately 26 graves were recorded. These are described in detail in the specialist report.

8.1.12.10 Archaeological resources

Archaeological remains are sparse in the study area. As expected, the only remains were recorded next to the pan that would have been a focal point for humans in antiquity. Because the pan and its margins are located within an environmental buffer zone no impact is foreseen on these features, therefore the areas around the pans was not surveyed in detail and more features can be expected in the buffer zone. Archaeological features that were recorded during the survey for the proposed project is attached in Appendix 8

8.1.12.11 Cultural Landscapes, Intangible and Living Heritage.

The study area is rural in character surrounded by agricultural and mining developments and although it is not a significant cultural landscape the proposed mining can have a negative impact on the sense of place.

From a heritage point of view the area has been extensively disturbed and this would have impacted on heritage resources. Visual impacts to scenic routes and sense of place are also considered to be low due to the existing developments in the area.

8.1.12.12 Battlefields and Concentration Camps

There are no battlefields or related concentration camp sites located in the study area.

8.1.12.13 Palaeontology

An independent study was conducted by Prof Barry Millsteed and is attached in Appendix 8. A summary of the report is provided below.

The aerial extent of the Mining Right application area is underlain by an assemblage of stratigraphic units consisting of coal-bearing sediments of the Vryheid Formation and intrusive dolerite of the Karoo Dolerite Suite. These bedrock units are overlain in part by a Cainozoic ferricrete layer that appears to be present upon the topographically higher areas within the project area. Lying upon the ferricrete and, in the topographically lower areas upon the Vryheid Formation strata is by a pervasive layer of unconsolidated Cainozoic regolith. Due to the methodologies employed in the opencast mining process and also the extreme costs of mining no negative impact upon the geological sequence will be expected to occur below the base of Seam E in the opencast voids as the mining will not extend deeper than that. Within the underground mining operations, the negative impacts upon the geology will be predominantly constrained to occurring within Seam E. Coal seams occur at depths between 5–75 m. The coal seams are relatively flat lying, but the depth of burial tends to increase towards the centre of the application area due to increasing topographic height of the land surface. Any negative impacts will be constrained to the Vryheid Formation and the overlaying geological units. The required mine infrastructure, other than opencast voids and the underground mining operations will all be located on the land surface. Excavations required for all mine infrastructure, not inclusive of the underground mining operations, the opencast pits or the ventilation shaft infrastructure will result in an impact upon the underlying geology. It is assumed that the maximum depth of the negative impact they will cause upon the underlying geology will be < 2 m.

The rocks comprising the Karoo Dolerite Suite are unfossiliferous. It is also interpreted, herein, that the interpreted Cainozoic unconsolidated regolith and the Cainozoic ferricrete are unfossiliferous. Any impacts upon the rocks comprising these units caused by the progression of the mining operations will have a negligible to nil probability of resulting in a negative impact upon their palaeontological heritage. The sediments of the Vryheid Formation are known to contain plant macrofossil assemblages of the Glossopteris flora as well as trace fossil assemblages. The significance of the fossil assemblages contained in the Vryheid Formation is assessed as high, but the probability of any negative impact is moderate to good." (Millsteed 2019).

8.1.13 SOCIO-ECONOMIC ENVIRONMENT[13]

8.1.13.1 Chief Albert Luthuli Local Municipality

The proposed mining right area is located within the Gert Sibande District, within the Mpumalanga Province.

Gert Sibande District comprises of seven local municipalities, being Chief Albert Luthuli, Dipaleseng, Govan Mbeki, Lekwa, Mkhondo, Muskaligwa, and Pixley KaSeme (Figure 8-25).

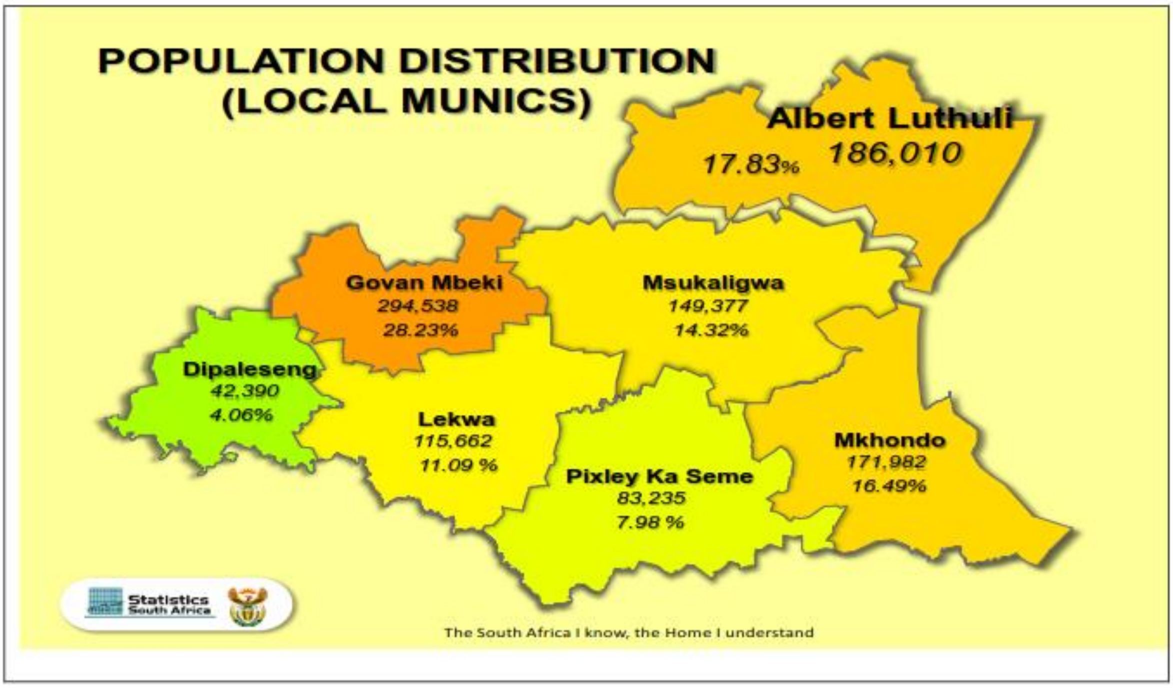


FIGURE 8-25: LOCAL MUNICIPALITIES

Chief Albert Luthuli is rated a Medium Capacity Municipality, which comprises of 5 formally declared towns, namely Carolina, Emanzana, Elukwatini, Empuluzi/Mayflower and Eklulindeni. The administrative head office of the municipality is situated in Carolina, with a satellite office at each of the other towns.

The Municipality has 47 750 households, and 186 010 citizens. Located on the eastern escarpment of the Mpumalanga Province, the surface area is approximately 5 560 km². A summary of the key statistics of the municipality is provided in Table 8-9.

8.1.13.2 Population

There are approximately 187 630 people residing in the municipality (StatsSA 2016 Community Survey). The major forces that drive population growth in the area are fertility, mortality, migration, HIV prevalence and access to Anti Retro Viral medicine.

The most dominant population group in the Municipality are Black African individuals, who represent more than 97.6% of the total population in the municipal area. White and Indian/Asian population groups comprise around 1.6% and 0.4% of the population respectively. The dominant languages in Chief Albert Luthuli Local Municipality are Siswati and isiZulu. Siswati is the most widely spoken language (56.6%).

[13] There is a general lack of recent published demographic and other socio-economic data for the area. Except where noted, the information in this section has been summarised from Statistics South Africa Census Data (2011)

TABLE 8-9: KEY STATISTICS OF CHIEF ALBERT LUTHULI MUNICIPALITY

KEY STATISTICS	NUMERICAL VALUE
Total population	187 630
Young (0-14)	36.5%
Working age (15 - 64)	58.2%
Elderly (65+)	5.3%
Dependency Ratio	71.7%
Gender Ratio	88.2.3%
Growth Rate	-0.09% (2001 - 2011)
Population density	33 person/km^2
Unemployment rate	35.4%
Youth unemployment rate	45.1%
No schooling aged 20+	19.9%
Higher education aged 20+	6.3%
Matric aged 20+	27%
Number of Households	47.705%
Number of Agricultural Households	19.113
Average Household size (person)	3.8
Female headed households	49.3%
Formal dwellings	76.5%
Housing owned/paying off	56.3%
Flush toilet connected to sewerage	18.9%
Weekly refuse removal	19.3%
Piped water inside dwelling	22.6%
Electricity for lighting	87.5%

Source: Statistics South Africa (2011)

8.1.13.3 Educational Facilities and Education

A total of 111 schools can be found in Chief Albert Luthuli Municipality, 48 of which are Secondary institutes.

19.9% of the municipal population has not attended any type of a schooling system, while 95.5% have primary school education. A little over 1901 individuals (0.11%) have graduated from a University / Technikon.

In Chief Albert Luthuli Municipality, around 27 % of adults have a matric certificate compared to 29 % in the Mpumalanga Province. The percentage of the population with a tertiary education in Chief Albert Luthuli (6.3%) is also lower than that for the Mpumalanga Province (9.6%).

The nearest school to the site is situated immediately west of the western boundary of the proposed MRA. The land on which the school is built is owned by Ilima.

8.1.13.4 Access to Water, Sewage and Solid Waste Services

Piped water is accessed by about 68.7% of the Municipalities population and about 18.9% of the municipal population have access to flush toilets. About 19.3% of the population have access to a weekly refuse collection service[14]

8.1.13.5 Housing

Within the Chief Albert Luthuli Local Municipality, 76% of households live in formal units, while 18% are found in informal housing units.

A variety of residential components are available within the municipal boundaries. More than 15.3% of household dwellings found in the Municipality can be classified as Urban. Some 77.5% of local dwellings can be described as Tribal/Traditional.

The average household size in Chief Albert Luthuli Local Municipality is about 3.8, female headed households is about 49%, formal dwellings at 86% and the housing owned is at 52%.

8.1.13.6 Public Safety and Security

The Municipality has one fully-fledged fire station in Carolina, and a satellite fire station in Elukwatini; as well as an operational fire engine and three rescue vehicles.

8.1.13.7 Community Health and Health Facilities

Health services are provided by clinics and hospitals in both urban and rural areas. There are a total of twenty one (21) clinics in the Chief Albert Luthuli Municipal area; grouped into two clusters; the Northern Cluster from Diepdale to Carolina (10), and Southern Cluster from Hartebeeskop to Badplaas (11).

In addition, there are two Level 1 Hospitals (Carolina Hospital and Embhuleni Hospital), which receive patients referred from the clinics and provides outpatient services as well.

Mpumalanga is one of the three (3) Provinces with the highest infection rates of HIV / AID‟s. Latest statistics for the Province reveal an increase in the District infection rate. HIV prevalence rate of pregnant women was 43.2% in 2011 - increasing between 2001 & 2011. HIV prevalence rate excluding pregnant women was 21.6% (2011) - decreasing trend.

The municipality is responsible for the provision of graves to the communities for burials and maintenance of 6 municipal cemeteries. They are at Emanzana, Carolina, Ekulindeni, Elukwatini, Mayflower and Silobela. Other areas are falling within the tribal authority and are using the tribal cemeteries, which are spread throughout the villages at times.

8.1.13.8 Electricity and Energy

Around 87.5% of household dwellings found in Chief Albert Luthuli Local Municipality have access to electricity. The Municipality is licensed to distribute electricity in Carolina, Silobela and part of Emanzana only. Eskom is licensed for the bulk supply and reticulation in the former Ekulindeni, Elukwatini and Empuluzi TLC areas. Electrification of households in the rural areas, the informal settlements and parts of Silobela Township is a compelling necessity.

[14] CALLM DIDP (2017/ 22 Part 1)

Households with connection to electricity 51 383 in 2016 – the share of households connected to electricity improved to a level of more than 96% in 2016 – 1 902 households however are not connected to electricity at all (none).

As shown in Figure 8-26, the majority of the population have access to electricity, which is used primarily for cooking, heating and lighting. The proportion of households within the municipality that use electricity for lighting has increased from 50.9% in 2001 to approximately 87.5% in 2011.

Although relatively expensive, paraffin and gas are used for cooking and heating in some places. Households using electricity as a source of energy for cooking in 2011 is 50.8%.

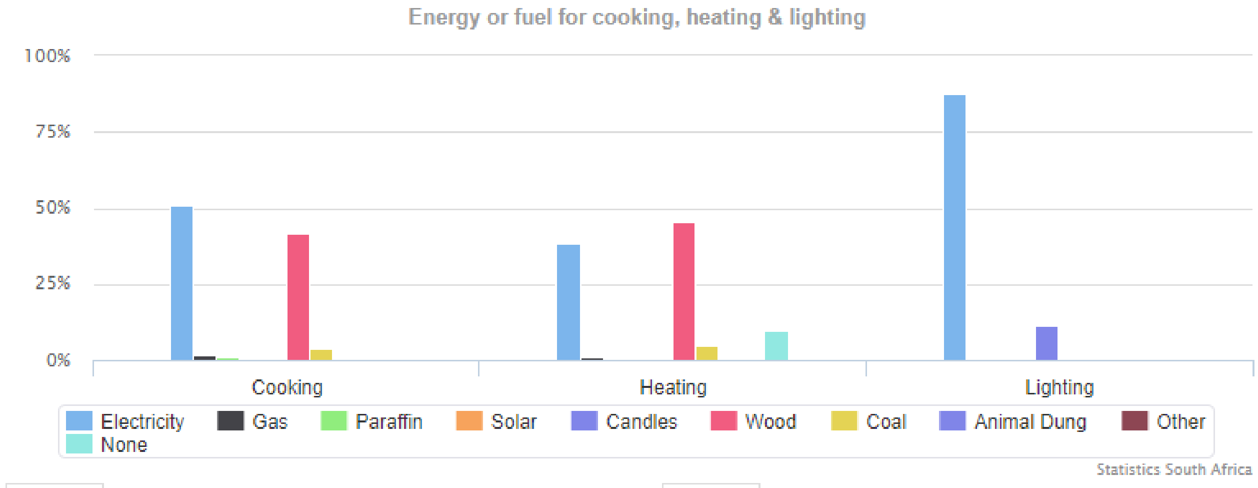


FIGURE 8-26: SUMMARY OF ENERGY OR FUEL FOR COOKING, HEATING & LIGHTING

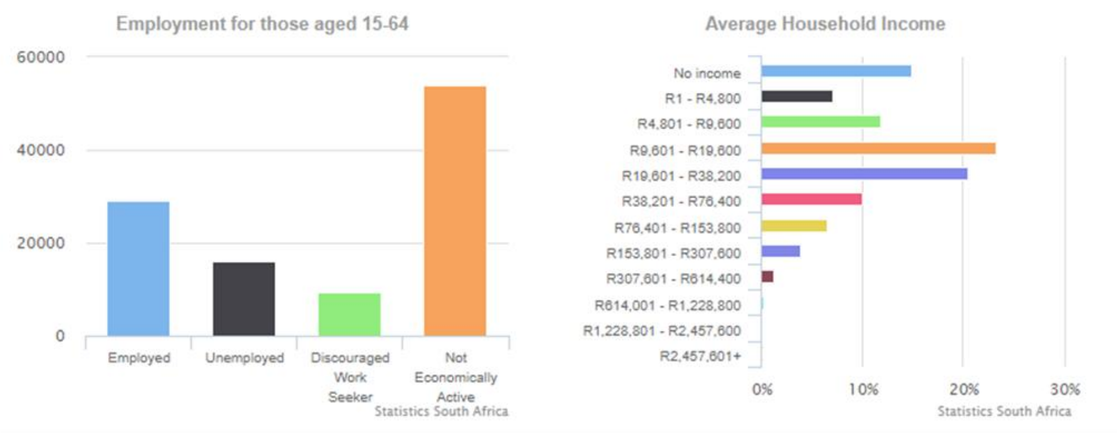
8.1.13.9 Employment15

Between 2001 and 2011, there has been a decrease in the number of people unemployed and a concomitant increase in the number of employed people across the Chief Albert Luthuli Local Municipality.

35,4% of the 45 116 economically active individuals (i.e. those who are employed or unemployed but looking for work) are unemployed. Of the 24 506 economically active youth (15–35 years) in the municipality. 35.8% of youth remain unemployed in 2011.

The average household income is approximately R 9 601 – R 19 600. Obtaining any form of income generating employment within the municipality has become increasingly difficult in recent years. This is attributed to the lack of education, resulting in the uneducated experiencing the high incidences of poverty.

15 Statistics South Africa (2011)



Source: Statistics South Africa (2011)

FIGURE 8-27: SUMMARY OF EMPLOYMENT AND INCOME

8.1.13.10Economy

The Spatial Economy and Development Rationale, part of the Draft Integrated Development Plan, noted the following:

- The overall economic outlook for the municipality is good, however there are few concerns worth noting
- High Prevalence of HIV means that 44% of the population require treatment for HIV and the food to support the use of the treatment;
- High unemployment rate among people in the 14 – 64 age group (Persons most economically productive years);
- The unemployment rate in the Municipality is 35,4% (2011); females 42% and males 28% - and the unemployment rate for young people is alarmingly high at 45%, which is mainly influenced by the lack of economic opportunities in the municipal area. The highest number of unemployed (54%) is in Ward 12 (Ekulindeni area) and the lowest number (20%) is in Ward 21 (Carolina area);
- Employment in the Municipality increased with 8 600 jobs between 2001 and 2011, and the number of employed individuals is 29 141 (0,12%). The percentage of employment in formal sector was 65,6%, and in the informal sector 21,9% (StatsSA 2011); and
- The main economic drivers in the Municipality sector; and the construction sector.

The mining sector is identified within the Chief Albert Luthuli Local Municipality Draft Integrated Development Plan (2017/ 22 Part 2) as a sector with development potential.

8.1.13.11Spatial Development Frameworks

The spatial development trajectory of the district is guided by the set of development principles outlined below:

- Actively protect, enhance and manage the natural environmental resources of the District by way of the guidelines provided in the GSDM Environmental Management Framework (EMF);
- Optimally capitalise on the strategic location of the District through strengthening of the five national/provincial economic corridors, and to functionally link all towns and settlements to one another and to surrounding regions;

- Establish a functional hierarchy of nodal points in the Gert Sibande District area to optimize the delivery of social and engineering infrastructure/services, promote local economic development, and protect valuable agricultural land;
- Provide a full range of social services at all the identified nodal points, in accordance with the nationally approved Thusong Centre concept;
- Consolidate the urban structure of the District around the highest order centres by way of residential infill development and densification in Strategic Development Areas (SDAs) identified in Municipal Spatial Development Frameworks;
- Ensure that all areas in the GSDM (urban and rural) are at least provided with the constitutionally mandated minimum levels of services as prescribed by the NDP and enshrined in the Constitution;
- Utilise the Chressiesmeer-Heyshope-Wakkerstroom precincts as Tourism Anchors around which to develop and promote the eastern parts of the District (around route R33) as a Primary Tourism Corridor;
- Promote forestry within and along the identified Primary Tourism Corridor;
- Promote intensive and extensive commercial farming activities throughout the District and facilitate Agrarian Transformation within the CRDP priority areas;
- Facilitate and accommodate mining in the District in a sustainable manner in order to support local electricity generation and industrial development;
- Unlock the industrial development potential of existing towns through developing industry specific Special Economic Zones/Economic Clusters throughout the District, in line with the Mpumalanga SDF and the Mpumalanga Vision 2030 Strategy in accordance with the following sectors:
  - Agricultural Cluster
  - Forestry Cluster
  - Industrial Cluster
- Enhance business activities (formal and informal) in the Central Business Districts of identified nodal points in the District and consolidate business activities around Thusong Centres and modal transfer facilities in rural areas.

There are currently two spatial development frameworks of relevance to the study area, namely the proposed Provincial Spatial Development Framework for Mpumalanga published on the 1st of February 2019 (Mpumalanga SDF, 2019) and the Chief Albert Luthuli Local Municipality Spatial Development Framework (2017) (CALLM, 2017).

The Mpumalanga SDF (2019) is composed of 3 phases namely:

- Phase 1 the Policy Context Report which highlights the Policy context that guides Spatial Planning and Spatial Context and develops a Draft Vision statement for the Province;
- Phase 2 the Spatial Challenges and Opportunities Report which consists of a biophysical analysis, a built environment analysis and a socio-economic analysis; and
- Phase 3 the Spatial Proposals Report which sets objectives in support to achieve the Draft Vision of the SDF.

According to the Mpumalanga SDF (2019), the proposed Kranspan mining right area falls within the area allocated for mining.

Mpumalanga SDF (2019) identifies a supporting ecological corridor present within the proposed Kranspan mining right area. This mostly relates to the Boesmanspruit River that flows just south of the Kranspan farm. The other supporting ecological corridor near Kranspan, located north of the mining right area is the Vaalwaterspruit, both these ecological corridors flows into the Nooitgedacht Dam.

It is understood that the R36 is scheduled for rehabilitation and upgrading under Phase 3. This may have an effect on the mine traffic as the R36 runs through the proposed Kranspan mining site.

The 2017 SDF for CALLM was obtained directly from the Chief Albert Luthuli Local Municipality. This SDF correlates and complements the newly published PSDF.

8.1.13.12 Integrated Development Plan

The GSDM IDP (2018/2019) identifies leading industries in terms of employment in the district as follows:

- Trade (18.8%);
- Community services (17.0%),
- Mining (14.5%) and
- Agriculture (13.9%).

The IDP notices a decrease in the role of agriculture and trade as employer and an increase in the role of community services and mining as employer.

The findings of the CALLM IDP (2018/2019) is summarised as follows:

- The 2018/19 IDP's strategic objectives:
  - Strategic Objective 1: Capitalise on the regional spatial development initiatives;
  - Strategic Objective 2: Focus development on development corridors and nodes;
  - Strategic Objective 3: Protect biodiversity and agricultural resources;
  - Strategic Objective 4: Economic development and job creation supporting and guiding the spatial development pattern of Mpumalanga;
  - Strategic Objective 5: Accommodating urbanisation within the province;
  - Strategic Objective 6: The integration of the historically disadvantaged communities into a functional nodal and settlement pattern;
  - Strategic Objective 7: Tenure upgrading;
  - Strategic Objective 8: Promote the development of rural areas that can support sustainable economic, social and engineering infrastructure);
  - Strategic Objective 9: Infrastructure Investment; and
  - Strategic Objective 10: Development of Metropolitan Areas
- Mining is the third largest job creating initiative in CALLM with 7.6% contribution to employment and 7.9% contribution to the economy.
- "The Management of Downscaling and Closure Programme provides for cases of retrenchments by the mine. This must, where possible, practicable and reasonable cover the skilling of people either in basic life skills, financial skills and SMME training."

- The mining sector is viewed as one of the main economic sectors which is key to spur the economic growth and employment in the Chief Albert Luthuli Municipality.
- In the municipality's SWOT analysis, mining is listed under strengths as an economic driver, as well as under threats as exploitation of labour by small scale mining.
- The challenges of mining in CALLM is the short lifespan of open cast coal mining operations as well as the management of mine waste and wastewater from mines in the Chief Albert Luthuli Local Municipality area.
- There is further no mention of mining being a threat for CALLM. The IDP states that the purpose of the SDF is to determine that there are no clashes of mine areas with areas allocated for other uses. The SDF showed that the Kranspan area clashes with no areas of importance.

8.1.13.13 Local Communities

A local community is situated on Portion 1 of the Farm Kranspan, within the mining right area. . A community survey was undertaken on the 27th of February 2019 to engage with the community as well as adjacent communities to the proposed mining right area, to establish the socio-economic dynamics of the community and record the concerns of the community in terms of the proposed mining project. In accordance with the requirements of Regulation 41(2)(e), the survey was also used to determine levels of literacy, and preferred language and communication methods.

From the survey, it was noted that the community consists of approximately 12 families, residing in approximately 50 informal structures.

It is understood that the community is in negotiations with Msobo Coal (Pty) Ltd. regarding the potential relocation of the community. This relocation is independent of the planned activities by Ilima and will thus proceed regardless of the outcome of the Ilima application for a mining right. Although the potential impacts of the proposed Ilima mining activities on this community have been assessed in the S&EIR Process, it is understood that the community is likely to be relocated before the proposed Ilima mining activities proceed.

8.2 DESCRIPTION OF THE CURRENT LAND USES

8.2.1 Existing Surface Land Uses

Existing land uses over the Kranspan Farm include the following:

- Cultivated fields, comprising of predominantly maize and soya;
- Farm roads and agricultural infrastructure including boreholes;
- Community on Portion 1;
- Cattle farming; and
- Farm steads.

Historically the area has been utilised for intensive commercial cultivation of annual crops and grazing of livestock with a significant amount of coal mining in close proximity (less than 5 km).

Parts of the land proposed for the mining operation and the beneficiation facilities is existing farmland that has been zoned as such and is already extensively transformed by these activities. There are no registered land claims applicable to the properties under consideration (Appendix 5).

8.2.2 Surrounding Land Uses

Surrounding land uses include the following:

- R36 Main Road to Carolina / Breyten;
- Community on RE of the Farm Witbank 209;
- Unnamed gravel road on the western boundary of the proposed mining rights area;
- Msobo Coal Mine;
- Jagtlust Colliery and the planned extension;
- Ezindongeni and Kromkrans primary schools;
- Rail tracks;
- Agriculture; and
- Farm steads.

8.3 DESCRIPTION OF SPECIFIC ENVIRONMENTAL FEATURES AND INFRASTRUCTURE ON THE SITE

8.3.1 SURFACE WATER FEATURES

There are several wetlands present within the proposed Mining Rights Application Area. The location of all the watercourses and the applicable buffers, namely 100 m for watercourses and 500 m for wetlands (pans), have been included in the environmental sensitivity plan. The Applicant has attempted to locate mining areas and supporting infrastructure in manner that avoids these areas. However, the planned site layout indicates that mining and infrastructure does overlap with some of the sensitive wetland habitat.

The potential impact of the proposed mining activities on the wetlands has been assessed and mitigation measures, including an offset mitigation plan, has been proposed.

8.3.2 PROTECTED AREAS

There are no protected areas within 5 km of the proposed mining right area. Appendix 3, Map 12 shows the proposed mining right area in relation to protected areas within a 5 km and 10 km radius of the boundary of the area.

The most significant protected area in proximity to the site is the Chrissiesmeer Protected Environment, situated approximately 9 km to the east of the proposed mining right area. The Chrissiesmeer Protected Environment comprises of over 320 pans on private land and includes the largest inland freshwater lake in South Africa.[16]

The Chrissiesmeer Protected Environment was established in 2014 by the Mpumalanga Tourism and Parks Agency as a protected environment in terms of the National Environmental Management: Protected Areas Act 57 of 2003. The Chrissiesmeer Protected Environment Landowners Association is the management authority of the protected area.

The Chrissiesmeer Protected Environment provides protection for the Chrissiesmeer Panveld, an Endangered ecosystem type listed in terms of the National Environmental Management: Biodiversity Act 10 of 2004.

It is not anticipated that the proposed mining development will have an impact on the Chrissiesmeer Protected Environment as the zone of impact, as determined by the various specialist studies[17] is assessed to be within 1 km to 2 km of the boundary of the proposed mining right area.

[16] Dws, 2014. Reserve Determination Studies for Selected Surface Water, Groundwater, Estuaries and Wetlands In The Usutu/Mhlatuze Water Management Area: Integrated Groundwater Wetland Water Resource Units

[17] Modelled mitigated impact extent indicated in the geohydrological and air quality studies

8.3.3 Critical Biodiversity Area and Ecological Support Area

All of the Natural Habitat (untransformed vegetation) within the project area falls within Critical Biodiversity Areas (CBAs) according to the Mpumalanga Biodiversity Sector Plan (MBSP) (Lötter et. al, 2014). Just over half of the untransformed grassland in the project area (736 ha) has been classified as CBA: Irreplaceable, while the pans, wetlands and other grassland have been classified as CBA: Optimal (Appendix 3, Map 9).

These are the most sensitive habitats in the project area and represent the areas where impacts on ecology would be most significant. Critical Biodiversity Areas are areas that are essential for meeting biodiversity targets for species, ecosystems or ecological processes.

8.4 ENVIRONMENTAL AND CURRENT LAND USE MAP

The following dominant current land use categories are recognised:

- Cultivated fields, comprising of predominantly maize and soya;
- Farm roads and agricultural infrastructure including boreholes;
- Community on Portion 1;
- Cattle farming; and
- Farm steads.

Historically the area has been utilised for intensive commercial cultivation of annual crops and grazing of livestock with a significant amount of coal mining in close proximity (less than 5 km).

Appendix 3, Map 10 shows the current land uses associated with the site and surrounding areas.

9 METHODOLOGY USED IN DETERMINING AND RANKING THE NATURE, SIGNIFICANCE, CONSEQUENCES, EXTENT, DURATION AND PROBABILITY OF POTENTIAL ENVIRONMENTAL IMPACTS AND RISKS

9.1 OVERVIEW

The impact assessment methodology comprised of a risk-based impact matrix in which the outcomes, impacts and residual risk of the project activities was determined as follows:

- Step 1: Identify and describe the impact in terms of its nature (negative or positive) and type (direct or indirect);
- Step 2: Assess the impact severity (including reversibility and the potential for irreplaceable loss of resources), impact duration and impact spatial scale (extent);
- Step 3: Assign an impact consequence rating;
- Step 4: Assess the impact probability;
- Step 5: Assign the impact significance rating;
- Step 6: Identify measures and controls by which the impact can be avoided, managed or mitigated; and
- Step: Repeat the impact assessment on the assumption that the mitigation measures are applied and assign the residual impact (post mitigation) significance rating.

The purpose of the impact assessment was not to identify every possible risk and impact which the proposed project activities may have on the receiving social environment. Rather, the assessment was focused on identifying and assessing the most material impacts, commensurate with the nature of the project activity and the characteristics of the receiving social environment.

All impacts were assessed in the following phases:

- Construction;
- Operation; and
- Decommissioning and Closure.

9.2 APPLICATION OF IMPACT RATING CRITERIA

The first phase of impact assessment is the identification of the various project activities which may impact upon the identified environmental categories.

