

**Anglo Operations (Pty) Ltd: Khwezela Bokgoni
Colliery**

**Risk Assessment Report - Post 2A
Dam Water Management Strategy**

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Risk Assessment Report: Anglo Operations (Pty) Ltd: Khwezela Bokgoni Colliery – Post 2A Dam Water Management Strategy Project

Name of Applicant Anglo Operations (Pty) Ltd – Khwezela Bokgoni Colliery
Project Post 2A Dam Water Management Strategy Project
Document Draft Scoping Report
Tel No. (011) 638 4608
Postal Address Private Bag X1; Marshalltown; Johannesburg; 2107
Physical Address 55 Marshall Street; Johannesburg
DMR Reference No



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1. Background description

The Anglo Operations situated in the Mpumalanga Province and approximately 15 km south of eMalahleni. Surrounding towns and settlements include the following of which distances were measured by drawing a straight line from the plant area at the Khwezela Bokgoni Colliery:

- eMalahleni – 15 km north-east;
- Clewer – 14.71 km north-west;
- Ogies – 17.5 km south-west;
- Bronkhorstspuit – 53.21 km north-west;
- Kwa-Guqa – 19.66 km north-west; and
- Kriel – 27.25 km north-east.

The general areas surrounding the Khwezela Bokgoni Colliery have been modified to a large extent by mining and agricultural activities. The area in the vicinity of the Khwezela Bokgoni Colliery has low relief with some pan depressions including the nearby Berries Pan and Tweefontein Pan. Surface drainage is expected in a south to south-eastern direction towards the Olifants River, situated on the eastern border of the colliery.

Early topo-cadastral maps indicate that the pre-mining (1960s) land use was agricultural. There is evidence of previous grazing on a number of blocks, as shown by the presence of *Stoebe vulgaris*, that is an indicator of excessive grazing pressure. Invasive wattle and eucalyptus trees were present in the area, and large stands of wattle have been removed as part of the colliery land management strategy. The Khwezela Bokgoni Colliery processing plant and associated infrastructure was commissioned in 1979, and consists of a tip, stockpiles, processing plant and overland conveyors. Mining infrastructure consists of open pits, offices, a sewage plant, workshops, water reticulation pipelines, overhead powerlines and service roads. Table 1 below provides a summary of the properties associated with the proposed application area. Refer also to Figure 1 below for a map showing the farm portions.

The Khwezela Bokgoni Colliery is an existing opencast coal mine situated within the Nkangala District Municipality and eMalahleni Local Municipality. The locations of the proposed activities (pipelines and pump stations) applicable application area are presented in Figure 2 below.

Khwezela Bokgoni Colliery falls within the administrative boundaries as presented in Table 2.



Table 1: Description of the properties applicable to this application

Farm Name	Portion 1 of the farm Kleinkopje 15 JS; Portion 14 of the farm Klippan 332 JS; Portion 9 of the farm Klippan 332 JS; Portion 8 of the farm Klippan 332 JS; Portion 4 of the farm Klippan 332 JS; and Remainder portion 2 of the farm Klippan 332 JS
Application Area (Ha)	47 196 m of pipeline 5 West Void – 17ha
Magisterial District	eMalahleni Local Municipality; and Nkangala District Municipality.
Distance and Direction from Nearest Town	The Project will be situated in the Mpumalanga Province and approximately 15 km south of eMalahleni.
21-digit Surveyor General Code for each farm portion	Portion 1 of the farm Kleinkopje 15 JS - T0IS00000000001500001; Portion 14 of the farm Klippan 332 JS - T0JS000000000033200014; Portion 9 of the farm Klippan 332 JS - T0JS000000000033200009; Portion 8 of the farm Klippan 332 JS - T0JS000000000033200008; Portion 4 of the farm Klippan 332 JS - T0JS000000000033200004; and Remainder portion 2 of the farm Klippan 332 JS - T0JS000000000033200002

Table 2: Administrative boundaries

Province	Mpumalanga Province
District Municipality	Nkangala Magisterial District
Local Municipality	eMalahleni Local Municipality
Ward	30
Department of Mineral Resources (“DMR”) Local Office	DMR – eMalahleni Regional Offices
Department of Water and Sanitation (“DWS”) Local Office	DWS – Bronkhorstspuit Regional Offices
Department of Agriculture Rural Development Land and Environmental Affairs (“DARDLEA”) Local Office	DARDLEA – Mpumalanga
Catchment Zone	Quaternary catchment B11F
Water Management Area	Olifants River Catchment area
Water Forums	Olifants River Catchment Forum



