OLD_KPS_SOP_HSE_055 – ENVIRONMENTAL MONITORING AND INSPECTION

KLIPSPRUIT COLLIERY/HSE/ENVIRONMENTAL

Seriti Power (Pty) Ltd

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REVISION HISTORY

The following list records amendments to this document:

Table 1 - Revision History

Rev #	Date	Reason For Change	Originator
7	23/06/2022	Aligned to Seriti Logo and Branding.	Phineas Maphaha

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List of Figures

No table of figures entries found.

List of Tables

References

The following list of files were used in the design of this document or legal elements that inform the document e.g. other COP's, FRS, MHSA, ISO's, Risk Assessment:

Table 2 - List of References

Title	Document Number/Ref
1. Land and Rehabilitation	OLD_KPS_COP_HSE_007
2. Integrated Water Management	OLD_KPS_COP_HSE_008
3. Environmental Management Manual	OLD_KPS_COP_HSE_009
4. Legal and Other Requirements	OLD_KPS_SOP_HSE_060
5. Waste Management	OLD_KPS_SOP_HSE_053
6. Emergency Preparedness and Response	OLD_KPS_COP_HSE_002
7. Emergency Preparedness and Response	OLD_KPS_COP_HSE_002
8. Air Quality. GHG & Energy Management	OLD_KPS_SOP_HSE_051
9. Environmental Data and Incident Monitoring	OLD_KPS_SOP_HSE_054

Title	Document Number/Ref
10. Spillage Clean-up of Hydrocarbon Products	OLD_KPS_SOP_HSE_057
11. Operational manual for the Pollution Control Dams	
12. Klipspruit EMPR and WUL	
13. Klipspruit South EA and WUL	
14. Klipspruit Weltevreden EA and WUL	
15. KPSX EMP	
16. Constitution of the Republic of South Africa, - Section 24 (Act 108 of 1996)	
17. National Environmental Management Act (NEMA107 of 1998 and its amendments)	
18. Minerals and Petroleum Resources Development Act (MPRDA 28 of 2002)	
19. National Environmental management: Air Quality Act, 2004 (Act No 39 of 2004) and its regulations	
20. National Water Act and Regulations (NWA 36 of 1998)	
21. South32 Klipspruit Water use Licence 24075037	
22. SANS 10103: 2008 Ambient noise monitoring	
23. SANS 1929: 2005 Dust monitoring	

1 Scope and Field of Application

The target audience of this procedures is all Klipspruit Colliery employees and contractors working at any KPS-managed operation or facility.

The intent of this standard operating procedure is to define methods for monitoring and measuring processes of environmental aspects related to mining activities that may have significant impacts on the environment. These include data collection to track performance of the operations to effectively manage impacts to surface water, groundwater, air, noise, biodiversity, and monitoring of the ecosystem, bio-systems, land rehabilitation, waste and hazardous substances as well as measuring sustainability indicators.

2 Terms and Abbreviations

These are definitions of terms and abbreviations used within this document. For a more comprehensive dictionary please refer to our intranet.

Table 3 - Terms and Abbreviations

Term/Abbreviation	Definition
EMPR	Environmental Management Programme Report
KPI	Key Performance Indicator
KPS	Klipspruit Colliery
KPSX	Klipspruit Extension
OLD	Operational Level Document

Term/Abbreviation	Definition
SOP	Standard Operating Procedure
WUL	Water Use License
Environment	Surroundings within which humans, other biological, physiological, chemical and other socio-economic factors exist. It includes Air, Water, Land, Animals and Human being.
Dam	Includes any settling dam, slurry dam, evaporation dam, catchment or barrier dam and any other form of impoundment used for the storage of water
Dust (or Settleable particulate matter)	Means any material composed of particles small enough to pass through a 1 mm screen and large enough to settle by virtue of their weight into the sampling container from the ambient air.
Dustfall	Means the deposition of dust.
Non-residential	Means any area not classified for residential use as per local town planning scheme.
Residential	Means any area classified for residential use as per local town planning scheme.
Noise	Any unwanted or unpleasant sound.
Ground vibration	Any unwanted or unpleasant movement of the ground that may have cosmetic damage to a house and structure

3 Inputs

The intent of this standard operating procedure is to define methods for monitoring and measuring processes of environmental aspects related to mining activities that may have significant impacts on the environment. These include data collection to track performance of the operations to effectively manage impacts to surface water, groundwater, air, noise, biodiversity, and monitoring of the ecosystem, bio-systems, land rehabilitation, waste and hazardous substances as well as measuring sustainability indicators.

4 Responsibilities

4.1 General Manager

- Is responsible and accountable for environmental performance at their operation or areas of responsibility.
- Appoints competent line personnel to take responsibility and accountability for environmental management at site-level; clearly specifying their roles & KPI's.

4.2 Heads of Department

- Responsible for providing resources to control risks associated with this plan.
- Provides resources to effectively manage risks associated with environmental management.
- Ensure that all relevant training required is undertaken.

4.3 Superintendent/ Supervisor/Specialist

- Establish, implement, maintain and monitor an environmental inspection programme.

- Ensure safe and efficient execution of this SOP.
- Ensure that all relevant areas are monitored and inspected at regular intervals as required by the respective EMPR's and permit requirements to comply with all legal requirements

5 Monitoring Procedure

5.1 Ground Water and Surface Water Quality Monitoring

Table 4 - Surface water quality monitoring points

DESCRIPTION	CO-ORDINATES		FREQUENCY
K1 Southern farm dam in O/C section	S26°01.915"	EO29°01.689"	The areas have been mined through
K2 Northern farm dam in O/C section	S26°01.866"	EO29°01.499"	
K3 D/S mining area	S26°01.262"	EO29°01.654"	Monthly
K9 D/S mining area and Phola township - below confluence	S26°00.507"	EO29°01.484"	Monthly
K7 D/S mining area and Phola township - above confluence	S26°00.780"	EO29°01.483"	Monthly
K10 D/S mining area and Phola township - Zaid tributary	S26°00.588"	EO29°01.433"	Monthly
K4 Zaid Concer Collier River	S26°03'52.6"	EO28°59'13.6"	Monthly
K5 Enslin Farm Estate Dam	S26°04'06.3"	EO29°00'18.6"	Monthly
K6 Kendal United 2 and 4 Seam Dam	S26°03'57.2"	EO29°00'06.1"	Monthly
K8 Ogies Colliery U/g Mining Dam	S26°04'10.9"	EO29°02'55.5"	This site is located on third party mining area. Removed from monitoring plan due to blocked access
K17 R545 Bridge River	S26°00'19.7"	EO29°01'33.7"	Monthly

Table 5 - Groundwater quality monitoring points

DESCRIPTION	CO-ORDINATES		FREQUENCY
KGM B 4 Sampling level 17.5m	S26°01'15.3"	EO29°00'50.6"	Sept, Dec, Mar, Jun
KGM B 11A	S26°02'16.1"	EO29°00'07.1"	Sept, Dec, Mar, Jun
BSW 3	S26°01'31.0"	EO29°02'12.1"	Sept, Dec, Mar, Jun
KGM 13	S26°03.124"	EO29°02.41"	Sept, Dec, Mar, Jun
KGM B 9	S26°03'43.9"	EO29°00'25.5"	Sept, Dec, Mar, Jun
KGM B 16	S26"03'12.5"	E029"01'23.6"	Sept, Dec, Mar, Jun
KGM 8	S26°03.277"	EO29°59.482"	Sept, Dec, Mar, Jun

BSW 4	S26°02'45.9" EO29°02'37.1"	Sept, Dec, Mar, Jun
KGM B 6	S25°55'037" EO29°25'145"	Sept, Dec, Mar, Jun
KGM 7	S26°03.129" EO29°01.153"	Sept, Dec, Mar, Jun
KGM 10	S26°03'11.49" EO29°02'23.99"	Sept, Dec, Mar, Jun