The identification of significant project activities is supported by the identification of the various receiving environmental receptors and resources. These receptors and resources allow for an understanding of the impact pathways and assessment of the sensitivity of the receiving environment to change.

The significance of the impact is then assessed by rating each variable numerically, according to defined criteria as provided in Table 9-1. The purpose of the significance rating of the identified impacts is to develop a clear understanding of the influences and processes associated with each impact.

The severity, spatial scope and duration of the impact together comprise the consequence of the impact; and when summed can obtain a maximum value of 15. The frequency of the activity and the frequency of the impact together comprise the likelihood of the impact and can obtain a maximum value of 10.

The values for likelihood and consequence of the impact are then read from a significance rating matrix as shown in Table 9-1 and Table 9-2.

The model outcome of the impacts is then assessed in terms of impact certainty and consideration of available information. The Precautionary Principle is applied in instances of uncertainty or lack of information by increasing assigned ratings or adjusting final model outcomes. In certain instances, where a variable or outcome requires rational adjustment due to model limitations the model outcomes are adjusted. Arguments and descriptions for such adjustments, as well as arguments for each specific impact assessments are presented in the text and encapsulated in the assessment summary table linked to each impact discussion.

TABLE 9-1: CRITERIA FOR ASSESSING THE SIGNIFICANCE OF IMPACTS

Severity of impact	Rating	
Insignificant / non-harmful	1	
Small / potentially harmful	2	
Significant / slightly harmful	3	
Great / harmful	4	
Disastrous / extremely harmful	5	
Spatial scope of impact	**Rating**	
Activity specific	1	
Area specific	2	Consequence
Whole project site / local area	3	
Regional	4	
National/International	5	
Duration of impact	**Rating**	
One day to one month	1	
One month to one year	2	
One year to ten years	3	
Life of operation	4	
Post closure / permanent	5	
Frequency of activity / Duration of aspect	**Rating**	
Annually or less / low	1	
6 monthly / temporary	2	
Monthly / infrequent	3	
Weekly / life of operation / regularly / likely	4	
Daily / permanent / high	5	Likelihood
Frequency of impact	**Rating**	
Almost never / almost impossible	1	
Very seldom / highly unlikely	2	
Infrequent / unlikely / seldom	3	
Often / regularly / likely / possible	4	
Daily / highly likely / definitely	5	

***Activity**: a distinct process or task undertaken by an organisation for which a responsibility can be assigned.*

***Environmental aspect**: an element of an organisation's activities, products or services which can interact with the environment.*

***Environmental impacts**: consequences of these aspects on environmental resources or receptors.*

***Receptors**: comprise, but are not limited to people or man-made structures.*

***Resources**: include components of the biophysical environment.*

***Frequency of activity**: refers to how often the proposed activity will take place.*

***Frequency of impact**: refers to the frequency with which a stressor will impact on the receptor.*

***Severity**: refers to the degree of change to the receptor status in terms of the reversibility of the impact; sensitivity of receptor to stressor; duration of impact (increasing or decreasing with time); controversy potential and precedent setting; threat to environmental and health standards.*

***Spatial scope**: refers to the geographical scale of the impact.*

Duration: *refers to the length of time over which the stressor will cause a change in the resource or receptor.*

TABLE 9-2: SIGNIFICANCE RATING MATRIX

	CONSEQUENCE (SEVERITY + SPATIAL SCOPE + DURATION)														
LIKELIHOOD (FREQUENCY OF ACTIVITY + FREQUENCY OF IMPACT)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30
	3	6	9	12	15	18	21	24	27	30	33	36	39	42	45
	4	8	12	16	20	24	28	32	36	40	44	48	52	56	60
	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75
	6	12	18	24	30	36	42	48	54	60	66	72	78	84	90
	7	14	21	28	35	42	49	56	63	70	77	84	91	98	105
	8	16	24	32	40	48	56	64	72	80	88	96	104	112	120
	9	18	27	36	45	54	63	72	81	90	99	108	117	126	135
	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150

TABLE 9-3: POSITIVE/NEGATIVE MITIGATION RATINGS

COLOUR CODE	SIGNIFICANCE RATING	VALUE	NEGATIVE IMPACT MANAGEMENT RECOMMENDATION	POSITIVE IMPACT MANAGEMENT RECOMMENDATION
	Very High	126-150	Improve current management	Maintain current management
	High	101-125	Improve current management	Maintain current management
	Medium-High	76-100	Improve current management	Maintain current management
	Low-Medium	51-75	Maintain current management	Improve current management
	Low	26-50	Maintain current management	Improve current management
	Very Low	1-25	Maintain current management	Improve current management

10 THE POSITIVE AND NEGATIVE IMPACTS THAT THE PROPOSED ACTIVITY AND ALTERNATIVES WILL HAVE ON THE ENVIRONMENT AND THE COMMUNITY THAT MAY BE AFFECTED

The positive and negative impacts are presented in the stipulated format in Table 16-2. The complete impact assessment matrix is provided in Appendix 7.

11 THE POSSIBLE MITIGATION MEASURES THAT COULD BE APPLIED AND THE LEVEL OF RISK

The mitigation hierarchy has been applied throughout the S&EIR Process.

The mitigation hierarchy is a systematic approach to mitigation planning and can be summarised into the following steps:

- Avoidance;
- Minimisation;
- Restoration; and
- Offsets.

In the Scoping Phase, mitigation measures were predominantly focussed on avoidance and minimisation. This is done through activities such as the site layout selection process and implementation of the environmental design criteria including the environmental sensitivity plan, by the engineering team.

In the Impact Assessment Phase, the findings and recommendations of the specialist studies were used to refine the site layout selection and to develop the environmental and operational controls which are focused on impact minimisation and restoration (as part of mine rehabilitation and closure).

The mitigation measures are described in the EMPr (Part B of the EIR).

12 THE OUTCOME OF THE SITE SELECTION MATRIX AND FINAL SITE LAYOUT PLAN

The project site has been selected based on the presence of a mineable resource. The project plan and site layout has been based on limiting the project area footprint, avoiding sterilisation of the coal seam and avoiding sensitive areas where possible, from an environmental and social perspective, while still considering engineering feasibility and financial considerations.

The process followed in developing the final site layout plan is described in Section 6 of the EIR.

The changes from the initial site layout have resulted in a significant reduction in the extent to which mining and infrastructure overlap with sensitive areas. The final site layout does however include the proposed mining of habitat (wetland and natural grassland) identified to be highly sensitive by the specialists. The establishment of an offset, developed in accordance with best practice guidelines, has been proposed as a mitigation measure for the planned loss of these areas. This is further described in Section 21 and the EMPr.

13 MOTIVATION WHERE NO ALTERNATIVE SITES WERE CONSIDERED

The location of the mining and placement of associated infrastructure within the proposed mining right area is determined primarily by the location and extent of the coal seam which is being targeted and which has been defined through the prospecting activities. Refinement of the location of mining and infrastructure placement was undertaken in response to the environmental sensitivity plan developed through the S&EIR Process. The approach to the development and application of the environmental sensitivity plan is described in section 6.1.4.

14 STATEMENT MOTIVATING THE ALTERNATIVE DEVELOPMENT LOCATION WITHIN THE OVERALL SITE

The project site has been selected based on the presence of a mineable resource. The project plan and site layout has been based on limiting the project area footprint, avoiding sterilisation of resources and avoiding sensitive areas, where possible, from an environmental and social perspective, while still considering engineering feasibility and financial considerations.

15 FULL DESCRIPTION OF THE PROCESS UNDERTAKEN TO IDENTIFY, ASSESS AND RANK THE IMPACTS AND RISKS THE ACTIVITY WILL IMPOSE ON THE PREFERRED SITE (IN RESPECT OF THE FINAL SITE LAYOUT PLAN) THROUGH THE LIFE OF THE ACTIVITY

The impact assessment methodology is described in Section 9 of this report.

16 ASSESSMENT OF EACH IDENTIFIED POTENTIALLY SIGNIFICANT IMPACT AND RISK

The assessment is presented in the required format in Table 16-2. The complete impact assessment matrix is provided in Appendix 7. A summary description of the most significant impacts identified is provided below.

16.1 DIRECT LOSS OF ECOLOGICALLY SENSITIVE HABITAT

The direct loss of wetland and untransformed grassland habitat was assessed by the relevant specialists to be a high impact before mitigation with avoidance recommended as the primary mitigation measure. The high impact significance is due to the conservation value of these habitats and the CBA designation of some of these areas.

The terrestrial ecology study has classified approximately 1367 ha of the proposed mining area as comprising of high sensitive habitat. This includes habitat with a CBA designation identified in the MBSP as well as additional areas identified by the specialist as being of high ecological sensitivity.

Based on the final site layout, approximately 21 % (287 ha) of the total extent of high sensitive habitat is likely to be transformed through the development of the opencast pits and supporting mine infrastructure. These areas are summarised in Table 16-1 and shown in Map 17 in Appendix 3.

Similarly, the surface water ecosystems study has identified various wetland habitat across the mining right area. The wetlands have been prioritised based on their functional value. The revised mine plan avoids the majority of the high priority wetlands but there remains an area of approximately 57 ha of wetland habitat which overlaps with planned mining.

TABLE 16-1: MINE PLAN OVERLAP WITH ECOLOGICALLY SENSITIVE AREAS

PARAMETER	EXTENT OF OVERLAP WITH MINE PLAN	
	ORIGINAL CBA EXTENT AS PER MBSP	REVISED CBA EXTENT AS PER SPECIALIST STUDY
CBA IRREPLACEABLE (HA)	165.48	**152.61 (A)**
CBA OPTIMAL (HA)	111.96	**83.34 (B)**
ADDITIONAL HIGH SENSITIVE VEGETATION AS PER SPECIALIST STUDY (HA)	**50.94 (C)**	
WETLAND AREA (HA)	**57 (D)**	
TOTAL EXTENT OF MINE PLAN OVERLAP WITH HIGH SENSITIVE VEGETATION (HA)	**A + B + C +D = 343.89**	

The mitigation hierarchy was applied to this impact and this resulted in a revised mine plan which reduced the extent of the impact significantly (57%, 267 ha). Section 6.1.4 describes this process in detail.

The terrestrial ecology study has noted that these habitats cannot be restored after they have been transformed. The restoration step in the mitigation hierarchy is thus likely to have limited success. The remaining step in the mitigation hierarchy is thus the development of an offset plan as further mitigation.

The terrestrial ecology study has noted that while the areas that are classified as CBA: Optimal could potentially be mitigated by offsets. This would have to be the subject of a larger scale study on adjacent and nearby properties to identify potential options that would need to be adequately surveyed to determine whether they qualify as offsets or not. Areas classified as CBA: Irreplaceable cannot be mitigated through the Offset option and can only be sufficiently mitigated through Avoidance.

A large extent of the CBA areas to the immediate north-east and north-west of the proposed Kranspan mining right area have already been transformed by mining activities (Figure 16-1). There is thus a probability that the CBA areas within the proposed Kranspan mining right area may become further fragmented and isolated from surrounding similar habitat.

In accordance with the best practice guideline for wetland offset mitigation, consideration of the offset, has been recommended as a mitigation measure for the residual impact after the other steps in the mitigation hierarchy have been applied. A conceptual offset mitigation plan outlining the proposed approach to the offset, is provided in the surface water ecosystems report.

The development of the offset, where applicable and feasible, has been recommended as an aspect for inclusion in the conditions of the authorisation. Specifically, it is recommended that the affected areas of the mine plan be avoided until the offset has been developed and approved by relevant stakeholders.

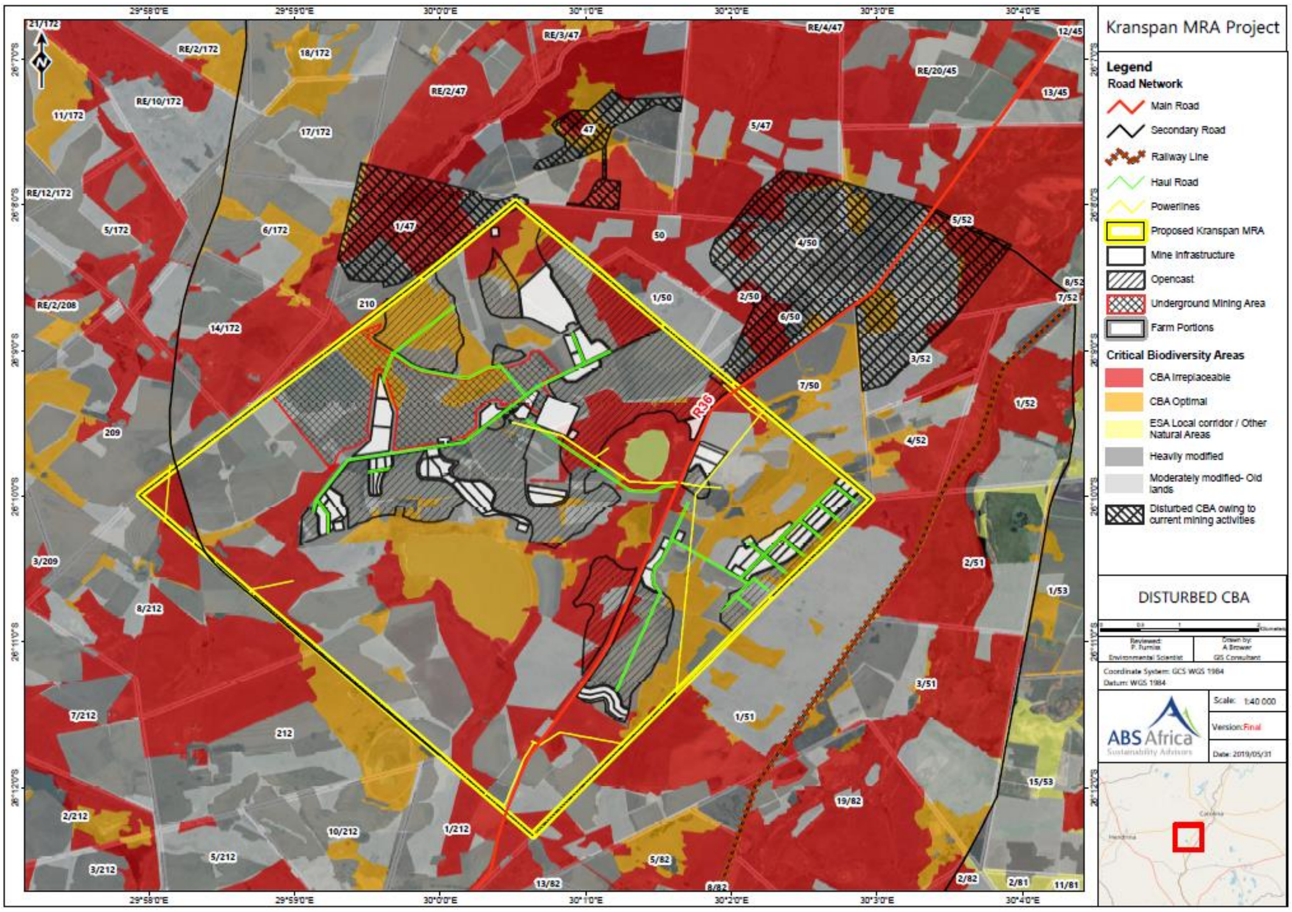


FIGURE 16-1: TRANSFORMED CBA AREAS ADJACENT TO THE PROPOSED KRANSPAN MINING RIGHT AREA

16.2 IMPACTS TO GROUNDWATER AND SURFACE WATER RESOURCES

The geohydrological study has indicated that the mining activities, including the associated disposal of discard, may have an impact on groundwater availability and groundwater quality.

Key findings from the study are as follows:

- Mining activities will have a negative impact on groundwater availability in private boreholes and springs within the proposed mining right area. The hydrocensus indicated that boreholes predicted to be affected directly (destroyed) or indirectly (dewatering) are not in use at present;
- To manage the expected groundwater seepage during the operational phase of mining, the study recommends that each of the 6 planned PCDs include provision for 8 400 m^3 per annum of groundwater;
- Regional groundwater levels are expected to recover within 30 to 50 years after mining and mine dewatering ceases. During the time of recovery, groundwater flow will be reversed towards the mining areas, thus restricting the movement of contaminated groundwater outside of the mining right area;
- Sulphate concentrations, due to the open pit mining, at the end of the operational phase may increase to above 100 mg/l at two of the borehole locations (not in use at present). It is however noted that at these concentrations, the groundwater will still be usable and should not pose any

health or aesthetic risks from a sulphate concentration perspective. Sulphate concentrations in the other boreholes in the zone of influence are not expected to exceed 100 mg/l;

- Contamination is not expected to move significant distances from the mining areas (approximately 300 m) due to the impact of mine dewatering and the reversal of groundwater flow towards the mining areas during the operational phase;
- The risk of decant from the underground workings is very low. Decant may occur from the rehabilitated open cast pits at 20 positions. Depending on several factors, the decant may occur between 6 and 39 years after mining ceases;
- The findings of the geochemical characterisation of the discard material, based on the static leach testwork, conclude that five of the six discard samples could be considered acid generating with a low acid neutralising capacity;
- The overburden material poses a lower environmental risk with only one out of twenty samples taken demonstrating significant acid generating potential;
- Depending on the quality of the decant and if the decant is not contained, the most significant impact of poor quality decant is likely to be on the wetlands and pans in the proposed mining right area;
- The impact to groundwater quality in the long-term (100 years after mining ceases) was modelled on various scenarios, including mining with no discard disposal facility, mining with in-pit discard disposal in all open cast pits, mining with an unlined surface discard facility and mining with a lined surface discard facility. In all scenarios, sulphate concentrations are predicted to increase at various receptors with the maximum predicted sulphate concentration of 1200 mg/l associated with the scenario where discard is disposed in all open cast pits; and
- In general, with mitigation measures implemented, the impacts to groundwater availability and groundwater quality are expected to be contained predominantly within the proposed mining right area.

The study notes that the groundwater impact assessment was based on a worst-case scenario, which is in line with the requirements of the precautionary principle. Key assumptions in this regard were as follows:

- The study assessed the impact of in-pit discard disposal in all the open cast pits. This was important to determine which of the pits would not be suitable for in-pit disposal. From the recommendations of the study, only Pit 5 is now proposed to be used for the in-pit disposal of discard. This is expected to reduce the impact on groundwater quality;
- In the absence of more specific data, it was assumed that sulphate concentrations of up to 3000 mg/l would leach from the discard material. The static leach testwork completed on the Kranspan discard samples indicated a sulphate concentration of 250 mg/l. Kinetic leach tests and geochemical modelling are currently underway, which will improve the understanding of long-term leachate quality associated with the discard material; and
- Oxidation of the discard material during the operational phase and post-closure of the operations was assumed. These results have been used by the Applicant to refine the in-pit disposal design such that the placement of the discard in-pit will not be above the water table, minimising the extent to which the material may oxidise.

Within the management measures section of the geohydrological study, it is concluded that with the implementation of additional management measures, such as restrictions being placed on the pit location and depth to which the discard can be backfilled, the rate and extent to which the discard could oxidise will be reduced. The resultant discard leachate could therefore be of better quality than what was used for the simulations in the groundwater impact assessment. If the leachate associated with the discard is of better quality, the resultant impact on groundwater quality will be reduced.

For this reason, the geohydrological study recommends that the groundwater quality impact assessment is revised once the results of the kinetic tests and geochemical modelling are available. This, and the mitigation measures associated with restricting the in-pit disposal of discard material have been included in the EMPr and recommended as conditions to be included in the authorisation.

TABLE 16-2: ASSESSMENT OF EACH IDENTIFIED POTENTIALLY SIGNIFICANT IMPACT AND RISK

ACTIVITY **whether listed or not listed.** (E.g. Excavations, blasting, stockpiles, discard dumps or dams, Loading, hauling and transport, Water supply dams and boreholes, accommodation, offices, ablution, stores, workshops, processing plant, storm water control, berms, roads, pipelines, power lines, conveyors, etc...etc...etc.)	**POTENTIAL IMPACT** (e.g. dust, noise, drainage surface disturbance, fly rock, surface water contamination, groundwater contamination, air pollution etc....etc...)	**ASPECTS AFFECTED**	**PHASE** In which impact is anticipated	**SIGNIFICANCE** if not mitigated	**MITIGATION TYPE**[18] (modify, remedy, control, or stop) through (e.g. noise control measures, storm-water control, dust control, rehabilitation, design measures, blasting controls, avoidance, relocation, alternative activity etc. etc) E.g. Modify through alternative method. Control through noise control Control through management and monitoring through rehabilitation	**SIGNIFICANCE** if mitigated
Summary of Socio-Economic Impacts and Risks						
All activities involving employment and procurement of goods and services	The development will create direct employment opportunities in the construction and operational phase respectively. Many more indirect employment opportunities will also be created. Implementation of the commitment to maximise	Socio-Economic Environment	All Phases	Medium-High '+'	Enhance through implementation of the SLP	High '+'

[18] Please refer to the EMPr for details of the mitigation measures

	local employment wherever practicable will increase the significance of this positive impact					
All activities involving employment and procurement of goods and services	Procurement of local goods and services by the mine, employees and contractors will stimulate local business and create opportunities for entrepreneurship. In addition, implementation of the seven agreed LED projects committed to in the SLP will have a significant positive impact for the broader community	Socio-Economic Environment	All Phases	Medium-High '+'	Enhance through implementation of the SLP	Medium-High '+'
All activities involving employment and procurement of goods and services	Implementation of the HRD programme, as described in the SLP is expected to result in skills transfer, career progression, re-skilling and improved levels of literacy in the community as a whole	Socio-Economic Environment	All Phases	Medium-High '+'	Enhance through implementation of the SLP	High '+'
All activities involving employment and procurement of goods and services	An influx of people seeking employment can be expected during the construction phase especially. This will place additional demand on municipal services in the proposed project area, such as public safety, health care, water, sanitation, and housing. The impact can be mitigated	Socio-Economic Environment	All Phases	Medium-High '-'	Control through planning.	Low-Medium '-'

	through cooperative planning with the local municipality.					
Loss of common property	Parts of the proposed mining area are currently used for commercial agriculture. During the operational phase, less agricultural product will be available from Kranspan. This impact is however likely to be temporary as the land may be returned to agriculture after rehabilitation has been completed. The loss of agricultural product from Kranspan, relative to the size of the local market, is also considered to be insignificant and the temporary impact is thus not deemed to be a risk to food security either locally or regionally		Construction, Operational	Medium-High '-'	Control through planning.	Low-Medium '-'
All mine-related activities	Minor, major and fatal injuries from potential mine health and safety incidents. There are multiple health and safety risks associated with surface and underground mining, ore processing and movement of man and materials. In addition, the mine will store and handle various hazardous substances including explosives. Implementation of a comprehensive health and	Socio-Economic Environment	All Phases	High '-'	Control through planning design and operational controls	Low - Medium '-'

	safety management programme and adherence to legislation governing mine health and safety requirements will mitigate this impact					
All mine-related activities	Increased levels of crime may be experienced in the area as a result of the influx of people seeking employment. Contact crimes may result in injuries and in severe cases, fatalities	Socio-Economic Environment	All Phases	Medium-High'-'	Control through planning, design and operational controls	Low - Medium '-'
All mine-related activities	The mining will generate royalties in accordance with the MPRDA, payable to the national government. Furthermore, the development of the site and connection to municipal services will result in the payment of rates and taxes to the Municipality.	Socio-Economic Environment	Construction and Operational	Low-Medium '+'	No mitigation identified	Low-Medium '+"
All mine-related activities	Minor, major and fatal injuries to community members from health and safety incidents like vehicle collisions, fire and other incidents. The pre-mitigation impact significance rating is High because of the potential human health and property damage consequences of a community safety incident, which may include loss of life. The post-	Socio-Economic Environment	All Phases	High '-'	Control through planning design and operational controls	Low '-'

	mitigation impact significance rating is Low due to the ability to prevent these impacts through adherence to the relevant legal requirements on mine health and safety and the mitigation measures in the EMPr					
All mine-related activities	Decommissioning and closure of the mine will have a negative impact on those employed, the families they support and the businesses which provide services to the mine. The impact of closure can be mitigated through the implementation of the measures in the SLP, including regular, consultative review of closure strategies and the portable skills / re-skilling programme	Socio-Economic Environment	Decommissioning and Closure	Medium-High'-'	Control through planning and implementation of the SLP. See detailed mitigation measures in Section 31.10 of this report	Low - Medium '-'
Summary of Groundwater Impacts and Risks						
Mine dewatering	Lowering of groundwater levels in private boreholes, thus affecting the performance of the boreholes that fall within the dewatering cone	Groundwater	Construction and Operational	Medium-High'-'	Monitor through groundwater monitoring programme Replace boreholes affected by dewatering	Low - Medium '-'
Underground and open cast mining	Contamination of groundwater in private boreholes, making the groundwater unfit for use	Groundwater	Operational	Medium-High'-'	Control through design and operational controls	Low - Medium '-'

					Monitor through groundwater monitoring programme	
Spread of contamination from the surface discard stockpile	Contamination of groundwater in private boreholes, making the groundwater unfit for use	Groundwater	Operational	Medium-High'-'	Control through design and operational controls Monitor through groundwater monitoring programme	Low - Medium '-'
Spread of contamination from the surface discard stockpile	Contamination of groundwater in private boreholes, making the groundwater unfit for use	Groundwater	Closure and Decommissioning	Medium-High'-'	Control through design and operational controls Monitor through groundwater monitoring programme	Low - Medium '-'
Summary of Air Quality Impacts and Risks[19]						
Elevated PM10 and PM2.5 Concentrations as a Result of mining Activities	Elevated PM10 and PM2.5 Concentrations	Air quality	Construction	Medium-High'-'	Control through design and operational controls	Low - Medium '-'
Dust Fall due to Mining and transportation	Elevated dust fall levels	Air quality	Construction	Low - Medium '-'	Control through design and operational controls	Low - Medium '-'
Summary of Terrestrial Ecology Impacts and Risks						
Clearing of Vegetation for Site Access, Infrastructure Siting and Mining of Open Pit	Loss of Natural Habitat of High or Medium-High Ecological Sensitivity	Terrestrial flora	Construction and Operational	High '-'	Avoid / minimise through design and operational controls	Medium-High'-'
Clearing of Vegetation for Site Access, Infrastructure Siting and Mining of Open Pit	Introduction/proliferation of alien invasive species	Terrestrial flora	Construction and Operational	High '-'	Avoid / minimise through design and operational controls	Low - Medium '-'

[19] Operational phase scenario 1, 2, 3 and 4 has the same impact rating value for PM10, PM2.5 and dust fall.