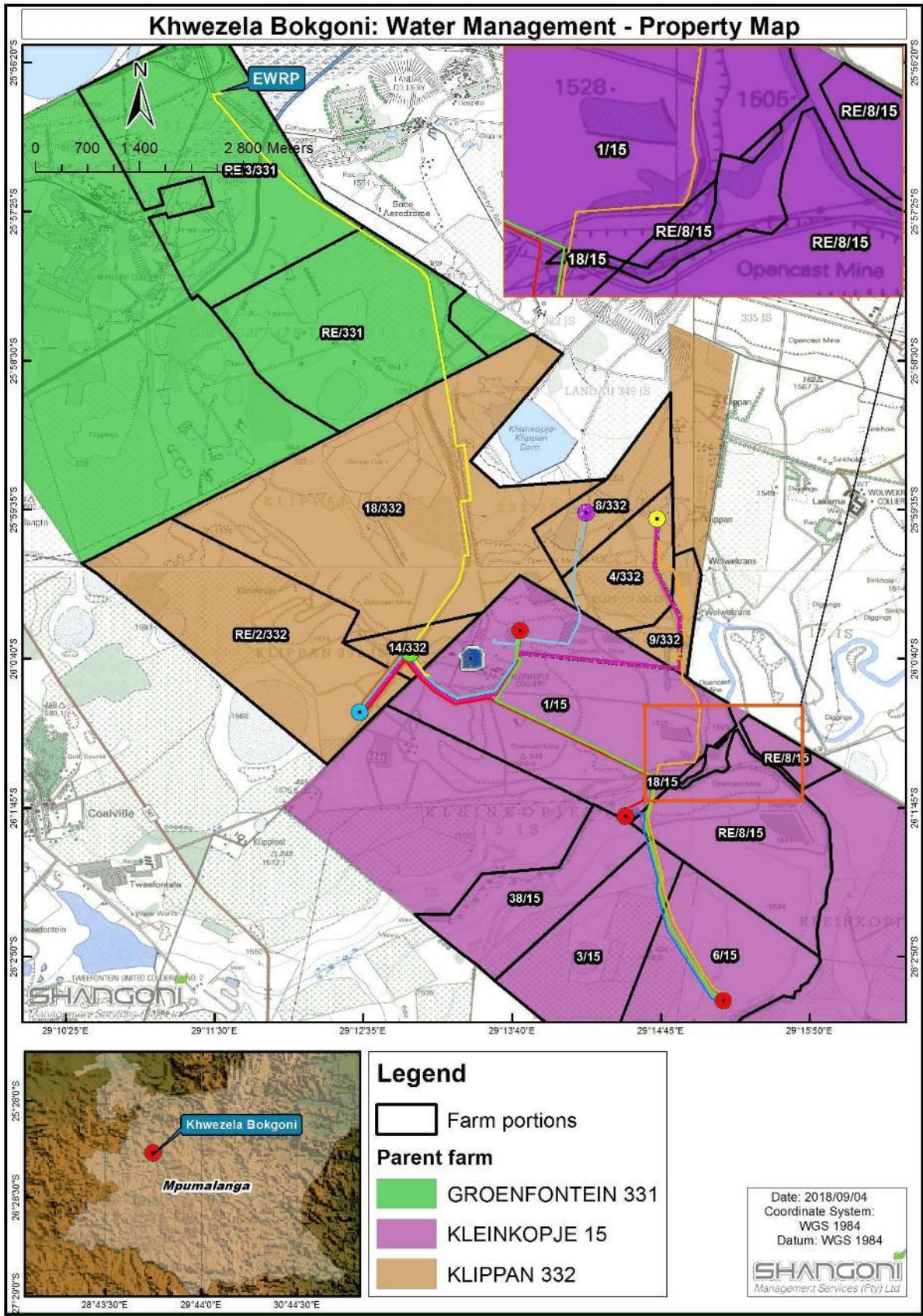


Figure 1: Location and property map



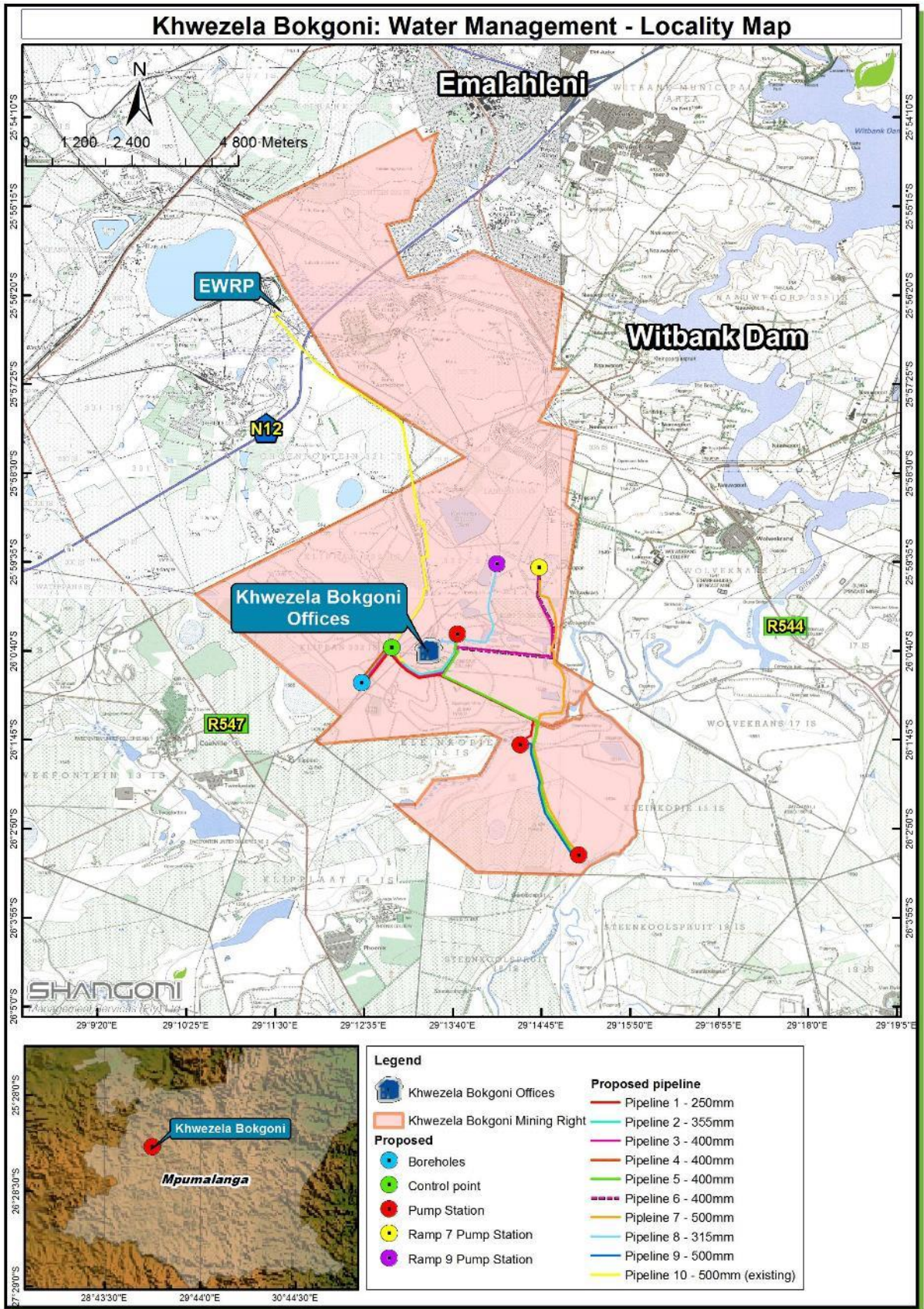


Figure 2: Localities of the proposed activities.



2. Description of the scope of the proposed overall activity

2.1. Listed and specified activities

Table 3: Activities and listed activities associated with the development

Name of Activity	Aerial Extent of Activity Ha or m ² or km	Listed Activity (Mark with X)	Applicable Listing Notice (GN R983, GN R984, GN R985)	Waste Management Authorisation (Mark with X)	Listed activity description
Construction of pipelines and associated pump stations	47 196 m of pipeline	X	Activity 10 of Listing Notice 1 (GNR 983 of GG 38282 of 4 Dec 2014, as amended)		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 – (i) with an internal diameter of 0,36 metres or more; or (ii) with a peak throughput of 120 litres per second or more; excluding where— a) such infrastructure is for the bulk transportation of sewage, effluent, process water, waste water, return water, industrial discharge or slimes inside a road reserve or railway line reserve; or (b) where such development will occur within an urban area. <u>The Project:</u> The proposed bulk water pipelines will have a total length greater than 1000 metres in length and are greater than 0.36 metres in diameter.
			Activity 12 of Listing Notice 1		The development of—



Name of Activity	Aerial Extent of Activity Ha or m ² or km	Listed Activity (Mark with X)	Applicable Listing Notice (GN R983, GN R984, GN R985)	Waste Management Authorisation (Mark with X)	Listed activity description
			(GNR 983 of GG 38282 of 4 Dec 2014, as amended)		(i) dams or weirs, where the dam or weir, including infrastructure and water surface area, exceeds 100 square metres; or (ii) infrastructure or structures with a physical footprint of 100 square metres or more; where such development occurs— (a) within a watercourse; (b) in front of a development setback; or (c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse; — excluding— (aa) the development of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour; (bb) where such development activities are related to the development of a port or harbour, in which case activity 26 in Listing Notice 2 of 2014 applies; (cc) activities listed in activity 14 in Listing Notice 2 of 2014 or activity 14 in Listing Notice 3 of 2014, in which case that activity applies; (dd) where such development occurs within an urban area; (ee) where such development occurs within existing roads, road reserves or railway line reserves; or



Name of Activity	Aerial Extent of Activity Ha or m ² or km	Listed Activity (Mark with X)	Applicable Listing Notice (GN R983, GN R984, GN R985)	Waste Management Authorisation (Mark with X)	Listed activity description
					<p>(ff) the development of temporary infrastructure or structures where such infrastructure or structures will be removed within 6 weeks of the commencement of development and where indigenous vegetation will not be cleared.</p> <p><u>The Project:</u></p> <p>The proposed infrastructure associated with the project will have a physical footprint of greater than 100 square metres within 32 metres of a watercourse, measures from the edge of a watercourse.</p>
			<p>Activity 19 of Listing Notice 1 (GNR 983 of GG 38282 of 4 Dec 2014, as amended)</p>		<p>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;</p> <p>but excluding where such infilling, depositing, dredging, excavation, removal or moving—</p> <p>(a) will occur behind a development setback;</p> <p>(b) is for maintenance purposes undertaken in accordance with a maintenance management plan;</p> <p>(c) falls within the ambit of activity 21 in this Notice, in which case that activity applies;</p> <p>(d) occurs within existing ports or harbours that will not increase the development footprint of the port or harbour; or</p>



Name of Activity	Aerial Extent of Activity Ha or m ² or km	Listed Activity (Mark with X)	Applicable Listing Notice (GN R983, GN R984, GN R985)	Waste Management Authorisation (Mark with X)	Listed activity description
					<p>(e) where such development is related to the development of a port or harbour, in which case activity 26 in Listing Notice 2 of 2014 applies</p> <p><u>The Project:</u> According to the method statement, pipelines will be buried in a 1 m deep x 1 m wide trench and backfilled with selected gravel material. The excavation and backfilling material will be in excess of 10 m³ and may occur within a watercourse.</p>
			<p>Activity 11 of Listing Notice 2 (GNR 984 of GG 38282 of 4 Dec 2014, as amended)</p>		<p>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 —</p> <p>(i) water catchments; (ii) water treatment works; or (iii) impoundments; excluding treatment works where water is to be treated for drinking purposes.</p> <p><u>The Project:</u> Water will be transferred between a combination of impoundments and the eMalahleni Water Reclamation Plant. This activity may not be triggered depending on the amount of water being transferred daily.</p>
			<p>Activity 14 of Listing Notice 3</p>		<p>The development of—</p>



Name of Activity	Aerial Extent of Activity Ha or m ² or km	Listed Activity (Mark with X)	Applicable Listing Notice (GN R983, GN R984, GN R985)	Waste Management Authorisation (Mark with X)	Listed activity description
			(GNR 985 of GG 38282 of 4 Dec 2014, as amended)		(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 has been adopted, within 32 metres of a watercourse, measured from the edge of a watercourse; excluding the development of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour. <u>The Project:</u> The proposed infrastructure associated with the project will have a physical footprint of greater than 10 square metres within 32 metres of a watercourse, measured from the edge of a watercourse.
Storage of mine affected water in 3A North Underground Area and 5 West Void.	5 West Void – 17ha	X	Activity 6 of Listing Notice 2 (GNR 984 of GG 38282 of 4 Dec 2014, as amended)		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;



Name of Activity	Aerial Extent of Activity Ha or m ² or km	Listed Activity (Mark with X)	Applicable Listing Notice (GN R983, GN R984, GN R985)	Waste Management Authorisation (Mark with X)	Listed activity description
					<p>(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;</p> <p>(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</p> <p>(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.</p> <p><u>The Project:</u></p> <p>The project proposes to store water underground and this will require a WUL in terms of Section 21 (g) of the National Water Act (Act No. 36 of 1998).</p>



2.2. Description of the proposed activities to be undertaken

The Khwezela Bokgoni Colliery is an existing opencast coal mine situated in close proximity to the town of eMalahleni in the Mpumalanga Province of South Africa. A number of the sections being mined, are mining through old underground bord-and-pillar workings that are economically exploited through the utilisation of opencast dragline mining techniques. In the north of Pit 2A, a second dragline is required to allow for the necessary productivity improvement to sustain economic viability. Mining in the south of Pit 2A is planned to be continued with the Marion 8200 Dragline by means of the current double bench single pass mining method.