Table 6 - Surface and discharge monitoring points

DESCRIPTION	CO-ORDINATES	FREQUENCY
N12 East Boundary Canal 1	S26°01.237" E029°01.009"	Monthly
N12 West Boundary Canal 2	S26°01'14.28" E29°0'39.71"	Monthly
K15 Balancing dam	S26°03.151" EO29°01.454"	Monthly
Sewage Effluent	S26°03.001" E29°02.020"	Monthly
K19 South Dam	S26°03.251" EO28°59.560"	Monthly

Table 7 - Drinking water sampling sites

DESCRIPTION	LOCATION	FREQUENCY
Mining Kitchen	Mining Building	Monthly
Admin Building Kitchen	Main offices	Monthly
ROM Kitchen	Crusher Plant	Monthly
Deployment Kitchen	Mining Building	Monthly
EME Workshop	EME workshop	Monthly
Contractors Workshops	TAU, Moolmans and BME	Monthly

KPSX Monitoring Points

Table 8 - Surface Water monitoring points

DESCRIPTION	LOCATION	FREQUENCY
Wel SW1	S26.02.57,3 E29.05.616	Monthly
Wel SW2	S26.02.842 E29.06.16	Monthly
Wel SW3	S25.98.082 E29.09.818	Monthly
Wel SW4	S25.90.873 E29.06.536	Monthly
Wel SW5	S25.9.3930 E29.08.414	Monthly
Wel SW6	S25.9.646 E29.03.474	Monthly
Wel SW7	S26.00.538 E29.02.585	Monthly
Wel SW8	S25.9.674 E29.02.717	Monthly

Wel SW9	S26.03.120 E29.11.216	Monthly
Wel SW10	S26.06.184 E29.09.275	Monthly
Wel SW11	S25.9.755 E29.04.011	Monthly
Wel SW12	S25.9.517 E29.05.039	Monthly
Wel SW13	S26.01.686 E29.04.818	Monthly
Wel SW14	S25.9.504 E29.09.725	Monthly

Table 9 - Groundwater Monitoring Points

DESCRIPTION	LOCATION	FREQUENCY
BHP_M01	S26.01.310 E29.08.184	Monthly Water Levels; Quarterly Sampling
BHP_M02	S26.02.000 E29.08.600	Monthly Water Levels; Quarterly Sampling
BHP_M03	S25.9.570 E29.09.100	Monthly Water Levels; Quarterly Sampling
BHP_M04	S25.9.510 E29.09.300	Monthly Water Levels; Quarterly Sampling
BHP_M05	S25.9.850 E29.05.700	Monthly Water Levels; Quarterly Sampling
BHP_M06	S26.00.700 E29.04.500	Monthly Water Levels; Quarterly Sampling
BHP_P01	S26.07.251 E28.9.956	Monthly Water Levels; Quarterly Sampling
BHP_P02	S26.05.296 E29.04.362	Monthly Water Levels; Quarterly Sampling
BHP_P03	S26.07.057 E28.9.965	Monthly Water Levels; Quarterly Sampling
BHPW05	S25.9.803 E29.10.749	Monthly Water Levels; Quarterly Sampling
BHPW07	S25.9.850 E29.04.700	Monthly Water Levels; Quarterly Sampling
BHPW08	S25.9.436 E29.05.571	Monthly Water Levels; Quarterly Sampling
WELBH01	S26.02.560 E29.05.580	Monthly Water Levels; Quarterly Sampling
WELBH08	S26.01.227 E29.05.033	Monthly Water Levels;

		Quarterly Sampling
WELBH09	S26.02.124 E29.04.016	Monthly Water Levels; Quarterly Sampling
WELBH16	S25.9.554 E29.05.005	Monthly Water Levels; Quarterly Sampling
WELBH23	S25.9.299 E29.06.907	Monthly Water Levels; Quarterly Sampling
WELBH24	S25.9.233 E29.08.236	Monthly Water Levels; Quarterly Sampling;
WELBH25	S25.95886 E29.09002	Monthly Water Levels; Quarterly Sampling;
WELBH26	S26.01192 E29.04646	Monthly Water Levels; Quarterly Sampling
WELBH27	S26.02095 E29.02583	Monthly Water Levels; Quarterly Sampling
WELWEL03	S25.9.520 E29.09.600	Monthly Water Levels; Quarterly Sampling
WELWEL05	S26.05.700 E29.08.600	Monthly Water Levels; Quarterly Sampling
BH 008	S25.99867 E29.06287	Monthly Water Levels; Quarterly Sampling
BH 009	S25.99051 E29.05902	Monthly Water Levels; Quarterly Sampling

KPSS Monitoring Points

Table 10 - Surface Water monitoring points

DESCRIPTION	LOCATION	FREQUENCY
KSSW06	S26.06424 E29.00155	Monthly Water Levels; Quarterly Sampling
KSSW10	S26.07815 E28.98727	Monthly Water Levels; Quarterly Sampling
KSSW11	S26.06971 E29.00660	Monthly Water Levels; Quarterly Sampling

Table 11 - Groundwater Water monitoring points

DESCRIPTION	LOCATION	FREQUENCY
BHPSM01	S 26.3202 E 29.24786	Monthly Water Levels;

		Quarterly Sampling
BHPSM06	S26.06702 E29.01695	Monthly Water Levels; Quarterly Sampling
BHPSM08	S26.06061 E28.99892	Monthly Water Levels; Quarterly Sampling
BHPSM09	S26.06920 E29.01069	Monthly Water Levels; Quarterly Sampling
BHPSM10	S26.05307 E29.04308	Monthly Water Levels; Quarterly Sampling
BHPSM13	S26.07278 E28.99983	Monthly Water Levels; Quarterly Sampling

5.1.1 Water monitoring and sampling process

- Water sample is collected in a sampling bottle supplied by the Laboratory.
- The sampler must rinse the bottle twice before taking water sample at any sampling point.
- Groundwater and surface water samples are collected and analysed by an accredited laboratory.
- All water samples collected are tested for acidity, pH, TALK, EC, TCaCO3, TDS, SS, NH4, Ca, Cl, Mg, NO3, K, Na, SO4, Al, F, Fe, Zinc, Si and Mn and checked against the SANS 241 drinking standards for water (Appendix 8).
- An annual monitoring and measurement will be undertaken for all water monitoring variables required by DWS Resource Water Quality Objectives (RWQO) for management unit 18 and water quality guidelines not covered by the Mine's approved EMPR's, EIA's and Water use licenses, in order to identify potential impacts to water resources and the environment (Appendix 10).
- Monitoring and measurements for water monitoring variables to which the organisation subscribes shall also be undertaken at specified frequencies and as when necessary or required.
- All samples are taken, stored and analysed as per the laboratory SOP.
- Microbiological samples are taken for kitchen and workshops tap. These samples are analysed for Standard plate count, Total Coliforms and Faecal Coliforms.
- Sewage effluent sample is taken at the sewage treatment plant to analyse for both chemical and microbiological components. They include: Alkalinity, conductivity, pH, TDS, SS, COD, OA, OD, Ammonia, Ortho Phosphate, Nitrate, Cl2, F, Oil and grease and heavy metals for chemical components. Samples are also analysed for Faecal Coliforms for microbiological components.
- All water samples are taken in accordance with the Klipspruit Monitoring Program.
- All water monitoring results are stored on the relevant network drive.
- Surface water monitoring results are reported monthly to the Department of Water and Sanitation (DWS) according to the Integrated Water Use Licence conditions.

5.2 Water Quantity Monitoring and Dam level

Water quantity monitoring is done on regular basis through electronic flow meters interfaced with the mine SCADA system. The system monitors dam capacities and also amount of water being pumped out of the working areas and into water containment dams, and volumes using flow meters placed at different sites around the mine.