All staff activities that take place outdoors	Increased utilisation of plant and animal resources as a result of an influx of people into the study area	Terrestrial flora / fauna	Construction and Operational	Low - Medium '-'	Control through training and inductions	Low '-'
Clearing of Vegetation for Site Access, Infrastructure Siting and Mining of Open Pit	Disturbance/loss of threatened faunal habitat and associated Species of Conservation Concern	Terrestrial fauna	All phases	High '-'	Avoid / minimise through design and operational controls	Medium-High'-'
All staff activities that take place outdoors	Illegal utilisation of animal resources as a result of an influx of people into the study area	Terrestrial fauna	All phases	Low - Medium '-'	Avoid / minimise through design and operational controls Control through training and inductions	Low '-'
Summary of Surface Water Ecosystems Impacts and Risks						
All construction-phase activities	Destruction of wetland habitat during construction phase if buffer zones are not taken into consideration	Surface water ecosystems (non-perennial watercourses and wetlands/pans)	Construction	Medium-High'-'	Avoid / control through design and operational controls	Very Low '-'
Operational phase activities	Impact on wetland habitat integrity.	Surface water ecosystems (non-perennial watercourses and wetlands/pans)	Construction and Operational	High '-'	Avoid / control through design and operational controls	Low - Medium '-'
All site activities	Fragmentation of interconnected habitat	Surface water ecosystems (non-perennial watercourses and wetlands/pans)	All phases	Medium-High'-'	Avoid / control through design and operational controls	Very Low '-'
All site activities	Disturbances that induce invasion of exotic flora	Surface water ecosystems (non-perennial	All phases	Medium-High'-'	Avoid / control through design and operational controls	Very Low '-'

		watercourses and wetlands/pans)				
All construction phase and operations phase activities	Soil erosion will impact watercourses both locally as well as downstream within more established habitat.	Surface water ecosystems (non-perennial watercourses and wetlands/pans)	All phases	High '-'	Avoid / control through design and operational controls	Low - Medium '-'
All site activities	Contamination of surface water will impact integrity of all surface water resources.	Surface water ecosystems (non-perennial watercourses and wetlands/pans)	All phases	High '-'	Avoid / control through design and operational controls	Low - Medium '-'
Summary of Soils and Land Use Impacts and Risks						
All construction phase activities	Loss of Soil Utilisation - removal from system	Soils	Construction	High '-'	Avoid / minimise through design and operational controls	Low - Medium '-'
All construction and operational phase activities	Loss of Soil Utilisation - Erosion and Compaction	Soils	All phases	Low - Medium '-'	Avoid / minimise through design and operational controls	Low - Medium '-'
All construction phase activities	Loss of Soil Utilisation - Product and Hydrocarbon Spills	Soils	Construction	Medium-High '-'	Avoid / minimise through design and operational controls	Low - Medium '-'
Ineffective Housekeeping and Management of Stockpiles and Exposed Soils Open cast Mining	Loss of Soil Utilisation	Land Capability / Land Use	Operational	High '-'	Avoid / minimise through design and operational controls	Low - Medium '-'
Ineffective Housekeeping and Management of Stockpiles and Exposed Soils	Contamination due to Product and Hydrocarbon Spills	Land Capability / Land Use	Operational	Medium-High '-'	Avoid / minimise through design and operational controls	Low '-'

Ineffective Housekeeping and Management of Stockpiles and Exposed Soils	Loss of soil Utilisation due to Infrastructure - Dumps, stockpiles etc.	Land Capability / Land Use	Operational	High '-'	Avoid / minimise through design and operational controls	Low - Medium '-'
Continued Activities including Mining and Transportation	Erosion and Compaction - wind, water and vehicle movement	Land Capability / Land Use	Decommissioning & Closure	Medium-High '-'	Avoid / minimise through design and operational controls	Low - Medium '-'
Continued Activities including Concurrent Rehabilitation and Closure	Loss of soil Nutrient Pool	Land Capability / Land Use	Decommissioning & Closure	Medium-High '-'	Avoid / minimise through design and operational controls	Low - Medium '-'
Continued Activities including Concurrent Rehabilitation and Closure	Compaction from vehicle movement during material replacement	Land Capability / Land Use	Decommissioning & Closure	Medium-High '-'	Avoid / minimise through design and operational controls	Low - Medium '-'
Continued Activities including Concurrent Rehabilitation and Closure	Contamination by dirty water and hydrocarbon spills	Land Capability / Land Use	Decommissioning & Closure	Low - Medium '-'	Avoid / minimise through design and operational controls	Low '-'
Continued Activities including Concurrent Rehabilitation and Closure	Reduction in area of impact and return of soil utilisation potential	Land Capability / Land Use	Decommissioning & Closure	Low '+'	Avoid / minimise through design and operational controls	Low - Medium '+'
Summary of Noise Impacts and Risks						
Blasting, mining operations, construction of surface infrastructure,	Elevated Noise Levels	Noise	All phases	Medium-High '-'	Avoid / minimise through design and operational controls	Low - Medium '-'

haulage and decommissioning						
Summary of Traffic and Road Safety Impacts and Risks						
Movement of Man and Materials	Heavy vehicles may cause damage to the road surface	Traffic and Road Safety	Construction and Operational	High'-'	Avoid / minimise through planning, design and operational controls Limiting the number of heavy vehicles and heavy vehicle weight Road maintenance plan needs to be prepared in conjunction with the relevant road authority	Medium-High'-'
Movement of Man and Materials	Vehicles may reduce road safety due to reduced speed of the heavy vehicles entering fast flowing traffic	Traffic and Road Safety	Construction and Operational	Medium-High'-'	Avoid / minimise through design and operational controls Acceleration lanes will neutralise the impact of heavy vehicles	Low '-'
Movement of Man and Materials	Loading and offloading of workers along roads at the mine access intersection may reduce road safety	and Road Safety	Construction and Operational	Medium-High'-'	Avoid / minimise through design and operational controls	Low '-'
Summary of Blasting Impacts and Risks						
Blasting	Blast-induced ground vibration damage to buildings closer than 1000 m from blasting	Structural damage	Operational	Medium-High'-'	Avoid / minimise through design and operational controls	Low - Medium '-'
Blasting	Blast-induced ground vibration damage to buildings	Structural damage / loss of access to a water resource	Operational	Medium-High'-'	Avoid / minimise through design and operational controls	Low - Medium '-'

	closer than 500 m from blasting					
Blasting	Blast Induced Damage to Wells	Structural damage / health and safety	Operational	Low '-'	Avoid / minimise through design and operational controls	Low '-'
Blasting	Damage to structures or injury to people closer than 1000 m from fly rock	Structural damage / health and safety	Operational	Medium-High'-'	Avoid / minimise through design and operational controls	Low '-'
Blasting	Damage to structures or complaints from neighbours caused by high air blast	Structural damage / health and safety	Operational	High '-'	Avoid / minimise through design and operational controls	Low '-'
Blasting	Water Pollution from Dissolved Nitrates	Ground and surface water quality	Operational	High '-'	Avoid / minimise through design and operational controls	Very Low '-'
Blasting	Dust and fumes generated by blasting affecting health and wellbeing of surrounding neighbours	Health and safety	Operational	Medium-High'-'	Avoid / minimise through design and operational controls	Low '-'
Blasting	Damage to ruins, graves and heritage sites caused by vibration and fly rock	Structural damage	Operational	Medium-High'-'	Avoid / minimise through design and operational controls	Low '-'
Summary of Heritage Impacts and Risks						
Construction & Operation (Clearing, Mining, Stockpiling, Transportation)	Disturbance/Loss of Significant Archaeological or Cultural Heritage Sites/Remains	Archaeology, palaeontology, and cultural heritage	All phases	Low - Medium '-'	Maintain / monitor through implementation of chance-find procedure	Low '-'
Summary of Palaeontological Impacts and Risks						

Construction & Operation (Clearing, Mining, Stockpiling, Transportation)	Disturbance/Loss of highly scientifically significant plant macrofossil assemblages of the Glossopteris flora	Archaeology, palaeontology, and cultural heritage	All phases	High '-'		Low - Medium '-'
Summary of Impacts to Geology						
Clearing of Areas for Site Access, Infrastructure Siting, Mining of Open Pits	Sterilisation of mineral resources	Geology and Mineral Resources	All phases	Medium-High'-'	Avoid / minimise through design and operational controls	Low '-'
Summary of Impacts to Topography						
Clearing of Areas for Site Access, Infrastructure Siting, Mining of Open Pits	Permanent, localised change in topography due to the development of the open pits and mine residue deposits	Geology and Mineral Resources	All phases	Low - Medium '-'	Avoid / minimise through design and operational controls	Low '-'
Spontaneous Combustion						
Surface and underground mining	Damage to infrastructure, sterilisation of resources, and possible impacts to employee health and safety	Health and Safety	Operational Phase	Medium-High'-'	Avoid / minimise through design and operational controls	Low '-'

17 SUMMARY OF SPECIALIST REPORTS

Several specialist studies were undertaken to inform the impact assessment. A summary of the description of the baseline environment form these studies has been integrated into Section 8 of the EIR. The findings of the impact assessment and key recommendations from the studies are summarised in Table 16 1.

The complete specialist reports are provided in Appendix 8.

TABLE 17-1: SUMMARY OF SPECIALIST REPORTS

LIST OF STUDIES UNDERTAKEN	RECOMMENDATIONS OF SPECIALIST REPORTS	SPECIALIST RECOMMENDATIONS THAT HAVE BEEN INCLUDED IN THE EIA REPORT (MARK WITH AN X WHERE APPLICABLE)	REFERENCE TO APPLICABLE SECTION OF REPORT WHERE SPECIALIST RECOMMENDATIONS HAVE BEEN INCLUDED.
Heritage and palaeontology	The historic structures (KP 9, 12, 17, 21 and 22) should be assessed by a conservation architect if they are to be impacted on by the development who will make suitable recommendations for mitigation, after which a destruction permit can be applied for from the relevant heritage authority. The cemeteries located in the pit area (KP 4,5,7 and 18) will be directly impacted on. It is recommended that these cemeteries are preserved in situ, fenced with an access gate for family members, with a 50-meter buffer zone. If this is not possible the cemeteries can be relocated adhering to all legal requirements. The total number of graves should be confirmed prior to development. Numbers indicated in the specialist report is an estimate. The cemeteries KP 14 and 16 could be indirectly impacted by the development and it is therefore recommended that the cemeteries are preserved in situ, fenced with an access gate for family members, with a feasible buffer zone. It is recommended that before construction starts, it should be confirmed whether the identified stone cairns represent graves (KP 8 and 20 are located within the impact area).	X	Section 6 Section 8 Section 18 Section 19 Section 20 Section 21 Part B-EMPr

	Through the social consultation process the existence of unknown and unmarked graves must be confirmed. Implementation of a heritage site development plan to ensure the protection of heritage resources within the mining area. Implementation of a chance find procedure In terms of the palaeontological heritage the following recommendations apply: When the surface infrastructure elements of the mine are being constructed these locations must be regularly inspected to observe if the excavations have encountered bedrock of the Vryheid Formation. These regular inspections should be made by a suitable mine employee (such as the environmental officer) who has been trained to identify the types of fossils that may reasonably be expected to occur within the Vryheid Formation. Should fossil materials be identified, the excavations must be halted in that area and SAHRA informed of the discovery an experienced Karoo palaeontologist should be contacted by the mine to assess the significance of the fossils. If fossil materials prove to be scientifically significant the palaeontologist should make recommendations that they should be either be protected completely in situ or could have damage mitigation procedures emplaced (i.e., excavation by a suitability by a suitably experienced palaeontologist) to minimise negative impacts. Once excavation of the opencast pit voids begins: On-site checks for the occurrence of any fossils of the excavated pits and stockpiled material should be conducted biannually (i.e., every six months).		

	The frequency of these checks should be reassessed after twelve (12) months based on the findings. The Karoo palaeobotanist should submit a monitoring report to SAHRA on this work. In addition, should any fossil materials be identified, the palaeontologist should ascertain their scientific and cultural importance. Should the fossil prove scientifically or culturally significant the particular excavations involved should be halted and SAHRA informed of the discovery. Should scientifically or culturally significant fossil material exist within the project areas any negative impact upon it could be mitigated by its excavation (under permit from SAHRA) by a palaeontologist and the resultant material being lodged with an appropriately permitted institution. In the event that an excavation is impossible or inappropriate the fossil or fossil locality could be protected, and the site of any planned construction moved When the underground mining component of the mining program commences no damage mitigation protocols are recommended. The coals comprising Seam E are the product of a complex series of jellification and other coalification processes that transformed the original vegetation (peat) into coal. Recognisable plant macrofossil materials are not expected to be present within the coals. Such plant macrofossil materials may be present within any siliciclastic partings within the seam. However, the automatic mining machinery will destroy any such fossils before they can be recognised these as being present. Should scientifically or culturally significant fossil material exist within the project area any negative impact upon it could be mitigated by its excavation (under permit from SAHRA) by a palaeontologist and the resultant material being lodged with an		

	appropriately permitted institution. In the event that an excavation is impossible or inappropriate the fossil or fossil locality could be protected, and the site of any planned construction moved		
Surface Water	The findings of the specialist report can be summarised as follows: • The study area is located in the X11B quaternary sub-catchment of the Komati River Drainage Basin; • The Boesmanspruit is the major stream flowing past the study area with effective 2catchment areas of 597 km; • The study area has a Mean Annual Precipitation (MAP) of 698 mm3; • The Nett Mean Annual Runoff (MAR) of the Boesmanspruit is 26.2 mil m3; • The study area contributes 1.05 mil m3 or 4.0% of the nett mean annual runoff of the Boesman Spruit • The Base / Normal Flow of the Boesmanspruit is 0.1 m3 /s; • The study area contribute 0.0044 m /s or 4.0% of the base flow for the Boesman Spruit • The drainage density of the study area was calculated at 0.38 km/km2; • The recommended 100 year flood levels of the three pans are as follows: ○ "S1" = 1 654.90 masl ○ "S2" = 1 654.66 masl ○ "S3" = 1 651.80 masl	X	Section 6 Section 8 Section 18 Section 19 Section 20 Section 21 Part B-EMPr
Terrestrial Ecology Flora	**Disturbance or loss of an Endangered vegetation type and listed Threatened Ecosystem as well as associated populations of Species of Conservation Concern**	X	Section 6 Section 8 Section 18

	The only viable option within the Mitigation Hierarchy (Avoid / Minimize / Restore / Offset) is Avoid. Applying the Minimize option would be in conflict with the MBSP, which considers open-cast mining to be an unacceptable land use activity in CBAs; thus, any open-cast areas mining within Untransformed Grassland or Unchannelled Valley-bottom Wetlands and Seeps would be an unacceptable and inconsistent with the MBSP. option. It is highly unlikely that any Untransformed Grassland or Unchannelled Valley-bottom Wetlands and Seeps could be restored to pre-construction ecological state, even with extensive human intervention, invalidating the Restore option. The only way the Offset option would be viable is if adjacent or nearby relevant habitat with the relevant SCC is available for purchase for formal conservation. Since this investigation is beyond the scope of this study, the Offset option was not considered.. Avoidance is thus the only viable mitigation option as follows: • Design Open-cast areas to exclude the areas of Untransformed Grassland in the northern quarter of the project area and to avoid all Unchannelled Valley-bottom Wetlands and Seeps, particularly those where African Marsh Harrier (EN) and African Grass Owl (VU) have been confirmed to occur. • Relocate Overburden facilities and Haul Roads to avoid all High or Med-High ES vegetation communities. • Minimum vegetation clearance should be ensured by clearing only those areas that are utilised for infrastructure construction, mining areas and entries and waste dumping activities. A “permit to clear” procedure should be established in order to control and monitor vegetation clearance. Where it is possible and permissible to relocate		Section 19 Section 20 Section 21 Part B-EMPr

	protected plant species, permits should be applied for from the relevant authority and the "permit to clear" procedure should also apply. • Close monitoring of all movements of equipment, site personnel and workers should be carried out so as to minimize unauthorised activities in any part of the project area. • Avoid the two alternative washing plant sites and modify the design of the preferred site to avoid small areas of wetland and grassland that the current **Introduction/proliferation of alien invasive species** • An Invasive Alien Plant management plan will need to be established as part of the mine's Environmental Management Programme (EMPR). The objective of this plan should be the continuous eradication of existing invasive populations and the detection of new populations, particularly in newly or constantly disturbed areas such as roadsides. • A small team of labourers should be trained in the identification of the key invasive alien plant species, as well as the safe and effective use of relevant herbicides on these species. • The team should be equipped with adequate equipment such as knapsack sprayers, which should be stored in a safe location with the herbicides. • Accurate and auditable records should be kept of areas cleared of invasive aliens and the success of follow-up operations, so that the program can be audited as part of the overall EMP audit. **Illegal utilisation of flora resources**		

	• Contractor staff should be accommodated off-site, reducing the risk of illegal harvesting taking place after hours. • Labour supervisors and SHE officials should monitor the activities of labourers when working away from infrastructure in natural habitat. • Part of staff induction should be awareness of the consequences of being caught harvesting plant resources.		
Terrestrial Ecology Fauna	**Disturbance/loss of threatened faunal habitat and associated Species of Conservation Concern** Avoidance is the only viable mitigation option as follows: • Design Open-cast areas to exclude the areas of Untransformed Grassland in the northern quarter of the project area and to avoid all Unchannelled Valley-bottom Wetlands and Seeps, particularly those where African Marsh Harrier (EN) and African Grass Owl (VU) have been confirmed to occur. • Relocate Overburden facilities and Haul Roads to avoid all High or Med-High ES vegetation communities. • Minimum vegetation clearance should be ensured by clearing only those areas that are utilised for infrastructure construction, mining areas and entries and waste dumping activities. A "permit to clear" procedure should be established in order to control and monitor vegetation clearance. • Close monitoring of all movements of equipment, site personnel and workers should be carried out so as to minimize unauthorised activities in any part of the project area.	X	Section 6 Section 8 Section 18 Section 19 Section 20 Section 21 Part B-EMPr

	Illegal utilisation of faunal resources • Contractor staff should be accommodated off-site, reducing the risk of illegal harvesting taking place after hours. • Labour supervisors and SHE officials should monitor the activities of labourers when working away from infrastructure in natural habitat. • Part of staff induction should be awareness of the consequences of being caught harvesting faunal resources		
Blasting	• There will be a negative impact from blast induced ground vibration in four cases (R36 road a nearby community and two farm dwellings all within the boundaries of the operation). This can be achieved through timing designs and initiation systems that ensure only one hole fires per instant in time during a blast. • Air blast and fly rock present the highest significance ratings and will need to be controlled by applying blast designs with stemming lengths that will effectively curb fly rock including controlled stemming application of the holes. Atmospheric conditions have a major impact on amplifying air vibration in certain directions, but if effective stemming is applied and presplits are timed with short delays between each hole, air vibration will be low, and amplification will be insignificant. • The temporary removal of people and stopping of road/rail traffic will be necessary to a safe distance of a minimum of 1000 m from planned blasting activities at blasting time. • A few heritage sites (ruins and one grave) exist within the opencast mining area. These present a challenge that will require specialist involvement in the blast designs and	X	Section 6 Section 8 Section 18 Section 19 Section 20 Section 21 Part B-EMPr

	mining sequences when mining approaches closer than 150 m to these sites.		
Soils	The following requirements (all be they generic) should be adhered to wherever possible: • Over areas of open cast pits or openings of a boxcut workings strip all usable soil as defined (500mm). Stockpile alluvial soils should be stockpiled separately from the colluvial (shallower) materials, which in turn should be stored separately from the overburden. • At rehabilitation replace soil to appropriate soil depths, and cover areas to achieve an appropriate topographic aspect and attitude to achieve a free draining landscape and as close as possible the pre-mining land capability rating. • Over area of structures (offices, workshops, haul roads) and soft overburden stockpiles strip the top 300 mm of usable soil over all affected areas including terraces and strip remaining usable soil where founding conditions require further soil removal. Store the soil in stockpiles of not more than 1.5 m around infrastructure area for closure rehabilitation purposes. Stockpile hydromorphic soils separately from the dry materials. For rehabilitation strip all gravel and other material places to form terraces and recycle as construction material or place in open pit. Remove foundations to a maximum depth of 1m. Replace soil to appropriate soil depths, and over areas and in appropriate topographic position to achieve pre-mining land capability and land form. • Over area of construction of by-product/tailings/slurry storage facilities and hard overburden stockpiles strip usable soil to a depth of 750 mm in areas of arable soils and between 300mm and 500mm in areas of soils with grazing	X	Section 6 Section 8 Section 18 Section 19 Section 20 Section 21 Part B-EMPr

	land capability. Stockpile hydromorphic soils separately from the dry and friable materials. For rehabilitation strip all gravel and other material places to form terraces and recycle as construction material or place in open pit. Remove foundations to a maximum depth of 1m. Replace soil to appropriate soil depths, and over areas and in appropriate topographic position to achieve pre-mining land capability. • Over area of access roads, lay-down pads and conveyor servitudes strip the top 150 mm of usable soil over all affected areas and stockpile in longitudinal stockpile within the mining lease area. • In general, the depth of the topsoil's material for the site is between 300mm and 450mm. However, due to the shallow soil depths on the more rocky slopes, and the need to rehabilitate these areas with sufficient materials to induce growth at closure, it is recommended that a minimum of 500mm is stripped from the mining and associated infrastructure areas (Sites with impacts to below the B2/1 level, or foundations that extend into the saprolitic zone (weathered rock)), and 300mm from all roads (Access and Haulage Ways) and founding pads for the soil stockpiles and all dump footprints. • The positioning of any/all storage facilities will need to be assessed on the basis of the cost of double handling, distances to the point of rehabilitation need, and the potential for use of the materials as storm water management facilities (berms). Suggestions include the use of materials in positions upslope of the mining infrastructure and open cast mining facilities as clean water diversion berms, and/or as stockpiles close to, but outside		

	of the final voids that are to be created by the mining operations. • Soils removed from area that require deep foundations, lay-down pads for by-product facilities and the processing facility, dam footprints, all access roads and haulage ways and their associated support infrastructure must be stockpiled as close as possible to the facilities as is possible without the topsoil's becoming contaminated or impacted by the operations. • The vegetated soils should be stripped and stockpiled without the vegetation having been cleared/stripped off wherever practical, while any grassland/natural veld that have been disturbed should be fertilized with super phosphate prior to being stripped (wherever practical). • This will ensure that the fertilizer is well mixed into the soil during the stripping operation and will aid in the quick cover to the stockpiles and reduce the amount of fertilizer required during the rehabilitation program. All utilization of the land for any other purpose will need to stop before mining begins. • The lower portions of the subsoil's (>500mm) and the soft overburden material (where removed) can be stored as separate stockpiles close to the areas where they will be required for backfilling and final rehabilitation. • The base to all of the proposed structures to be constructed should be founded on stabilized materials, the soils having been stripped to below the topsoil contact (200mm to 300mm) and or to 500mm as the depth of utilisable soil. • It is proposed that prior to soil stripping, an appropriate (to be determined by local experts) fertilizer (super phosphate) should be added to the sandy loams and silty clay loams at		

	a rate of about 200 kg/ha if they have not previously been fertilized. This will help to enhance the seed pool and encourage growth within the stored materials. • The stripping and handling of these sensitive materials during the construction phase or while opening up of the open cast mining sections is highlighted, because the correct removal, storage and reinstatement of the materials will have a significant effect on the costs and the final success or failure of the rehabilitation plan at closure. • Of importance to the success and long term sustainability of rehabilitating these sensitive environments will be the replacement of the materials in their correct topographic position, and the ability of the rehabilitation team to re-create a layer within the final profile that will inhibit vertical infiltration of water. • Long term and forward planning for the utilization of the materials to their best advantage and the understanding of the final "End Land Use" will need to be well understood if the optimum utilization of the materials is to be achieved. Please refer to the recommendations of materials replacement under the decommissioning and closure plan section. • The consequences of not achieving these goals will need to be assessed and quantified in terms of the long term ecological impacts, and will require the input of the specialist ecologists, hydrogeologists and engineers in formulating the management plan. • It is proposed that the construction of any berms needed and soil storage stockpiles are undertaken in a series of 1,5m lifts if the storage facilities are to be greater than 1,5m high. For soils that are to be stored for any length of time (greater than three years) it is recommended that all		

	utilisable soil should be stockpiled, while the heavier subsoil's and calcrete materials should be stored as separate stockpiles. Storing the soil in this manner will maximize the beneficial properties of each material, and render them available for use at closure in the best position. Separation of these layers at the time of utilizing these soils is a matter for management, as the mixing and dilution of the soil properties is not recommended. • The utilisable soil stockpiled must be adequately vegetated as soon after emplacement on the storage pads as possible and maintained throughout the life of mining. • It is imperative, where possible, that the slopes of the stockpile berm facility are constructed to 1:6 or shallower. This will minimize the chances of erosion of the soils and will enhance the growth of vegetation. However, prior to the establishment of vegetation, it is recommended that erosion control measures, such as the planting of Vetiver Grass hedges, or the construction of benches and cut-off drains be included in the stockpile/berm design. • These actions will limit the potential for uncontrolled run-off and the subsequent erosion of the unconsolidated soils, while the vegetation is establishing itself, and throughout the life of the mining operation. • Vetiver is a recognised and certified natural grass specie in South Africa, and after many years of trials and testing has been given a positive record of decision as a non-invasive material that can be used as a hedging grass in the development of erosion control. The advantages to the use of Vetiver Grass, is documented in the attached brochure (Refer Appendix 2 - The Vetiver Network International - www.vetiver.org).		

	• Erosion and compaction of the disturbed soils and the management of the stored or stockpiled materials are the main issues that will need to be managed on these sensitive soil forms. This is due to the sensitivity of the soils to mechanical disturbances during/after the removal of surface vegetation and the difficulties in replacing the disturbed materials. • Working with or on the differing soil materials (all of which occur within the areas that are to be disturbed) will require better than average management and careful planning if rehabilitation is to be successful. Care in removal and stockpiling or storage of the "Utilisable" soils, and protection of materials which are derived from the "hardpan ferricrete" layer is imperative to the success of sustainable rehabilitation in these areas.		
Environmental Noise	In the quantification of noise emissions and simulation of noise levels as a result of the proposed project, it was calculated that ambient noise evaluation criteria for human receptors will be exceeded at KN 1, KN 2, KN 3 and KN5. 'Very strong' reaction may be expected from KN 2 and KN 3 (during the day and night) and a little' to 'medium' reaction with 'sporadic' to 'widespread' complaints reaction may be expected at KN 5 (during the day and night). **Engineering and Operational Practices** For general activities, the following good engineering practice should be applied to all project phases: ➲ Equipment with lower sound power levels must be selected. Vendors should be required to guarantee optimised equipment design noise levels.	X	Section 6 Section 8 Section 18 Section 19 Section 20 Section 21 Part B-EMPr

	➲ Where possible, other non-routine noisy activities such as construction, decommissioning, start-up and maintenance, should be limited to day-time hours. ➲ A noise complaints register must be kept. **Specifications and Equipment Design** As the site or activity is in close proximity to NSRs, equipment and methods to be employed should be reviewed to ensure the quietest available technology is used. Equipment with lower sound power levels must be selected in such instances and vendors/contractors should be required to guarantee optimised equipment design noise levels. **Enclosures** As far as is practically possible, source of significant noise should be enclosed. The extent of enclosure will depend on the nature of the machine and their ventilation requirements. Motors are examples of such equipment. It should be noted that the effectiveness of partial enclosures and screens can be reduced if used incorrectly. **Use and Siting of Equipment and Noise Sources** Plant and equipment should be sited as far away from NSRs as possible. Also: a) Machines used intermittently should be shut down between work periods or throttled down to a minimum and not left running unnecessarily. This will reduce noise and conserve energy.		

	b) Plants or equipment from which noise generated is known to be particularly directional, should be orientated so that the noise is directed away from NSRs. c) Acoustic covers of engines should be kept closed when in use. d) Construction materials such as beams should be lowered and not dropped. **Maintenance** Regular and effective maintenance of equipment are essential to noise control. Increases in equipment noise are often indicative of eminent mechanical failure. Also, sound reducing equipment/materials can lose effectiveness before failure and can be identified by visual inspection. Noise generated by friction in conveyor rollers, trolley etc. can be reduced by sufficient lubrication. **Controlling the Spread of Noise** Naturally, if noise activities can be minimised or avoided, the amount of noise reaching NSRs will be reduced. Alternatively, the distance between source and receiver must be increased, or noise reduction screens, barriers, or berms must be installed. **Distance** To increase the distance between source and receiver is often the most effective method of controlling noise since, for a typical point source at ground level, a 6-dB decrease can be achieved with every doubling in distance. It is however conceded that it might not always be possible.		

	Screening If noise control at the source and the use of distance between source and receiver is not possible, screening methods must be considered. The effectiveness of a noise barrier is dependent on its length, effective height, and position relative to the source and receiver as well as material of construction. To optimize the effect of screening, screens should be located close to either the source of the noise, or the receiver. The careful placement of barriers such as screens or berms can significantly reduce noise impacts but may result in additional visual impacts. Although vegetation such as shrubs or trees may improve the visual impact of construction sites, it will not significantly reduce noise impacts and should not be considered as a control measure. Earth berms can be built to provide screening for large scale earth moving operations and can be landscaped to become permanent features once construction is completed. Care should be taken when constructing earth berms since it may become a significant source of dust. From a noise perspective, the project may proceed provided that mitigation measures be implemented to ensure minimal impacts on the surrounding environment.		
Air Quality	The impacts due to the proposed Project were assessed with respect to location of the opencast areas relative to the closest receptors. Two options were assessed for the disposal of discard	X	Section 6 Section 8 Section 18 Section 19

	from the beneficiation plant, namely disposal via surface discard stockpile or via backfilling. No significant differences were found with respect to the options for discard disposal. However, the proposed Project operations are projected to result in exceedances at the closest receptors (AQSRs #1, #5, #13 and #14, viz. informal housing located on-site, a nearby school and two farmsteads – the latter located within the project site boundary) even with design mitigation measures in place (water suppression on roads, dust suppression fitted on drill rigs, roofing and one side covering of the overland conveyor, and water sprays at materials handling points and crushers). It is recommended that the two on-site farmsteads not be used for residential purposes at the time of commencement of Kranspan mining operations. It is also recommended that continuous PM10 and PM2.5 monitoring be conducted at the school and informal community from Year 3 onwards, to start an investigation into the impacts on these receptors well before nearby opencast mining occurs from Year 5 through Year 12. Should exceedances of the daily PM10 and/or PM2.5 NAAQS occur, the relocation of the school and/or informal community must be considered. The proposed Project operations should not result in significant ground level concentrations or dustfall levels at the nearby receptors provided the design mitigation measures are applied effectively. From an air quality perspective, the proposed project		Section 20 Section 21 Part B-EMPr

	can be authorised permitted the recommended mitigation and monitoring measures are applied. **<u>Recommendations</u>** A summary of the recommendations and management measures is given below: ➲ Construction and closure phases: ➢ Air quality impacts during construction would be reduced through basic control measures such as limiting the speed of haul trucks; limit unnecessary travelling of vehicles on untreated roads; and to apply water sprays on regularly travelled, unpaved sections. ➢ When haul trucks need to use public roads, the vehicles need to be cleaned of all mud and the material transported must be covered to minimise windblown dust. ➢ The access road to the Project also needs to be kept clean to minimise carry-through of mud on to public roads. ➲ Operational phases: ➢ In controlling dust due to drilling operations, dust suppression must be fitted on drill rigs to achieve an emission reduction efficiency of 97%. ➢ For the control of vehicle entrained dust it is recommended that water (at an application rate >2 litre/m2/hour), be applied. Literature reports an emissions reduction efficiency of 75%.		

	- In controlling dust from crushing and screening operations, it is recommended that water sprays be applied to keep the ore wet, to achieve a control efficiency of up to 50%. - Mitigation of materials transfer points should be done using water sprays at the tip points. This should result in a 50% control efficiency. Regular clean-up at loading points is recommended. - In minimizing windblown dust from stockpile areas, water sprays should be used to keep surface material moist. A mitigation efficiency of 50 % is anticipated. - In minimizing windblown dust from the overland conveyor, roofing and covering of one side of the conveyor should be installed to achieve a mitigation efficiency of 50 %. ➲ Given the high impacts that are expected at the on-site informal community, nearby school and two on-site farmsteads it is recommended that the two farmsteads not be used for residential purposes at the time that opencast mining commences and that continuous PM10 and PM2.5 monitoring be conducted at the school and informal community starting two years before opencast mining occurs near the two receptors. This will give time to track the impacts as opencast activities occur closer to these two receptors and to decide on additional mitigation measures or whether to relocate either or both of these receptors should exceedances of the NAAQS occur. ➲ Continuous monitoring of dustfall must be conducted as part of the Project's air quality management plan.		