The coal mined at the Khwezela Bokgoni Colliery is treated at the on-site coal beneficiation plant. The Khwezela Bokgoni Colliery produces the following products that are sold to both the local and international market: Select coal – Low ash coal product and steam coal product and Non-select coal – Steam coal product.

Refer to the Figure 4 below for the layout plan of the proposed activities and related infrastructure.

The Project is an extension to the Khwezela Bokgoni Colliery Pit 2A extension project. The mine revised its mine plan to extend mining operations in Pit 2A to include the mining of the coal situated in the area beneath 2A Dam. The mining out of the 2A Dam at Khwezela Bokgoni Colliery will result in a surplus of water, as confirmed by a recent update of the groundwater water balance. The Project will focus on the management of water at the operation after mining out of 2A Dam.

It is proposed that mine affected water from Pit 2A is pumped to- and temporarily stored within- the 3A North Underground Area and 5 West Void before being pumped to the eMalahleni Water Reclamation Plant (“EWRP”) for treatment. The proposed water management strategy process is as follows (also refer to Figure 3 below):

Surplus water from 2A Dam –

The extension of mining activities to include the area under 2A Dam will result in the need to temporarily store water from the mining area before being pumped to the EWRP.

Temporary storage of the surplus water from the 2A Dam –

It is proposed that water is temporarily stored within the following areas:

- 3A North Underground Area, and
- 5 West Void.

eMalahleni Water Reclamation Plant–

The process as outlined above will be conducted through the construction of associated infrastructure (pumps and pipelines) to facilitate the movement of water from 2A Dam to the proposed storage areas that will ultimately be pumped to the EWRP for treatment.



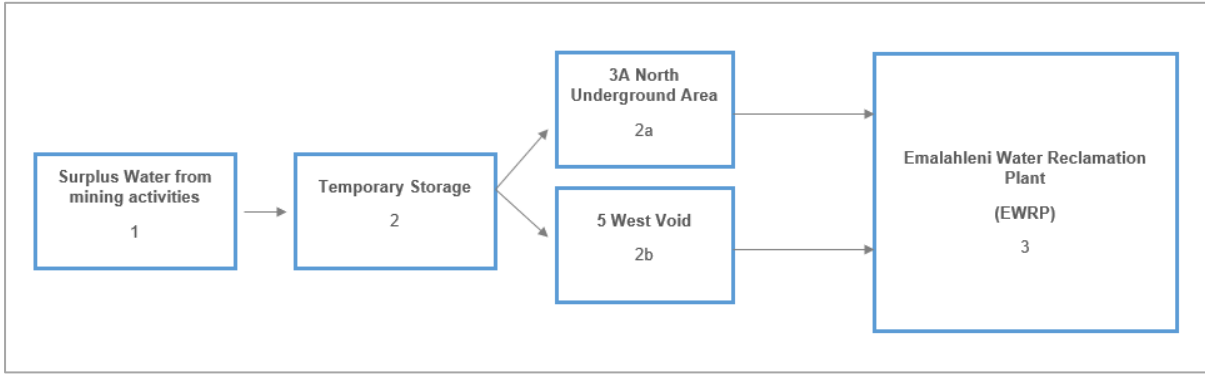


Figure 3: Key process involved in the proposed 2A Dam water management strategy.

2.3. Activity infrastructure description

2.3.1 Surface infrastructure

The main activities and infrastructure that will be used to facilitate the process as outlined above, are as follows:

- Proposed water storage areas: 3A North Underground Area and 5 West Void (existing areas that will be used for storage);
- Proposed 400 mm diameter HDPE pipeline pumping water from 3A North Underground Area to Jacuzzi Arm Tank;
- Control point to pump water to Jacuzzi Arm Tank or to Plant Reservoir;
- Two (2) proposed 400 mm diameter HDPE pipelines pumping water from Ramp 7;
- Proposed 355 mm diameter HDPE pipeline pumping water from Plant Return Water Dams (“PRWDs”);
- PRWDs (existing infrastructure);
- Proposed pump station at the PRWDs;
- Proposed 315 mm diameter HDPE pipeline from Ramp 9 to 3A North Underground Area;
- Proposed Ramp 9 pump station;
- Utilising existing infrastructure at Ramp 7 pump station;
- 400 mm diameter pipeline from Ramp 7 to 3A North Underground Area (existing infrastructure);
- Proposed 500 mm diameter HDPE pipeline from Ramp 7 to 5 West Void;
- Proposed 400 mm diameter HDPE pipeline pumping water from the PRWDs to Ramp 15;
- Proposed 250 mm diameter HDPE pipeline pumping water from 5 West PCD to 3A North Underground Area;
- Utilising existing infrastructure at 5 West PCD pump station;
- Proposed 500 mm diameter HDPE pipeline pumping water from 5 West Void to 5 West PCD; and
- Proposed pump station at 5 West Void.



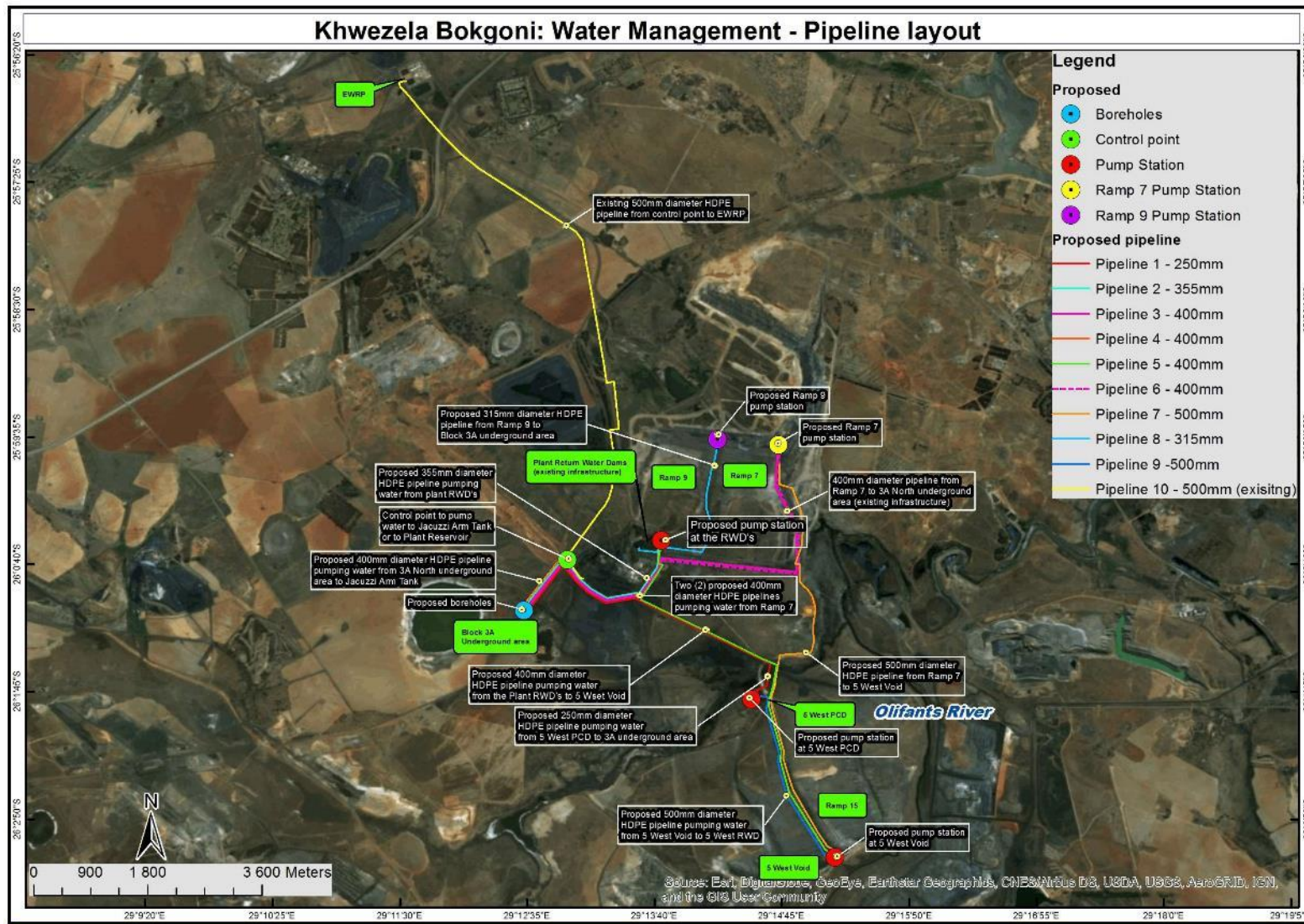


Figure 4: Layout Map of the proposed activities.