Table 12 - Water Quantity monitoring sites

DESCRIPTION	TYPE
Balancing Dam	Volume, level

South Dam	Volume
Ramp1 void	Volume, elevation
Bankfontein void	Volume, elevation
South PCD 1	Volume, level
KPSX PCD 1	Volume, level
KPSX PCD 3	Volume, level
KPSX PCD 4	Volume, level
Smaldeel to Bankfontein	Flow
Balancing Dam to Phola	Flow
Ramp 1 to Balancing dam	Flow
Ramp 4 to Balancing Dam	Flow
Ramp 2 and 3 to Balancing dam	Flow
South Dam to Balancing Dam	Flow
Water Filling Point	Flow
Main pit to old voids	Flow
Portable Water Reservoir Tank	Flow
Plant runoff sump to Balancing dam	Flow
ROM sump to Balancing dam	Flow

5.3 Air Quality and Vibration Monitoring

- Klipspruit Colliery has conducted detailed risk assessments for all processes identified. Historical risk assessments was part the approved EMPR (2003) which is stored on the Klipspruit Colliery network drive.
- Dust Monitoring Buckets (Direction and Non-Directional are place around the mine's sensitive area (refer to Appendix 3) and results are monitored as per the SANS 1929: 2005.
- Ground Vibrations is monitoring only when triggered by blasting events.

5.3.1 Collection and Analysis Method of Dust Deposition

- The water insoluble particulates settling from the atmosphere (dust deposition) is monitored using the American Society Standard Test Method for Collection and Measurement of Dust fallout (ASTM1739). All dust monitoring sampling and analysis for Klipspruit Colliery is done by an appointed accredited laboratory.
- All dust monitoring data is stored on the Klipspruit Colliery's network drive
- Dust fallout monitoring points are listed below.

Table 13 - Dust Monitoring Sites

DESCRIPTION	CO-ORDINATES	FREQUENCY
KPF2 Enslin	S26°03.916" E029°00.489"	Monthly

KPF6 Dam	S26°02.115" E029°03.312"	Monthly
KPF5 Phola	S26°00.952" E029°02.125"	Monthly
KPF3 N 12 South Boundary	S26°04.513" E029°02.665"	Monthly
KF 05 South Boundary	S26°03.18.7" E029°01.41.4"	Monthly
Bankfontein	S26°02.48.2" E029°59.26.1"	Monthly
KPF3 R545 next to Zibulo	S26°01'15.3" EO29°00'50.6"	Monthly
KPF9 Ogies school	S26°02.53.8" E029°04.043"	Monthly
Ogies Town	S26°03.16.41" E029°02.54.24"	Monthly

- All dust fallout monitoring samples are measured, tested and reflect the following: lab reference, site name, sampled commence date, sample collection date, mass collected, sampling period, settle-able particles, compliance to the acceptable rates and comments.
- All dust fallout samples will be measured against acceptable dust fall rates as per National Dust Control Regulations (GN.R 827) of the national Environmental Management: Air Quality Act, 2004 (Act No.39 of 2004).

Table 14 - KPSX Dust Monitoring Points

DESCRIPTION	CO-ORDINATES	FREQUENCY
Khumalo Household	S25.98422 E29.04600	Monthly
Makause Combined School	S25.99606 E29.04367	Monthly
Ogies Township	S26.05722 E29.04556	Monthly
Wonderfontein Farm	S25.97606 E29.04838	Monthly
Debruto Farm	S25.97742 E29.08209	Monthly
Skhosana	S25.95314 E29.05640	Monthly
Graveyard	S25.99472 E29.04601	Monthly
Dump Site	S25.98744 E29.04823	Monthly

Table 15 - Acceptable dust fall rates as per National Dust Control Regulations

Restriction Areas	Dustfall rate (D) (mg/m2/day,30 days average)	Permitted frequency of exceeding dust fall rate
Residential Area	D < 600	Two within a year, not sequential months.
Non-residential area	600 < D < 1200	Two within a year, not sequential months.

- All dust fallout sampling and analysis are collected and analysed by an accredited laboratory.
- All samples are taken, stored and analysed as per laboratory SOP.
- The dust fallout samples are collected on month basis. Results are emailed to the mine personnel and stored in the file plan.

General Dust Control Measures

- Dust control measures are applied to prevent dust from becoming airborne by the correct application of water at source of dust.

Haul roads

- Haul roads are being watered down using recycled water regularly or as and when required. Dust a-side product is applied on permanent haul road, Smaldeel road.

ROM Tip

- ROM tip is fitted with water sprays and should be kept in good working order.

Workshops and Surrounding Areas

- Water and wash down structures to prevent the accumulation of dust.
- Clean vehicles, equipment and machinery prior to servicing.

Operators Cabins on Machines

- All machines are provided with a totally enclosed operator cabin, which is dust proof.
- Rubber seals on windows and doors are in position and not damaged.
- The Operator cabin is provided with a ventilation system, which is maintained in good working condition

Drilling Operations

- Where “dry drilling” is done, the dust suppression system must be maintained in a good working condition.
- The side curtains around the drill rod will be of sufficient length to reach ground level and the ventilation pipe between the dust collector and the inlet positioned inside the enclosed curtain area will not be damaged.
- Where “wet drilling” is done, the water injection system is kept operational.
- The water reservoir is not allowed to run dry during drilling.

Blasting

- No special precautions for dust suppression during blasts are implemented due to the short duration of impact.
- Wind direction?

Remote areas including security gate

- Effective dust suppression must be applied on service road along remote access gates.

5.3.2 Particulate matter and Meteorological data

Table 16 - Location of PM and meteorological monitor

Site name	Site Code	Co-ordinates	Frequency

		X	Y	Monthly
Klipspruit Offices	PM10, 2.5 monitor	26º03'10.1"S	29º02'07.4"E	
Ogies Police Station	PM10, 2.5 monitor	26º03'03.9"S	29º03'10.2"E	
KPSX Makause School	PM10, 2.5 monitor	25º59'50.06"S	29º02'34.06"E	

- Particulate matter will be monitored using a met-one Environmental sampler (E-Sampler) capable for monitoring Wind Speed, Wind Direction, Barometric pressure, and Average temperature, $PM_{2.5}$, PM_{10} and TSP.
- The particulate matter will be measured against the National Ambient Air Quality Standards for Particulate Matter (PM_{10}) as per National Ambient Air Quality Standards (GN.R 1210) of the National Environmental Management: Air Quality Act, 2004 (Act No.39 of 2004).

Table 17 - National Ambient Air Quality Standards for Particulate Matter (PM10)

Averaging Period	Concentration	Frequency of Exceedance	Compliance Date
24 hours	120 µg/m^3	4	Immediate- 31 December 2014
24 hours	75 µg/m^3	4	1 January 2015
1 Year	50 µg/m^3	0	Immediate- 31 December 2014
1 Year	40 µg/m^3	0	1 January 2015
The reference method for the determination of the particulate matter fraction of suspended particulate matter shall be EN 12341			

5.3.3 Ground Vibration

- The impact of vibration has been assessed and the report is located in the approved EMPR (2003) Appendices 8 and 9 on Klipspruit Colliery's network drive.
- Vibration monitoring data in electronic format on the file plan.
- All vibration monitoring for Klipspruit Colliery is done by appointed contractor.
- Blast Analysis Africa (BAA), has installed NOMIS Seismograph permanent monitoring stations at Klipspruit Colliery, to monitor blast induced ground vibrations and air blast.

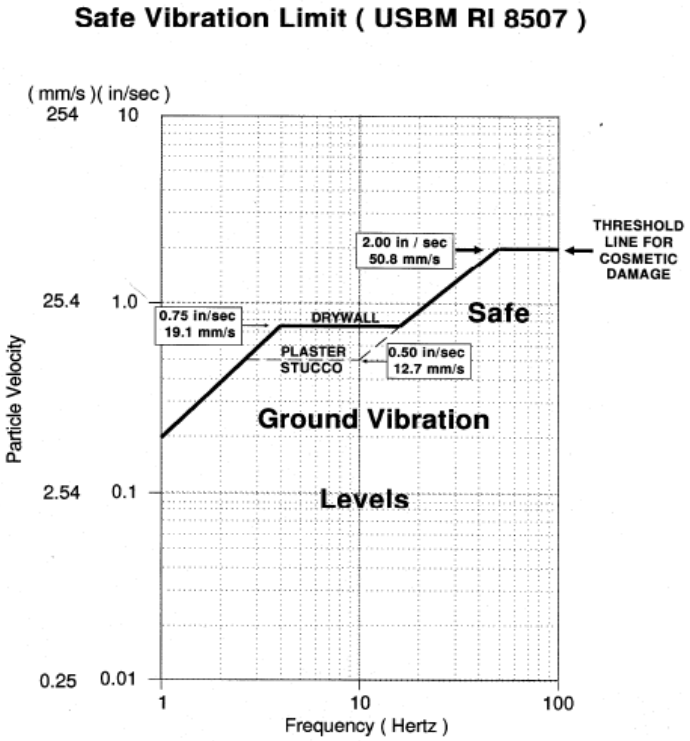
Table 18 - Location of Vibration Monitoring Sites