Geochemical Characterisation	Sampling was conducted in two phases. The first phase involved the analysis of discard samples generated during small-scale washing experiments. The material selected for the wash tests was based on the analysis of information for 24 reject samples provided by the project geologist. Six samples were selected that covered the range of total sulphur, ash content and calorific value. The second phase involved the analysis of 20 samples, selected from drill core material from four newly drilled monitoring holes. In summary, the reject coal material has a high probability of becoming acid generating if stored in a surface impoundment for a significant amount of time. The contradiction between the ABA and NAG data for these samples introduces a degree of uncertainty around the magnitude of the acid generating potential. Greater clarity should be provided by the on-going kinetic test. The environmental risk associated with the waste rock material (drill cores) is lower, with only one of the 20 samples demonstrating significant acid generating potential. The static tests provide an often unrealistic, worst case scenario as a result of the sample preparation. Milling the material to -75 µm creates a reactive surface area and degree of mineral liberation that is very significantly greater than is likely on an actual waste rock dump. As such, while the tests may be indicative of acid generating and metal leaching potential, the magnitude is often overestimated. The tests conducted during this phase of the project indicated that the material did exceed the TCT and LCT0 values for a number of elements, but in these cases the measured values were significantly below the relevant TCT1 and LCT1 values, so the material should be classified accordingly.	X	Section 6 Section 8 Section 18 Section 19 Section 20 Section 21 Part B-EMPr
Geohydrology	The results of the impact assessment are summarised as follows:	X	Section 6 Section 8

	➲ Impact on groundwater availability during the construction and operational phases of mining: ➢ The rate of groundwater seepage during the construction and operational phases of mining was calculated. Due to the anticipated heterogeneous nature of the fractured rock aquifer, a range of seepage rates is provided. Under average conditions, the total volume of groundwater seepage to the box cut and adit may be around 125m^3/d during the construction phase. It is further recommended that provision is made for 18 000 m^3 of groundwater per year in the pollution control dam that will be constructed during this phase of mining. During the operational phase of mining, groundwater seepage rates may vary according to many factors that influence the seepage rate. On average, the total volume of groundwater seepage may vary between 100 and 340 m^3/d. Maximum flow rates are expected during Year 10 due to the depth and extent of mining at this stage. It is further recommended that provision is made for a total of 50 400 m^3/a of groundwater in all the pollution control dams. This is equivalent to 8 400 m^3/a for each of the six planned dams. ➢ It is anticipated that mining activities will have a negative impact on groundwater availability in private boreholes and springs. ➢ In addition to the boreholes that may be destroyed, groundwater levels may also be lowered in private boreholes as a result of mine dewatering. Even though the boreholes and spring listed above will be destroyed, they are included in the assessment presented below for comparison. The impact of mine dewatering on private		Section 18 Section 19 Section 20 Section 21 Part B-EMPr

	boreholes is listed below. It is noted that groundwater is one of the only water resources available to farmers in the area. Whether or not the estimated lowering in groundwater levels will have a negative impact on current groundwater use will depend on the depth and construction of the boreholes. This information is not available for the private boreholes. It is however likely that boreholes in which groundwater levels are lowered by more than 10m will be lost. Two boreholes (KR7 and KR8) could be lost in this regard. Neither of these were recorded to be in use during the hydrocensus. ➲ Impact on groundwater quality during the construction and operational phases of mining: ➢ Under average conditions and based on the results of preliminary geochemical analyses, modelling suggests that sulphate concentrations may increase to above 150 mg/l within the mining area during the operational phase. This assessment excludes the placing of discard in pits or on surface. The contamination is not expected to move significant distances from the mining areas due to the impact of mine dewatering and the reversal of groundwater flow towards the mining areas during the operational phase. ➢ The most significant impact on private boreholes is expected to occur in the vicinity of KR7 and KR8, which are situated near the proposed plant. The increase in sulphate concentrations is however not expected to pose a health or aesthetic risk. ➲ Long-term impacts on groundwater - rate of groundwater level recovery:		

	➢ Regional groundwater levels are expected to take 30 – 50 years to recover around the mining areas after mining and mine dewatering ceases. ➲ Long-term impacts on groundwater - risk of decant: ➢ The risk of decant depends on several factors, which are discussed in more detail in this report. The main factor that controls the risk of decant is the rate of recharge of rainwater to the disturbed areas. It is unlikely that the opencast mining areas could be rehabilitated to natural recharge conditions and for this reason, decant is likely from all the pits. The most likely decant point at each pit is associated with the lowest topographical elevation and a total of 20 possible decant locations are listed below for the thirteen planned pits. The locations of the decant points are indicated in the specialist report. The static test results indicate that there is an acid generating potential for some of the material that will be handled on site, specifically the coal and discard material. For this reason, the quality of decant is not expected to be good. The decant is expected to be acidic (pH<5), with elevated salt and trace metal concentrations. ➢ The most significant impact of decant will be on wetland functioning. As the decant points are all associated with low-lying areas, they are typically associated with wetlands. If the decant is not contained, the acidic pH conditions and high salt and trace metal concentrations are expected to kill the wetland fauna and flora. These impacts would most probably be irreversible in the long-term. ➢ In addition to impacting negatively on wetlands, the unmanaged decant will also flow across land to the pans		

	and non-perennial streams that drain the project area. As with the wetlands, the decant will negatively affect water quality in these surface water bodies and will most probably result in irreversible acidification and unacceptable salt loads. ➢ If no subsidence takes place over the underground mining areas, it is unlikely that the underground workings would decant in the long-term. Long-term impacts on groundwater quality: ➲ As mentioned previously, various scenarios were tested to determine the long-term impact of mining on groundwater quality. These are: ➢ Scenario 1: the long-term impact if all rehabilitation measures are implemented and deterioration in groundwater quality does not take place during the operational phase of mining. ➢ Scenario 2: tests the impact of placing discard material into the mine-out pits. Although it is acknowledged that this will not take place in all of the pits as the volume of discard generated will be less than the void space available in all the pits, the model was used to see the impact of backfilling all the pits with discard. This will allow identification of pits that may be more suitable for backfill with discard. In order to complete this scenario, it was assumed that the discard material will acidify during the operational phase as well as post-closure resulting in an increase in sulphate concentrations. ➢ Scenario 3: evaluates the impact of placing discard in a stockpile on surface within the plant area. The scenario assumes that the discard stockpile will not be lined and		

	the rate of seepage would be governed by the permeability of the weathered aquifer. ➢ Scenario 4: test the effect of lining the discard stockpile with a Class C liner. In order to complete this simulation, literature-based liner leakage volumes were applied. ➲ The outcome of each scenario is discussed in detail in the report. A summary of the simulations is presented below in terms of the estimated salt loads resulting from each scenario on receptors identified. It is shown that backfilling the pits with discard will result in the most significant impact. It is however noted that the information presented is an over-estimation, as not all pits would be backfilled with discard. The calculations further indicate that a Class C liner installed at a surface discard stockpile would result in a 9% decrease in salt load. ➢ The result of the simulations indicates that not all of the pits are suitable for backfilling with discard. It is noted that this option would result in a negative impact on decant quality in the long-term and that sulphate concentrations may increase by up to 30% inside the pits. As the discard is expected to acidify in the long-term, the impact on groundwater quality, wetlands and private boreholes may therefore be more significant. ➢ Due to the increased risk of decant and deterioration in groundwater quality, pits around the largest of the pans should not be backfilled with discard. Pits that are located along the two lineaments should also not be backfilled with discard, as these would preferentially transmit contaminated water. Pits that are situated immediately adjacent to streams should also not be backfilled with discard due to the increased negative risks associated with decant and the groundwater component		

	of baseflow to the streams. Based on the criteria used during the evaluation, it is concluded that only one pit is suitable for discard disposal, as detailed in the report. Mining from this pit is scheduled from Year 6. ➢ Two scenarios were evaluated for the placement of discard on a surface stockpile, namely an unlined and a lined facility. As expected, an unlined facility will result in a significant increase in sulphate concentrations in the immediate vicinity of the discard stockpile in the long-term. Sulphate concentrations may increase to above 2500 mg/l in the weathered aquifer in the immediate vicinity of the discard facility in this case. It is further possible that the plume may reach the lineament to the west of the discard stockpile and that contamination from the discard stockpile may flow preferentially along the fault towards the largest pan in the southwest. It is expected that leachate from the unlined discard stockpile will be captured in the backfilled situated down gradient of it and will to a certain extent be contained in the pit until such time that it is flooded. This is however expected to have a negative impact on decant quality in the long-term. Due to the proximity to the largest pan and the wetlands associated with it, this is expected to result in significant negative impacts in the long-term. ➢ If the discard dump is lined with a Class C liner (compacted clay), the most significant positive impact on sulphate concentrations is expected in the immediate vicinity of the site. For this scenario, sulphate concentrations are expected to remain below 900 mg/l at the stockpile. Groundwater quality will however still be affected by the mining activities in this area and lining of the facility will not mitigate the regional impact of mining		

	on groundwater quality. For this scenario, the discard facility is not expected to have a noticeable impact on pitwater and decant quality.		
Surface Water Ecology	➲ The proposed development area was shown to incorporate a relatively high proportion of wetland habitat units, ranging from valleyhead seeps, hillslope seeps, channelled and unchannelled valley-bottom and depression-type wetland units. These units have been delineated and their outer boundaries, together with a 100 m conservation buffer zone, are presented in Figure 15; ➲ The wetland units are interspersed amongst formal cultivation, which is considered to be the main pressure and driver of ecological change at present; ➲ The wetland units were shown to all fall within a C PES category (moderately modified), with a high ecological importance and sensitivity; ➲ Laboratory analysis of water samples showed that the wetlands retain a relatively good water quality, excepting for one depression wetland that is subject to runoff from mining areas located to the north of the site. Water quality within this wetland unit has been degraded to the point of posing a risk to both human and livestock health; ➲ The DWS risk assessment indicates that all activities that will impact the wetland directly carry a high risk factor. The impact significance ratings also indicate that the potential impacts carry a high significance before mitigation. The significance of the impacts is largely due to the direct involvement of deleterious impacts to wetland habitat units. The significance is, however, largely dependent on the amount of wetland	X	Section 6 Section 8 Section 18 Section 19 Section 20 Section 21 Part B-EMPr

	habitat that will be included into the layout planning and the severity of those impacts; ➲ Infrastructure layout planning that takes into consideration the wetland delineation mapping, associated conservation buffer zones, as well as the proposed mitigation measures can greatly reduce the overall significance of the impacts to the wetland systems associated with the site; and ➲ It should be noted that, in order to conserve the ecological structures within the region, a holistic habitat conservation approach should be adopted. This includes keeping general habitat destruction and construction footprints to an absolute minimum within the terrestrial habitat as well. Conserving the habitat units will ultimately conserve the species communities that depend on it for survival. This can only be achieved by the efforts of the contractor during the various processes of the construction phase.		

18 ENVIRONMENTAL IMPACT STATEMENT

18.1 SUMMARY OF THE KEY FINDINGS OF THE ENVIRONMENTAL IMPACT ASSESSMENT

Key findings of the impact assessment for the proposed mine development are as follows:

- The need and desirability of the proposed development has been established;
- With mitigation measures applied, the proposed development is compatible with surrounding land uses;
- The proposed development has the potential to create significant employment and economic development opportunities for local communities during the construction and operational phases of the project;
- The mine SLP has provided costed plans for optimising local employment, skills development and a commitment to implementing local economic development projects, identified in collaboration with the CALLM;
- Impacts to ecologically sensitive habitat and surface and groundwater resources have been assessed to be the most significant potential impacts associated with the proposed development. Mitigation measures for these impacts have been recommended. Compliance with these mitigation measures in this report should be included as conditions of the environmental authorisation.

18.2 FINAL SITE MAP

The final site map, showing the position of key infrastructure is provided in Appendix 3, Map 2.

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

A summary of the positive and negative impacts and risks associated with the proposed development are provided below. (The impacts have been assessed in detail in the various specialist reports and summarised in Section 16 and 17 of the EIR).

18.3.1 POSITIVE IMPACTS

Several positive socio-economic impacts have been identified:

- The proposed development will ensure that the current 350 Ilima employees will remain employed instead of retrenchments having to be implemented due to current operational mine closures. Many more indirect employment opportunities will also be created. Implementation of the commitment to maximise local employment wherever practicable will increase the significance of this positive impact;
- Procurement of local goods and services by the mine, employees and contractors will stimulate local business and create opportunities for entrepreneurship. In addition, implementation of the agreed LED projects committed to in the SLP will have a significant positive impact for the broader community;
- Implementation of the HRD programme, as described in the SLP is expected to result in skills transfer, career progression, re-skilling and improved levels of literacy for employees and in the wider community;

- The mining will generate royalties in accordance with the MPRDA, payable to the national government. Furthermore, the development of the site and connection to municipal services will result in the payment of rates and taxes to the CALLM; and
- The Project will result in the availability of an additional source of coal for the Eskom market.

Opportunities to maximise the benefits of the positive impacts should be identified throughout the LOM.

18.3.2 Negative Impacts

Several negative impacts have been identified and is summarised below.

18.3.2.1 Groundwater

- Lowering of groundwater levels in private boreholes, thus affecting the performance of the boreholes that fall within the dewatering cone;
- Contamination of groundwater in private boreholes, making the groundwater unfit for use;

18.3.2.2 Flora

- Disturbance or loss of an Endangered vegetation type and listed Threatened Ecosystem as well as associated populations of Species of Conservation Concern;
- Introduction/proliferation of alien invasive species; and
- Illegal utilisation of flora resources.

18.3.2.3 Fauna

- Disturbance/loss of threatened faunal habitat and associated Species of Conservation Concern; and
- Illegal utilisation of faunal resources.

18.3.2.4 Blasting

- Blast induced damage to road surfaces and earth dams;
- Damage to structures or injury to people closer than 1000 m from fly rock;
- Damage to structures or complaints from neighbours caused by high air blast;
- Water pollution from dissolved nitrates; and
- Fumes generated by blasting affecting health and wellbeing of surrounding neighbours.

18.3.2.5 Surface Water Ecosystem

- Destruction of wetland habitat;
- Fragmentation of interconnected habitat; and
- Contamination of surface water will impact integrity of all surface water.

18.3.2.6 Soils

- Loss of utilisable soil resource; and
- Contamination of soils.

18.3.2.7 Air Quality

- Elevated PM10 and PM2.5 concentrations as a result of mining activities; and

- Dust Fall due to mining and transportation.

18.3.2.8 Noise

- Elevated Noise Levels.

18.3.2.9 Heritage

- Irreplaceable loss of heritage resources and accidental damage to burial sites

18.3.2.10 Socio-Economic

- Loss of common property;
- Influx of job seekers – demand on municipal services;
- Increased levels of crime may be experienced in the area as a result of the influx of people seeking employment;
- Minor, major and fatal injuries from potential mine health and safety incidents;
- There may be some temporary loss of employment for farm workers as affected farm portions are mined

18.3.3 Cumulative Impacts

Cumulative impacts were assessed by each relevant specialist within the methodology described in Section 9.

18.3.3.1 Summary Assessment of Cumulative Impacts

Cumulative impacts were assessed by each relevant specialist within the methodology described in Section 9.

The absence of information on the nature and extent of the impacts of planned and existing developments in and around the study area prevented a quantitative assessment of the cumulative impacts.

Qualitatively, the key social and environmental resources which may be impacted upon by the proposed development and other developments in the area and thus for which there is a reasonable likelihood of a cumulative impact are as follows:

- Soils, surface water and groundwater resources;
- Natural habitats including wetland and untransformed grassland areas;
- Community on Portion 1 of Kranspan;
- Airshed within a 2 km radius of the site; and
- Public road infrastructure, including sections of the R36 which are likely to be used by several mining companies.

The significance of the cumulative impact on these resources was broadly assessed based on the IFC Rapid Cumulative Impact Assessment (RCIA) approach. The summary results of this assessment are presented in Table 18-1.

TABLE 18-1: CUMULATIVE IMPACT ASSESSMENT

CUMULATIVE IMPACT SIGNIFICANCE	INTERPRETATION	RESOURCE	COMMENT
High	There is a significant risk for cumulative impacts **and** the Project impact represents a significant contributor to the expected cumulative impacts. Controlling the Project impact will substantially reduce the predicted cumulative impact	➲ Natural habitats (CBA Irreplaceable and priority wetlands as defined by the specialist)	➲ Any loss of a CBA Irreplaceable habitat, by definition, is a significant cumulative impact.
Medium	There is a significant risk for cumulative impacts but the Project impacts **are not** a dominant contributor to the predicted cumulative impact. The predicted cumulative impact is the result of multiple activities requiring action by a range of role players rather than any one party	➲ Soils, surface water and groundwater resources ➲ Natural habitats (CBA Optimal and high sensitive habitats as defined by the specialist) ➲ Community on Portion 1	➲ Several operating and proposed developments, including ongoing agricultural activities in the area are likely to impact on these resources. ➲ The cumulative impact is only applicable if the community is not relocated. ➲ It is understood that the community will be relocated ahead of the commencement of the Ilima activities. ➲ The specialist studies indicated that emissions to air and blasting may have an impact on the community. The Ilima activities are not considered to be a dominant contributor.
Low	There is limited to no significant risk for cumulative impacts **and** the contribution from the Project impact is negligible or nil. Applying additional control measures to the Project impact will have no influence on the predicted cumulative impact	➲ Public Road Infrastructure ➲ Airshed ➲ Natural habitats (wetlands with little to no functional value as defined by the specialist)	➲ The Applicant activities are not likely to be a dominant contributor to impacts on these resources. ➲ Project impacts from the proposed Ilima mining activities have also been assessed to be negligible (post-mitigation)

19 PROPOSED IMPACT MANAGEMENT OBJECTIVES AND THE IMPACT MANAGEMENT OUTCOMES FOR INCLUSION IN THE EMPR

The key objectives of an EMPr are to set out the management and monitoring measures required to both minimise any potentially adverse environmental impacts and enhance the environmental benefits of the Project, and to ensure that responsibilities and appropriate resources are efficiently allocated to implement the plan.

The aspects which are considered to be of most importance to the development, including the respective management objectives and outcomes for the impacts associated with these aspects are provided in Table 19-1.

The management objectives and outcomes will be achieved through the implementation of the management actions in the EMPr.

TABLE 19-1: IMPACT MANAGEMENT OBJECTIVES AND OUTCOMES

ASPECT	MANAGEMENT OBJECTIVE	MANAGEMENT OUTCOME
Soil	➲ Protect and manage topsoil and subsoil resources over the full Life of Mine. ➲ Prevent the use of soil resources for any purpose other than rehabilitation. ➲ Reinstate the soil profile in the same sequence in which it was removed. ➲ Prevent the contamination of soil resources. ➲ Managed response to the clean-up of accidental spillages and leaks.	➲ Soil resources protected from contamination. ➲ Successful rehabilitation of disturbed areas. ➲ Accidental leaks and spillages responded to rapidly and all contamination remediated in accordance with legal requirements.
Air	➲ Land users minimally affected by mine activities. ➲ Control and minimise particulate and dust emissions to air. ➲ Monitor dustfall over the LOM to ensure that any changes in dust fall rates are identified and investigated	➲ Good stakeholder relations with community members. ➲ Air emissions from the development managed in accordance with legal requirements.
Groundwater	➲ Surrounding land users unaffected by dewatering and other mine activities. ➲ Prevent the contamination of groundwater resources. ➲ Managed response to the clean-up of accidental spillages and leaks. ➲ Monitor groundwater to ensure that any changes in groundwater quality and quantity are identified and investigated	➲ Good stakeholder relations with community members. ➲ Groundwater resources protected from contamination. ➲ Accidental leaks and spillages responded to rapidly and all contamination remediated in accordance with legal requirements.
Surface water	➲ Control the flow of storm water across the site.	➲ Managed storm water flow.

	➲ Allow for clean and dirty stormwater separation. ➲ Remain outside of the 500m wetland buffer.	➲ Uncontrolled release of dirty stormwater or effluent from onsite activities prevented. ➲ Wetland feature not impacted upon by mine activities.
Health and Safety	➲ Prevent criminal activities onsite. ➲ Prevent occupational and community health and safety incidents. ➲ Ensure no damage to infrastructure from blasting. ➲ Complaints which are received are properly investigated and responded to appropriately.	➲ Secure and safe site. ➲ Good stakeholder relations with community members and authorities.
Noise	➲ Prevent noise impacts from development activities at sensitive noise receptors. ➲ Complaints which are received are properly investigated and responded to appropriately.	➲ Good stakeholder relations with community members and authorities.
Heritage	➲ Protection of heritage resources.	➲ No heritage resources damaged or destroyed during construction activities.
Traffic and Road Safety	➲ Prevent road safety incidents and limit disruptions to traffic flow. ➲ Complaints which are received are properly investigated and responded to appropriately.	➲ Damage to road surfaces minimised. ➲ Good stakeholder relations with community members and authorities.
Socio-Economic	➲ Influx is managed in a planned and peaceful manner. ➲ Support for the development by the local community is enhanced. ➲ Maximise the local economic development potential of the development.	➲ Community conflict avoided. ➲ Employment from community. ➲ Local procurement. ➲ Good stakeholder relations with community members and authorities.

20 FINAL PROPOSED ALTERNATIVES

No additional alternatives to those identified and assessed through the impact assessment process are proposed for the mine development.

21 ASPECTS FOR INCLUSION AS CONDITIONS OF AUTHORISATION

The following aspects should be included in the authorisation:

- The Applicant must continue to reassess the risks and impacts of the development throughout its operational life. Should any change in the risk and impact profile of the development be determined, additional management controls and mitigation measures must be implemented and the EMPr amended to reflect these changes;
- Any substantive changes to the final site layout must be subjected to a field surveys by relevant specialists, including but not necessarily limited to heritage and ecology;
- Several specialist studies have recommended the constitution of a community or stakeholder forum as a means to facilitate engagement over the LOM and provide a formal structure for the mine to share information regarding compliance, investigation of reported grievances from the community and monitoring data. The establishment of this structure should be included as a condition of the authorisation;
- In-pit disposal of discard:
  - Must be limited to Pit 5;
  - The discard material must not be backfilled beyond the level of the pre-mining coal seam depth;
  - Should additional discard disposal capacity be required and the material be backfilled to above the pre-mining coal seam depth, that geochemical and groundwater modelling is undertaken to estimate this impact prior to the implementation of this management option. The outcome of these simulations must guide the extent to which discard can be placed above the coal seam depth;
  - The full extent of the discard material must be placed below the regional rest (pre-mining) groundwater table; and
  - Additional mitigation measures must be implemented to further reduce the risk of in-pit disposal of discard to groundwater resources. This must be informed by the outcome of updates to the groundwater model inclusive of the kinetic leach testwork.
- The EMPr must be updated to include the detailed engineering design for the surface discard facility, should it be required;
- Prior to the construction of the wash plant, the groundwater model must be updated with the findings of the kinetic leach testwork and the detailed design of the in-pit disposal;
- Additional mitigation measures must be implemented to further reduce the impact on groundwater availability and quality if necessary, based on the findings of the updated groundwater model;
- An offset mitigation plan, developed as per the requirements of the Wetland Offset Guideline (DWS and SANBI, 2016) and any other relevant guidelines, must be compiled for the areas of high ecological sensitivity proposed to be mined or transformed by mine support infrastructure. This plan must be submitted to the relevant departments at least one year prior to the commencement of vegetation clearance of the affected areas;
- A traffic impact assessment must be undertaken in consultation with the relevant road authority in order to determine the need for any road safety controls as a result of the development;
- A spontaneous combustion prevention plan must be compiled;
- The EMPr, including all management and monitoring measures must be implemented; and
- An emergency preparedness and response plan must be developed by the Applicant for the site.

22 DESCRIPTION OF ANY ASSUMPTIONS, UNCERTAINTIES, AND GAPS IN KNOWLEDGE

Advisory on Business and Sustainability Africa (Pty) Ltd. (ABS Africa) has prepared this report specifically for Ilima Coal Company (Pty) Ltd. (Ilima). The contents of this report:

- Are based on the legal requirements for undertaking an Environmental Impact Assessment, as defined in the National Environmental Management Act, 1998 (Act No. 107 of 1998) and the scope of services as defined within the contractual undertakings between Ilima and ABS Africa;
- Are specific to the intended development at the proposed site. The report shall not be used nor relied upon neither by any other party nor for any other purpose without the written consent of ABS Africa. ABS Africa accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report; and
- Reflect the best judgement of ABS Africa in light of the information available at the time of preparation. The analyses contained in this report has been developed from information provided by Ilima and other parties. This information is not within the control of ABS Africa and ABS Africa has not audited such information and makes no representations as to the validity or accuracy thereof.

In addition, it is noted that:

- The assessment has been based on the project description provided by the Applicant. Changes to this project description may influence the assessment and the mitigation measures in the EMPr;
- The geochemical characterisation of the discard and overburden material has been based on the static leach testwork results. The impact assessment and associated mitigation measures have been based on these results. The assessment and mitigation measures should be updated once the kinetic leach testwork results become available;
- Offset mitigation has been recommended as a mitigation measure for the residual impact on certain wetlands which are planned to be mined.
- Where relevant, the impact assessment has placed reliance on the information and recommendations in the specialist studies completed for the Project. The assumptions, uncertainties and gaps applicable to each specialist study are provided in the respective specialist reports;
- It has been assumed that the respective specialists have ensured that the relevant quality control standards were applied with respect to sample collection, preparation and laboratory testing protocols, including equipment calibration; and
- The post-mitigation impact is based on the understanding that the Applicant will establish the financial and administrative framework necessary for the complete implementation of the mitigation measures outlined in the EMPr over the Life of Mine (LOM).

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

23.1 REASONS WHY THE ACTIVITY SHOULD BE AUTHORISED OR NOT

The need and desirability for the Project has been established. The mitigation hierarchy has been applied to the several negative impacts that have been identified. and management controls have been recommended to reduce the extent of residual impacts.

Accordingly, based on the findings of the impact assessment, and with the understanding that the mitigation measures will be implemented, and the conditions of the environmental authorisation enforced by the relevant authorities, the EAP is of the opinion that an environmental authorisation for the development may be granted.

23.2 CONDITIONS THAT MUST BE INCLUDED IN THE AUTHORISATION

23.2.1 SPECIFIC CONDITIONS TO BE INCLUDED INTO THE COMPILATION AND APPROVAL OF EMPR

The following aspects should be included in the authorisation:

- The Applicant must continue to reassess the risks and impacts of the development throughout its operational life. Should any change in the risk and impact profile of the development be determined, additional management controls and mitigation measures must be implemented and the EMPr amended to reflect these changes;
- Any substantive changes to the final site layout must be subjected to a field surveys by relevant specialists, including but not necessarily limited to heritage and ecology;
- Several specialist studies have recommended the constitution of a community or stakeholder forum as a means to facilitate engagement over the LOM and provide a formal structure for the mine to share information regarding compliance, investigation of reported grievances from the community and monitoring data. The establishment of this structure should be included as a condition of the authorisation;
- In-pit disposal of discard:
  - Must be limited to Pit 5;
  - The discard material must not be backfilled beyond the level of the pre-mining coal seam depth;
  - Should additional discard disposal capacity be required and the material be backfilled to above the pre-mining coal seam depth, that geochemical and groundwater modelling is undertaken to estimate this impact prior to the implementation of this management option. The outcome of these simulations must guide the extent to which discard can be placed above the coal seam depth;
  - The full extent of the discard material must be placed below the regional rest (pre-mining) groundwater table; and
  - Additional mitigation measures must be implemented to further reduce the risk of in-pit disposal of discard to groundwater resources. This must be informed by the outcome of updates to the groundwater model inclusive of the kinetic leach testwork.
- The EMPr must be updated to include the detailed engineering design for the surface discard facility, should it be required;
- Prior to the construction of the wash plant, the groundwater model must be updated with the findings of the kinetic leach testwork and the detailed design of the in-pit disposal;
- Additional mitigation measures must be implemented to further reduce the impact on groundwater availability and quality if necessary, based on the findings of the updated groundwater model;
- An offset mitigation plan, developed as per the requirements of the Wetland Offset Guideline (DWS and SANBI, 2016) and any other relevant guidelines, must be compiled for the areas of high ecological sensitivity proposed to be mined or transformed by mine support infrastructure. This plan

must be submitted to the relevant departments at least one year prior to the commencement of vegetation clearance of the affected areas;

- A traffic impact assessment must be undertaken in consultation with the relevant road authority in order to determine the need for any road safety controls as a result of the development;
- A spontaneous combustion prevention plan must be compiled.;
- The EMPr, including all management and monitoring measures must be implemented; and
- An emergency preparedness and response plan must be developed by the Applicant for the site.

23.2.2 Rehabilitation Requirements

The rehabilitation requirements are described in the EMPr.

24 PERIOD FOR WHICH ENVIRONMENTAL AUTHORISATION IS REQUIRED

In terms of the MPRDA, the maximum period a mining right may be issued for is 30 years, with the option to renew for another 30 years. The application is therefore for a period of 30 years.

25 UNDERTAKING

It is hereby confirmed that the financial provisioning requirements described in the Closure Plan are applicable to the EIR and EMPr.

26 FINANCIAL PROVISION

26.1 EXPLAIN HOW THE AFORESAID AMOUNT WAS DERIVED

The estimate for rehabilitation and closure for the Kranspan project is based on the principles and closure activities as set out in the report. The closure plan is considered conceptual and therefore certain uncertainties relating to the actual activities to be implemented as part of the decommissioning and closure phases of the project will only be confirmed once a detailed closure plan has been developed.

The costing is based on the DMR methodology, in Part B of this report.

The quantum for closure summarized in Table 32-1 and reflects the environmental closure liability associated with the first 6 months of mining. Based on the mine plan it is anticipated that a steady sate will then be achieved after 6 months and that the roll-over mining plan can be implemented after that. This allows for concurrent reclamation to be undertaken from the 1st year of mining, thereby limiting the liability associated with the closure of the mine towards the end of its life. The increase in closure liability is reflected in Table 32-2 and Table 32-3. Which reflects months 6 to 18 of mining.

26.2 CONFIRM THAT THIS AMOUNT CAN BE DERIVED FROM THE OPERATING EXPENDITURE

In compiling and submitting their Mine Work Programme, the Applicant has confirmed that the required amount for financial provision for rehabilitation and closure can be derived from operating expenditure over the LOM.