3. Descript used in determining and ranking potential environmental impacts and risks

The environmental risk of any aspect is determined by a combination of parameters associated with the impact. Each parameter connects the physical characteristics of an impact to a quantifiable value to rate the environmental risk.

Impact assessments should be conducted based on a methodology that includes the following:

- Clear processes for impact identification, predication and evaluation;
- Specification of the impact identification techniques;
- Criteria to evaluate the significance of impacts;
- Design of mitigation measures to lessen impacts;
- Definition of the different types of impacts (indirect, direct or cumulative); and
- Specification of uncertainties.

After all impacts have been identified, the nature and scale of each impact can be predicted. The impact prediction will take into account physical, biological, socio-economic and cultural information and will then estimate the likely parameters and characteristics of the impacts. The impact prediction will aim to provide a basis where the significance of each impact can be determined and appropriate mitigation measures can be developed.

The risk assessment methodology is based on defining and understanding the three basic components of the risk, i.e. the source of the risk, the pathway and the target that experiences the risk (receptor). Refer to Figure 5 below for a model representing the above principle (as contained in the DWA's Best Practice Guideline: G4 – Impact Prediction).

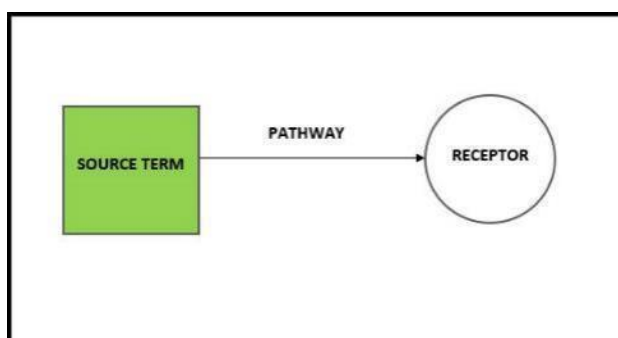


Figure 5: Impact prediction model

Table 4 and Table 5 below indicate the methodology to be used in order to assess the Probability and Magnitude of the impact, respectively, and Table 6 provides the Risk Matrix that will be used to plot the Probability against the Magnitude in order to determine the Severity of the impact.



Table 4: Determination of Probability of impact

Score	Frequency of Aspect / Unwanted Event	Availability of Pathway from the source to the receptor	Availability of Receptor
1	Never known to have happened, but may happen	A pathway to allow for the impact to occur is never available	The receptor is never available
2	Known to happen in industry	A pathway to allow for the impact to occur is almost never available	The receptor is almost never available
3	< once a year	A pathway to allow for the impact to occur is sometimes available	The receptor is sometimes available
4	Once per year to up to once per month	A pathway to allow for the impact to occur is almost always available	The receptor is almost always available
5	Once a month - Continuous	A pathway to allow for the impact to occur is always available	The receptor is always available

Step 1: Determine the **PROBABILITY** of the impact by calculating the average between the Frequency of the Aspect, the Availability of a pathway to the receptor and the availability of the receptor.



Table 5: Determination of Magnitude of impact

Score	Source			Receptor		
	Duration of impact	Extent	Volume / Quantity / Intensity	Toxicity / Destruction Effect	Reversibility	Sensitivity of environmental component
1	Lasting days to a month	Effect limited to the site. (metres);	Very small quantities / volumes / intensity (e.g. < 50L or < 1Ha)	Non-toxic (e.g. water) / Very low potential to create damage or destruction to the environment	Bio-physical and/or social functions and/or processes will remain unaltered.	Current environmental component(s) are largely disturbed from the natural state. Receptor of low significance / sensitivity
2	Lasting 1 month to 1 year	Effect limited to the activity and its immediate surroundings. (tens of metres)	Small quantities / volumes / intensity (e.g. 50L to 210L or 1Ha to 5Ha)	Slightly toxic / Harmful (e.g. diluted brine) / Low potential to create damage or destruction to the environment	Bio-physical and/or social functions and/or processes might be negligibly altered or enhanced / Still reversible	Current environmental component(s) are moderately disturbed from the natural state. No environmentally sensitive components.
3	Lasting 1 – 5 years	Impacts extended on area beyond boundary of site (hundreds of metres)	Moderate quantities / volumes / intensity (e.g. > 210 L < 5000L or 5 – 8Ha)	Moderately toxic (e.g. slimes) Potential to create damage or destruction to the environment	Bio-physical and/or social functions and/or processes might be notably altered or enhanced / Partially reversible	Current environmental component(s) are a mix of disturbed and undisturbed areas. Area with some environmental sensitivity (scarce /



Score	Source			Receptor		
	Duration of impact	Extent	Volume / Quantity / Intensity	Toxicity / Destruction Effect	Reversibility	Sensitivity of environmental component
						valuable environment etc.).
4	Lasting 5 years to Life of Organisation	Impact on local scale / adjacent sites (km)	Very large quantities / volumes / intensity (e.g. 5000 L – 10 000L or 8Ha– 12Ha)	Toxic (e.g. diesel & Sodium Hydroxide)	Bio-physical and/or social functions and/or processes might be considerably altered or enhanced / potentially irreversible	Current environmental component(s) are in a natural state. Environmentally sensitive environment / receptor (endangered species / habitats etc.).
5	Beyond life of Organisation / Permanent impacts	Extends widely or globally	Very large quantities / volumes / intensity (e.g. > 10 000 L or > 12Ha)	Highly toxic (e.g. arsenic or TCE)	Bio-physical and/or social functions and/or processes might be severely/substantially altered or enhanced / Irreversible	Current environmental component(s) are in a pristine natural state. Highly Sensitive area (endangered species, protected habitats etc.)

Step 2: Determine the **MAGNITUDE** of the impact by calculating the average of the factors above



Table 6: Determination of Severity of impact

Environmental Impact Rating / Priority					
	MAGNITUDE				
Probability	1 Minor	2 Low	3 Medium	4 High	5 Major
5 Almost Certain	Low	Medium	High	High	High
4 Likely	Low	Medium	High	High	High
3 Possible	Low	Medium	Medium	High	High
2 Unlikely	Low	Low	Medium	Medium	High
1 Rare	Low	Low	Low	Medium	Medium

Step 3: Determine the **SEVERITY** of the impact by plotting the averages that were obtained above for Probability and Magnitude.

4. DMR impact assessment and mitigation measures table template requirements

In terms of section 16(3)(b) of the Environmental Impact Assessment (EIA) Regulations, 2014, as amended, any report submitted as part of an application must be prepared in a format that may be determined by the Competent Authority. The Department of Mineral Resources (DMR) therefore instructed that the prescribed reports required in respect of applications for an environmental authorisation for a listed activities triggered are submitted in the exact format of, and provide all the information required in terms of, the template provided by the Competent Authority.

It is the purpose of the Risk Assessment Report (RAR) to provide the Competent Authority with the detail associated with the impact assessment table template (as provided below) and included into the various sections of the EIAR / EMPr.

The following table and column headings (shown in Table 7 below), form part of the Shangoni risk assessment table template, which takes into account the DMR's EIAR / EMPr template (refer to the full completed table in Section 5 below).

For ease of reference, the various table columns, as required by the DMR, have been incorporated into one integrated risk assessment table, as is presented in Table 7 below



4.1. Shangoni risk assessment table template in relation to the requirements as per the DMR report template

Table 7: Shangoni risk assessment table template in relation to the requirements as per the DMR report template and table content.