Site name	Site Code	*X*	*Y*
Bridge	UM17743	S 26 05' 60.88"	E 29 03' 10.91"
Conveyor North	UM17744	S 26 05' 89.65"	E 29 02' 47.00"
Conveyor South	UM17745	S 26 06' 39.88"	E 29 02' 54.99"
Pylons	UM17746	S 26 06' 08.64"	E 29 03' 54.97"
Village East	UM17758	S 26 05' 47.43"	E 29 04' 64.37"

Village North	UM17759	S 26 05’ 28.76”	E 29 04’ 47.08”
Point 02 North East Corner	UM12781	S 25 98’ 13.27”	E 29 06’ 51.21”
Point 03 Graveyard	UM17747	S 25 98’ 42.05”	E 29 05’ 32.74”
Point 04 Makause School	UM17750	S 25 99’ 50.58”	E 29 05’ 00.30”
Point 05 Western Dam	UM17747	S 26 00’ 98.70”	E 29 04’ 54.19”
Point 06 N12	UM13639	S 26 01’ 59.04”	E 29 06’ 26.19”
Point 07 Ogies Mill	UM6279	S 26 05’ 17.29”	E 29 04’ 23.45”
Point 08 Diesel Bay	UM11514	S 25 99’ 76.11”	E 29 05’ 73.59”

Vibration Criteria Limits

Although there are no formalized limits to vibration, the US Bureau of Mines limits are commonly applied in South Africa. The limiting curve, developed from empirical studies (Siskind 1980), is shown in Graph 1. This represents the limit for cosmetic damage to a house. The maximum ground vibration amplitudes are frequency dependent with higher frequencies allowing higher peak amplitudes. In general, at lower frequencies, the ground vibration should not exceed 12.7 mm/s, but at higher frequencies, the limit can increase to 50 mm/s. Generally, the ground vibration should not be allowed to exceed 12.7 mm/s at any building to limit the risk of cosmetic or any more serious.



Graph 1

- Blasting is conducted only during daylight time. To limit the amount of noise produced by blasting operations, blasting on overcast days is avoided. Blasting times are communicated to the affected in advance.
- Blasting schedules are communicated and directly affected landowners are informed of when blasting will take place

5.3.4 Ozone depleting substances

- The impact of ozone will be monitored annually by use of Real Time Wireless Continuous Monitor.

5.3.5 PCB substances

- The existence of the PCB substances is analyses annually in the annual Condition Monitor assessment.

5.4 Biomonitoring

Biomonitoring points - KPS

DESCRIPTION	CO-ORDINATES	FREQUENCY
Klipspruit 1 Shallow, seasonal stream and sedge wetland situated on the eastern side of the future surface mining area on the farm Klipfontein 3 IS.	S: 26° 02’ 01.1’’ E: 29° 01’ 41.5’’	Biannual
Klipspruit 2 First order stream situated on the western side of the future surface mining area on the farm Klipfontein 3 IS.	S: 26° 01’ 58.0’’ E: 29° 01’ 21.3’’	Biannual
Klipspruit 3 Perennial stream and *Typha capensis* wetland system situated downstream of current and future surface mining operations.	S: 26° 01’ 18.3’’ E: 29° 01’ 38.9’’	Biannual
Klipspruit 4 Site located on the Saalklapspruit upstream of the confluence with the perennial stream associated with Klipspruit Colliery.	S: 26° 00’ 55.2’’ E: 29° 01’ 03.1’’	Biannual
Klipspruit 5 Site located on the Saalklapspruit downstream of the confluence with the perennial stream associated with Klipspruit Colliery.	S: 26° 00’ 29.6’’ E: 29° 01’ 29.9’’	Biannual
KPS Intake Site located at the intake of mine affected water at the WTP.	S: 26° 03’ 04.13’’ E: 29° 02’ 22.93’’	Biannual
KPS Discharge Site located at the discharge of treated water originated from the WTP.	S: 26° 01’ 20.95’’ E: 29° 01’ 42.74’’	Biannual
KPS 6 Wetland Site located within the wetland system prior to confluence within the Saalklapspruit.	S: 26° 00’ 44.77’’ E: 29° 01’ 27.40’’	Biannual

Biomonitoring points - KPSX

DESCRIPTION	CO-ORDINATES	FREQUENCY
BHP 1 Grootspruit at lower water crossing.	S: 25° 55' 28.74'' E: 29° 04' 52.87''	Biannual
BHP 3 Below the dam, unchanneled valley bottom wetland system.	S: 25° 57' 03.47'' E: 29° 05' 46.99''	Biannual
BHP Pit G Grootspruit, below the dam	S: 25° 57' 34.52'' E: 29° 05' 36.54''	Biannual
BHP Y2 Within a tributary of the Grootspruit	S: 25° 58' 48.83'' E: 29° 05' 34.29''	Biannual
BHP 8 Downstream of the proposed project area and adjacent to the town of Phola.	S: 25° 58' 33.15'' E: 29° 02' 27.10''	Biannual

- All biomonitoring conducted on site is done by a registered Professional Natural Scientist.
- All biomonitoring conducted on site is done by a registered Professional Natural Scientist.
- All bio monitoring is in accordance with the conditions of the KPS Integrated Water Use License and shall include the 95% charge balance analysis, including all metals.
- All bio monitoring results are stored in the network drive.
- Biomonitoring program will be revised to align with the mine activities.

5.5 Rehabilitation and Vegetation Performance Assessments

- Land rehabilitation include levelling of spoils and carbonaceous material, topsoil placement and grass establishment is covered in the procedure OLD_KPS_SOP_HSE_058: Land Management and Rehabilitation.
- Land and rehabilitation specialist is appointed once a year to conduct rehabilitation performance assessment of the areas.
- A list of rehabilitation performance assessments points are determined and monitored for the land capability, Soil loss hazard, Land form, Soil fertility, and Species composition of the vegetation, Physical structure of the vegetation and Pasture vigour.
- These will then be measured against a 5 points scale:
    1- Very poor
    2- Poor
    3- Fair
    4- Good
    5- Best

5.6 Ambient Noise Assessment

- A monitoring program for Klipspruit will be established to monitor continuous noise levels which has been generated by the operation's activities. This shall consider the assessment criteria below:

Activities	**Area**
Load and tipping	Mining area
Hauling	Mining Area

Screening, Crushing and Conveying	Crusher Plant
Drilling and Blasting	Pit Area
Coal Tipping (ROM Tip)	Crusher Plant

5.6.1 Methodology

- Environmental Noise survey will be conducted during the day and night time at selected (sensitive receptors) around the perimeter of the mine.
- The environmental noise survey will be conducted according to the requirements of SANS 10328:2008 and SANS 10103 for the measurement and rating of environmental noise with respect to annoyance and to speech communication
- The measurement points will take into account noise sensitive receptors, such as farmsteads, schools, hospitals, churches etc. and only sensitive areas within a radius of two kilometres from the mining activities will be taken into account.
- The reason for the two-kilometre buffer zone is in accordance to the Concave method (SANS 10357) of calculating noise propagation.
- At each measurement point the ambient noise level will be sampled in terms of the following parameters:
- The A-weighted equivalent sound pressure level (LAeq) for duration not less than 15 minutes per monitoring point.
- Measurements to be taken during both daytime (06:00 to 22:00) and the night time (22:00 to 06:00).

5.7 Waste Generation and Disposal

- All waste generated on site is collected by the responsible contractor in accordance to waste procedure.
- All waste generated on site is classified in the waste management procedure which also includes all waste storage areas on site.
- All waste is disposed of at a permitted site by the responsible contractor.
- All records of waste disposed are stored on site in the relevant network drive and as hard copies on-site and with responsible contractor.
- Geochemistry assessment should be done on coarse material to assess acid and base generation potential.