27 DEVIATIONS FROM APPROVED SCOPING REPORT AND PLAN OF STUDY

27.1 DEVIATIONS FROM THE METHODOLOGY USED IN DETERMINING THE SIGNIFICANCE OF POTENTIAL ENVIRONMENTAL IMPACTS AND RISKS

No deviations from the impact assessment methodology outlined in the Scoping Report and Plan of Study are applicable.

27.2 MOTIVATION FOR THE DEVIATION

No motivation applicable.

28 OTHER INFORMATION REQUIRED BY THE COMPETENT AUTHORITY

In compliance with the provisions of sections 24(4) (a) and (b) read with section 24 (3) (a) and (7) of the National Environmental Management Act (Act 107 of 1998), the EIA report must include the:

(1) Impact on the socio-economic conditions of any directly affected person.

The socio-economic impact of the proposed mining activities have been assessed and are described in Section 16 of the EIR. In addition, the geohydrological study has identified that certain boreholes are likely to be destroyed or affected by the proposed mining activities. Compensation for this and other impacts would need to be included in the discussions between the Applicant and individual landowners as part of the access to land agreement to be negotiated between the parties.

It is understood that the community on Portion 1 of the Farm Kranspan 49 is in negotiations with Msobo Coal (Pty) Ltd. for the potential relocation of the community. Although the potential impacts of the proposed Ilima mining activities on this community have been assessed in the S&EIR Process, it is understood that the community is likely to be relocated before the proposed Ilima mining activities proceed.

(2) Impact on any national estate referred to in section 3(2) of the National Heritage Resources Act.

The specialist heritage impact assessment report is provided in Appendix 8.

Heritage sites that have significant importance were identified by the specialist investigation. Buffers have been applied to avoid heritage features of high significance A chance find procedure is included as a mitigation measure in the EMPr. SAHRA has been consulted through the S&EIR Process and their requirements have been addressed.

(3) Other matters required in terms of sections 24(4) (a) and (b) of the Act.

All reasonable and feasible alternatives in terms of site layout, location, public participation, potential impacts and mitigation have been addressed throughout the EIR.

29 ENVIRONMENTAL MANAGEMENT PROGRAMME

29.1 DETAILS OF THE EAP

The details of the EAP are provided in Part A, Section 1 of the EIR.

29.2 DESCRIPTION OF THE ASPECTS OF THE ACTIVITY

The description of the aspects of the activity are provided in Part A, Section 1(h) of the EIR

30 COMPOSITE MAP

The broad placement of the surface infrastructure was informed by an environmental sensitivity plan which considered the location of all known sensitive physical, social and environmental features within the Mine Rights Application surface area.

The placement of the proposed site infrastructure options in relation to the identified sensitive areas is shown in Appendix 3, Map 11.

The Final Site Layout Map showing the proposed location of the mine structures and infrastructure is shown in Map 2.

31 DESCRIPTION OF IMPACT MANAGEMENT OBJECTIVES INCLUDING MANAGEMENT STATEMENTS

31.1 DETERMINATION OF CLOSURE OBJECTIVES

Rehabilitation and closure of areas disturbed in mining and related operations will be considered to be complete when:

- All structures, equipment and infrastructure not consistent with the post closure land use have been decommissioned, demolished and removed from site;
- Ownership of all remaining infrastructure and services required to support the proposed post closure land use have been formally transferred to the local authority responsible for the administration of the area;
- The area has been made safe for all post closure land users and livestock;
- All surface disturbances and remaining landforms are structurally and ecologically stable and have sustainable soil and vegetation covers where applicable; and
- Surface water management structures are in place and are free of damage due to erosion.

31.2 THE PROCESS FOR MANAGING ANY ENVIRONMENTAL DAMAGE, POLLUTION, PUMPING AND TREATMENT OF EXTRANEOUS WATER OR ECOLOGICAL DEGRADATION AS A RESULT OF UNDERTAKING A LISTED ACTIVITY

All management actions and controls identified through the impact assessment, including the specialist studies undertaken, have been included in Table 30-1, Table 30-2 and Table 31-1.

The actions and controls are aimed in this first instance at preventing or avoiding damage, pollution, or degradation of the environment. A comprehensive surface and groundwater monitoring programme will be implemented. The results of the monitoring will be used to assess the risks and impacts of the mining activities throughout the LOM. The actions and controls will be updated based on the monitoring results.

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

Acid mine drainage occurs when sulphide minerals (typically pyrite) are exposed to oxygen and water. A chemical reaction follows resulting in the formation of dissolved metal ions (typically iron) and sulphuric acid. The latter results in a reduction in pH which then causes the leaching of metals at concentrations which are harmful to the environment. Microorganisms which thrive in acidic environments also contribute to acid mine drainage by accelerating the metal leaching process.

According to Skousen *et al.* (2018)[20], the control of acid mine drainage prior to mining requires an understanding of the following:

- Overburden or mine waste geochemistry;
- Method of overburden or mine waste handling and placement during operations; and
- Post-mining hydrology of the site.

These factors were assessed in an integrated manner through the geochemical assessment, surface water ecosystems assessment as well as the geohydrological assessment. These studies are included in Appendix C.

The first step in controlling acid mine drainage is the geochemical characterisation of the mine materials (overburden stockpiles and discard). Geochemical characterisation aims to identify the distribution and variability of key geochemical parameters (such as sulphur content, acid neutralising capacity and elemental composition) and acid generating and metal leaching characteristics.

For the proposed mining at Kranspan, the following testwork has been undertaken:

- Whole rock and elemental analysis;
- Mineralogical analysis;
- Acid base accounting (ABA);
- Net acid generation (NAG); and
- Short term leaching tests.

The static tests provide an often unrealistic, worst case scenario as a result of the sample preparation. Milling the material to -75 µm creates a reactive surface area and degree of mineral liberation that is very significantly greater than is likely on an actual waste rock dump. As such, while the tests may be indicative of acid generating and metal leaching potential, the magnitude is often overestimated.

In addition, based on the results of the static leach testwork, kinetic leach testwork (laboratory leach column) has commenced on a composite sample of discard material. This testwork is scheduled to continue until November 2019 in order to determine the long-term leachate quality associated with the discard material.

Two rock sampling sets were analysed as part of the static tests completed. These included 6 discard samples generated during a small-scale washing experiment, using reject (discard) coal samples. A number

[20] Skousen *et al.* 2018. Acid mine drainage formation, control and treatment: Approaches and strategies. https://www.sciencedirect.com/science/article/pii/S2214790X18302156. Accessed on 4 June 2019

(20) of drill core samples were also taken for analysis. These are representative of overburden stockpile material. The samples were analysed at a SANAS accredited laboratory.

The results of the geochemical characterisation static leach testwork were then considered in the geohydrological study. The latter also considered the findings of the surface water ecosystems study, particularly with respect to the description of sensitive surface water resources like pans and wetlands which could be impacted on by acid mine drainage.

The potential for acid mine drainage from discard management, overburden handling and decant from rehabilitated pits was then modelled in the geohydrological study. The model considered the potential impacts during the operational phase and the post-closure phase.

Mitigation measures for preventing and managing acid mine drainage have been proposed based on the results of these studies.

31.4 RISK ANALYSIS FOR POLLUTION CONTROL MEASURES FOR MINE RESIDUE STOCKPILES

31.4.1 METHODOLOGY

Regulation 3(3) of the Regulations Regarding the Planning and Management of Residue Stockpiles and Residue Deposits, 2015[21] requires that a risk analysis be conducted on all mine residue stockpiles to determine the appropriate mitigation and management measures. Regulation 3(5) further requires that suitable pollution control measures for mine residue stockpiles be recommended based on the risk analysis. The aspects that are required to be considered in the risk analysis are summarised in Figure 31-1.

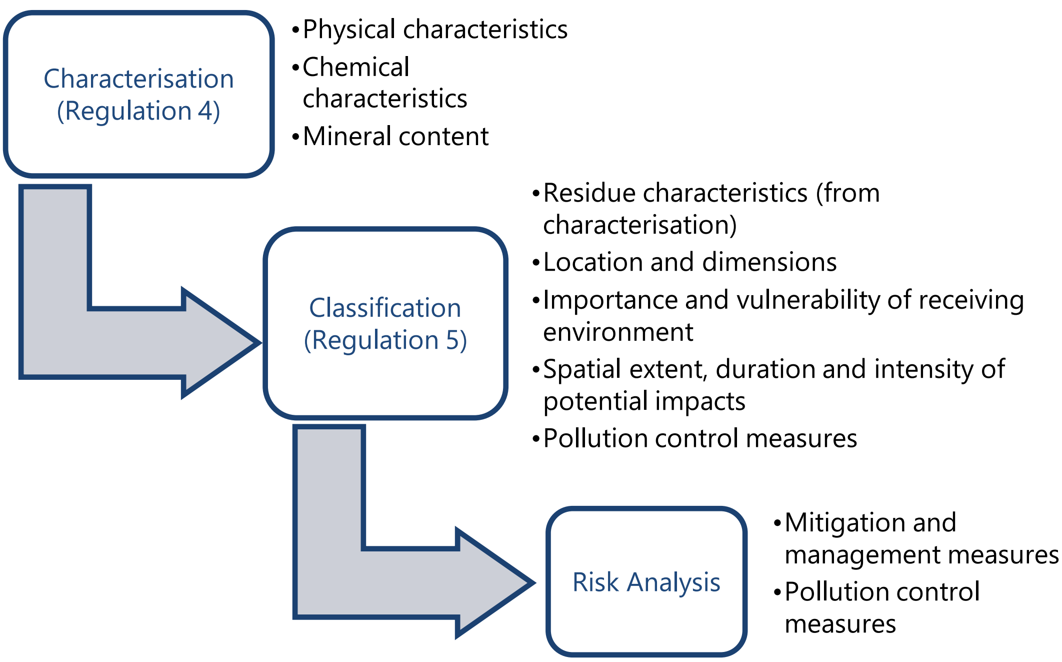


FIGURE 31-1: SUMMARY OF RISK ANALYSIS REQUIREMENTS

[21] Government Notice R632 of 24 July 2015 (as amended), promulgated in terms of the National Environmental Management: Waste Act 59 of 2008

A qualitative risk analysis was undertaken and was informed by the findings of several of the specialist studies completed as part of the S&EIR Process and of relevance to the mine residue stockpiles. These were as follows:

- Geochemical characterisation study;
- Geohydrological study;
- Soils and hydropedological study;
- Surface water ecosystems study;
- Terrestrial biodiversity study;
- Waste classification report; and
- Air quality study.

The following guidelines were also considered in undertaking the risk analysis:

- The Guideline for the Compilation of a Mandatory Code of Practice on Mine Residue Deposits (Department of Minerals and Energy, 2000);
- SANS 0286:1998 and
- Department of Water Affairs and Forestry, 2007. Best Practice Guidelines for Water Resource Protection in the South African Mining Industry.

Regulation 3(1) of the Regulations Regarding the Planning and Management of Residue Stockpiles and Residue Deposits, 2015 require that the identification and assessment of impacts arising from residue stockpiles be done as part of the environmental impact assessment conducted in terms of NEMA. The impacts as assessed in Section 16 of the EIR were accordingly used in the risk analysis.

The waste classification report and geochemical characterisation study were used to inform the characterisation and classification of the material, as required by Regulation 4 and 5 of the Regulations Regarding the Planning and Management of Residue Stockpiles and Residue Deposits, 2015.

31.4.2 MINE RESIDUE MATERIAL

The scope of this risk analysis pertains to the following mine residue material:

31.4.2.1 Overburden material

This is the material which overlies the coal seam and which is removed through excavation (softs) and blasting (hards). The material is planned to be stored in separate stockpiles on surface, adjacent to the topsoil stockpiles. These are described in detail in Section 3.2.5 of the EIR.

The stockpiles are temporary in that they are only on surface for as long as it takes to extract the coal from the relevant pit.

After the coal has been removed, the overburden material is placed back into the pit in the same sequence as it was removed, typically hards, softs and then topsoil. Whilst on surface, the overburden stockpiles are managed as part of the dirty water management area. Runoff from the stockpile areas thus drains and is contained in the PCDs.

Multiple stockpiles of different sizes are proposed to be established across the mining right area as mining progresses. The total surface area of the overburden stockpiles is estimated to be approximately 181 ha. The actual number, dimensions and surface area extent of stockpiles established at any one time will however be limited to the number and surface area extent of the pits being mined as continuous rehabilitation will be practiced.

Maximum stockpile height is estimated to be at 12 m with an angle of repose of 38 degrees (1:1.28).

It is noted that, except for a few small areas, the proposed position of the overburden stockpiles largely avoids the high sensitivity biodiversity areas identified in the terrestrial ecology and surface water ecosystems studies.

The material will be mechanically placed (and not hydraulically) and this significantly reduces the risk of a structural failure.

31.4.2.2 Discard material

Discard is generated from the coal washing process. It is planned to either be deposited back into the open pits or managed in an engineered surface discard facility. In accordance with the recommendations from the geochemical characterisation testwork, geochemical modelling and groundwater study, only Pit 5 is proposed to be used for the in-pit disposal of the discard material. The proposed discard management approach is described in detail in Section 3.2.9 of the EIR.

Based on the mine planning undertaken to date and informed by the findings of the geochemical modelling, approximately 5 384 455 m^3 of discard material is proposed to be backfilled in Pit 5 as part of the rehabilitation of this pit.

This comprises of a surface area of approximately 143 ha and is based on backfilling of the discard into the mined pit.

A surface discard facility has also been included in the site infrastructure layout plan. This facility will however only be established if the in-pit disposal of discard is not suitable. A position for the surface discard facility has been proposed but the design thereof including geotechnical investigations can only be completed once the need for the facility and the design basis has been confirmed.

The risk analysis of the surface discard facility has thus been based on the geochemical characterisation of the material and the receiving environment and on the understanding that the facility will meet all appropriate engineering design requirements with respect to among others, safety, storage capacity and the physical containment of the material.

The conceptual design of the facility suggests that the facility will be approximately 18 m high with a surface area footprint of approximately 15 ha. The proposed location for the surface discard facility is near to the wash plant. There is a geological fault approximately 50 m to the north-west of the proposed position of the facility.

A portion of the surface discard facility footprint is within a high sensitivity biodiversity area.

31.4.3 CHARACTERISATION AND CLASSIFICATION OF MATERIALS

The overburden material comprises of the hards and softs material. This is a combination of carbonaceous clay, sandstone, siltstone, and carbonaceous shale. The proportions of these vary through the profile across the site.

An example of drill cores from the Kranspan site comprising of this material is shown in Figure 31-2.

	2- Carbonaceous clay 3- Sandstone 5 - Sandstone/siltstone and shale 6 - Carbonaceous shale 7 - Sandstone 9 - Sandstone

FIGURE 31-2: ANNOTATED PHOTOGRAPH OF DRILL CORES OF A SAMPLE OF OVERBURDEN MATERIAL

The geochemical characterisation and waste classification reports (Appendix 8) indicated the following:

- Fourteen of the 20 overburden samples could be considered acid generating. The magnitude of the predicted acid generation is relatively low. The remaining six samples were predicted to be acid consuming, although the magnitude of the neutralising capacity was again low;
- Five of the 6 discard samples could be considered acid generating;
- The Total Concentration (TC)[22] values are below the Total Concentration Threshold (TCT) 1 level;
- The Leachable Concentrations (LC)[23] for both the water soluble and TCLP tests do not exceed the LCT1 threshold values; and
- In terms of the Norms and Standards for Disposal of Waste to Landfill, both the overburden and discard material classifies as a Type 3 waste.

The following is noted with respect to the TCT and LCT thresholds as they relate to the results for the overburden and discard material samples:

- The TCT and LCT thresholds are applicable to the disposal of waste to landfill. There are significant differences between mine residue material and the material typically disposed of to landfill;
- The TCT1 threshold is derived from the land remediation values for commercial/industrial land, based on the Framework for Contaminated Land. The TCT0 threshold was derived, in most cases, by dividing the TCT1 value by 100;
- The LCT0 threshold is derived from the lowest value of the standard for human health effects listed for drinking water in South Africa.

[22] Defined in Government Notice R635 of 23 August 2013

[23] Defined in Government Notice R635 of 23 August 2013

31.4.4 RISK ANALYSIS

Mine residue facilities pose a hazard due to their size, nature and position. Depending on the nature of the material, the type of residue facility and the characteristics of the receiving environment, there are several risks and impacts associated with this hazard, including:

- Damage to mine and community property within the Zone of Influence[24] of a mine residue facility arising from a structural failure;
- Health and safety risks to employees and communities within the Zone of Influence of a mine residue facility. This may include injury and potentially loss of life arising from a structural failure;
- Spontaneous combustion of discard material and associated impacts;
- Surface water contamination;
- Groundwater contamination;
- Impacts to sensitive habitats such as wetlands;
- Sterilisation of soil resources; and
- Restriction on post-mining land-uses.

There are multiple potential causes of these risks and impacts including improper design and poor operational controls. The significance of a risk which a mine residue facility may pose is a function of the probability of the risk occurring and the consequence of that risk, should it occur.

The risks and impacts associated with the proposed mine residue facilities have been assessed on this basis. Section 16 of the EIR summarises the outcome of the assessment.

31.4.4.1 Overburden stockpiles

The following is concluded with respect to the risks associated with the **overburden stockpiles**:

- The pre-mitigation environmental risk associated with the overburden stockpiles is assessed to be **Medium-Low**. This is due to the findings of the geochemical characterisation that the material is generally inert and the short-term duration of these stockpiles on surface. With mitigation measures implemented, predominantly the design and operational controls associated with the separation of clean and dirty water, continuous rehabilitation and management of dust emissions, the impact significance is assessed to be **Low**;
- The total concentration and leach tests conducted on the material indicate that the material has a low potential for acid generation;
- Consequently, the installation of a liner system for this material, consistent with the Norms and Standards for Disposal of Waste to Landfill, is unnecessary given the low risk that the material presents; and
- No additional pollution control measures are recommended based on the outcome of the risk analysis.

[24] A safety hazard classification defined in SABS0286:1998 which provides criteria for determining the distance which material within a residue facility may flow in the event of a catastrophic failure of a facility

31.4.4.2 *In-pit discard disposal facility*

The following is concluded with respect to the risks associated with the **in-pit discard facility**:

- The pre-mitigation environmental risk associated with the in-pit disposal of discard is assessed to be **Medium-High**. This is primarily due to the findings of the geochemical characterisation and geohydrological study that the material may, depending on exposure to water and oxygen, be acid-generating in the long-term. This may have a direct impact on groundwater and surface water resources and users thereof;
- The geohydrological specialist study has however recommended several mitigation measures for restricting the in-pit disposal to limit the extent of oxidation and thus the potential impact on groundwater and surface water resources. With the mitigation measures implemented, the post-mitigation impact is **Low-Medium**; and
- No additional pollution control measures to those recommended in the geohydrological specialist study are proposed based on the outcome of the risk analysis.

31.4.4.3 *Surface discard facility*

The following is concluded with respect to the risks associated with the possible **surface discard facility**:

- The risk analysis on the surface discard facility has been based on the geochemical characterisation of the material and the receiving environment. The risks associated with the potential failure and associated Zone of Influence of the surface discard facility must be assessed as part of the engineering design of the facility;
- The proposed position of the facility has been selected to ensure that it does not overly the geological faults identified as part of the geophysical survey. These faults may act as a preferential pathway to groundwater resources;
- The pre-mitigation environmental risk associated with the possible surface discard facility is assessed to be **Medium-High**. This is primarily due to the findings of the geochemical characterisation and geohydrological study that the discard material has a high probability of becoming acid generating if stored on surface for a significant amount of time. This may have a direct impact on groundwater and surface water resources and users thereof;
- Modelling of the possible surface discard facility with and without a Class C liner system was undertaken in the geohydrological study. This showed that an unlined facility is likely to have a greater impact on groundwater quality, pans and wetlands in the mining right area. A Class C liner, with assumed liner leakage rates, was modelled to result in a reduced impact to groundwater resources, including:
    - A 9% decrease in salt load;
    - A reduction in sulphate concentrations from 2500 mg/l to 900 mg/l nearest to the facility; and
    - No detrimental impact to pit water quality and decant water quality.
- It is more cost-effective to prevent impacts to groundwater than to try and treat contamination. Unlike the in-pit discard disposal facility (with restrictions in place), the material in the surface discard disposal facility is likely to be acid generating and this will result in poor quality leachate, which may then infiltrate into groundwater resources. The extent to which this may occur during the operational phase of mining and in the post-closure environment is dependent on several factors including the design of the facility; and

- To reduce the risk of potential groundwater pollution from the surface discard facility, it is important that the engineering design make provision for the installation of a liner system. This is consistent with the recommendations in the geohydrological report.

It is recommended that the risk analysis on the discard material stockpiles be repeated should the update to the groundwater model, inclusive of the additional geochemical characterisation testwork, indicate a more significant risk to surface or groundwater resources.

31.5 POTENTIAL RISK OF ACID MINE DRAINAGE

31.5.1 GEOCHEMICAL CHARACTERISATION

The results of the static leach testwork completed on the overburden and discard samples indicate the following (Van Hille, 2019) with respect to the risk for acid mine drainage and associated metal leaching:

- The XRF data for the discard samples identified zinc as the most significant trace element, with the concentration exceeding the TCT0 threshold (240 mg/kg) by a significant amount for all six samples, although the values were substantially below the TCT1 value of 160 000;
- A number of the samples showed trace element concentrations for arsenic, barium, cobalt, copper, nickel, lead, antimony and vanadium that marginally exceeded the TCT0 threshold;
- The XRF analysis of the overburden samples showed that the calcium and magnesium concentrations were relatively low, suggesting limited acid neutralising capacity. The zinc concentrations were only a fraction of those measured for the discard coal. A number of the samples contained barium, copper, lead, antimony and zinc at concentrations that exceeded the TCT0 threshold, but not by a substantial amount;
- The acid base accounting analysis of the discard coal indicated that five of the six samples could be considered acid generating, with Ant 185 (1) the exception;
- The sulphur grade was relatively consistent across the six samples (0.52-0.89%);
- The acid neutralising capacity was low (<15 kg H_2SO_4/t) for all but Ant 185 (1) (30 kg H_2SO_4/t), resulting in NAPP values of between 3.5 and 23 kg/t;
- The NAG tests performed on the discard coal confirmed that five of the six samples could be considered acid generating, but the magnitude of acid generation was significantly higher than predicted in all cases. This discrepancy is difficult to explain, particularly as the sulphate concentrations measured in the NAG leachate are more consistent with the acidity predicted by ABA;
- Fourteen of the 20 overburden samples could be considered acid generating based on the ABA analysis. The magnitude of the predicted acid generation is relatively low (<17 kg H_2SO_4/t) for all but GC01-6 (65 kg H_2SO_4/t);
- The remaining six samples were predicted to be acid consuming, although the magnitude of the neutralising capacity was again low (<13 kg H_2SO_4/t) for all but GC03-2 (111 kg H_2SO_4/t). The ABA data were consistent for the whole rock characterisation;
- The relationship between the ABA and NAG results was far more consistent for the overburden material;
- Leachate was generated by three different tests, a deionised water leach, TCLP test and NAG test. For the reject coal samples, the concentrations of zinc and manganese in the leachate from all three tests generally exceeded the LCT0 threshold. While the concentrations of zinc in particular exceeded the LCT0 by some margin, they were consistently below the LCT1 value;

- In addition to zinc and manganese, nickel and lead concentrations in particular from the TCLP and NAG tests exceeded the LCT0 value in several cases, but only marginally;
- The overburden samples were essentially inert under deionised water leach conditions, with only three instances of individual elements exceeding the LCT0 thresholds;
- The TCLP leach resulted in concentrations of barium, manganese and lead that exceeded the LCT0 threshold for several of the samples. While the TCLP test is typically a legislative requirement it does not provide particularly useful data as the acetic acid used is more relevant where putrefiable waste is present, which is typically not the case with mine waste; and
- The leachate from the NAG tests showed elevated concentrations of chromium, manganese, lead and nickel in several cases, with values exceeding the LCT0 threshold, but significantly lower than the LCT1 value.

In the absence of this information, the groundwater impact assessment assumed that there would be oxidation of the discard material during the operational phase and post-closure of the operations. This approach is in line with the requirements of the precautionary principle and represents the worst-case scenario.

31.5.2 GEOHYDROLOGICAL STUDY

The geohydrological study concluded the following in relation to the risk of acid mine drainage:

- Under average conditions and based on the results of preliminary geochemical analyses, modelling suggests that sulphate concentrations may increase to above 150 mg/l within the mining area during the operational phase of mining. This assessment excludes the placing of discard in pits or on surface. The increase in sulphate concentrations is however not expected to pose a health or aesthetic risk;
- The risk of decant depends on several factors, which are discussed in more detail in the report. The main factor that controls the risk of decant is the rate of recharge of rainwater to the disturbed areas. It is unlikely that the opencast mining areas could be rehabilitated to natural recharge conditions and for this reason, decant is likely from all the pits. The most likely decant point at each pit is associated with the lowest topographical elevation and a total of 20 possible decant locations have been identified;
- The static test results indicate that there is an acid generating potential for some of the material that will be handled on site, specifically the coal and discard material. For this reason, the quality of decant is not expected to be good. The decant is expected to be acidic (pH<5), with elevated salt and trace metal concentrations;
- The most significant impact of decant will be on wetland functioning. As the decant points are all associated with low-lying areas, they are typically associated with wetlands. If the decant is not contained, the acidic pH conditions and high salt and trace metal concentrations are expected to kill the wetland fauna and flora. These impacts would most probably be irreversible in the long-term;
- In addition to impacting negatively on wetlands, the unmanaged decant will also flow across land to the pans and non-perennial streams that drain the project area. As with the wetlands, the decant will negatively affect water quality in these surface water bodies and will most probably result in irreversible acidification and unacceptable salt loads;
- If no subsidence takes place over the underground mining areas, it is unlikely that the underground workings would decant in the long-term;

- The impact to groundwater quality in the long-term (100 years after mining ceases) was modelled on various scenarios, including mining with no discard disposal facility, mining with in-pit discard disposal in all open cast pits, mining with an unlined surface discard facility and mining with a lined surface discard facility. The model was based on the assumption that the material will oxidise. In all scenarios, sulphate concentrations are predicted to increase at various receptors with the maximum predicted sulphate concentration of 1200 mg/l associated with the scenario where discard is disposed in all open cast pits; and
- In general, with mitigation measures implemented, the impacts to groundwater availability and groundwater quality are expected to be contained predominantly within the proposed mining right area.

Within the management measures section of the geohydrological study, it is concluded that with the implementation of additional management measures, such as restrictions being placed on the pit location and depth to which the discard can be backfilled, the rate and extent to which the discard could oxidise will be reduced. The resultant discard leachate could therefore be of better quality than what was used for the simulations in the groundwater impact assessment. If the leachate associated with the discard is of better quality, the resultant impact on groundwater quality will be reduced.

For this reason, the geohydrological study recommends that the groundwater quality impact assessment is revised once the results of the kinetic tests and geochemical modelling are available. This, and the mitigation measures associated with restricting the in-pit disposal of discard material have been included in the EMPr and recommended as conditions to be included in the authorisation.

31.6 ENGINEERING OR MINE DESIGN SOLUTIONS TO BE IMPLEMENTED TO AVOID OR REMEDY ACID MINE DRAINAGE

Avoidance of acid mine drainage is more cost-effective than the treatment thereof. Skousen *et al.* (2018) note the following proven control measures for avoiding or preventing acid mine drainage:

- Land reclamation, which includes management of overburden stockpiles and rehabilitation of mined areas in a manner which facilitates the quick movement of surface water flow off mined areas;
- Alkaline amendment to active disturbances. This includes managing stockpiles by blending acid-generating material with material with a high acid neutralising potential as well as the use of limestone to increase alkalinity;
- Alkaline recharge trenches comprising of or surface trenches filled with alkaline material to add alkalinity to water prior to infiltration. The increased alkalinity buffers the formation of acid;
- Oxygen barriers. These involve the installation of technologies like impervious membranes, dry seals, hydraulic mine seals, grout curtains/walls to restrict the extent to which material which may acid-generating comes in contact with oxygen or water;
- Water covers, involving the placement of material which may be acid-generating beneath a pond or lake, either natural or artificial;
- Alkaline amendment to abandoned mines. Measures include the removal of surface stockpiles known to be a source of acid mine drainage and backfilling of underground voids with impermeable material; and
- Remining and reclamation. This involves returning to a previously mined area to decrease the recharge, cover acid-producing materials and/or remove the remaining coal, which is the source of most of the pyrite.

To the extent applicable to the proposed mining activities at Kranspan, these controls have been considered and applied to the proposed Kranspan mining activities.

Avoidance measures implemented for the potential acid mine drainage impact associated with the proposed mining activities include:

- Revision of the mine plan to avoid the extent to which environmentally sensitive areas are directly impacted upon;
- Implementation of strip mining and concurrent rehabilitation measures to minimise the surface area extent potentially exposed to oxidation;
- After mining, reinstatement of the overburden material in the same stratigraphic sequence in which it was removed. This prevents mixing of the different soils and limits the extent to which carbonaceous material may be exposed to oxidative conditions;
- Design of clean and dirty water storm water systems to minimise the flow of surface water into areas where acid may be generated, including the pits and overburden stockpile areas. In addition, the stormwater management plan provides for six HDPE-lined pollution control dams for containing dirty water runoff, seepage into mine workings and decant from rehabilitated pits;
- Prevention of dirty surface water runoff and decant into sensitive environmental features like wetland and pans;
- If the surface discard stockpile is necessary, it will designed and constructed in accordance with the legal requirements;
- In-pit disposal of discard:
  - Must be limited to Pit 5;
  - The discard material must not be backfilled beyond the level of the pre-mining coal seam depth;
  - Should additional discard disposal capacity be required and the material be backfilled to above the pre-mining coal seam depth, that geochemical and groundwater modelling is undertaken to estimate this impact prior to the implementation of this management option. The outcome of these simulations must guide the extent to which discard can be placed above the coal seam depth;
  - The full extent of the discard material must be placed below the regional rest (pre-mining) groundwater table; and
  - Additional mitigation measures must be implemented to further reduce the risk of in-pit disposal of discard to groundwater resources. This must be informed by the outcome of updates to the groundwater model inclusive of the kinetic leach testwork.
- The EMPr must be updated to include the detailed engineering design for the surface discard facility, should it be required;
- Prior to the construction of the wash plant, the groundwater model must be updated with the findings of the kinetic leach testwork and the detailed design of the in-pit disposal; and
- Additional mitigation measures must be implemented to further reduce the risk of in-pit disposal of discard to groundwater resources. This must be informed by the outcome of updates to the groundwater model inclusive of the kinetic leach testwork.