NO	ASPECTS AFFECTED	ACTIVITY	POTENTIAL IMPACT				SIGNIFICANCE if not mitigated			MITIGATION TYPE (modify, remedy, control, or stop) through e.g. noise control measures)	MITIGATION MEASURES	SIGNIFICANCE If mitigated			STANDARD TO BE ACHIEVED	COMPLIANCE WITH STANDARDS	TIME PERIOD FOR IMPLEMENTATION
			Impact Description	Reversibility	Irreplaceable loss	PHASE in which impact is anticipated	SIZE AND SCALE of disturbance	Probability	Magnitude			Significance	Probability	Magnitude			
For referencing purposes	As required in the following sections of the DMR EIAR / EMPr template: <ul style="list-style-type: none"> Section 3(i) of Part A Section 1 (e) of Part B 	As required in the following sections of the DMR EIAR / EMPr template: <ul style="list-style-type: none"> Section 3(g) (v) of Part A Section 3(i) of Part A Section 1(d) (ix) of Part B Section 1 (e) of Part B Section 1 (f) of Part B 	As required in the following sections of the DMR EIAR / EMPr template: <ul style="list-style-type: none"> Section 3(g) (v) of Part A Section 3(i) of Part A Section 1 (e) of Part B Section 1 (f) of Part B 	As required in the following sections of the DMR EIAR / EMPr template: <ul style="list-style-type: none"> Section 3(i) of Part A Section 1 (e) of Part B 	As required in the following sections of the DMR EIAR / EMPr template: <ul style="list-style-type: none"> Section 1(d) (ix) of Part B. 	As required in the following sections of the DMR EIAR / EMPr template: <ul style="list-style-type: none"> Section 3(g) (v) of Part A Section 3(i) of Part A 	As required in the following sections of the DMR EIAR / EMPr template: <ul style="list-style-type: none"> Section 3(g) (v) of Part A Section 3(i) of Part A 	As required in the following sections of the DMR EIAR / EMPr template: <ul style="list-style-type: none"> Section 1 (e) of Part B Section 1 (f) of Part B 	As required in the following sections of the DMR EIAR / EMPr template: <ul style="list-style-type: none"> Section 1(d) (ix) of Part B 	As required in the following sections of the DMR EIAR / EMPr template: <ul style="list-style-type: none"> Section 1(d) (ix) of Part B 	As required in the following sections of the DMR EIAR / EMPr template: <ul style="list-style-type: none"> Section 3(g) (v) of Part A Section 3(i) of Part A 	As required in the following sections of the DMR EIAR / EMPr template: <ul style="list-style-type: none"> Section 3(g) (v) of Part A Section 3(i) of Part A 	As required in the following sections of the DMR EIAR / EMPr template: <ul style="list-style-type: none"> Section 1 (e) of Part B 	As required in the following sections of the DMR EIAR / EMPr template: <ul style="list-style-type: none"> Section 1(d) (ix) of Part B. Section 1 (f) of Part B 	As required in the following sections of the DMR EIAR / EMPr template: <ul style="list-style-type: none"> Section 1(d) (ix) of Part B. Section 1 (f) of Part B 		



5. Risk assessment and mitigation / management measures

Table 8: Impacts and Risks identified including mitigation/management measures



NO	ASPECTS AFFECTED	ACTIVITY	POTENTIAL IMPACT				PHASE in which impact is anticipated	SIZE AND SCALE of disturbance	SIGNIFICANCE if not mitigated			MITIGATION TYPE (modify, remedy, control, or stop) through e.g. noise control measures)	MITIGATION MEASURES	SIGNIFICANCE If mitigated			STANDARD TO BE ACHIEVED	COMPLIANCE WITH STANDARDS	TIME PERIOD FOR IMPLEMENTATION
			Impact Description	Reversibility	Irreplaceable loss	Probability			Magnitude	Significance	Probability			Magnitude	Significance				
1	Geology	Pumping of affected water into 3A North Underground Area and 5 West Void.	The pumping of water underground may affect the stability of the geology due to the weathering and erosion.	Reversible	High Degree	Operational, Decommissioning	17 Ha	5	3	H	Control	The velocity of affected water pumped into 3A North Underground Area and 5 West Void should be minimised to decrease the possibility of erosion and weathering.	4	2	M	Geology to remain stable and prevent sinkholes	Geological surveys (Quarterly).	1 Year	



NO	ASPECTS AFFECTED	ACTIVITY	POTENTIAL IMPACT				PHASE in which impact is anticipated	SIZE AND SCALE of disturbance	SIGNIFICANCE if not mitigated			MITIGATION TYPE (modify, remedy, control, or stop) through e.g. noise control measures)	MITIGATION MEASURES	SIGNIFICANCE If mitigated			STANDARD TO BE ACHIEVED	COMPLIANCE WITH STANDARDS	TIME PERIOD FOR IMPLEMENTATION
			Impact Description	Reversibility	Irreplaceable loss	Probability			Magnitude	Significance	Probability			Magnitude	Significance				
2	Topography	Earthworks and excavation trench of pipeline.	Altered runoff patterns, leading to increased erosion and sedimentation of freshwater habitat.	Reversible	Low Degree	Construction	46 196 m	4	2	M	Control, Remedy	<ul style="list-style-type: none"> Earthworks to be limited to areas required for construction of pipelines and associated pump stations. Drainage lines to be reinstated and rehabilitated upon completion of construction. 	2	2	L	To prevent alterations of natural topography of the area.	General implementation of activities taking Mining and Biodiversity Guidelines into account.	1 Year	



NO	ASPECTS AFFECTED	ACTIVITY	POTENTIAL IMPACT				PHASE in which impact is anticipated	SIZE AND SCALE of disturbance	SIGNIFICANCE if not mitigated			MITIGATION TYPE (modify, remedy, control, or stop) through e.g. noise control measures)	MITIGATION MEASURES	SIGNIFICANCE If mitigated			STANDARD TO BE ACHIEVED	COMPLIANCE WITH STANDARDS	TIME PERIOD FOR IMPLEMENTATION
			Impact Description	Reversibility	Irreplaceable loss	Probability			Magnitude	Significance	Probability			Magnitude	Significance				
3	Soils	<ul style="list-style-type: none"> Clearance of vegetation. Removal and stockpiling of topsoil. Construction of pipelines and associated pump stations. Earthworks and excavation of trench for pipeline. 	<ul style="list-style-type: none"> A loss of microbes and viable seed may occur as a result of the temporary stockpiling of topsoil. The removal of topsoil may result in the mixing of the horizons of the soil that will have an impact on the fertility and production potential of the soil. The temporary stockpiling of topsoil may result in a decrease in the fertility of the soil and the leaching of minerals due to exposure of the soil to elements. Soil pollution due to hazardous chemical substances including fuel greases and oils used on site. Erosion due to pipe bursts. The ineffective handling of hydrocarbon spillages may lead to the contamination of soil, surface water and ground water resources. 	Reversible	Low Degree	Construction and Decommissioning	46 196 m	3	3	M	Control, Remedy	<ul style="list-style-type: none"> Topsoil and subsoil are to be excavated and stockpiled separately. Erosion preventative measures should be implemented on stockpiles. Temporary stockpiles are to be exposed to the elements for as minimal time as possible i.e. excavation to only take place just before pipeline is installed and backfilling to commence immediately upon installation of pipeline. Immediately clean all spillages of fuels, lubricants and other petroleum-based products Regular inspection of pipelines. All hydrocarbon spills to be cleaned up immediately and the area suitably rehabilitated. 	2	2	L	<ul style="list-style-type: none"> To prevent the loss of valuable topsoil. To prevent soil contamination and to conserve surface and ground water resources as well as to prevent impact on downstream water users 	Rehabilitation monitoring to be undertaken by suitably qualified rehabilitation specialist (in consultation with ecologist). General implementation of activities taking Mining and Biodiversity Guidelines into account.	1 Year	