5.8 Sustainability Indicators and Reporting

- The sustainability indicator information is recorded every month and stored in the relevant network drive.
- These include the greenhouse gases, rehabilitation and disturbed land, water consumption; discard production, coal production, diesel consumption, electricity consumption and mine waste moved.
- Management of rehabilitation including vegetation assessment, subsidence, alien vegetation monitoring is undertaken as per rehabilitation procedure.
- Rainfall is monitored using rain gauge and recorded on a production pack.
- The sewage treatment plant efficiency will only be monitored once a month and if inefficiencies are picked, they will be investigated and action plans taken.
- Exceedance on the Dust fall out and PM monitoring will be investigated and action plans to alleviate the situation will be drafted and the proposed actions will be implemented.
- Fauna and Flora will be monitored as and when needed and action plans will be adhered to.
- Compliance assessment of all licenses and authorization are undertaken on quarterly basis.

5.9 Triggers

Documents may be reviewed based upon risk requirements or upon specified triggering events (e.g., fatal risk triggers). As appropriate and based upon the magnitude of the trigger, the change management procedure shall be followed.

Events that may trigger a review of controlled documents are:

- Changes in legislation and regulatory standards.
- Periodic review of the document.
- An actual or potential significant HSEC event at or near the site that may require additional controls or procedures to manage the risk.
- Audit outcomes or findings.
- Incorporation of industry best practice.
- At the author or users' discretion for continuous improvement.
- Following a General Managers instruction that affects the management of the risk identified.

6 Environmental Inspection Process

- Environmental inspections are performed to maintain compliance to Environmental Authorisations and license conditions by the Environment, Maintenance and Production personnel on monthly basis and should cover all active areas listed on a table 8.1.
- Environmental inspection shall assess functionality and impact of the pumps, dam wall and levels, pipelines, culverts, highwall drains, canals, hydrocarbon bund walls and dust suppression system.
- The inspection shall verify and confirm implementation and compliance to discard stacking procedure, waste management procedure, water management procedure and land rehabilitation procedure.

6.1 Environmental Inspection Schedule

ENVIRONMENTAL INSPECTION	LINE MANAGER
Sewage plants	Section Engineer
Fresh water canals	Section Manager
Workshop and Wash bay areas including contractors	Section Engineer
Stores and security access	Section Engineer
Salvage, and Mining Yard	Section Engineer
Tip and Crushing plant area, and conveyor	Section Engineer
Coal stockpile and Discard dump	Section Manager
Pollution Control Dams	Section Engineer
Pit, old voids and cut off berms	Section Manager
Rehabilitated areas and Soil dumps	Section Manager
Water, Dust, Wind socks and PM monitoring stations	Lead Environmental

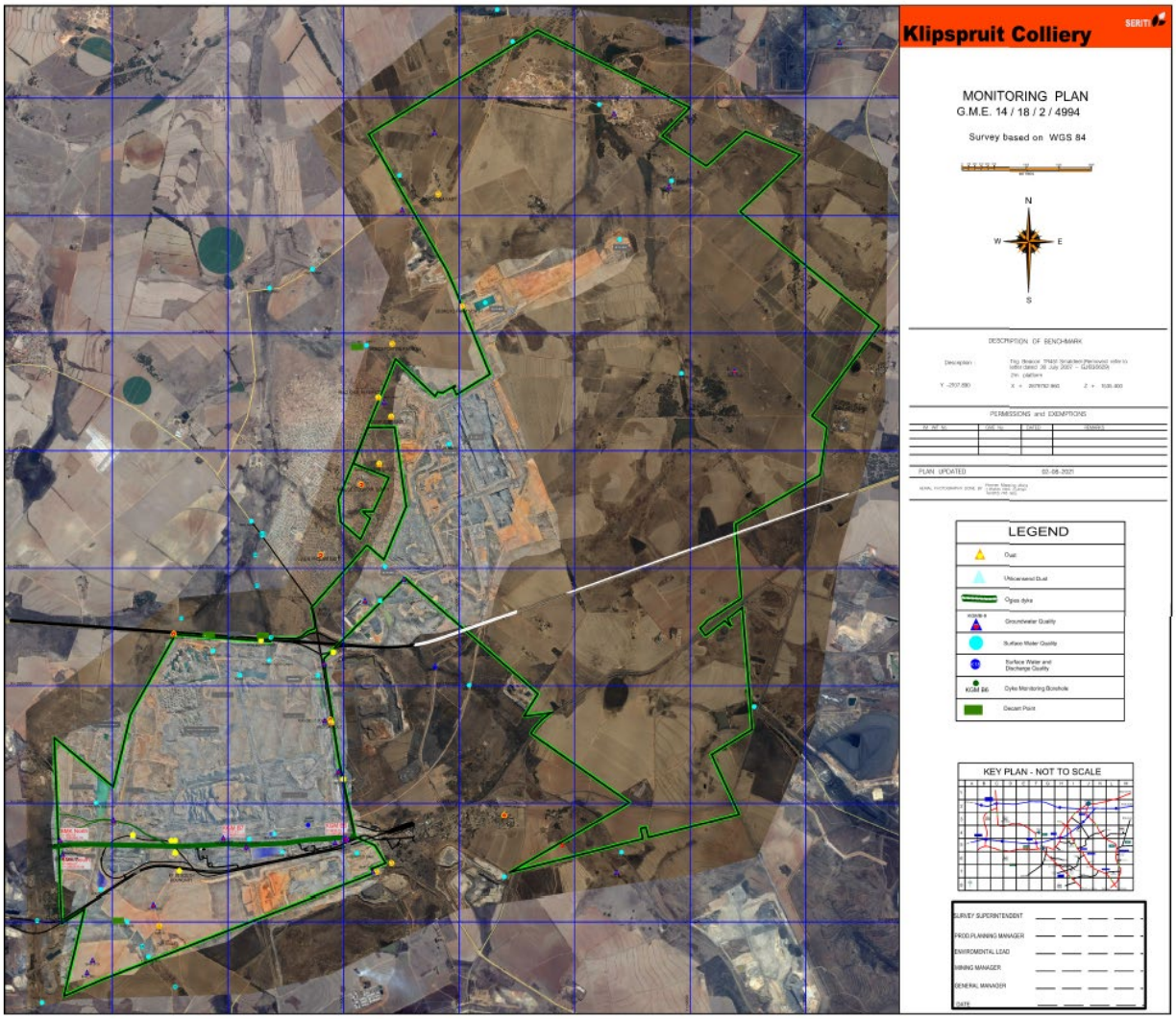
6.2 Deviations and Non-conformances

- All recorded deviations during the inspection shall be communicated to the responsible line personnel and be accepted.

6.3 Document Review Triggers

- Documents may be reviewed based upon risk requirements or upon specified triggering events (e.g., fatal risk triggers). As appropriate and based upon the magnitude of the trigger, the change management procedure shall be followed.
- Events that may trigger a review of controlled documents are:
  - Changes in regulatory standards.
  - Periodic review of the document.
  - An actual or potential significant HSE event at or near the site that may require additional controls or procedures to manage the risk.
  - Audit outcomes or findings.
  - Incorporation of industry best practice.
- At the author or users' discretion for continuous improvement

Appendix A: Monitoring Plan



Appendix B: Location of Seismograph Stations

Figure 1: Monitor Positions Seriti KPS South (Google Earth)