31.7 MEASURES THAT WILL BE PUT IN PLACE TO REMEDY ANY RESIDUAL OR CUMULATIVE IMPACT THAT MAY RESULT FROM ACID MINE DRAINAGE

Groundwater monitoring will continue throughout the LOM to detect changes in water quality and this will be used to inform the need for any additional control measures, including post-closure water treatment.

Decant will be contained in an HDPE-lined, engineered facility, appropriately designed for the volume water required to be managed.

Poor quality water will not be released into the environment.

Various technologies can be employed for treating acid mine drainage should this be necessary. The choice of the technology is dependent on several factors including the volume of water, level of acidity, water oxidation status and concentrations of metals (Skousen et al., 2018). Without knowing these variables, it is not possible to accurately design and cost a water treatment system.

In general, water treatment can be undertaken:

- Actively, typically through the establishment of a water treatment plant and the use of chemicals; and
- Passively, by, for example, the construction of wetlands which make use of natural chemical and biological processes to improve the quality of water. Passive water treatment systems are suitable for conditions of low to moderate flow and acidity.

Active water treatment is an expensive management option which, if necessary, will have to be implemented for the long-term. The focus must therefore be on preventing and limiting the extent to which acid mine drainage may occur in the first instance.

Should the monitoring programme indicate that water treatment of acid mine drainage is likely to be necessary, a treatment plan will be developed based on the quality and flow of water requiring treatment. The preference will be on using passive water treatment technologies.

The treatment plan will include the cost for the treatment of water for as long as this may be needed. This cost will be included in the update to the mine's financial provisioning for rehabilitation and closure, as required by legislation.

31.8 VOLUMES AND RATES OF WATER USE REQUIRED FOR THE MINING, TRENCHING OR BULK SAMPLING OPERATION

The water requirements for the proposed mine development and operations are described in Section 3.3.3 and 3.3.5 of the EIR.

31.9 HAS A WATER USE LICENCE BEEN APPLIED FOR?

Ilima has submitted an Integrated Water Use Licence Application (IWULA) for all water uses pertaining to the proposed mining activities. This is discussed in Part A, Section 4 of the EIR. Further information on the various water uses is provided in the Draft Integrated Waste and Water Management Plan (IWWMP), submitted in support of the IWULA.

31.10 IMPACTS TO BE MITIGATED IN THEIR RESPECTIVE PHASES

The mitigation measures to be implemented are summarised in the required DMR format in Table 31-1.

31.11 IMPACT MANAGEMENT OUTCOMES

The impact management outcomes are summarised in the required DMR format in Table 31-2.

31.12 IMPACT MANAGEMENT ACTIONS

The impact management actions are summarised in the required DMR format in Table 31-3.

TABLE 31-1: IMPACTS TO BE MANAGED IN THEIR RESPECTIVE PHASES

ACTIVITIES	PHASE	SIZE AND SCALE OF DISTURBANCE	MITIGATION MEASURES	COMPLIANCE WITH STANDARDS	TIME PERIOD FOR IMPLEMENTATION
			ADMINISTRATIVE CONTROLS		
All mining and associated activities	All phases	Please refer to Table 3-1.	➲ The EMPr shall be incorporated into any Environmental Management System (EMS) applicable to the site; ➲ All resources required to ensure compliance with the EMPr, including budgetary, personnel and equipment shall be in place for the duration of the LOM; ➲ A signed commitment to ensure compliance with the EMPr shall be obtained from Contractors appointed to undertake any of the activities on behalf of the applicant; ➲ An appropriately qualified, trained and experienced person shall be designated to fulfil the compliance monitoring requirements in the EMPr; ➲ The following records shall be maintained on Site: ➢ Environmental Authorisation; ➢ Approved EMPr; ➢ Emergency preparedness and response plan; ➢ Documentation concerning compliance monitoring, environmental performance and EMPr implementation;	Implementation of the mitigation measures will ensure compliance with NEMA, NEMAQA, NEMWA, MPRDA and the regulations, norms and standards promulgated in terms of these Acts	Mitigation measures are required to be implemented from the commencement of site preparation activities throughout the LOM

			➢ Record of all individuals receiving job-specific and SHE training; ➢ Compliance monitoring and auditing data/reports and results of inspections conducted; ➢ Approved SHE method statements; ➢ Waste management records; ➢ Equipment maintenance records; ➢ Maintenance and inspection of all safety equipment e.g. fire extinguishers; ➢ A completed and signed environmental incident/non-conformance report in respect of each reported environmental incident or nonconformity; ➢ A completed and signed environmental incident/non-conformance register; ➢ A completed and up-to-date external complaints and grievances form and register in respect of each external complaint received; ➢ Emergency contact register; ➢ A hazardous substance register.		
SOCIO-ECONOMIC					
All activities involving employment and procurement of goods and services	All phases	As above	➲ The Applicant must continue to reassess the risks and impacts of the development throughout its operational life. Should any change in the risk and impact profile of the development be determined, additional management controls and mitigation	SLP Mining Charter MPRDA	Throughout the LOM

			measures must be implemented and the EMPr amended to reflect these changes; ➲ The SLP and EMPr, including all management and monitoring measures must be implemented and compliance thereto audited by a competent independent person on an annual basis; ➲ The following social management plans and procedures must be developed by the Applicant prior to construction commencing: ➲ An emergency preparedness and response plan; ➲ A comprehensive mine health and safety management plan, incorporating controls for ensuring community health and safety; ➲ A compensation policy and framework outlining the procedure to be followed for the compensation of any losses confirmed to be as a result of the activities of the mine; and ➲ A written complaints and grievance procedure. ➲ The Applicant must establish a community engagement forum comprising of representatives of, among others, the mine management, surrounding landowners / land users, community members, authorities, and local business; ➲ All relevant monitoring data with respect to air quality and groundwater must be made available to the community engagement forum;		

			➲ The Project should encourage and invest in alternative livelihoods development so that at decommissioning and closure phases, the local area is not reliant exclusively on the Project for employment and economic opportunities; ➲ Work closely with local health services in monitoring and addressing changes in levels of community health and wellbeing; ➲ Implement an HIV/AIDS awareness programme addressing factual health issues as well as behaviour change; ➲ An annual report on the progress of implementation of the programmes and commitments made by the Applicant in the mine social and labour plan should be provided to the community engagement forum, steering committee and all other relevant stakeholders. It is recommended that the report include feedback on relevant socio-economic indicators, to be agreed by the forum, and which may include indicators such as: ➢ Local employment; ➢ Business opportunities; ➢ Crime and safety; ➢ Housing supply and suitability; ➢ Housing affordability; ➢ Influx management; ➢ Income distribution;		

			➢ Skills development, training and development; and ➢ Transport and traffic.		
All mine-related activities	All phases	As above	⮊ Implementation of a comprehensive mine health and safety programme; ⮊ Petrochemicals, oils, solvents, paints and other identified hazardous substances shall only be stored under controlled conditions; ⮊ All hazardous materials will be stored in a secured, appointed area that is fenced and has restricted entry; ⮊ All applicable emergency contact details shall be confirmed and displayed at various locations across the site; ⮊ Speed limits for mine vehicles and personnel established; and ⮊ Notification of relevant stakeholders when large loads are required, or road closures are to occur.	Mine Health and Safety Act, 1996 MPRDA National Road Traffic Act SLP Mining Charter	Throughout the LOM
All mine-related activities	Decommissioning and Closure	As above	⮊ The impact of closure can be mitigated through the implementation of the measures in the SLP, including regular, consultative review of closure strategies and the portable skills / re-skilling programme.	SLP Mining Charter MPRDA	Throughout the LOM, increasing in detail as mine closure approaches
GROUNDWATER					
Mine dewatering	Construction and Operational	As above	⮊ The volume and quality of groundwater that is currently abstracted from private boreholes within the delineated zone of influence must be established before mining commences. These boreholes are listed in Table 20 of the specialist report. This is a critical step in	MPRDA and NEMA principles Water management measures in compliance with NWA and IWUL IWWMP	Throughout the LOM in accordance with the groundwater monitoring programme

			understanding what impact mining will have on these boreholes and must be use as a basis for managing the loss of any groundwater to private users during mining. In order to achieve this, pumping tests should be completed on the identified boreholes to establish borehole yield. . A groundwater sample must be taken from each borehole and submitted for chemical analysis according to the details provided in Table 6 of the specialist report; ➲ An attempt must be made to measure the flow of KR_Spring5 in order to establish baseline conditions. A sample must also be taken from the spring for chemical analysis. These tests must be completed prior to the commencement of mining and must be used as a basis for entering into negotiations with the owner regarding the potential loss of this spring during mining; ➲ Negotiations must be entered into with the owners of private boreholes that will be destroyed during opencast mining. These boreholes are listed in Table 19 of the specialist report; ➲ A dedicated groundwater monitoring programme must be implemented in all private boreholes within the delineated zone of influence. These boreholes are listed in Table 20 of the specialist report. This monitoring programme must include groundwater level and quality measurements. Should monitoring information indicate adverse impacts, Ilima must enter into negotiations with the affected landowners to	NWA NEMA	

			negotiate alternative water supply options of equivalent quantity and quality; ➲ Feedback must be provided to owners of boreholes within the affected zones regarding progress made with mining activities, rehabilitation and the outcome of monitoring programmes on a quarterly basis when groundwater monitoring will take place to ensure that they are informed of aspects of mining that may be of significance. ➲ The volume of water pumped from underground to surface during the operational phase must be recorded. This information must be used to update the impact assessment presented in this report, as necessary. ➲ If water-bearing structures are intersected during mining that contribute significant volumes of seepage to the pits and underground workings, they must be characterised and quantified. The risk and timing of decant must be re-assessed taking this information into consideration. ➲ If subsidence over underground workings is identified as a possibility, a geotechnical study must be completed to delineate areas of possible subsidence. This information must be used to re-asses the risk of decant and to quantify the associated impacts. Current simulations assume that no subsidence will take place over the underground workings. ➲ Surface and underground rehabilitation measures must be designed to minimise the risk of decant . In order to do so, the adit must		

			be sealed upon mine closure and concurrent rehabilitation of the opencast pits must be maintained throughout the life of mining. ➲ Groundwater levels must be monitored on a monthly basis in the dedicated monitoring boreholes. This information together with daily on-site rainfall measurements must be used to improve the understanding of the rate of recharge as well as of aquifer parameters like storage coefficients and specific yield. ➲ The numerical model used in this assessment should be updated, verified and re-calibrated on a regular basis as monitoring information becomes available. ➲ The final model must be prepared at least five years prior to mine closure to ensure that predictions of long-term impacts are undertaken with the highest possible level of confidence.		
Underground and open cast mining	Operational, Closure and Decommissioning	As above	➲ Dedicated monitoring boreholes must be maintained in the two lineaments that transect the mining area. Boreholes 1-130, 1-130b, 5-110 and 5-110b are suitable for this and are situated down gradient of the plant area. Boreholes 6-220 and 6-220b are also situated on one of the lineaments. Based on the available information, it is anticipated that borehole KR11 is also situated on this fault and should therefore be included in the monitoring programme. If any of these boreholes are destroyed during mining, they must be replaced. ➲ Surface infrastructure, like the plant and the alternative discard stockpile option, must be		Throughout the LOM in accordance with the groundwater monitoring programme

			positioned off the lineaments. Prior to the establishment of these areas, a geophysical survey must be completed to pin-point the faults. The positions of boreholes 1-130 and 5-110 can be used as a guideline in this regard. ➲ Only Pit 5 should be considered for in-pit discard disposal. It is preferable that discard is placed in the bottom of the northern most part of this pit to contain seepage and limit impacts. The boundary pillar between Pits 5 and 6 must be kept in place to avoid inter-pit flow of leachate associated with the discard. A groundwater monitoring borehole must be drilled down gradient of the area where discard is backfilled to the pit in order to monitoring the impact of this on groundwater quality. ➲ Prior to the implementation of either a surface discard stockpile or in-pit disposal of the discard, a geochemical study must be completed to evaluate the impact of placement of the discard material. In this study, it was assumed that leachate from the discard would deteriorate according to the description in Section 3 of the specialist report. These assumptions must be confirmed and re-assessed once the results of the kinetic geochemical tests are available. In addition, it is recommended that geochemical modelling is undertaken to establish the potential quality of leachate if the discard is placed at the bottom of the pit and flooded to eliminate contact with oxygen. Conversely, the impact on leachate quality should be assessed if the discard is placed above the coal seam level		

			and remains in contact with oxygen and water. In the latter instance, it is likely that the quality of leachate will deteriorate. Once the outcome of this study is available, the contaminant transport simulations presented in the geohydrogical report must be re-assessed. ➲ If the surface discard stockpile alternative is implemented, it is recommended that at least a compacted clay liner be considered in order to reduce long-term adverse impacts on groundwater and decant quality. This facility must be designed according to legal requirements. ➲ If the option to backfill discard to Pit 5 is implemented, it is important that measures are put in place to monitor and control in-pit water levels. The discard must be placed in the northern section of this pit, where the coal floor contours dip away from the nearby downstream pan and wetlands. The volume of discard that can be placed in this area must be assessed as part of the design phase for this option to determine whether or not it would be sufficient for the life of the operations. Seepage that collects in the portion of Pit 5 that is used for discard disposal should be removed through a penstock or similar measures indicated by the professional engineer appointed to design the facility. A groundwater monitoring borehole should be drilled to the north of this area (between Pits 5 and 6) to monitor the impact of placing discard in this area. This borehole must be drilled prior to the commencement of this activity. The designs for the facility must		

			furthermore take cognisance of the potential decant point that was identified in this area of Pit 5. Potential decant at this position post closure of the facility can be mitigated by creating a PCD or a return water dam in this area to contain seepage and potential decant. It is noted that the pit is not likely to decant if it is kept open for discard disposal during the operational phase of mining. The risk of decant in the long-term can be controlled with the penstock or similar water collection system identified during the design stage of the facility and/or contained in the proposed PCD. ➲ Once the kinetic geochemical test results are available, the impact assessment presented in the geohydrological study should be updated and amended, as necessary. ➲ A monitoring programme must be implemented to establish underground water quality during the life of operations. This information must be used to update the long-term impact of mining on groundwater quality presented in this report. ➲ Updated contaminant transport simulations must be undertaken once this information is available in order to improve the confidence levels in long-term predictions. These simulations must be completed at least five years prior to mine closure to ensure that effective measures are developed to manage long-term impacts		
AIR QUALITY					
All construction-phase activities which	Construction	As above	➲ Air quality impacts during construction would be reduced through basic control measures	NEM:AQA	Throughout the LOM in accordance with the

generate particulate emissions Excavations, Site Clearance and Transportation			such as limiting the speed of haul trucks; limit unnecessary travelling of vehicles on untreated roads; and to apply water sprays on regularly travelled, unpaved sections; ➲ When haul trucks need to use public roads, the vehicles need to be cleaned of all mud and the haul material must be covered to minimise any windblown dust; ➲ The access road to the Project needs to be kept clean to minimise carry-through of mud on to public roads; and ➲ Cement will be stored in weather proof containers to avoid the wind from blowing cement dust that might be harmful to employees in the immediate environment or contaminate soil and water sources in the immediate environment.	Dust Control Regulation GNR 827 of 2013 Ambient Air Quality Standards	ambient air quality monitoring programme
All operational-phase activities which generate particulate emissions Mining, Material Handling and Transportation	Operational	As above	➲ Regular water sprays on unpaved roads to ensure at least 75% control efficiency; ➲ Monthly physical inspection of road surface, daily visual observation of entrained dust emissions from unpaved road surfaces.; ➲ Controlled blasting techniques to be used to ensure minimal dust generation; ➲ Blasting only to be conducted on cloudless days, if possible; ➲ Addition of chemical surfactants to water sprays to lower water surface tension and increase binding properties; ➲ Drilling to be controlled through water sprays or vacuum packs;		Throughout the LOM in accordance with the ambient air quality monitoring programme

			➲ Increase in-pit material moisture content; ➲ Drop height from excavator into haul trucks to be kept at a minimum for ore and waste rock; ➲ Tipping onto ROM storage piles to be controlled through water sprays, should significant amounts of dust be generated; ➲ Keep material handled by dozers and wheeled loaders moist to achieve a control efficiency of 50%, especially during dry periods; ➲ Regular clean-up at loading areas; ➲ Water sprays at ROM stockpile can achieve 50% control efficiency. Increase in moisture content provides higher threshold friction velocity and ensures that particulates are not as easily entrained due to high surface winds; ➲ Reshape all disturbed areas to their natural contours; ➲ Cover disturbed areas with previously collected topsoil and replant native species; ➲ Rock cladding with larger pieces of waste rock is recommended to reduce wind erosion emissions from the overburden storage piles; ➲ Revegetation of overburden stockpile is recommended; and ➲ Water sprays at the crushers to achieve at least 50% control efficiency.		
TERRESTRIAL ECOLOGY					
Clearing of Vegetation for Site Access, Infrastructure	Construction and Operational	As above	➲ Design Open-cast options to exclude any significant areas of Untransformed Grassland	MPRDA NEMA	Throughout the LOM

Siting and Mining of Open Pits			and to avoid Unchannelled Valley-bottom Wetlands and Seeps; ➲ Locate overburden facilities and Haul Roads to avoid all High or Med-High ES vegetation communities; ➲ Minimum vegetation clearance should be ensured by clearing only those areas that are utilised for infrastructure construction, mining areas and entries and waste dumping activities. A "permit to clear" procedure should be established in order to control and monitor vegetation clearance; ➲ Close monitoring of all movements of equipment, site personnel and workers should be carried out so as to minimize unauthorised activities in any part of the project area; ➲ An Invasive Alien Plant management plan must be established.. The objective of this plan should be the continuous eradication of existing invasive populations and the detection of new populations, particularly in newly or constantly disturbed areas such as roadsides. ➲ A small team of labourers should be trained in the identification of the key invasive alien plant species, as well as the safe and effective use of relevant herbicides on these species; ➲ The team should be equipped with adequate equipment such as knapsack sprayers, which should be stored in a safe location with the herbicides; ➲ Careful records should be kept of areas cleared of invasive aliens and the success of	NEMWA NEMBA	

			follow-up operations, so that the program can be audited as part of the overall EMP audit; ➲ Contractor staff should be accommodated off-site, reducing the risk of illegal harvesting taking place after hours; ➲ Labour supervisors and SHE officials should monitor the activities of labourers when working away from infrastructure in natural habitat; and ➲ Part of staff induction should be awareness of the consequences of being caught harvesting plant and faunal resources.		
Construction/ Operation activities (Disturbances, vegetation Clearing, Accidents, Access Roads)	All phases	As above	➲ Continuous Environmental Awareness raising and training to employees and surrounding communities will be crucial; this should involve an induction training program, where appropriate conservation principles, safety procedures, snake bite avoidance and first aid treatment are taught through the use of easy-to-understand study material. Designated staff must be trained to be able to safely capture and relocate potentially dangerous snake species; ➲ Strict measures for speed control should be instituted on all roads within the lease area. The measures should include erection of speed control humps in respective areas, installation of traffic signs in selected areas warning drivers of road humps, pedestrian crossings, sharp bends and other accident-prone areas, with regular training and awareness raising of all drivers on site on		Throughout the LOM

			speed control and enforcing a maximum speed limit of 50 km/h on all mine roads; ➲ All staff operating motor vehicles must undergo an environmental induction training course that includes instruction on the need to comply with speed limits, to respect all forms of wildlife and to prevent accidental road kills of fauna; ➲ Road mortalities should be monitored by both vehicle operators (for personal incidents only) and an Environmental Control Officer (all road kill on periodic monitoring basis as well as specific incidents) with trends being monitored and subject to review as part of the monthly reporting. Monitoring should occur via a logbook system where staff members take note of the date, time and location of the sighting/ incident. This will allow determination of the locations where the greatest likelihood exists of causing a road mortality and to develop mitigations for these areas; ➲ Excavations must be left open for as short a time as possible to avoid trapping herpetofauna and causing habitat fragmentation (open trenches preventing migration/dispersal); ➲ Any trapped herpetofauna unable to escape an excavation should be captured by a trained person and safely relocated to suitable nearby habitat; ➲ Design, construction and operation of all facilities should focus on the lowest levels of disturbance, i.e. using non-reflective paints in		

			tones that will blend in with the surrounds, low wattage/coloured lighting pointing away from wildlife habitat and using natural vegetation as buffers around mining activities; and ➲ All noise generating activities should be mitigated to be within legal noise limits as part of Noise Control Action Plan; this plan should detail monitoring protocols, corrective and preventative measures such as silencers and enclosure of high-noise facilities/infrastructure, as well as the continuous monitoring of these measures to ensure they are effective in minimising disturbance to the surrounding fauna.		
			SURFACE WATER ECOSYSTEMS		
All construction- and operational phase activities	All phases	As above	➲ Indiscriminate destruction of vegetation layers from wetland areas that fall outside of the ultimate infrastructure footprint should be avoided. A delineation map has been presented (Figure 15 of the specialist report), which indicates the extent of the 100 m conservation buffer zones. It is recommended that these buffer zones be fenced off within applicable areas to avoid indiscriminate habitat destruction and treated as "no-go" areas. This includes using these areas for soil stockpiling, equipment storage, fuelling areas, etc; ➲ Stormwater management must ensure erosion protection at the outfall points into the receiving environment; ➲ Any soil that is removed for trenching purposes must be stored in their respective	IWWMP MPRDA NEMA NEMBA GN704 CARA	Throughout the LOM

			layers and returned to the excavation in reverse order; ➲ The soils must be stored outside of the wetland and buffer zones in order not to smother established wetland vegetation. Adequate site reinstatement must be implemented in order to abate the formation of erosion through modification of the surface water hydrology; ➲ Silt traps and fencing should be used in areas of steeper topography (if applicable); ➲ The movement of heavy machinery within wetland zones should be limited to only single access roadways. Upon completion of the construction phase, this roadway should be ripped and/or disk ploughed to loosen the compacted soils and to allow for the establishment of vegetation within the affected areas, which should be a mixture of veld grasses typical of the surrounding area within similar habitat units; and ➲ Indiscriminate habitat destruction should be avoided and the construction footprint, including service and support areas should be kept to a minimum.		
SOILS, LAND CAPABILITY AND LAND USE					
All construction phase activities	Construction	As above	➲ The mitigation measures should be implemented according to the specialist recommendations in Table 17-1. Effective soil stripping during the dryer and less windy months when the soils are less susceptible to erosion and compaction. This will assist the	IWWMP MPRDA NEMA NEMBA	Throughout the LOM

			stockpiling and vegetative cover to propagate before the following wet season; ➲ The material from the boxcut phase must be stored as per overburden classification. ➲ Stock-pilling of any material should not be located within 1:100-year flood line, delineated riparian zone or 100m from the watercourse, whichever is greatest. ➲ Stripped off topsoil must be re-used to rehabilitate any disturbed land and must not be used for maintenance of access roads. If and where possible concurrent rehabilitation of all disturbed areas shall be done on an ongoing basis to prevent degradation of the natural environment. ➲ Effective cladding of any stockpiles, dumps, berms and/or by-product facilities and the minimising of the height of all stockpiles wherever possible will help to reduce wind erosion and the loss of materials; ➲ Soil replacement to all areas (temporary) that are not required for the operational phase, and the preparation of a seed bed to facilitate the re-vegetation program for these areas will limit potential erodibility during the operational phase and into the rehabilitation and closure phases; ➲ Soil amelioration (cultivation) to enhance the growing capability of the stockpiled soils so that they can be used for rehabilitation at closure and to maintain the soils viability during storage;	GN704 CARA	

			➲ Backfilling of the boxcut with soft overburden, discards and the creation through compaction of a barrier layer at the soil backfill interface using the relatively more impermeable clay rich subsoil (Non utilisable soils) and soft overburden. These actions are recommended as the ferricrete layer and any hard-impermeable sedimentary layers will have been destroyed and will not be available to re-create this barrier; ➲ Replacement of the growing medium (Utilisable soil) in the correct order and as close as possible to its original position in the topography will help to maintain the soil pedogenisis and utilization potential relative to the ecology and biological constraints; ➲ Soil replacement and the preparation of a seed bed to facilitate the re-vegetation program and to limit potential erodibility during the rehabilitation process; ➲ Stripping will only occur where soils are to be disturbed by activities that are described in the design report, and where a clearly defined end rehabilitation use for the stripped soil has been identified; ➲ It is recommended that all vegetation is stripped and stored as part of the utilizable soil. However, the requirements for moving and preserving fauna and flora according to the biodiversity action plan should be consulted; ➲ Soils will be handled in dry weather conditions so as to cause as little compaction as possible. Utilizable soil (Topsoil and upper portion of		

			subsoil B2/1) must be handled and stockpiled separately from the lower "B" horizon and all softs (decomposed rock); ➲ The "Utilizable" soil will be stripped to a depth of 500mm or until hard rock is encountered. These soils will be stockpiled together with any vegetation cover present (only large bushes to be removed prior to stripping). The total stripped depth should be 500mm, where possible; ➲ Stockpiling areas will be identified in close proximity to the source of the soil to limit handling and to promote reuse of soils in the correct areas; and ➲ Soils stockpiles will be demarcated, and clearly marked to identify both the soil type and the intended area of rehabilitation.		
Continued Activities Including Mining and Transportation Stripping of Soils, Clearing of Vegetation and Stockpiling of Materials Continuous Clearing, Disturbance, Laydown, Stockpiling and Transportation	All phases	As above	➲ Minimisation of overall/total area of impacted; ➲ Timely replacement of the soils so as to minimise the area of disturbance; ➲ Effective vegetative and soil cover and protection from wind (dust) and dirty water contamination; ➲ Adequate protection from erosion (wind and water); ➲ Servicing of all vehicles and equipment on a regular basis and in well-constructed and bunded areas, well-constructed and maintained oil traps and dirty water collection systems;		

			➲ Cleaning of all roadways and haulage ways, drains and storm water control facilities; ➲ Containment and management of spillage; ➲ Soil replacement and the preparation of a seed bed to facilitate and accelerate the re-vegetation program and to limit potential erosion, and ➲ Soil amelioration to enhance the growth capability of the soils and sustain the soils ability to retain oxygen and nutrients, thus sustaining vegetative material during the storage stage.		
	Operational		➲ Rapid growth of vegetation on the Soil Stockpiles will be promoted (e.g. by means of watering or fertilisation). The purpose of this exercise will be to protect the soils and combat erosion by water and wind; ➲ Stockpiles will be established with storm water diversion berms to prevent run off erosion; ➲ Soil stockpile heights will be restricted where possible to <1.5m so as to avoid compaction and damage to the soil seed pool. Where stockpiles higher than 1.5m cannot be avoided, these will be benched to a maximum height of 15m. Each bench should ideally be 1.5m high and 2m wide. For storage periods greater than 3 years, vegetative cover is essential, and should be encouraged using fertilization and induced seeding with water. The stockpile side slopes should be stabilized at a slope of 1 in 6. This will promote vegetation growth and reduce run-off related erosion;		

			➲ No waste material will be placed on the soil stockpiles; and ➲ Equipment movement on to the soil stockpiles will be limited to avoid topsoil compaction and subsequent damage to the soils and seedbank.		
	Decommissioning and closure	As above	The following issues need to be taken into consideration during all phases of the project: ➲ Stockpiled soil will be used to rehabilitate disturbed sites either ongoing as disturbed areas become available for rehabilitation and/or at closure. The utilizable soil (500mm) removed during the construction phase or while opening up of decline adit entrance, shall be redistributed in a manner that achieves an approximate uniform stable thickness consistent with the approved postmining land use (Low intensity grazing), and will attain a free draining surface profile. A minimum layer of 300mm of soil will be replaced; ➲ A representative sampling of the stripped soils will be analysed to determine the nutrient status of the utilizable materials. As a minimum the following elements will be tested for: EC, CEC, pH, Ca, Mg, K, Na, P, Zn, Clay% and Organic Carbon. These elements provide the basis for determining the fertility of soil. based on the analysis, fertilisers will be applied if necessary; ➲ Vegetate long-term soil stockpiles; ➲ Erosion control measures will be implemented to ensure that the soil is not washed away and		

			that erosion gulleys do not develop prior to vegetation establishment; ➲ Prevent contamination of topsoil and stockpiled soil; ➲ If soil (whether stockpiled or in its undisturbed natural state) is polluted, the first management priority is to treat the pollution by means of in situ bioremediation. The acceptability of this option must be verified by an appropriate soils expert and by DWAF, on a case by case basis, before it is implemented; ➲ If in situ treatment is not possible or acceptable then the polluted soil must be classified according to the Minimum Requirements for the Handling, Classification and Disposal of Hazardous Waste (DWAF 1998) and disposed at an appropriate, permitted, off-site waste facility; ➲ It is recommended that a qualified person (agronomist or plant ecologist) be employed to establish the possible need or not for lime, organic matter and fertilizer requirements that will be applied, prior to the starting of the rehabilitation process; ➲ The area must be fenced, and all animals kept off the area until the vegetation is self sustaining; ➲ Newly seeded/planted areas must be protected against compaction and erosion; ➲ Traffic should be limited were possible while the vegetation is establishing itself;		