NO	ASPECTS AFFECTED	ACTIVITY	POTENTIAL IMPACT				PHASE in which impact is anticipated	SIZE AND SCALE of disturbance	SIGNIFICANCE if not mitigated			MITIGATION TYPE (modify, remedy, control, or stop) through e.g. noise control measures)	MITIGATION MEASURES	SIGNIFICANCE If mitigated			STANDARD TO BE ACHIEVED	COMPLIANCE WITH STANDARDS	TIME PERIOD FOR IMPLEMENTATION
			Impact Description	Reversibility	Irreplaceable loss	Probability			Magnitude	Significance	Probability			Magnitude	Significance				
4	Land Capability	Pumping of affected water into 3A North Underground Area and 5 West Void. Construction of pipelines and associated pump stations.	Since Khwezela Bokgoni Colliery will be pumping water to the existing 3A North Underground Area and 5 West Void, that are areas that have been previously disturbed and where the land capability has already been altered, no additional changes in land capability will take place during the Construction or Operational Phases.																
5	Fauna and Flora	<ul style="list-style-type: none"> Clearance of vegetation Removal and stockpiling of topsoil. Earthworks and excavation of trench for pipeline 	<ul style="list-style-type: none"> Spread of alien invasive plant species from the transformed areas to the natural vegetation. Disturbance of sensitive vegetation. Damage to natural habitat due to construction activities and consequential displacement of faunal species. Revegetation of areas disturbed during construction 	Reversible	Low Degree	Construction, Decommissioning	17 Ha 46 196 m	4	2	M	Control	<ul style="list-style-type: none"> Alien invasive species should be removed (prioritising NEMBA category 1A & B species). Any sensitive vegetation present on site must be demarcated to avoid disturbance. Construction activities should be restricted to the development footprint. Ensure immediate revegetation of disturbed areas following completion of construction activities. 	2	2	L	To preserve and protect indigenous fauna and flora.	Rehabilitation monitoring to be undertaken by suitably qualified rehabilitation specialist (in consultation with ecologist). General implementation of activities taking Mining and Biodiversity Guidelines into account.	1 Year	



NO	ASPECTS AFFECTED	ACTIVITY	POTENTIAL IMPACT			PHASE in which impact is anticipated	SIZE AND SCALE of disturbance	SIGNIFICANCE if not mitigated			MITIGATION TYPE (modify, remedy, control, or stop) through e.g. noise control measures)	MITIGATION MEASURES	SIGNIFICANCE If mitigated			STANDARD TO BE ACHIEVED	COMPLIANCE WITH STANDARDS	TIME PERIOD FOR IMPLEMENTATION
			Impact Description	Reversibility	Irreplaceable loss			Probability	Magnitude	Significance			Probability	Magnitude	Significance			
6	Sensitive landscapes (including wetlands)	<ul style="list-style-type: none"> Construction of pipelines within wetland habitat. Construction of pipelines within 500 m regulated area but outside wetlands. 	<ul style="list-style-type: none"> Alteration/damage to banks. Disturbance and loss of biodiversity & habitat. Dust generation. Compaction of wetland sediments. Spillages and leaks from machinery and equipment. Water quality impact. 	Reversible	Low Degree	Construction	46 196 m	4	3	H	Control	<ul style="list-style-type: none"> Regular inspections of pipelines Appropriate storm water management features should be installed. Pipelines must cross the Tweefonteinspruit via the existing haul road crossings. No new excavations or disturbances within the wetland. Laydown areas and construction camps must be located outside delineated wetland habitat. Limit earthworks to the immediate footprint required for construction. 	3	2	M	To protect wetland and sensitive areas.	Bio-monitoring (Bi-annual). Groundwater monitoring (Quarterly). Surface water monitoring (monthly).	1 Year



NO	ASPECTS AFFECTED	ACTIVITY	POTENTIAL IMPACT			PHASE in which impact is anticipated	SIZE AND SCALE of disturbance	SIGNIFICANCE if not mitigated			MITIGATION TYPE (modify, remedy, control, or stop) through e.g. noise control measures)	MITIGATION MEASURES	SIGNIFICANCE If mitigated			STANDARD TO BE ACHIEVED	COMPLIANCE WITH STANDARDS	TIME PERIOD FOR IMPLEMENTATION
			Impact Description	Reversibility	Irreplaceable loss			Probability	Magnitude	Significance			Probability	Magnitude	Significance			
7	Sensitive landscapes (including wetlands)	<ul style="list-style-type: none"> Operation of pipeline within wetland habitat Operation of pipelines within the 500 m regulated area but outside wetland habitat 	<ul style="list-style-type: none"> Water quality deterioration due to leaks or pipe bursts. Erosion due to pipe bursts. 	Reversible	Low Degree	Operational	46 196 m	4	3	H	Control	<ul style="list-style-type: none"> The pipeline must include flow monitoring technology that will allow for leaks and pipe bursts to be identified immediately. Pumping must be stopped immediately following identification of a leak or burst. Relevant authorities must be notified within 24 hours of any pipe burst or significant leak. Immediate clean-up and repair of any erosion damage caused by pipe bursts. Regular inspections of the pipeline to ensure optimal operation and to check for any erosion damage along the route. Inspections to be undertaken as walkdown surveys within wetland areas. 	3	2	M	To protect wetland and sensitive areas.	Bio-monitoring (Bi-annual). Groundwater monitoring (Quarterly). Surface water monitoring (monthly).	1 Year



7	Ground water	Storage of surplus water in underground and opencast voids	<ul style="list-style-type: none"> The shallow weathered and unconfined aquifer is highly susceptible to pollution from surface. Artificial recharge could increase the water levels and pressures greater than ambient, which could result in the 'unlimited' migration of water and pollutants within the weathered aquifer. 	Reversible	Low Degree	Operational	17 Ha	2	3	M	Control	<ul style="list-style-type: none"> Control water levels at elevations lower than the surrounding strata to prevent mine water from entering adjacent aquifer/s. The absolute critical water levels in 5 West Void is 1502 mamsl and 3A North underground 1533 mamsl. Water levels must be kept well below these levels, i.e., critical water levels plus buffer. Water levels in underground compartments must be measured frequently to ensure that levels are controlled efficiently and kept well below absolute critical levels and/ or surrounding water levels. Monitor groundwater quality frequently to act timeously if pollution is detected outside of the active mining area. Monitor surface water in Tweefonteinspruit and Olifants River in up- and downstream localities on a regular basis. Do not allow spillage or seepage of affected mine water into the receiving surface 	2	2	L	To minimise the extent of disturbance of the aquifer and to limit degeneration of groundwater quality and quantity.	Groundwater monitoring (quarterly)	1 year
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NO	ASPECTS AFFECTED	ACTIVITY	POTENTIAL IMPACT				PHASE in which impact is anticipated	SIZE AND SCALE of disturbance	SIGNIFICANCE if not mitigated			MITIGATION TYPE (modify, remedy, control, or stop) through e.g. noise control measures)	MITIGATION MEASURES	SIGNIFICANCE If mitigated			STANDARD TO BE ACHIEVED	COMPLIANCE WITH STANDARDS	TIME PERIOD FOR IMPLEMENTATION
			Impact Description	Reversibility	Irreplaceable loss	Probability			Magnitude	Significance	Probability			Magnitude	Significance				
												water environment.							



NO	ASPECTS AFFECTED	ACTIVITY	POTENTIAL IMPACT				PHASE in which impact is anticipated	SIZE AND SCALE of disturbance	SIGNIFICANCE if not mitigated			MITIGATION TYPE (modify, remedy, control, or stop) through e.g. noise control measures)	MITIGATION MEASURES	SIGNIFICANCE If mitigated			STANDARD TO BE ACHIEVED	COMPLIANCE WITH STANDARDS	TIME PERIOD FOR IMPLEMENTATION
			Impact Description	Reversibility	Irreplaceable loss	Probability			Magnitude	Significance	Probability			Magnitude	Significance				
8	Ground water	Pumping of affected water into 3A North Underground Area and 5 West Void	At the LoM, when all mining has ceased at Khwezela Bokgoni Colliery, the water in the underground compartments begin to rise naturally and no dewatering will be necessary in the opencast section at 2A. All opencast areas will be rehabilitated and water within these artificially created aquifers will also begin to rise naturally, but more rapid than the surrounding 'natural' aquifers. Decant at the lowest elevation is therefore possible from the rehabilitated opencast areas due to increased transmissivity compared to ambient. Decant is also possible from underground voids but is unlikely.	Reversible	Low Degree	Closure	17 Ha	3	4	H	Control	<ul style="list-style-type: none"> A rehabilitation plan must be implemented, and the plan should be done in the line with the contents of National Water Act (Act No 36 of 1998), to avoid subsequent negative environmental impacts that may occur. Maintain containment barriers underground left intact between compartments to assist in final water containment. Update monitoring programme and the effectiveness of existing monitoring borehole positions should be re-evaluated. Continuation of the monitoring programme to establish post decommissioning trends. Pumping of affected water to EWRP should continue for as long as possible to keep water levels below decant levels. 	2	3	M	To minimise the extent of disturbance of the aquifer and to limit degeneration of groundwater quality and quantity.	Groundwater monitoring (quarterly)	1 Year	