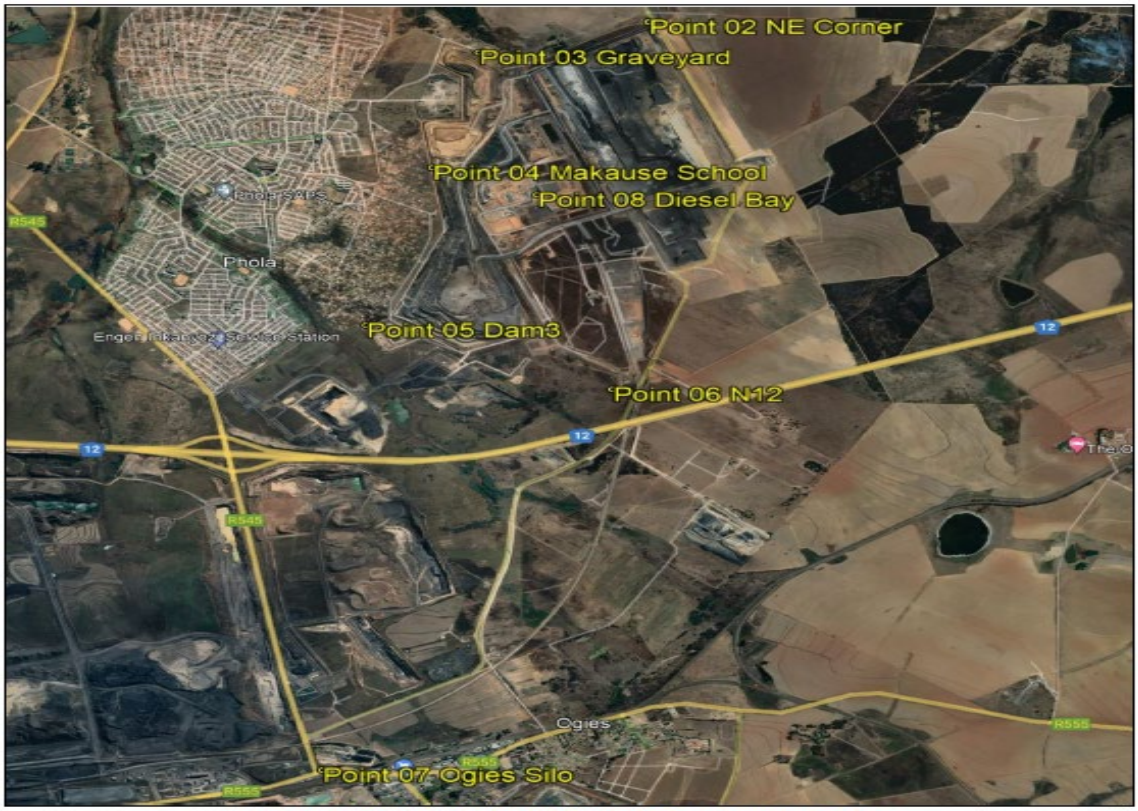
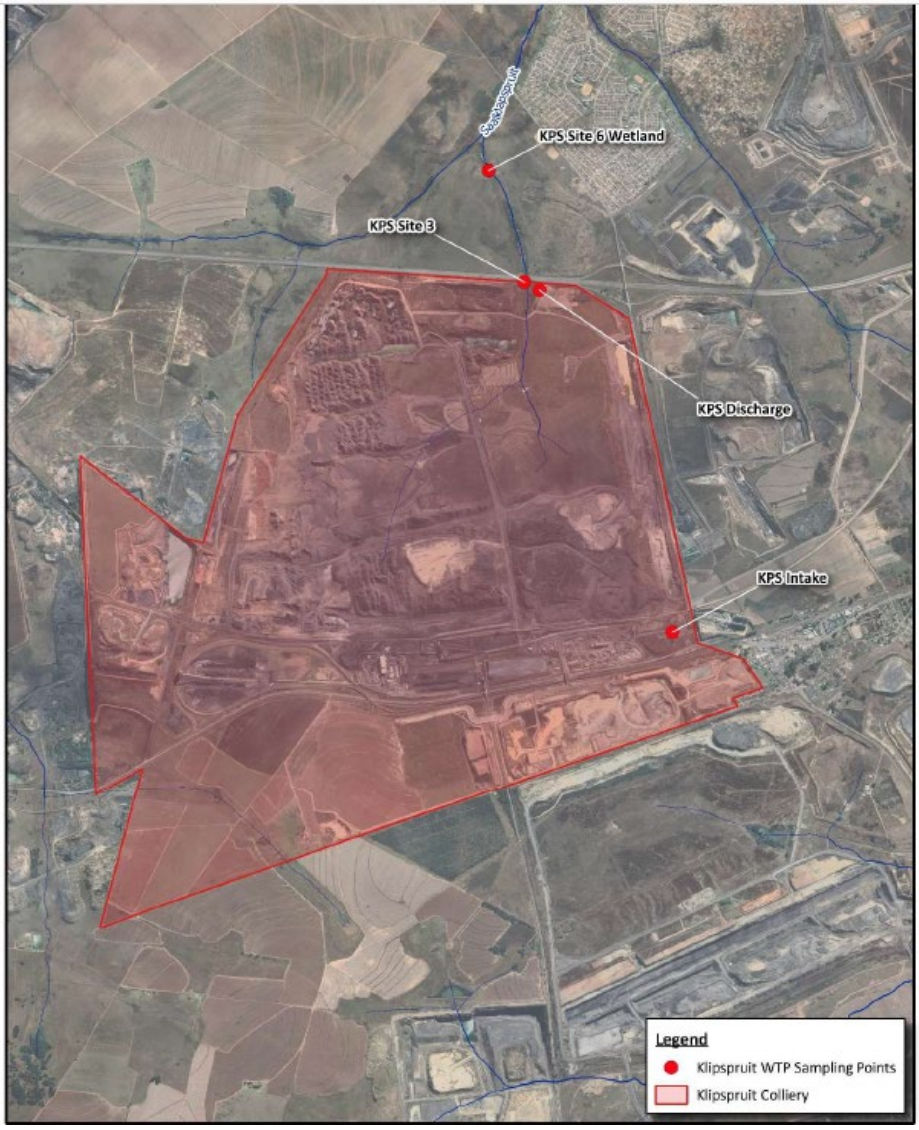


Figure 2: Monitor Positions Seriti KPS X (Google Earth)

Appendix C: Map of Biomonitoring Points



Appendix D: SANS 421 Drinking Water Standards

Determinand	Unit	Class I (recommended operational limit)	Class II (Max. allowable for limited duration)	Class II water consumption period,[a] max.
Physical and organoleptic requirements				
Colour (aesthetic)	mg/L Pt	< 20	20 – 50	No limit[b]
Conductivity at 25 °C (aesthetic)	mS/m	< 150	150 – 370	7 years
Dissolved solids (aesthetic)	mg/L	< 1 000	1 000 – 2 400	7 years
Odour (aesthetic)	TON	< 5	5 – 10	No limit[b]
pH value at 25 °C (aesthetic/ operational)	pH units	5,0 – 9,5	4,0 – 10,0	No limit[c]
Taste (aesthetic)	FTN	< 5	5 – 10	No limit
Turbidity (aesthetic/operational/ indirect health)	NTU	< 1	1 – 5	No limit[d]
Chemical requirements — macro-determinand				
Ammonia as N (operational)	mg/L	< 1,0	1,0 – 2,0	No limit[d]
Calcium as Ca (aesthetic/operational)	mg/L	< 150	150 – 300	7 years
Chloride as Cl^- (aesthetic)	mg/L	< 200	200 – 600	7 years
Fluoride as F^- (health)	mg/L	< 1,0	1,0 – 1,5	1 year
Magnesium as Mg (aesthetic/ health)	mg/L	< 70	70 – 100	7 years
(Nitrate and nitrite) as N (health)	mg/L	< 10	10 – 20	7 years
Potassium as K (operational/health)	mg/L	< 50	50 – 100	7 years
Sodium as Na (aesthetic/health)	mg/L	< 200	200 – 400	7 years
Sulfate as $SO_4^=$ (health)	mg/L	< 400	400 – 600	7 years
Zinc as Zn (aesthetic/health)	mg/L	< 5,0	5,0 – 10	1 year
Aluminium as Al (health)	µg/L	< 300	300 – 500	1 year
Antimony as Sb (health)	µg/L	< 10	10 – 50	1 year
Arsenic as As (health)	µg/L	< 10	10 – 50	1 year
Cadmium as Cd (health)	µg/L	< 5	5 – 10	6 months
Total Chromium as Cr (health)	µg/L	< 100	100 – 500	3 months
Cobalt as Co (health)	µg/L	< 500	500 – 1 000	1 year
Copper as Cu (health)	µg/L	< 1 000	1 000 – 2 000	1 year
Cyanide (recoverable) as CN^- (health)	µg/L	< 50	50 – 70	1 week
Iron as Fe (aesthetic/ operational)	µg/L	< 200	200 – 2 000	7 years[b]
Lead as Pb (health)	µg/L	< 20	20 – 50	3 months
Manganese as Mn (aesthetic)	µg/L	< 100	100 – 1 000	7 years
Mercury as Hg (health)	µg/L	< 1	1 – 5	3 months
Nickel as Ni (health)	µg/L	< 150	150 – 350	1 year
Selenium as Se (health)	µg/L	< 20	20 – 50	1 year
Vanadium as V (health)	µg/L	< 200	200 – 500	1 year
Chemical requirements — organic determinand				
Dissolved organic carbon as C (aesthetic/health)	mg/L	< 10	10 – 20	3 months[e]
Total trihalomethanes (health)	µg/L	< 200	200 – 300	10 years[f]
Phenols (aesthetic/health)	µg/L	< 10	10 – 70	No limit[b]