			➲ Plants should be watered and weeded as required on a regular and managed basis; ➲ Check for pests and diseases at least once every two weeks and treat if necessary; ➲ Replace unhealthy or dead plant material; ➲ Fertilise, hydro seeded and grassed areas with 200 kg/ha ammonium sulphate 4-6 weeks after germination, and ➲ Repair any damage caused by erosion; ➲ Position stockpiles upslope of mining areas, or as screens to restrict visibility of the mining operation provided that in doing so, the stockpile is not exposed to the risk of seepage or dirty water contamination; and ➲ Ensure that all stockpiles have a storm water diversion berm for protection against erosion and contamination by dirty water.		
NOISE					
Blasting, mining operations, construction of surface infrastructure, haulage and decommissioning	All phases	Not Applicable	**Engineering and Operational Practices** For general activities, the following good engineering practice should be applied to all project phases: ➲ Equipment with lower sound power levels must be selected. Vendors should be required to guarantee optimised equipment design noise levels; ➲ Where possible, other non-routine noisy activities such as construction, decommissioning, start-up and maintenance, should be limited to day-time hours; and	SANS Environmental Noise Standards	Throughout the LOM

			➲ A noise complaints register must be kept. **Specifications and Equipment Design** As the site or activity is in close proximity to NSRs, equipment and methods to be employed should be reviewed to ensure the quietest available technology is used. Equipment with lower sound power levels must be selected in such instances and vendors/contractors should be required to guarantee optimised equipment design noise levels. **Enclosures** As far as is practically possible, source of significant noise should be enclosed. The extent of enclosure will depend on the nature of the machine and their ventilation requirements. Motors are examples of such equipment. It should be noted that the effectiveness of partial enclosures and screens can be reduced if used incorrectly. **Use and Siting of Equipment and Noise Sources** Plant and equipment should be sited as far away from NSRs as possible. Also: a) Machines used intermittently should be shut down between work periods or throttled down to a minimum and not left running unnecessarily. This will reduce noise and conserve energy. b) Plants or equipment from which noise generated is known to be particularly directional,		

			should be orientated so that the noise is directed away from NSRs. c) Acoustic covers of engines should be kept closed when in use. d) Construction materials such as beams should be lowered and not dropped. **Maintenance** Regular and effective maintenance of equipment are essential to noise control. Increases in equipment noise are often indicative of eminent mechanical failure. Also, sound reducing equipment/materials can lose effectiveness before failure and can be identified by visual inspection. Noise generated by friction in conveyor rollers, trolley etc. can be reduced by sufficient lubrication. **Controlling the Spread of Noise** Naturally, if noise activities can be minimised or avoided, the amount of noise reaching NSRs will be reduced. Alternatively, the distance between source and receiver must be increased, or noise reduction screens, barriers, or berms must be installed. **Distance** To increase the distance between source and receiver is often the most effective method of controlling noise since, for a typical point source at ground level, a 6-dB decrease can be achieved		

			with every doubling in distance. It is however conceded that it might not always be possible. **Screening** If noise control at the source and the use of distance between source and receiver is not possible, screening methods must be considered. The effectiveness of a noise barrier is dependent on its length, effective height, and position relative to the source and receiver as well as material of construction. To optimize the effect of screening, screens should be located close to either the source of the noise, or the receiver. The careful placement of barriers such as screens or berms can significantly reduce noise impacts but may result in additional visual impacts. Although vegetation such as shrubs or trees may improve the visual impact of construction sites, it will not significantly reduce noise impacts and should not be considered as a control measure. Earth berms can be built to provide screening for large scale earth moving operations and can be landscaped to become permanent features once construction is completed. Care should be taken when constructing earth berms since it may become a significant source of dust.		
TRAFFIC ROAD AND SAFETY					
Movement of Man and Materials	Construction and Operational	As above	➲ A traffic impact assessment must be undertaken in consultation with the relevant road authority in order to determine the need	National Road Traffic Act	Throughout the LOM

			for any road safety controls as a result of the development. ➲ The number of truck movements through the town of Carolina must be limited to a minimum ➲ A monitoring system for ensuring safe use of trucks must be implemented		
GEOLOGY					
Clearing of Areas for Site Access, Infrastructure Siting, Mining of Open Pits and Development of overburden stockpiles and discard disposal facilities	Construction and Operational	As above	Avoid / minimise through design and operational controls	MPRDA	Operational
TOPOGRAPHY					
Clearing of Areas for Site Access, Infrastructure Siting, Mining of Open Pits	All Phases	As above	Minimise through design and operational controls	IWWMP MPRDA NEMA NEMBA GN704 CARA	
BLASTING					
Blasting	Operational	As above	➲ There is a need to mitigate vibration when mining comes closer than 200 m from the R36 and closer than 1000 m from privately owned homes. Only one hole per delay (instance in time) may be fired to limit ground vibration to the required levels. This is achieved through effective timing designs and using initiation	Blast Design Specification Mine Health and Safety Act Explosives Act	Throughout the LOM

			systems that accurately reflect the timing design; ➲ Air blast and related noise from blasting need to be controlled by providing adequate stemming in each blasthole as per an effective design. Stemming lengths should not be less than 20 hole-diameters, except in presplit holes. Strict control needs to be applied to prevent the occurrence of over-charged holes; ➲ Under-burdened faces are a major source of fly rock and air blast. Burden control on free faces must be applied and face profiling should be applied on faces that are oriented towards receptors that are closer than 1000 m from a blast. Effective burden control implies presplitting of all overburden and mid-burden blasts to create good quality vertical high walls; ➲ As a normal procedure, it will be necessary to temporarily clear people to a safe distance (1000 m) from blasting activities. This control must also apply to people working in the opencast operations immediately adjacent to the mine; ➲ In cases where roads or railway lines (R36 and the railway line to the South East of the mine) come within the zone of influence of fly rock from blasting, traffic must be stopped at a safe distance of a minimum of 1000 m during blasting operations; ➲ Pre-split blasting can generate very high air blast amplitudes. This should be controlled by firing presplit holes one at a time in sequence away from nearby receptors and in an upwind direction;		

			➲ Should any nitrous oxide fumes be observed during a blast, blasting activity should be reviewed and the cause of the fumes identified and corrected if needed. Causes include poor charging practices, incorrect explosives formulation or holes that are too close together in softer formations; ➲ Only waterproof explosives should be used. Bulk emulsions and bulk emulsion blends are suitable, but explosives that can dissolve in water, such as ANFO should never be used; ➲ Sleep times (how long a blast stands after it is charged and before it is fired), should be limited to a maximum value depending on the water quality which can cause break-down of emulsions inside a blasthole. Behaviour of the chosen emulsion product over time when exposed to groundwater (water present in the blastholes) must be tested to determine a safe sleep time; and ➲ Any spillages of stored explosives, especially ammonium nitrate prill, must be controlled with adequate bunding and cleaned immediately after a spillage occurs. **Special mitigation measures for structures closer than 500m to blasting** ➲ Stemming lengths must be increased to >25 hole diameters; and ➲ For each blast, every heritage site within 500 m of a blast must be mapped before the blast and then checked after the blast. If there is any fly rock within 250 m of such site, stemming lengths for the next blast must be increased to		

			30 hole diameters or specialist advice obtained to curb the risk in future blasts. **Sites within the mining area** Remnant pillars with a 50m radius should be left around each of the ruins and graves (KP4, KP9, KP12. KP13, KP22. Special care will be needed to minimise the risk of pillar displacement or damage during blasting around the pillar. This will require smaller diameter holes (reduced from 250 mm) long delays, and only one hole firing per delay when blasting closer than 100 m from the pillar. Specialist advice will be needed in working out the mining sequence around the pillars and in designing each blast closer than 100 m from the pillar edges to ensure no pillar displacement occurs and vibration limits are met. **Community** ➲ The mitigating measures for fly rock outlined above for heritage sites must be applied to the community on Portion 1; ➲ All people and animals must be evacuated from the village when blasting closer than 1000 m from the village; and ➲ To curb vibration when blasting closer than 800 m from the village, charge mass per delay will need to be reduced over and above the normal mitigation measures for controlling vibration. This can be achieved by drilling smaller diameter holes and/or by multi-benching using shorter holes. Specialist advice		

			should be obtained to ensure ground vibration at the village is effectively curbed to 7.5 mm/s.		
CULTURAL HERITAGE					
Construction & Operation (Clearing, Mining, Stockpiling, Transportation)	All Phases	As above	➲ Construction crews must be properly inducted to ensure they are fully aware of the procedures regarding chance finds; ➲ A consultation process to determine if any graves or still born burial sites exist in and around the structures must be conducted; ➲ The historic structures should be assessed by a conservation architect if they are to be impacted on by the development who will make suitable recommendations for mitigation, after which a destruction permit can be applied for from the relevant heritage authority; ➲ Implementation of a heritage site development plan to ensure the protection of heritage resources within the mining area; ➲ Life of Mine Implementation of paleontological protocols (Millsteed 2019); ➲ Implementation of Chance find procedure. **Chance Find Procedure** The possibility of the occurrence of subsurface finds cannot be excluded. Therefore, if during construction any possible finds such as stone tool scatters, artefacts or bone and fossil remains are made, the operations must be stopped and a qualified archaeologist must be contacted for an assessment of the find and therefor chance find procedures should be put in place as part of the	NHRA SAHRA	Throughout the LOM

			EMPr. A short summary of chance find procedures is discussed below. This procedure applies to the developer's permanent employees, its subsidiaries, contractors and subcontractors, and service providers. The aim of this procedure is to establish monitoring and reporting procedures to ensure compliance with this policy and its associated procedures. Construction crews must be properly inducted to ensure they are fully aware of the procedures regarding chance finds as discussed below. ➲ If during the pre-construction phase, construction, operations or closure phases of this project, any person employed by the developer, one of its subsidiaries, contractors and subcontractors, or service provider, finds any artefact of cultural significance or heritage site, this person must cease work at the site of the find and report this find to their immediate supervisor, and through their supervisor to the senior on-site manager. ➲ It is the responsibility of the senior on-site Manager to make an initial assessment of the extent of the find and confirm the extent of the work stoppage in that area. The senior on-site Manager will inform the ECO of the chance find and its immediate impact on operations. The ECO will then contact a professional archaeologist for an assessment of the finds who will notify the SAHRA		

PALAEONTOLOGY					
All mine activities	All Phases	As above	➲ When the surface infrastructure elements of the mine are being constructed these locations must be regularly inspected to observe if the excavations have encountered bedrock of the Vryheid Formation. ➲ These regular inspections should be made by a suitable mine employee (such as the environmental officer) who has been trained to identify the types of fossils that may reasonably be expected to occur within the Vryheid Formation. ➲ Should fossil materials be identified, the excavations must be halted in that area and SAHRA informed of the discovery (as required in Section 3.3 of specialist report). ➲ An experienced Karoo palaeontologist should be contacted by the mine to assess the significance of the fossils. ➲ If fossil materials prove to be scientifically significant the palaeontologist should make recommendations that they should be either be protected completely, in situ, or could have damage mitigation procedures emplaced (i.e., excavation by a suitability by a suitably experienced palaeontologist) to minimise negative impacts.	NHRA SAHRA	Throughout the LOM
REHABILITATION AND CLOSURE					
Rehabilitation of mining area	All Phases	As above	➲ As various facilities reach the end of their period of use, rehabilitation activities must be initiated concurrent with on-going mining operations in accordance with the Closure Plan	IWWMP MPRDA NEMA NEMBA GN704	Throughout the LOM

			➲ Rehabilitation activities must be undertaken during all phases of the project in order to restore the land back to a sustainable and stable condition ➲ On-going removal of waste steel and other salvageable materials from the site during operations ➲ On-going clearing of areas affected by spillages ➲ Ensuring that the necessary environmental monitoring data is collected in order to enable assessment of the extent of rehabilitation works required and the design of those works ➲ Ensuring that financial provision is made both for the concurrent rehabilitation of the site and also for the final rehabilitation and closure process. The provision will be made in the prescribed manner after consultation with the DMR and other relevant authorities.	CARA	
VISUAL					
Construction of infrastructure and mine residue facilities	Construction and Operational	As above	➲ Structures that are required to be built from steel or concrete can be painted in a natural tone fitting with the surrounding environment ➲ Light faded green and tans can be used at the base of buildings, fading to lighter colours, with the top section of the buildings painted a light grey to merge with the skyline. Tall structures' roofs should be painted a 'dirty' grey or light blue. A principle to note is that lighter tones advance toward the viewer while darker tones recede from the viewer. Pure whites, blacks and bright colours should be avoided	NEMA MPRDA	Throughout the LOM

			➲ To reduce the potential of glare external surfaces of buildings and structures should be articulated or textured to create interplay of light and shade. Avoid shiny or bare metal where possible ➲ During construction of the project development, access roads will require an effective dust suppression management program, such as regular wetting and/or the use of non-polluting chemicals that will retain moisture in the road surface. Where a paved surface is required use dark paving materials that complement the natural brown colours and textures of the soil and rock in the area rather than light coloured materials i.e. concrete colours should be avoided ➲ A registered landscape architect should be consulted to advise on the use of indigenous plants to enhance biodiversity and to screen structures and break stark contrasting lines if carefully planned and positioned. Where structures are silhouetted when viewed from public roads, the harsh lines can be broken by planting fast growing large trees ➲ Shielding of night lights can greatly reduce the sky glow by ensuring that lights have proper shielding		
SURFACE WATER					
Dewatering Mining Dirty stormwater management Ore Stockpiles Material Handling	All Phases	As above	➲ A surface water monitoring programme must be implemented in accordance with the requirements of the IWUL. ➲ Changes in water quality must be investigated and additional mitigation measures implemented where necessary	MPRDA NEMA NEMBA GN704 CARA	Throughout the LOM

			➲ The transport, storage, use and disposal of chemicals and hydrocarbons must be carefully controlled ➲ Secondary containment facilities and pollution control structures to be provided ➲ Mine dirty stormwater must be contained in pollution control dams ➲ Stormwater management structures (i.e. berms) must be constructed to separate dirty water from clean water ➲ Water balance must be updated annually ➲ The area of surface disturbance must be minimised to that which is necessary for the mine infrastructure ➲ Monitor and maintain all clean and dirty water structures to ensure the separation of clean and dirty storm water ➲ Re-use and recycle dirty water from the pollution control dams where practical ➲ Implement an early warning system for ensuring that the pollution control dams remain compliant with the capacity, freeboard and other controls specified in GN704 ➲ All water containment structures on the site designed and maintained to accommodate a 1 in 50 year storm event		

TABLE 31-2: IMPACT MANAGEMENT OUTCOMES

ACTIVITIES	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE	MITIGATION TYPE	STANDARD TO BE ACHIEVED
SOCIO-ECONOMIC					
All activities involving employment and procurement of goods and services	Local employment Local economic development Training and development Community infrastructure development	Socio-Economic Environment	All Phases	Enhance through implementation of the SLP	SLP Mining Charter MPRDA
	Local inflation Influx of job seekers - demand on municipal services Influx of job seekers - disruption in community dynamics			Control through planning	SLP Mining Charter MPRDA IFC Performance Standards
All mine-related activities	Mine health and safety		All Phases	Control through planning design and operational controls	Mine Health and Safety Act, 1996 MPRDA
All mine-related activities	Security risk				SLP
	Contribution of royalties, rates and taxes		Construction and Operational	No mitigation identified	SLP Mining Charter MPRDA
	Community health and safety		All Phases	Control through planning design and operational controls	National Road Traffic Act SLP Mining Charter MPRDA

	Mine closure and associated effects on the local economy		Decommissioning and Closure	Control through planning and implementation of the SLP	SLP Mining Charter MPRDA
GROUNDWATER					
Mine dewatering	Lowering of groundwater levels in private boreholes, thus affecting the performance of the boreholes that fall within the dewatering cone	Groundwater	Construction and Operational	• Monitor through groundwater monitoring programme • Replace boreholes affected by dewatering	MPRDA and NEMA principles Water management measures in compliance with NWA and IWUL IWWMP NWA NEMA
Underground and open cast mining	Contamination of groundwater in private boreholes, making the groundwater unfit for use	Groundwater	Operational	• Control through design and operational controls • Monitor through groundwater monitoring programme	
Underground and open cast mining	Contamination of groundwater in private boreholes, making the groundwater unfit for use	Groundwater	Closure and Decommissioning		
AIR QUALITY					
All construction-phase activities which generate particulate emissions	Elevated PM10 and PM2.5 Concentrations	Air quality	Construction	Control through design and operational controls	NEM:AQA Dust Control Regulation GNR 827 of 2013 Ambient Air Quality Standards
Excavations, Site Clearance and Transportation	Elevated dust fall levels	Air quality	Construction		
All operational-phase activities which generate particulate emissions	Elevated PM10 and PM2.5 Concentrations	Air quality	Operational		
Mining, Material Handling and Transportation	Elevated dust fall levels	Air quality	Operational		
FLORA AND FAUNA					
Clearing of Vegetation for Site Access, Infrastructure Siting and Mining of Open Pits	Loss of Natural Habitat of High or Moderate Biodiversity Value	Terrestrial flora	Construction and Operational	Avoid / minimise through design and operational controls	MPRDA NEMA

Clearing of Vegetation for Site Access, Infrastructure Siting and Mining of Open Pits	Loss of Conservation Important Plant Species	Terrestrial flora	Construction and Operational		NEMWA NEMBA
Clearing of Vegetation for Site Access, Infrastructure Siting and Mining of Open Pits	Introduction/proliferation of alien invasive species	Terrestrial flora	Construction and Operational		
All staff activities that take place outdoors	Increased utilisation of plant and animal resources as a result of an influx of people into the study area	Terrestrial flora / fauna	Construction and Operational		
Construction/ Operation activities (Disturbances, vegetation Clearing, Accidents, Access Roads)	Disturbance/Loss of Fauna Species	Terrestrial fauna	All phases		
Construction/ Operation activities (Disturbances, vegetation Clearing, Accidents, Access Roads)	Loss of Faunal Habitat	Terrestrial fauna	All phases		
Construction/ Operation activities (Disturbances, vegetation Clearing, Accidents, Access Roads)	Introduction/Invasion of Alien Fauna and Spread of Diseases	Terrestrial fauna	All phases		
SURFACE WATER ECOSYSTEMS					
All construction-phase activities	Destruction of habitat	Surface water ecosystems (non-perennial watercourses and wetlands/pans)	Construction	Avoid / control through design and operational controls	IWWMP MPRDA NEMA NEMBA GN704 CARA
All construction and operational phase activities	Fragmentation of interconnected habitat	Surface water ecosystems (non-perennial watercourses and wetlands/pans)	Construction and Operational		
All site activities	Vegetation disturbance that induces invasion of exotic flora	Surface water ecosystems (non-perennial	All phases		

		watercourses and wetlands/pans)			
All site activities	Soil erosion	Surface water ecosystems (non-perennial watercourses and wetlands/pans)	All phases		
All site activities	Contamination of surface water resources	Surface water ecosystems (non-perennial watercourses and wetlands/pans)	All phases		
SOILS, LAND CAPABILITY AND LAND USE					
All construction phase activities	Disturbance/Loss of soil resources as a result of construction activities	Soils	Construction	Avoid / minimise through design and operational controls	IWWMP MPRDA NEMA NEMBA GN704 CARA
All construction and operational phase activities	Ineffective housekeeping and management of stockpiles and exposed soils resulting in additional disturbances/ losses of soil due to erosion as well as contamination		All phases		
Continued Activities Including Mining and Transportation	Increased/ decreased sediment loads on downstream systems		All phases		
Stripping of Soils, Clearing of Vegetation and Stockpiling of Materials	Disturbance/Loss/Sterilisation of inherent land capability and land use	Land Capability / Land Use	All phases		
Continuous Clearing, Disturbance, Laydown, Stockpiling and Transportation	Loss of land services, ecosystem support and services		All phases		
NOISE					
Blasting, mining operations, construction of surface infrastructure, haulage and decommissioning	Noise impacts generated may impact on the social environment, especially communities adjacent to the mining area	Noise	All phases	➲ No communities are expected to be affected by the noise from construction and operational phase activities	SANS Environmental Noise Standards

				➲ Minimise through design and operational controls	
GEOLOGY					
Clearing of Areas for Site Access, Infrastructure Siting, Mining of Open Pits	Sterilisation of mineral resources	Geology / mineral resource	Construction and Operational	Avoid / minimise through design and operational controls	MPRDA
TOPOGRAPHY					
Clearing of Areas for Site Access, Infrastructure Siting, Mining of Open Pits	Permanent, localised change in topography due to the development of the open pits and mine residue deposits	Topography	All Phases	Minimise through design and operational controls	IWWMP MPRDA NEMA NEMBA GN704 CARA
BLASTING					
Blasting	Blast-induced ground vibration damage to buildings closer than 500 m from blasting resulting in minor damage to buildings (real or perceived by building owners) in the form of cracks in walls	Structural damage	Operational	Avoid / minimise through design and operational controls	Blast Design Specification Mine Health and Safety Act
	Blast Induced Damage to Boreholes resulting in a loss of water perceived to be caused by blasting induced vibration	Structural damage / loss of access to a water resource			
	Damage to structures or injury to people closer than 1000 m from fly rock resulting in serious to fatal injury or damage to property and infrastructure caused by uncontrolled fly rock	Structural damage / health and safety			
	Complaints or minor damage to buildings and structures caused by high air blast levels	Structural damage / health and safety			

	Accumulation of dissolved nitrates in the water system causing an increase in algal and weed growth in waterways	Ground and surface water quality			NWA
CULTURAL HERITAGE					
Construction & Operation (Clearing, Mining, Stockpiling, Transportation)	Disturbance/Loss of Significant Archaeological or Cultural Heritage Sites/Remains	Archaeology, palaeontology, and cultural heritage	All phases	Maintain / monitor through implementation of chance-find procedure	SAHRA

TABLE 31-3: IMPACT MANAGEMENT ACTIONS

ACTIVITIES	POTENTIAL IMPACT	MITIGATION TYPE	TIMEFRAME FOR IMPLEMENTATION	STANDARD TO BE ACHIEVED
		SOCIO-ECONOMIC		
All activities involving employment and procurement of goods and services	Local employment	Enhance through implementation of the SLP	Mitigation measures are required to be implemented from the commencement of site preparation activities throughout the LOM	SLP Mining Charter MPRDA
	Local economic development			
	Training and development			
	Community infrastructure development			
	Local inflation	Control through planning	As above	SLP Mining Charter MPRDA
	Influx of job seekers - demand on municipal services			
	Influx of job seekers - disruption in community dynamics			
All mine-related activities	Mine health and safety	Control through planning design and operational controls	As above	Mine Health and Safety Act, 1996 MPRDA
	Security risk			SLP
	Contribution of royalties, rates and taxes	No mitigation identified	As above	SLP Mining Charter MPRDA
	Community health and safety	Control through planning design and operational controls	As above	National Road Traffic Act SLP Mining Charter MPRDA

	Mine closure and associated effects on the local economy	Control through planning and implementation of the SLP	As above	SLP Mining Charter MPRDA
GROUNDWATER				
Mine dewatering	Lowering of groundwater levels in private boreholes, thus affecting the performance of the boreholes that fall within the dewatering cone	➲ Control through design and operational controls ➲ Monitor through groundwater monitoring programme	As above	MPRDA and NEMA principles Water management measures in compliance with NWA and IWUL IWWMP NWA NEMA
Underground and open cast mining,	Contamination of groundwater in private boreholes, making the groundwater unfit for use	➲ Control through design and operational controls ➲ Monitor through groundwater monitoring programme	As above	
AIR QUALITY				
All construction-phase activities which generate particulate emissions	Elevated PM10 and PM2.5 Concentrations	Control through design and operational controls	As above	NEM:AQA Dust Control Regulation GNR 827 of 2013 Ambient Air Quality Standards
Excavations, Site Clearance and Transportation	Elevated dust fall levels			
All operational-phase activities which generate particulate emissions	Elevated PM10 and PM2.5 Concentrations			
Mining, Material Handling and Transportation	Elevated dust fall levels			
FLORA AND FAUNA				

<table>
<tr><td rowspan="3">Clearing of Vegetation for Site Access, Infrastructure Siting and Mining of Open Pits</td><td>Loss of Natural Habitat of High or Moderate Biodiversity Value</td><td rowspan="7">Avoid / minimise through design and operational controls</td><td rowspan="7">As above</td><td rowspan="7">MPRDA
NEMA
NEMWA
NEMBA</td></tr>
<tr><td>Loss of Conservation Important Plant Species</td></tr>
<tr><td>Introduction/proliferation of alien invasive species</td></tr>
<tr><td>All staff activities that take place outdoors</td><td>Increased utilisation of plant and animal resources as a result of an influx of people into the study area</td></tr>
<tr><td rowspan="3">Construction/ Operation activities (Disturbances, vegetation Clearing, Accidents, Access Roads)</td><td>Disturbance/Loss of Fauna Species</td></tr>
<tr><td>Loss of Faunal Habitat</td></tr>
<tr><td>Introduction/Invasion of Alien Fauna and Spread of Diseases</td></tr>
<tr><td colspan="5">SURFACE WATER ECOSYSTEMS</td></tr>
<tr><td rowspan="5">All construction and operational phase activities</td><td>Destruction of habitat</td><td rowspan="5">Avoid / minimise through design and operational controls</td><td rowspan="5">As above</td><td rowspan="5">IWWMP
MPRDA
NEMA
NEMBA
GN704
CARA</td></tr>
<tr><td>Fragmentation of interconnected habitat</td></tr>
<tr><td>Vegetation disturbance that induces invasion of exotic flora</td></tr>
<tr><td>Soil erosion</td></tr>
<tr><td>Contamination of surface water resources</td></tr>
<tr><td colspan="5">SOILS, LAND CAPABILITY AND LAND USE</td></tr>
<tr><td>All construction phase activities</td><td>Disturbance/Loss of soil resources as a result of construction activities</td><td rowspan="3">Avoid / minimise through design and operational controls</td><td rowspan="3">As above</td><td rowspan="3">IWWMP
MPRDA
NEMA
NEMBA
GN704
CARA</td></tr>
<tr><td>All construction and operational phase activities</td><td>Ineffective housekeeping and management of stockpiles and exposed soils resulting in additional disturbances/ losses of soil due to erosion as well as contamination</td></tr>
<tr><td>Continued Activities Including Mining and Transportation</td><td>Increased/ decreased sediment loads on downstream systems</td></tr>
</table>

Stripping of Soils, Clearing of Vegetation and Stockpiling of Materials	Disturbance/Loss/Sterilisation of inherent land capability and land use			
Continuous Clearing, Disturbance, Laydown, Stockpiling and Transportation	Loss of land services, ecosystem support and services			
NOISE				
Blasting, mining operations, construction of surface infrastructure, haulage and decommissioning	Noise impacts generated may impact on the social environment, especially communities adjacent to the mining area	Minimise through design and operational controls	As above	SANS Environmental Noise Standards
TRAFFIC AND ROAD SAFETY				
Movement of Man and Materials	Heavy vehicles may cause damage to the road surface	Avoid / minimise through planning, design and operational controls	As above	National Road Traffic Act
	Vehicles may reduce road safety due to reduced speed of the heavy vehicles entering fast flowing traffic	Avoid / minimise through design and operational controls		
	Loading and offloading of workers along roads at the mine access intersection may reduce road safety	Avoid / minimise through planning, design and operational controls		
BLASTING				
Blasting	Blast-induced ground vibration damage to buildings closer than 500 m from blasting resulting in minor damage to buildings (real or perceived by building owners) in the form of cracks in walls	Avoid / minimise through design and operational controls	As above	Blast Design Specification

	Blast Induced Damage to Boreholes resulting in a loss of water perceived to be caused by blasting induced vibration			
	Damage to structures or injury to people closer than 1000 m from fly rock resulting in serious to fatal injury or damage to property and infrastructure caused by uncontrolled fly rock			
	Complaints or minor damage to buildings and structures caused by high air blast levels			
	Accumulation of dissolved nitrates in the water system causing an increase in algal and weed growth in waterways			NWA
GEOLOGY AND TOPOGRAPHY				
Clearing of Areas for Site Access, Infrastructure Siting, Mining of Open Pits	Sterilisation of mineral resources	Avoid / minimise through design and operational controls	As above	MPRDA
	Permanent, localised change in topography due to the development of the open pit and mine residue deposits	Avoid / minimise through design and operational controls	As above	NEMA CARA
CULTURAL HERITAGE				
Construction & Operation (Clearing, Mining, Stockpiling, Transportation)	Disturbance/Loss of Significant Archaeological or Cultural Heritage Sites/Remains	Maintain / monitor through implementation of chance-find procedure	As above	SAHRA

32 FINANCIAL PROVISION

32.1 DETERMINATION OF THE AMOUNT OF FINANCIAL PROVISION

The estimate for rehabilitation and closure for the Kranspan project is based on the principles and closure activities as set out in the report. The closure plan is considered conceptual and therefore certain uncertainties relating to the actual activities to be implemented as part of the decommissioning and closure phases of the project will only be confirmed once a detailed closure plan has been developed.

The costing is based on the DMR methodology, as described earlier in the report.

A summary of the key facilities to be rehabilitated as well as the costs associated with the rehabilitation is provided in Table 32-1, based on the different phases associated with the rehabilitation and closure of the mine.

It is worth nothing that a significant portion of the closure activities can be completed concurrently with the mining operations, thus significantly reducing the works required at the end of the life of mine.

The quantum for closure summarized in Table 32-1 and reflects the environmental closure liability associated with the first 6 months of mining. Based on the mine plan it is anticipated that a steady sate will then be achieved after 6 months and that the roll-over mining plan can be implemented after that. This allows for concurrent reclamation to be undertaken from the 1st year of mining, thereby limiting the liability associated with the closure of the mine towards the end of its life. The increase in closure liability is reflected in Table 32-2 and Table 32-3. Which reflects months 6 to 18 of mining.