NO	ASPECTS AFFECTED	ACTIVITY	POTENTIAL IMPACT		PHASE in which impact is anticipated	SIZE AND SCALE of disturbance	SIGNIFICANCE if not mitigated			MITIGATION TYPE (modify, remedy, control, or stop) through e.g. noise control measures)	MITIGATION MEASURES	SIGNIFICANCE If mitigated			STANDARD TO BE ACHIEVED	COMPLIANCE WITH STANDARDS	TIME PERIOD FOR IMPLEMENTATION	
			Impact Description	Reversibility			Irreplaceable loss	Probability	Magnitude			Significance	Probability	Magnitude				Significance
9	Surface Water	<ul style="list-style-type: none"> Grading, vegetation clearing and soil stripping Trench excavation and storage of soil stockpiles Use of hazardous materials 	<ul style="list-style-type: none"> Decrease in surface water quality when any surface water comes into contact with dust, eroded soil, carbonaceous materials or other pollutants generated during the construction phase. The sediment load within surface water runoff may increase if not prevented or mitigated. Spillages of hazardous materials (i.e. oil, fuel and / or grease) used during the construction of the proposed Project may impact on the surrounding clean water environment. Deterioration of water quality, affecting the use of surface water as a natural resource. 	Reversible	Low Degree	Construction	46 196 m	3	2	M	Control	<ul style="list-style-type: none"> Laydown area must be kept as small as reasonably possible. Soil stockpiles must be placed in designated areas and covered to protect the soils. The excavated trenches must be filled in and revegetated as soon as possible to prevent erosion. Store fuel and oil in designated bunded areas 	2	2	L	To conserve the surface water resource and prevent impact on downstream water users	Surface water quality monitoring (monthly).	1 Year



NO	ASPECTS AFFECTED	ACTIVITY	POTENTIAL IMPACT				PHASE in which impact is anticipated	SIZE AND SCALE of disturbance	SIGNIFICANCE if not mitigated			MITIGATION TYPE (modify, remedy, control, or stop) through e.g. noise control measures)	MITIGATION MEASURES	SIGNIFICANCE If mitigated			STANDARD TO BE ACHIEVED	COMPLIANCE WITH STANDARDS	TIME PERIOD FOR IMPLEMENTATION
			Impact Description	Reversibility	Irreplaceable loss	Probability			Magnitude	Significance	Probability			Magnitude	Significance				
10	Surface Water	Operation of the pipeline system	<ul style="list-style-type: none"> In areas where the pipelines are to be installed above ground, and support structures are needed, it could impact on the natural flow of surface water towards the Olifants River The pipelines will be constructed below ground. However, should a pipeline burst, or similar incident occur, affected water could migrate to the surface and affected water could spill into the clean water environment. Deterioration of water quality, affecting the use of surface water as a natural resource. 	Reversible	Low Degree	Operational	46 196 m	3	2	M	Control	<ul style="list-style-type: none"> Construct the pipelines along the edges of the existing ramps, haul roads, light vehicle gravel roads and through the existing plant area. Utilise existing storm water culverts at any watercourse crossing Conduct regular inspections on the pipeline system to detect any leaks or malfunctions 	2	2	L	To conserve the surface water resource and prevent impact on downstream water users.	Surface water quality monitoring (monthly).	1 Year	
11	Air Quality	<ul style="list-style-type: none"> Clearance of vegetation. Construction of Pipelines and associated pump stations 	Continued utilisation of gravel roads to gain access to the Khwezela Bokgoni Colliery surface land use areas could impact intermittently on the dust content of the air and on the fallout dust levels, within the study area.	Reversible	Low Degree	Construction	46 196 m	3	2	M	Control	<ul style="list-style-type: none"> Ensure dust suppression is implemented throughout construction phase. 	2	2	L	To reduce air quality impacts from construction activities.	Dust fallout monitoring (monthly)	1 Year	
12	Noise	It is anticipated that the proposed project will not have a severe impact on noise aspects. Mining activities are currently taking place at Khwezela Bokgoni Colliery. Therefore, it is likely that regular passers-by and the local residents are desensitised to the mining activities.																	
13	Visual	It is anticipated that the proposed project will not have a severe impact on visual aspects. Mining activities are currently taking place at Khwezela Bokgoni Colliery. Therefore, it is likely that regular passers-by and the local residents are desensitised to the mining activities.																	



NO	ASPECTS AFFECTED	ACTIVITY	POTENTIAL IMPACT				PHASE in which impact is anticipated	SIZE AND SCALE of disturbance	SIGNIFICANCE if not mitigated			MITIGATION TYPE (modify, remedy, control, or stop) through e.g. noise control measures)	MITIGATION MEASURES	SIGNIFICANCE If mitigated			STANDARD TO BE ACHIEVED	COMPLIANCE WITH STANDARDS	TIME PERIOD FOR IMPLEMENTATION
			Impact Description	Reversibility	Irreplaceable loss	Probability			Magnitude	Significance	Probability			Magnitude	Significance				
14	Sites of Archaeological and Cultural Importance		It is anticipated that no site of archaeological and cultural importance will be impacted.																
15	Socio-Economic	<p>Pumping of affected water into 3A North Underground Area and 5 West Void.</p> <p>Construction of pipelines and associated pump stations</p>	Jobs will be retained, providing income and, therefore, having a further impact on the regional socio-economy aspects of the area, along with other benefits arising from the Social and Labour Plan.	Reversible	Low Degree	Operational	Local and Regional	Positive		Control	<ul style="list-style-type: none"> Where possible and feasible, local procurement of labour should be applied to ensure the maximum benefit to the impacted community. Continuous skills and development training will equip low-skilled labourers with experience and advanced skills to work on other mining projects within the area, thus creating long-term employment if the foreseeable future. 	Positive		Prevent socio-economic impacts by employment opportunities.	Implementation of approved Social and Labour Plan.	1 year			



6. Summary of the positive and negative implications and risks of the proposed activity and identified alternatives

Table 9: Summary of the negative environmental impacts, after mitigation

NO.	ACTIVITY	POTENTIAL IMPACT	PHASE in which impact is anticipated	SIGNIFICANCE If mitigated
Geology				
1	Pumping of affected water into 3A North Underground Area and 5 West Void.	The pumping of water underground may affect the stability of the geology due to the weathering and erosion.	Operational; Decommissioning	Medium
Topography				
2	Earthworks and excavation of trench for pipeline.	Altered runoff patterns, leading to increased erosion and sedimentation of freshwater habitat.	Construction	Low
Soils				
3	<ul style="list-style-type: none"> Clearance of vegetation. Removal and stockpiling of topsoil. Construction of pipelines and associated pump stations. Earthworks and excavation of trench for pipeline. 	<ul style="list-style-type: none"> A loss of microbes and viable seed may occur as a result of the temporary stockpiling of topsoil. The removal of topsoil may result in the mixing of the horizons of the soil that will have an impact on the fertility and production potential of the soil. The temporary stockpiling of topsoil may result in a decrease in the fertility of the soil and the leaching of minerals due to exposure of the soil to elements. 	Construction; Operational; Decommissioning	Low



NO.	ACTIVITY	POTENTIAL IMPACT	PHASE in which impact is anticipated	SIGNIFICANCE If mitigated
		<ul style="list-style-type: none"> Soil pollution due to hazardous chemical substances including fuel greases and oils used on site. Erosion due to pipe bursts 		
Land Capability				
4	Pumping of affected water into 3A North Underground Area and 5 West Void. Construction of pipelines and associated pump stations.	Since Khwezela Bokgoni Colliery is pumping water to the existing 3A North Underground Area and 5 West Void, that are areas that have been previously disturbed and where the land capability has already been altered, no additional changes in land capability will take place during the Construction or Operational Phases.		
Fauna and Flora				
5	<ul style="list-style-type: none"> Clearance of vegetation Removal and stockpiling of topsoil. Earthworks and excavation of trench for pipeline 	<ul style="list-style-type: none"> Spread of alien invasive plant species from the transformed areas to the natural vegetation. Disturbance of sensitive vegetation. Damage to natural habitat due to construction activities and consequential displacement of faunal species. Revegetation of areas disturbed during construction 	Construction; Decommissioning	Low
Sensitive Landscapes (Including Wetlands)				
6	<ul style="list-style-type: none"> Construction of pipelines within wetland habitat. Construction of pipelines within 500m regulated area but outside wetlands. 	<ul style="list-style-type: none"> Alteration/damage to banks. Disturbance and loss of biodiversity & habitat. Dust generation. 	Construction	Medium