[a] The limits for the consumption of class II water are based on the consumption of 2 L of water per day by a person of mass 70 kg over a period of 70 years. Column 4 shall be

[b] The limits given are based on aesthetic aspects.

[c] No primary health effect – low pH values can result in structural problems in the distribution system.

[d] These values can indicate process efficiency and risks associated with pathogens.

[e] When dissolved organic carbon is deemed of natural origin, the consumption period can be extended.

[f] This is a suggested value because trihalomethanes have not been proven to have any effect on human health.

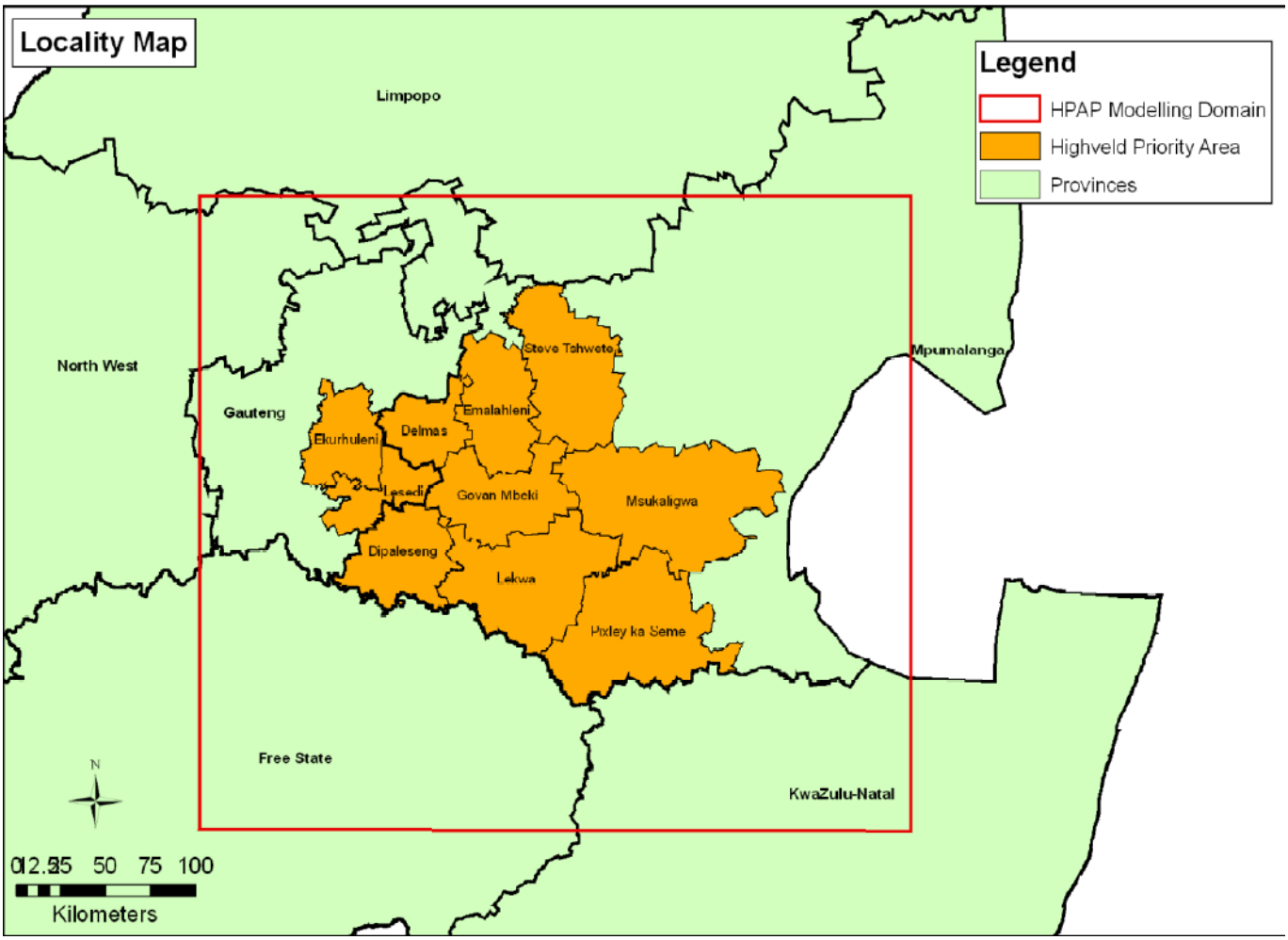
Appendix E: Calibration Needs

ITEM	RESPONSBILE PERSON	REPORTING PARAMETER	SOURCE	INSTRUMENT	CALIBRATION FREQUENCY
1	Instrumentation Supervisor	Water	Scada	Flow meter	Once a year

Appendix F: Baseline Assessment Parameters

Annual parameters as determined through the baseline assessments:	
PH	Faecal Coliforms(mg/l)
Conductivity	Bicarbonate Alkalinity HCO3 as CaCO3
Total Acidity as CaCO3 to pH 8.3	Carbonate Alkalinity CO3 as CaCO3
Total Alkalinity CacO3 (mg/l) as CaCO3	M Alkalinity (mg/l)
Suspended Solids(mg/l)	P Alkalinity (mg/l)
TDS (mg/l)	Total Hardness as CaCO3 (mg/l)
Calcium(mg/l)	Calcium Hardness as CaCO3(mg/l)
Magnesium (mg/l)	Magnesium Hardness as CaCO3(mg/l)
Potassium as K (mg/l)	Dissolved Organic Carbon (mg/l)
Sulphate SO4 (mg/l)	Total Phosphorus(mg/l)
Chromium VI(mg/l)	Chloride as Cl (mg/l)
Sodium as N (mg/l)	Free & Saline Ammonia NH3 as N
Ammonia NH3-N (mg/l)	Residual Chlorine (mg/l) (Sewage plants)
Nitrate & Nitrite as N (mg/l)	Fluoride as F (mg/l)
Manganese as Mn (mg/l)	Langelier Saturation Index
Iron(mg/l)	TDS to EC Ratio
Aluminium (mg/l)	Ion Balance (%)
Silicon as Si(mg/l)	pHs by 21° Celsius
Alkalinity CacO3 (mg/l)	E Coliform
Sodium absorption ratio	Total Coliform
Hydrocarbon analysis (Oil,soap and grease)	Temperature 0° C
Chemical Oxygen Demand(mg/l)	Dissolved Oxygen(mg/l)
Sechi disk depth	Oxygen Absorbed (mg/l)
Turbidity as N.T.U	Boron (mg/l)
Phosphate,PO4-P (mg/l)	Arsenic (mg/l)
Orthophosphates as P (mg/l)	Mercury(mg/l)
Cyanide	BTEX,TPH (mg/l) including Napthalene
Chlorophyl (mg/l)	Zinc (mg/l)
Cadmium (mg/l)	Total Inorganic Nitrogen (mg/l)
Cyanide (mg/l)	
Lead (mg/l)	
Selenium(mg/l)	
Copper (mg/l)	
Selenium	
Copper	