TABLE 32-1: KRANSPAN QUANTUM FOR CLOSURE: MONTHS 0-6

CALCULATION OF THE QUANTUM							
	KRANSPAN	**Location:**	**Ilima Coal Company**				
	0 - 6 Months	**Date:**	**June 2019 - Rev00**				
	Description: Class A (Medium Risk)	**Unit:**	**A Quantity**	**B Master rate (2019 Inflated)**	**C Multiplication factor**	**D Weighting factor 1**	**E=A*B*C*D Amount (Rands)**
Component			**Step 4.5**	**Step 4.3**	**Step 4.3**	**Step 4.4**	
1	Dismantling of processing plant & related structures (incl. overland conveyors & Power lines)	m^3	1467.00	R16.13	1.00	1.10	R 26 036
2 (A)	Demolition of steel buildings & Structures	m^2	0.00	R224.74	1.00	1.10	R 0
2 (B)	Demolition of reinforced concrete buildings & structures	m^2	1081.00	R331.20	1.00	1.10	R 393 827
3	Rehabilitation of access roads	m^2	64710.00	R40.22	1.00	1.10	R 2 862 679
4(A)	Demolition & rehabilitation of electrified railway lines	m	0.00	R390.34	1.00	1.10	R 0
4(B)	Demolition & rehabilitation of non electrified railway lines	m	0.00	R212.91	1.00	1.10	R 0
5	Demolition of housing &/or administration facilities	m^2	0.00	R449.48	1.00	1.10	R 0
6	Opencast rehabilitation including final voids & ramps	ha	18.18	R228 763.15	0.52	1.10	R 2 378 899
7	Sealing of shafts, adits & inclines	m^3	0.00	R120.65	1.00	1.10	R 0
8(A)	Rehabilitation of overburden & spoils	ha	43.50	R157 082.45	1.00	1.10	R 7 516 395
8(B)	Rehabilitation of processing waste deposits & evaporation ponds (basic, salt producing waste)	ha	0.00	R195 643.36	1.00	1.10	R 0
8(C)	Rehabilitation of processing waste deposits & evaporation ponds (acidic, metal-rich waste)	ha	2.00	R568 241.05	0.80	1.10	R 1 000 104
9	Rehabilitation of subsidised areas	ha	0.00	R131 532.90	1.00	1.10	R 0
10	General surface rehabilitation	ha	6.05	R124 435.80	1.00	1.10	R 828 120
11	River diversions	ha	0.00	R124 435.80	1.00	1.10	R 0
12	Fencing	m	1500.00	R141.94	1.00	1.10	R 234 204
13	Water management	ha	18.18	R47 313.99	0.67	1.10	R 633 944
14	2 to 3 years of maintenance & aftercare	ha	18.18	R16 559.90	1.00	1.10	R 331 165
	Specialist study (Hydrogeological study)	SUM	1.00	R149 181.56	1.00	1.10	R 164 100
	Specialist study (Auditing)	SUM	1.00	R74 102.19	1.00	1.10	R 81 512
							R 16 450 986
	Weighting Factor 2 (step 4.4)			1.05		Sub Total 1	**R 17 273 535**
	Preliminary and General			12% of Sub Total 1			**R 1 974 118**
	Administration and supervision costs			6% of Sub Total 1			**R 987 059**
	Engineering Drawings and specifications			2% of Sub Total 1			**R 329 020**
	Engineering and Procurement of specialist work			2.5% of Sub Total 1			**R 411 275**
	Development of a closure plan Final Groundwater modelling			2.5% of Sub Total 1			**R 411 275**
	Contingency			10% of Sub Total 1			**R 1 645 099**
						Sub Total 2	**R 23 031 380**
	VAT (15%)						**R 3 454 707.02**
	GRAND TOTAL						**R 26 486 087**

TABLE 32-2: KRANSPAN QUANTUM FOR CLOSURE: MONTHS 6-12

CALCULATION OF THE QUANTUM							
	KRANSPAN	**Location:**	**Ilima Coal Company**				
	6 - 12 Months	**Date:**	**June 2019 - Rev00**				
	Description: Class A (Medium Risk)	**Unit:**	**A Quantity**	**B Master rate (2019 Inflated)**	**C Multiplication factor**	**D Weighting factor 1**	**E=A*B*C*D Amount (Rands)**
Component			**Step 4.5**	**Step 4.3**	**Step 4.3**	**Step 4.4**	
1	Dismantling of processing plant & related structures (incl. overland conveyors & Power lines)	m^3	1467.00	R16.13	1.00	1.10	R 26 036
2 (A)	Demolition of steel buildings & Structures	m^2	0.00	R224.74	1.00	1.10	R 0
2 (B)	Demolition of reinforced concrete buildings & structures	m^2	1081.00	R331.20	1.00	1.10	R 393 827
3	Rehabilitation of access roads	m^2	64710.00	R40.22	1.00	1.10	R 2 862 679
4(A)	Demolition & rehabilitation of electrified railway lines	m	0.00	R390.34	1.00	1.10	R 0
4(B)	Demolition & rehabilitation of non electrified railway lines	m	0.00	R212.91	1.00	1.10	R 0
5	Demolition of housing &/or administration facilities	m^2	0.00	R449.48	1.00	1.10	R 0
6	Opencast rehabilitation including final voids & ramps	ha	14.98	R228 763.15	0.52	1.10	R 1 960 171
7	Sealing of shafts, adits & inclines	m^3	0.00	R120.65	1.00	1.10	R 0
8(A)	Rehabilitation of overburden & spoils	ha	49.88	R157 082.45	1.00	1.10	R 8 618 800
8(B)	Rehabilitation of processing waste deposits & evaporation ponds (basic, salt producing waste)	ha	0.00	R195 643.36	1.00	1.10	R 0
8(C)	Rehabilitation of processing waste deposits & evaporation ponds (acidic, metal-rich waste)	ha	3.00	R568 241.05	0.80	1.10	R 1 500 156
9	Rehabilitation of subsidised areas	ha	0.00	R131 532.90	1.00	1.10	R 0
10	General surface rehabilitation	ha	6.05	R124 435.80	1.00	1.10	R 828 120
11	River diversions	ha	0.00	R124 435.80	1.00	1.10	R 0
12	Fencing	m	1500.00	R141.94	1.00	1.10	R 234 204
13	Water management	ha	14.98	R47 313.99	0.67	1.10	R 522 359
14	2 to 3 years of maintenance & aftercare	ha	44.66	R16 559.90	1.00	1.10	R 813 522
	Specialist study (Hydrogeological study)	SUM	1.00	R149 181.56	1.00	1.10	R 164 100
	Specialist study (Auditing)	SUM	1.00	R74 102.19	1.00	1.10	R 81 512
							R 18 005 486
	Weighting Factor 2 (step 4.4)			1.05		Sub Total 1	R 18 905 760
	Preliminary and General			12% of Sub Total 1			R 2 160 658
	Administration and supervision costs			6% of Sub Total 1			R 1 080 329
	Engineering Drawings and specifications			2% of Sub Total 1			R 360 110
	Engineering and Procurement of specialist work			2.5% of Sub Total 1			R 450 137
	Development of a closure plan Final Groundwater modelling			2.5% of Sub Total 1			R 450 137
	Contingency			10% of Sub Total 1			R 1 800 549
						Sub Total 2	R 25 207 680
	VAT (15%)						R 3 781 152.04
	GRAND TOTAL						**R 28 988 832**

TABLE 32-3: KRANSPAN QUANTUM FOR CLOSURE: MONTHS 12-18

CALCULATION OF THE QUANTUM							
	KRANSPAN	Location:	Ilima Coal Company				
	12 - 18 Months	Date:	June 2019 - Rev00				
	Description: Class A (Medium Risk)	Unit:	A Quantity	B Master rate (2019 Inflated 6%)	C Multiplication factor	D Weighting factor 1	E=A*B*C*D Amount (Rands)
Component			Step 4.5	Step 4.3	Step 4.3	Step 4.4	
1	Dismantling of processing plant & related structures (incl. overland conveyors & Power lines)	m^3	1467.00	R16.13	1.00	1.10	R 26 036
2 (A)	Demolition of steel buildings & Structures	m^2	0.00	R224.74	1.00	1.10	R 0
2 (B)	Demolition of reinforced concrete buildings & structures	m^2	1081.00	R331.20	1.00	1.10	R 393 827
3	Rehabilitation of access roads	m^2	64710.00	R40.22	1.00	1.10	R 2 862 679
4(A)	Demolition & rehabilitation of electrified railway lines	m	0.00	R390.34	1.00	1.10	R 0
4(B)	Demolition & rehabilitation of non electrified railway lines	m	0.00	R212.91	1.00	1.10	R 0
5	Demolition of housing &/or administration facilities	m^2	0.00	R449.48	1.00	1.10	R 0
6	Opencast rehabilitation including final voids & ramps	ha	8.21	R228 763.15	0.52	1.10	R 1 074 299
7	Sealing of shafts, adits & inclines	m^3	0.00	R120.65	1.00	1.10	R 0
8(A)	Rehabilitation of overburden & spoils	ha	49.88	R157 082.45	1.00	1.10	R 8 618 800
8(B)	Rehabilitation of processing waste deposits & evaporation ponds (basic, salt producing waste)	ha	0.00	R195 643.36	1.00	1.10	R 0
8(C)	Rehabilitation of processing waste deposits & evaporation ponds (acidic, metal-rich waste)	ha	3.00	R568 241.05	0.80	1.10	R 1 500 156
9	Rehabilitation of subsidised areas	ha	0.00	R131 532.90	1.00	1.10	R 0
10	General surface rehabilitation	ha	6.05	R124 435.80	1.00	1.10	R 828 120
11	River diversions	ha	0.00	R124 435.80	1.00	1.10	R 0
12	Fencing	m	1500.00	R141.94	1.00	1.10	R 234 204
13	Water management	ha	8.21	R47 313.99	0.67	1.10	R 286 286
14	2 to 3 years of maintenance & aftercare	ha	75.10	R16 559.90	1.00	1.10	R 1 368 013
	Specialist study (Hydrogeological study)	SUM	1.00	**R149 181.56**	1.00	1.10	R 164 100
	Specialist study (Auditing)	SUM	1.00	**R74 102.19**	1.00	1.10	R 81 512
							R 17 438 033
	Weighting Factor 2 (step 4.4)			**1.05**		**Sub Total 1**	**R 18 309 935**
	Preliminary and General			12% of Sub Total 1			**R 2 092 564**
	Administration and supervision costs			6% of Sub Total 1			**R 1 046 282**
	Engineering Drawings and specifications			2% of Sub Total 1			**R 348 761**
	Engineering and Procurement of specialist work			2.5% of Sub Total 1			**R 435 951**
	Development of a closure plan			2.5% of Sub Total 1			**R 435 951**
	Final Groundwater modelling						
	Contingency			10% of Sub Total 1			**R 1 743 803**
						Sub Total 2	**R 24 413 247**
	VAT (15%)						**R 3 661 986.98**
	GRAND TOTAL						**R 28 075 233**

The following assumptions apply to the calculation of the quantum for closure associated with the Kranspan Project:

- It is assumed that concurrent rehabilitation will be undertaken as soon as steady state is achieved and the roll-over mining method is employed and that the surface disturbances that the calculations are based on will not change significantly.
- The establishment of a coal wash plant will not be undertaken during the first three years of mining at Kranspan and the financial provision for the closure of these facilities is therefore not presented in the Quantum.
- No underground mining is planned during the first 18 months of mining.
- All structures established for the project will be removed and the affected areas rehabilitated.

- All access roads will be rehabilitated as soon as the roads are no longer required
- It is assumed that no water treatment will be required following the closure of the mine and that the pollution control facilities will be adequate to contain any seeps from these areas.
- The conceptual closure plan and associated quantum for closure will be reviewed on an annual basis, as per the requirements of South African legislation and updated accordingly. Any changes to the mine plan or infrastructure requirements will be captured in the annual review and the quantum updated accordingly.

The assumptions will be reviewed on an annual basis based on the monitoring information generated as well as the various specialist studies to be undertaken as part of the calibration of the geohydrological model as well as the refinement of the closure plan.

32.1.1 Confirm Specifically that the Environmental Objectives in Relation to Closure have been Consulted with Landowner and Interested and Affected Parties

All aspects of the conceptual closure planning undertaken to date, including the applicable specialist studies and the closure plan itself is made available for review and comment as part of the public participation process described in the EIR.

Throughout the LOM, the applicant should, through appropriate engagement mechanisms such as the Future Forum, established in terms of the SLP, continue to engage with interested and affected parties in order to refine and further develop the closure plan ahead of its actual implementation.

32.1.2 Provide a Rehabilitation Plan that Describes and Shows the Scale Aerial Extent of the Main Mining Activities, Including The Anticipated Mining Area At The Times Of Closure

The Closure Plan in Appendix 8 details the conceptual rehabilitation measures to be implemented at the time of closure. The plan details the proposed closure measures to be implemented for the following:

- General reclamation and closure activities;
- Reclamation and closure activities applicable to specific infrastructure areas; and
- Rehabilitation monitoring, aftercare and maintenance.

The post closure land use is shown in Appendix 3.

32.1.3 Explain Why It Can Be Confirmed That The Rehabilitation Plan Is Compatible With The Closure Objectives

Ilima's objective for the rehabilitation and closure of the mine is to ensure that the site is left in a condition that is safe and stable where long-term environmental impacts are minimised and any future liability to the community and future land use restrictions are minimised. The final post-mining land use will be determined in consultation with the local communities, DMR as well as other departments responsible for environmental and social aspects. The land uses to be identified during this process are likely to include the following:

- Livestock grazing;
- Cultivation; and
- Wildlife habitat.

For health and safety reasons as well as the protection of specific rehabilitation works, specific areas within the license area may be designated as exclusion zones. Natural soil covers and vegetation will as far as possible be re-established over these areas but access by humans and / or livestock will be prohibited.

The following closure objectives form part of the conceptual closure plan:

- All structures not desirable or usable post closure will be demolished and building material removed or disposed of;
- Hazardous material, equipment and contaminated soils and steel structures will be disposed of safely and in an environmentally acceptable manner;
- The coal wash plant and other areas used for the handling and storage of hazardous materials will be decontaminated;
- Rehabilitation of disturbed areas to a final land use capability that is practical and best suited for the final landform, taking into consideration the socio-economic activities of the receiving communities.

At the end of the mine life, the residual facilities will include a Surface Discard Facility, surface water diversion structures and supporting infrastructure.

The ultimate end-use of the rehabilitated areas is considered to have three major objectives. The first is the re-establishment to the greatest feasible degree of vegetation on the disturbed areas within the concession. The second is the re-integration of the disturbed areas outside the project footprint into the agricultural and other prevalent economies. Thirdly, by working with and involving local people in the re-development of the disturbed land to assist them in working towards a more sustainable form of livelihood.

32.1.4 Calculate And State The Quantum Of The Financial Provisions Required To Manage And Rehabilitate The Environment In Accordance With The Applicable Guideline

The financial provision required for rehabilitation and closure is described in Table 32-1 - Table 32-3 and is included as part of the Closure Plan in Appendix 8.

32.1.5 Confirm That The Financial Provision Will Be Approved As Determined

The financial provision has been issued to the applicant and the amount will be incorporated into the financial model of the mine. The applicant is also committed to ensuring that the financial provision is updated annually as required by legislation.

TABLE 32-4: MECHANISMS FOR MONITORING COMPLIANCE WITH AND PERFORMANCE ASSESSMENT AGAINST THE ENVIRONMENTAL MANAGEMENT PROGRAMME AND REPORTING THEREON

SOURCE ACTIVITY	IMPACTS REQUIRING MONITORING PROGRAMMES	FUNCTIONAL REQUIREMENTS FOR MONITORING	ROLES AND RESPONSIBILITIES	MONITORING AND REPORTING FREQUENCY AND TIME PERIODS FOR IMPLEMENTING IMPACT MANAGEMENT ACTIONS
All mining and associated activities	General site management and compliance monitoring	➲ Inspections and compliance audits (internal and external) ➲ Performance assessment reporting	➲ Mine Manager – accountable for ensuring that EMPr is implemented by all mine personnel and that that there is overall compliance with EMPr ➲ Environmental Manager – responsible for monitoring compliance with the implementation of the EMPr ➲ ECO / SHE Representatives – day to day inspections, compliance monitoring and sampling as may be required ➲ External Auditor – responsible for performance assessment reporting, and auditing compliance with conditions of the EA and IWULA ➲ Independent specialists – responsible for undertaking specialist work as required over the LOM	➲ Daily and weekly inspections ➲ Quarterly compliance audits ➲ Annual performance assessment reporting
All construction-phase activities which generate particulate emissions Excavations, Site Clearance and Transportation All operational-phase activities which generate particulate emissions Mining, Material Handling and Transportation	➲ Elevated dust fallout levels ➲ Elevated PM10 and PM2.5 emissions	➲ To ensure that mitigation is effective, it is recommended that the newly installed dustfall monitoring network at the mine be expanded. It is recommended that continuous dustfall monitoring at one (1) additional location be conducted as part of the Project's air quality management plan (Figure 48 of specialist report). This should be undertaken throughout the Project duration to provide air quality trends. ➲ It is also recommended that PM10 and PM2.5 monitors at the school and informal community be installed from year 3 onwards, to start an investigation into the impacts on these receptors well before nearby opencast mining occurs from Year 5 through Year 12. Should exceedances of the daily PM10 and/or PM2.5 NAAQS occur, the relocation of		➲ Monthly dust fallout reporting ➲ Mitigation measures implemented from construction and throughout the LOM as applicable to the emission sources

		the school and/or informal community must be considered ➲ Regular communication of monitoring results to stakeholders.		
Mining dewatering Underground and open cast mining	➲ Lowering of groundwater levels in private boreholes ➲ Contamination of groundwater in private boreholes, making the groundwater unfit for use	➲ Implementation of the groundwater monitoring programme described in Section 9 of the Geohydrological Report. ➲ A surface water monitoring programme must be implemented in accordance with the requirements of the IWUL. ➲ Changes in water quality must be investigated and additional mitigation measures implemented where necessary ➲ All monitoring information must be entered into a spreadsheet for record keeping and analysis. Copies of the certificates of analyses must be kept on file at each mine for inspection. ➲ If a significant exceedance is recorded during the monitoring programme, the following actions should be taken: ➲ Log the exceedances in the incident reporting system within 24-hours of it occurring. ➲ Report the exceedances to the Environmental and Mine Manager as well as to the regulatory authority. ➲ Undertake an investigation to identify causes of the exceedances.		Quarterly groundwater sampling, analysis and reporting Mitigation measures implemented from construction and throughout the LOM as applicable to the emission sources

		➲ Consult with any landowner or affected party that may be impacted by the exceedances to determine their concerns and to negotiate remedial actions. ➲ Implement the necessary remedial actions according to the outcome of the investigation and consultation with the affected parties. ➲ Track the incident until completion. ➲ Regular monitoring reports must be prepared for internal use as well as for submission to the authorities, as required by the operations' water use licenses.		
Movement of man and materials	Wildlife road mortalities	➲ Logbook maintained on employee sightings / incidents		Ongoing throughout the LOM Mitigation measures implemented from construction and throughout the LOM as applicable to the emission sources
Blasting Mining operations, construction of surface infrastructure, haulage and decommissioning	Elevated noise levels	➲ The noise monitoring campaign described in Table 10 and 11 of the specialist report should be implemented. ➲ Noise monitoring at sites where noise is or may become an issue is essential. Noise sampling at KN 1 and KN 5 should be incorporated in an annual environmental noise monitoring programme. If KN 2 and KN3 are not purchased by Ilima they should be included in the monitoring programme.		➲ Annual noise monitoring campaign ➲ *Ad hoc* monitoring in response to complaints ➲ Mitigation measures implemented from construction and throughout the LOM as applicable to the emission sources

		➲ 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 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. 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 IEC standards and is subject to annual calibration by an accredited laboratory. ➲ The acoustic sensitivity of the SLM should be tested with a portable acoustic calibrator before and after each sampling session. ➲ Samples of 10 min to 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 recoded and reported: LAeq (T), statistical noise level LA90, LAFmin and LAFmax, octave band or 3rd octave band frequency spectra. ➲ The SLM should be located approximately 1.5 m above the ground and no closer than 3 m to any reflecting surface. ➲ Efforts should be made to ensure that measurements are not affected by the residual noise and extraneous influences, e.g. wind, electrical interference and any other non-acoustic interference, and that the instrument is operated under the conditions specified by the manufacturer. It is good practice to avoid conducting 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.		
Blasting	➲ Elevated noise levels ➲ Injury due to fly rock ➲ Damage to buildings	➲ Routine air blast and ground vibration monitoring should be carried out near the closest private home to each blast. Occasional audits should be conducted on blasting practices and mitigation options reconsidered if monitoring shows that levels exceed applicable guidelines. ➲ In areas where the unmitigated significance of fly rock is Medium High, a video must be taken and assessed for fly rock control of each blast as this will provide a form of evidence for potential complaints and will be useful for management improvement. ➲ A video recording of each blast must be made to determine the effectiveness of the fly rock control. **Fumes** ➲ Should any nitrous oxide fumes be observed during a blast, blasting activity should be reviewed and the cause of the fumes identified and corrected if needed. Causes include poor charging practices, incorrect explosives formulation or holes that are too close together in softer formations.		➲ Design of the blasting programme will be modified as appropriate based on the motoring results. ➲ Monitoring will be undertaken as part of the mining and blasting programme under the supervision of the environmental manager

		Nitrates dissolved in water ➲ Only waterproof explosives should be used. Bulk emulsions and bulk emulsion blends are suitable, but explosives that can dissolve in water, such as ANFO should never be used. ➲ Sleep times (how long a blast stands after it is charged and before it is fired), should be limited to a maximum value depending on the water quality which can cause break-down of emulsions inside a blasthole. Behaviour of the chosen emulsion product over time when exposed to groundwater water (water present in the blastholes) must be tested to determine a safe sleep time. ➲ Any spillages of stored explosives, especially ammonium nitrate prill, must be controlled with adequate bunding and cleaned immediately after a spillage occurs		
Construction/ Operation activities (Disturbances, vegetation Clearing, Accidents, Access Roads) All staff activities that take place outdoors	➲ Loss of untransformed natural habitat and indigenous plant species ➲ Illegal utilisation of plant and animal resources	➲ Monitoring of movement of equipment, site personnel and workers should be carried out to minimise unauthorized activities in any part of the project area		Mitigation measures implemented from construction and throughout the LOM as applicable to the emission sources
Continuous Clearing, Disturbance, Laydown, Stockpiling and Transportation	➲ Loss of utilisable soil	During the rehabilitation exercise preliminary soil sampling should be carried out to determine the fertilizer requirements more accurately. Additional		

		soil sampling should also be carried out annually until the levels of nutrients, specifically magnesium, phosphorus and potassium, are at the required level (approximately 20 and 120 mg/kg respectively). Once the desired nutritional status has been achieved, it is recommended that the interval between sampling be increased. An annual environmental audit should be undertaken. If growth problems develop, ad hoc, sampling should be carried out to determine the problem. ➲ Sampling should always be carried out at the same time of the year and at least six weeks after the last application of fertilizer. ➲ All of the soil samples should be analysed for the following parameters: o pH (H2O); o Electrical conductivity; o Calcium mg/kg; o Magnesium mg/kg; o Potassium mg/kg; o Sodium mg/kg; o Cation exchange capacity; o Phosphorus (Bray I); o Zinc mg/kg;		

		○ Clay% and; ○ Organic matter content (C %)		
All mining activities	➲ Loss of wetland ecological function	➲ The monitoring of ongoing wetland ecological function and overall health and integrity is aimed at monitoring the same points that are utilised in assessing overall wetland health initially, viz vegetation status, hydrology and geomorphology. ➲ Water quality should also be monitored for at least every six months during normal operations, but will increase in response to accidental spillages or other incidences that warrant more frequent monitoring. ➲ Site photographs from set points at all of the monitoring stations should be taken for all monitoring periods for reference and comparative purposes. These will be useful when undertaking trend analyses of the various monitoring aspects. ➲ All aspects included in section 8.2 (surface water ecosystems report) should be included in the monitoring programme		Bi-annually

32.1.6 INDICATE THE FREQUENCY OF THE SUBMISSION OF THE PERFORMANCE REPORT

The frequency of mine performance assessment reporting shall be at least annually or as otherwise determined by legislation.

In addition to the performance assessment, inspections and audits must also be undertaken as described below. A key objective of the performance assessment reviews, inspections and audits must be to identify the effectiveness of the management measures. Any gaps should be addressed, and if necessary, the EMPr updated to ensure the site requirements and management of risks and impacts are effective and practicable.

32.1.6.1 Inspections

SHE inspections of all parts of the operation shall be conducted daily on an *ad hoc* basis and formally at least once a week.

32.1.6.2 Internal Auditing

Internal SHE compliance audits shall be conducted on a quarterly basis. The purpose of the internal compliance audits shall be to confirm that all management actions outlined in the EMPr have been implemented. The mine manager will be responsible for the implementation of corrective measures that may result from the findings of such audits, which will investigate at least the following:

- Completeness of SHE documentation, including planning documents and inspection records;
- Compliance with monitoring requirements;
- Suitability of EMPr and IWWMP in addressing general environmental performance at the Site;
- Efficacy of management controls to address any non-compliance with monitoring requirements; and
- Training activities and record keeping.

32.1.6.3 External Auditing

External audits shall be completed in the manner and frequency determined in the conditions of the EA, IWUL and EMPr and the prevailing legislation.

32.1.7 ENVIRONMENTAL INCIDENTS AND NON-COMPLIANCES

The reporting of an environmental incident and or non-compliance shall be as follows:

- Site personnel shall, as soon as possible, inform the Contractor or Operator (as relevant) of the incident and/or non-compliance, the severity thereof and the corrective actions taken;
- The incident and/or non-compliance details shall be recorded on a register maintained on site;
- Depending on the level of the incident, the Contractor / Operator shall inform the Owner and the relevant authorities of the incident / non-compliance; and
- Any corrective actions required following the incident and / or non-compliance, including any rehabilitation requirements, shall be implemented by the Contractor / Operator.

32.1.8 ENVIRONMENTAL AWARENESS PLAN

32.1.8.1 Manner in which the Applicant Intends to Inform his or her Employees of any Environmental Risk which may result from their Work

The following environmental awareness activities shall be undertaken throughout the LOM, as relevant to the mine development phases (construction, operation and closure) and activities to be undertaken by specific contractors and/or employees:

- Induction training shall be provided to all personnel and visitors accessing the site. The induction training shall include information on at least the following:
  - All SHE hazards and risks on the site;
  - Emergency procedures to be followed in the event of an incident;
  - Heritage chance-find procedure;
  - Measures to prevent accidents, injuries and impacts to the environment;
  - No-go areas, including sensitive environmental features like wetlands and watercourses; and
  - Overview of the EMPr.
- Specific training programmes for all employee groups (management, supervisor, new hire, and refresher) relative to the type of work to be conducted shall be developed and implemented. These programmes shall, as a minimum, address the following:
  - Training of employees in all aspects of their work environment, hazard recognition, first aid, personal hygiene, electrical safety, rigging and lifting, vehicle safety, fire safety, safety practices for working around machinery with moving parts and other topics that may relate specifically to a job assignment or physical location at the Site;
  - Procedures for responding to fires, explosions, spills and leaks, injuries, vehicle accidents, property damage, bomb threats and robberies and attempted robberies;
  - Hazardous substances training summarising the requirements for the handling of hazardous substances on the site and how to respond to emergency situations shall be included in site induction and refresher training programmes;
  - Toolbox talks shall be presented daily with the objective of creating awareness of the Site SHE risks and hazards and how to effectively prevent accidents, injuries and impacts to the environment; and
  - All employees shall undergo initial and refresher training on spillage prevention and response, including the use of the onsite spill response equipment.

32.1.8.2 Manner in which Risk will be Dealt with in Order to Avoid Pollution or the Degradation of the Environment

The mine must continue to reassess the risks and impacts of the development throughout its operational life. Should any change in the risk and impact profile of the development be determined, additional management controls and mitigation measures must be implemented and the EMPr amended to reflect these changes.

32.1.9 SPECIFIC INFORMATION REQUIRED BY THE COMPETENT AUTHORITY

No specific information has been requested by the competent authority for the proposed mine development.

The financial provisions for closure and rehabilitation will be confirmed annually and all audits and associated statutory reporting requirements will be adhered to throughout the Life of Mine.

32.2 UNDERTAKING

The EAP herewith confirms:

(a) The correctness of the information provided in this report

(b) The inclusion of comments and inputs from stakeholders and I&APs

(c) The inclusion of inputs and recommendations from the specialist reports where relevant, and

(d) The acceptability of the project in relation to the finding of the assessment and the level of mitigation proposed.

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UNDERTAKING OF CORRECTNESS OF INFORMATION

I Paul Furniss herewith undertake that the information provided in the foregoing report is correct, and that the comments and inputs from stakeholder and interested and affected parties has been correctly recorded in the report.

Signature of the EAP

Date:

UNDERTAKING REGARDING LEVEL OF AGREEMENT

I Paul Furniss herewith undertake that the information provided in the foregoing report is correct, and that the level of agreement with interested and affected parties and stakeholders has been correctly recorded and reported herein.

Signature of the EAP

Date:

DISCLAIMER

Advisory on Business and Sustainability Africa (Pty) Ltd. (ABS Africa) has prepared this report specifically for Ilima Coal Company (Pty) Ltd. (Ilima).

The contents of this report:

- Are based on the legal requirements for undertaking an Environmental Impact Assessment, as defined in the National Environmental Management Act, 1998 (Act No. 107 of 1998) and the scope of services as defined within the contractual undertakings between Ilima and ABS Africa.
- Are specific to the intended development at the proposed site. The report shall not be used nor relied upon neither by any other party nor for any other purpose without the written consent of ABS Africa. ABS Africa accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.
- Reflect the best judgement of ABS Africa in light of the information available at the time of preparation. The analyses contained in this report has been developed from information provided by Ilima and other parties. This information is not within the control of ABS Africa and ABS Africa has not audited such information and makes no representations as to the validity or accuracy thereof.

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