NO.	ACTIVITY	POTENTIAL IMPACT	PHASE in which impact is anticipated	SIGNIFICANCE If mitigated
		<ul style="list-style-type: none"> • Compaction of wetland sediments. • Spillages and leaks from machinery and equipment. • Water quality impact. 		
7	<ul style="list-style-type: none"> • Operation of pipeline within wetland habitat • Operation of pipelines within the 500 m regulated area but outside wetland habitat 	<ul style="list-style-type: none"> • Water quality deterioration due to leaks or pipe bursts. • Erosion due to pipe bursts. 	Operational	Medium
Ground Water				
8	Storage of surplus water in underground and opencast voids	<ul style="list-style-type: none"> • The shallow weathered and unconfined aquifer is highly susceptible to pollution from surface. • Artificial recharge could increase the water levels and pressures greater than ambient, which could result in the 'unlimited' migration of water and pollutants within the weathered aquifer. 	Operational	Low
9	Storage of surplus water in underground and opencast voids	At the LoM, when all mining has ceased at Bokgoni, the water in the underground compartments begin to rise naturally and no dewatering will be necessary in the opencast section at 2A. All opencast areas will be rehabilitated and water within these artificially created aquifers will also begin to rise naturally, but more rapid than the surrounding 'natural' aquifers. Decant at the lowest elevation is therefore possible from the rehabilitated opencast areas due to	Closure	Medium



NO.	ACTIVITY	POTENTIAL IMPACT	PHASE in which impact is anticipated	SIGNIFICANCE If mitigated
		increased transmissivity compared to ambient. Decant is also possible from underground voids but is unlikely.		
Surface Water				
10	Grading, vegetation clearing and soil stripping. Trench excavation and storage of soil stockpiles	<ul style="list-style-type: none"> Decrease in surface water quality when any surface water comes into contact with dust, eroded soil, carbonaceous materials or other pollutants generated during the construction phase. The sediment load within surface water runoff may increase if not prevented or mitigated. Spillages of hazardous materials (i.e. oil, fuel and / or grease) used during the construction of the proposed Project may impact on the surrounding clean water environment. Deterioration of water quality, affecting the use of surface water as a natural resource. 	Construction	Low
11	Operation of the pipeline system	<ul style="list-style-type: none"> In areas where the pipelines are to be installed above ground, and support structures are needed, it could impact on the natural flow of surface water towards the Olifants River The pipelines will be constructed below ground. However, should a pipeline burst, or similar incident occur, affected water could migrate to the surface and 	Operation	Low



NO.	ACTIVITY	POTENTIAL IMPACT	PHASE in which impact is anticipated	SIGNIFICANCE If mitigated
		affected water could spill into the clean water environment. <ul style="list-style-type: none"> Deterioration of water quality, affecting the use of surface water as a natural resource. 		
Air Quality				
12	<ul style="list-style-type: none"> Clearance of vegetation. Construction of Pipelines and associated pump stations 	Continued utilisation of gravel roads to gain access to the Khwezela Bokgoni Colliery surface land use areas could impact intermittently on the dust content of the air and on the fallout dust levels, within the study area.	Construction	Low
Noise				
13	It is anticipated that the proposed project will not have a severe impact on noise aspects. Mining activities are currently taking place at Khwezela Bokgoni Colliery. Therefore, it is likely that regular passers-by and the local residents are desensitised to the mining activities.			
Visual				
14	It is anticipated that the proposed project will not have a severe impact on visual aspects. Mining activities are currently taking place at Khwezela Bokgoni Colliery. Therefore, it is likely that regular passers-by and the local residents are desensitised to the mining activities.			
Sites of Archaeological Importance				
15	It is anticipated that no site of archaeological and cultural importance will be impacted.			



Table 10: Summary of the positive environmental impacts, after mitigation

NO.	ACTIVITY	POTENTIAL IMPACT	PHASE in which impact is anticipated	SIGNIFICANCE If mitigated
Socio-Economic				
1	Pumping of affected water into 3A North Underground Area and 5 West Void. Construction of pipelines and associated pump stations	Jobs will be retained, providing income and, therefore, having a further impact on the regional socio-economy aspects of the area, along with other benefits arising from the Social and Labour Plan.	Operational	Positive Impact

7. Cumulative impacts

Cumulative impacts refer to the situation where an activity may in itself not have a significant impact, but may become significant when added to the existing and potential impacts from similar or different activities in the area. Cumulative impacts can be defined as “changes to the environment that are caused by an action in combination with other past, present and future human actions” (DEAT, 2004). Different types of cumulative impacts can occur, depending on the characteristics thereof. Table 8 below presents a summary of these cumulative impacts as per Guideline 5: Assessment of Alternatives and Impacts (DEAT, 2006).

Table 11: Types of Cumulative Impacts

Type	Description
Additive	Where it adds to the impact which is caused by other similar impacts.
Interactive impact	A cumulative impact is caused by different impacts that combine to form a new kind of impact.
	<p>Countervailing</p> <p>The net adverse cumulative impact is less than the sum of the individual impacts.</p> <p>Synergistic</p> <p>The net adverse cumulative impact is greater than the sum of the individual impacts.</p>



Table 12: Identified cumulative impacts

ENVIRONMENTAL COMPONENT (ASPECTS AFFECTED)	ACTIVITY	POTENTIAL IMPACT DESCRIPTION
Geology	Continuation of the Alternative Fuels and Resources Programme	No contribution to cumulative impacts associated with the Post 2A Dam Water Management Strategy project.
Topography, Soils Land Use and Land Capability	Continuation of the Alternative Fuels and Resources Programme	No contribution to cumulative impacts associated with the Post 2A Dam Water Management Strategy project.
Flora and Fauna	Continuation of the Alternative Fuels and Resources Programme	No contribution to cumulative impacts associated with the Post 2A Dam Water Management Strategy project.
Surface and Ground Water	Continuation of the Alternative Fuels and Resources Programme	Surface and ground water resources may become contaminated in the event that contaminated surface water runoff from the site enters the receiving environment.
Sensitive Landscapes (including wetlands)	Continuation of the Alternative Fuels and Resources Programme	Surface water runoff from the Post 2A Dam Water Management Strategy project site may cumulatively have an impact on the wetlands located on the project site.
Socio-Economic	Continuation of the Alternative Fuels and Resources Programme	Jobs will be retained, providing income and, therefore, having a further impact on the regional socio-economy aspects of the area, along with other benefits arising from the Social and Labour Plan.
Air Quality	Continuation of the Alternative Fuels and Resources Programme	Nuisance impact of dust on residences in Ulco, considering the cumulative impact of the existing mining and processing operation.

8. Proposed impact management objectives and the impact management outcomes for inclusion into the EMPr

Based on the assessment and where applicable the recommendations from specialist reports, the table below summarises the impact management objectives and the impact management outcomes for the development for inclusion in the EMPr as well as for inclusion as conditions of authorisation.

Table 13: Impact management objectives and the impact management outcomes

ENVIRONMENTAL ASPECT	OBJECTIVE	SUMMARY OF IMPACT MANAGEMENT OUTCOME
Geology	Geology to remain stable and prevent sinkholes	Geological surveys (Quarterly).



ENVIRONMENTAL ASPECT	OBJECTIVE	SUMMARY OF IMPACT MANAGEMENT OUTCOME
Topography	To prevent alterations of natural topography of the area.	General implementation of activities taking Mining and Biodiversity Guidelines into account.
Soil	<ul style="list-style-type: none"> • To prevent soil contamination and to conserve surface and ground water resources as well as to prevent impact on downstream water users. • To prevent the loss of valuable topsoil. 	Bio-monitoring (Bi-annual). Groundwater monitoring (Quarterly). Surface water monitoring (monthly). Rehabilitation monitoring to be undertaken by suitably qualified rehabilitation specialist (in consultation with ecologist). General implementation of activities taking Mining and Biodiversity Guidelines into account.
Flora and Fauna	To preserve and protect indigenous fauna and flora.	Rehabilitation monitoring to be undertaken by suitably qualified rehabilitation specialist (in consultation with ecologist). General implementation of activities taking Mining and Biodiversity Guidelines into account.
Sensitive Landscapes (including wetlands)	To protect wetland and sensitive areas.	Bio-monitoring (Bi-annual). Groundwater monitoring (Quarterly). Surface water monitoring (monthly).
Ground Water	<ul style="list-style-type: none"> • To minimise the extent of disturbance of the aquifer and to limit degeneration of groundwater quality and quantity. • To minimise the extent of disturbance of the aquifer and to limit degeneration of groundwater quality and quantity. 	Groundwater monitoring (quarterly)
Surface Water	<ul style="list-style-type: none"> • To conserve the surface water resource and prevent impact on downstream water users. • To conserve the surface water resource and prevent impact on downstream water users. 	Surface water quality monitoring (monthly).
Air Quality	To reduce air quality impacts from construction activities.	Dust fallout monitoring (monthly)
Socio-Economic	Prevent socio economic impacts by employment opportunities	Implementation of approved Social and Labour Plan.