Appendix G: Highveld Priority area



Appendix H: work management Schedule

Type	Frequency	Key Staff
Data Reporting	4W	Technician
Site Inspection	4W	Technician
Environmental Emergency Response Drill	52W	Specialist
CCV	4W	Specialist
Dam with safety risk inspection	Yearly	Engineer
Five yearly inspection - Dam with safety risk	5 Yearly	Appointed Professional Person (APP)

Appendix I: Environmental Licenses

Authorisation	Name	Date Approved	Expiry date	Reference number	Department
EMPr	Klipspruit Colliery EMP	2003/06/01	2010/06/01	OT6/2/2/495	DMR
	Klipspruit Colliery EMP amendment	2010/09/01	None	MP30/5/1/2/1/(125)	DMR
	Klipspruit South and Weltevrede	2017/08/17	None	MP30/5/1/2/2/125 MR	DMR
RoD Authorisations	Klipspruit High energy Fuel Silo	28 Jan 2010	None	17/2/4/NK 101	MDEDET
	Klipspruit Diesel tanks	2006/05/18	None	17/2/1 NK	MDEDET
	Klipspruit desalination plant	2011/02/01	2013/02/01	17/2/2/1p NK-1	MDEDET
WULs	Klipspruit Colliery	2006/04/12	2026/04/12	16/2/7/B100/C186	DWS
	Water Treatment Plant	2020/12/08	2030/12/08	06/2/2B720/11/3	DWS
	Klipspruit South	2017/03/27	2037/03/27	27/2/2/B20G/331	DWS
	Klipspruit Weltevrede	2016/10/24	2036/10/24	27/2/2/B20G/332	DWS
EA	Klipspruit South	2016/02/08	None	12/2/3N-365	DARDLEA
	Klipspruit Weltevrede	2016/02/08	None	17/2/3N-373	DARDLEA
	Northern Bypass road	2016/12/12	2036/12/12	27/2/2/B20G/332	DWS

Appendix J: Environmental Site Inspection Checklist

	Weekly Environmental Site Inspection			**Document Nr:**	**HES ENV 001TL**
Author User:	**Klipspruit**	Electronic version current, Uncontrolled copy valid at time of printing			
Frequency:	**Week**	**Inspection Date:**		Quantity	**1**
Task Description					
The objective of this checklist is to ensure that the workshops, water management infrastructure and containment facilities rehabilitation areas are cleaned up on regular basis to maintain a high standard of compliance to water use license and ISO14001.					

Task Description
The objective of this checklist is to ensure that the workshops, water management infrastructure, containment facilities and rehabilitation areas are inspected and maintained on regular basis to maintain a high standard of compliance to legal authorisations/licences and ISO14001.

HSE Information
In terms of the National Environmental Management Act (NEMA), 1998; National Water Act (NWA), 1998 and Other relevant Regulations:-
Remote sites, workshops, change houses, magazine, active pits, rehabilitated areas, sumps, cut of berms, canals, dams, culverts, conveyors, pumps and pipes are inspected as per the requirements set out in the NEMA, 1998, NWA,1998, other relevant regulations Environmental Authorisations (EA), Environmental Management Programmes (EMPR) and Water Use Licenses (WUL) conditions and maintained on regular basis.

Day	Area	Day	Area
Week 1	Fresh Water Canals, Water Plant, Sewage, Access Gate, Dumps and Stockpiles	**Week 4**	Workshop (LDV, EME, Tyre, Electrical, Refuelling and Contractors)
Week 2	Pits (South, BD and Main Pit) and related Monitoring Stations	**Week 3**	ROM Crusher, Tip and Conveyor line and related Monitoring Stations

Reference Documentation
Environmental Management Program Report (EMPR)
Environmental Authorisations (EA)
National Environmental Management Act, No.no 107 of 1998
National Water Act, No. 36 of 1998 and GN704 of 1999
Water Use License (WUL)

Work Preparation

Time	Task Description	Done		Task Comments
		Yes	No	
1 min	Check the correct work order and compliance to an inspection schedule.			

Work Execution

Generic Environmental Inspection Checklist

Task Description	Mark appropriate column			Immediate / Remedial Action Taken	Task Comments
	Yes	No	N/A		
1. Workshops and Administration Buildings					
HSE Policy displayed and available in the working place?					
HSE Policy communicated to all employees?					
Impact and Aspect Register available and well understood?					
Have the environmental risks from the Impact and Aspect Register been communicated to the relevant employees?					
Has waste disposal conducted in line with the SOP requirements for waste separation.					
Is there any evidence of hydrocarbon spillages on the ground?					
Is the spill kit readily available on site and utilized?					

Drip trays available and used at designated park areas?					
Are all dirty water drains unblocked and in good operational use?					
Is the sump effectively maintained and are records available for clean-up of silt and hydrocarbon?					
Is the Oil and Water Separation available? In good operational state?					
Hazardous Chemicals Storage Facility available?					
Diesel/ Hydrocarbon bund capacity displayed (110% capacity)?					
Is Responsible official and contact numbers displayed?					
Are all signages available and visible?					
2. Water management infrastructure including Dams					
Dam level free board in place and in line per WUL requirements of 0.8m?					
Record water level of sumps and dams?					
Vegetation control & plant cutting undertaken on dam walls as per schedule?					
Are there any signs of erosion on the dam wall?					
Dam maintained as per the Safe Dam Operating Procedure?					
Is there any ponding of water at toe of the dam wall?					
Is access control in place?					
Is the signage available and adequate?					
Are there a life ring and life line available?					
Are there rat holes under the dam wall?					

Are there signs of siltation in the dam?					
Is the spillway in good order (e.g. vegetation growth and erosion)?					
Are flow meters in good working condition?					
Are flow meters tested and calibrated?					
Are pumps maintained and any spillages around the pump?					
Are pipeline connected as per the colour coding standard?					
Any leaking pipelines?					
3. Pits					
Is there any ponding of water?					
Are there flow meters available to monitor water usage?					
Is the flow meter working, and calibrated as per the manufacturers specification?					
Where berms are used to separate clean & dirty water, are these berms constructed from inert material (soil)?					
Are any hydrocarbon spillages on the pumps used for clean water sumps/dams?					
Is pipeline leaks reported immediately to a site supervisor?					
Grass cover sufficient on the berms?					
Is the clean and dirty water system operating according to GN704 requirements?					
Is there any spontaneous combustion?					
Spontaneous combustion management plan in place?					

Are there any Carbonaceous spillages or material stored outside demarcated areas?					
Coal stockpiling conducted as per the plan?					
Land disturbance Plan completed?					
1. **4. Rehab Areas**					
Is aftercare including erosion control, fertiliser application and grass cut undertaken					
Are any alien and invasive plants visible in the area?					
Alien and invasive plants demarcated on plan?					
Land rehabilitation compliance (to plan)? -In terms of topsoil placement and vegetation establishment					
Any soil erosion on new rehabbed areas?					
5. Monitoring System and Contingency					
Check system malfunctions record if is up-to-date records and noncompliance raise?					
Check if records are tabulated under the following headings with a full explanation of all the contributory circumstances:					
Any operating errors;					
Any mechanical failures (including design, installation or maintenance);					
environmental factors (e.g. flood);					
loss of supply services (e.g. power failure)					
Record other causes					
Drawings, Photos and Additional Tasks					

Any Changes To Task List

Work Completion Sign-Off	
Technician/ Officer:	**Date: / /**
Supervisor/ Specialist:	**Date: / /**

Appendix K: Proof of Conciliation

DOCUMENT: Monitoring & Inspection V1.0

Proof of Conciliation / Review Committee

Name & Surname (Print)	Designation	Signature	Date
P. Maphaha	Specialist Environment		01-07-2022
Pheello Mofokeng	VOHS Snr Officer		01-07-2022
Nhworano Moiwegod	Environmental Officer		01.07.2022
JANE RAPALEDI	ENVIRONMENTAL CHEAD.		01/07/2022
Jumbo Makgaleke	ENV. HSE LEAD		01/07/2022
Tsafara Motsiwane	HSE (Safety Officer)		01/07/2022